FOUNDATIONS
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Axial point groups: rank 1, 2, 3 and 4 property tensor tables

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LINE GROUPS

RANK 1,2,3 AND 4 PROPERTY TENSOR TABLES

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Contents

Property Tensor Tables

Rank 1 Property Tensor Tables

Table Format:

V

1	e	a	ae
V	eV	aV	aeV

Series	n = 1	n > 1
$\mathbf{C}_n$	$\mathbf{C}_1 = \mathbf{1}$	$\mathbf{C}_\infty = \infty$
$\mathbf{C}_{nv}$	$\mathbf{C}_{1v} = \mathbf{m}_y$	$\mathbf{C}_{\infty v} = \infty\mathbf{mm}$
$\mathbf{S}_{2n}$	$\mathbf{S}_2 = \bar{\mathbf{1}}$	$\mathbf{C}_{\infty h} = \infty/\mathbf{m}$
$\mathbf{C}_{nh}$	$\mathbf{C}_{1h} = \mathbf{m}_z$	$\mathbf{C}_{\infty h} = \infty/\mathbf{m}$
$\mathbf{D}_n$	$\mathbf{D}_1 = \mathbf{2}_y$	$\mathbf{D}_\infty = \infty\mathbf{2}$
$\mathbf{D}_{nd}$	$\mathbf{D}_{1d} = \mathbf{2}_y/\mathbf{m}_y$	$\mathbf{D}_{\infty h} = \infty/\mathbf{mmm}$
$\mathbf{D}_{nh}$	$\mathbf{D}_{1h} = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z$	$\mathbf{D}_{\infty h} = \infty/\mathbf{mmm}$
$\mathbf{C}_{2n}(\mathbf{C}_n)$	$\mathbf{C}_2(\mathbf{C}_1) = \mathbf{2}_z(\mathbf{1}) = \mathbf{2}_z'$	$\mathbf{C}_\infty\mathbf{1}' = \infty\mathbf{1}'$
$\mathbf{S}_{2n}(\mathbf{C}_n)$	$\mathbf{S}_2(\mathbf{C}_1) = \bar{\mathbf{1}}(\mathbf{1}) = \bar{\mathbf{1}}'$	$\mathbf{C}_{\infty h}(\mathbf{C}_\infty) = \infty/\mathbf{m}'$
$\mathbf{C}_{nh}(\mathbf{C}_n)$	$\mathbf{C}_{1h}(\mathbf{C}_1) = \mathbf{m}_z(\mathbf{1}) = \mathbf{m}_z'$	$\mathbf{C}_{\infty h}(\mathbf{C}_\infty) = \infty/\mathbf{m}'$
$\mathbf{C}_{2nh}(\mathbf{S}_{2n})$	$\mathbf{C}_{2h}(\mathbf{S}_2) = \mathbf{2}_z/\mathbf{m}_z(\bar{\mathbf{1}}) = \mathbf{2}_z'/\mathbf{m}_z'$	$\mathbf{C}_{\infty h}\,\mathbf{1}' = \infty/\mathbf{m1}'$
$\mathbf{C}_{2nh}(\mathbf{C}_{nh})$	$\mathbf{C}_{2h}(\mathbf{C}_{1h}) = \mathbf{2}_z/\mathbf{m}_z(\mathbf{m}_z) = \mathbf{2}_z'/\mathbf{m}_z$	$\mathbf{C}_{\infty h}\mathbf{1}' = \infty/\mathbf{m1}'$
$\mathbf{D}_n(\mathbf{C}_n)$	$\mathbf{D}_1(\mathbf{C}_1) = \mathbf{2}_y(\mathbf{1}) = \mathbf{2}_y'$	$\mathbf{D}_\infty(\mathbf{C}_\infty) = \infty\mathbf{2}'$
$\mathbf{D}_{2n}(\mathbf{D}_n)$	$\mathbf{D}_2(\mathbf{D}_1) = \mathbf{2}_x\mathbf{2}_y\mathbf{2}(\mathbf{2}_y) = \mathbf{2}_x'\mathbf{2}_y\mathbf{2}_z'$	$\mathbf{D}_\infty\mathbf{1}' = \infty\mathbf{21}'$
$\mathbf{C}_{nv}(\mathbf{C}_n)$	$\mathbf{C}_{1v}(\mathbf{C}_1) = \mathbf{m}_y(\mathbf{1}) = \mathbf{m}_y'$	$\mathbf{C}_{\infty v}(\mathbf{C}_\infty) = \infty\mathbf{m}'\mathbf{m}'$
$\mathbf{C}_{2nv}(\mathbf{C}_{nv})$	$\mathbf{C}_{2v}(\mathbf{C}_{1v}) = \mathbf{2}_z\mathbf{m}_x\mathbf{m}_y(\mathbf{m}_y) = \mathbf{2}_z'\mathbf{m}_x'\mathbf{m}_y$	$\mathbf{C}_{\infty v}\mathbf{1}' = \infty\mathbf{mm1}'$
$\mathbf{D}_{nd}(\mathbf{S}_{2n})$	$\mathbf{D}_{1d}(\mathbf{S}_2) = \mathbf{2}_y/\mathbf{m}_y(\bar{\mathbf{1}}) = \mathbf{2}_y'/\mathbf{m}_y'$	$\mathbf{D}_{\infty h}(\mathbf{C}_{\infty h}) = \infty/\mathbf{mm}'\mathbf{m}'$
$\mathbf{D}_{nd}(\mathbf{D}_n)$	$\mathbf{D}_{1d}(\mathbf{D}_1) = \mathbf{2}_y/\mathbf{m}_y(\mathbf{2}_y) = \mathbf{2}_y/\mathbf{m}_y'$	$\mathbf{D}_{\infty h}(\mathbf{D}_\infty) = \infty/\mathbf{m}'\mathbf{m}'\mathbf{m}'$
$\mathbf{D}_{nd}(\mathbf{C}_{nv})$	$\mathbf{D}_{1d}(\mathbf{C}_{1v}) = \mathbf{2}_y/\mathbf{m}_y(\mathbf{m}_y) = \mathbf{2}_y'/\mathbf{m}_y$	$\mathbf{D}_{\infty h}(\mathbf{C}_{\infty v}) = \infty/\mathbf{m}'\mathbf{mm}$
$\mathbf{D}_{nh}(\mathbf{C}_{nh})$	$\mathbf{D}_{1h}(\mathbf{C}_{1h}) = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{m}_z) = \mathbf{2}_x'\mathbf{m}_y'\mathbf{m}_z$	$\mathbf{D}_{\infty h}(\mathbf{C}_{\infty h}) = \infty/\mathbf{mm}'\mathbf{m}'$
$\mathbf{D}_{nh}(\mathbf{D}_n)$	$\mathbf{D}_{1h}(\mathbf{D}_1) = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_x) = \mathbf{2}_x\mathbf{m}_y'\mathbf{m}_z'$	$\mathbf{D}_{\infty h}(\mathbf{D}_\infty) = \infty/\mathbf{m}'\mathbf{m}'\mathbf{m}'$
$\mathbf{D}_{nh}(\mathbf{C}_{nv})$	$\mathbf{D}_{1h}(\mathbf{C}_{1v}) = \mathbf{2}_x\mathbf{m}_y\,\mathbf{m}_z(\mathbf{m}_y) = \mathbf{2}_x'\mathbf{m}_y\,\mathbf{m}_z'$	$\mathbf{D}_{\infty h}(\mathbf{C}_{\infty v}) = \infty/\mathbf{m}'\mathbf{mm}$
$\mathbf{D}_{2nh}(\mathbf{D}_{nd})$	$\mathbf{D}_{2h}(\mathbf{D}_{1d}) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_y/\mathbf{m}_y) = \mathbf{m}_x'\mathbf{m}_y\,\mathbf{m}_z'$	$\mathbf{D}_{\infty h}\mathbf{1}' = \infty/\mathbf{mmm1}'$
$\mathbf{D}_{2nh}(\mathbf{D}_{nh})$	$\mathbf{D}_{2h}(\mathbf{D}_{1h}) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_x\mathbf{m}_y\mathbf{m}_z) = \mathbf{m}_x'\mathbf{m}_y\mathbf{m}_z$	$\mathbf{D}_{\infty h}\mathbf{1}' = \infty/\mathbf{mmm1}'$

Rank 2 Property Tensor Tables

Table Format:

V^2 $[V^2]$ $\{V^2\}$	1	e	a	ae
	V^2	eV^2	aV^2	aeV^2
	$[V^2]$	$e[V^2]$	$a[V^2]$	$ae[V^2]$
	$\{V^2\}$	$e\{V^2\}$	$a\{V^2\}$	$ae\{V^2\}$

Series	n = 1	n = 2	n > 2
$\mathbf{C}_n$	$\mathbf{C}_1 = \mathbf{1}$	$\mathbf{C}_2 = \mathbf{2}_z$	$\mathbf{C}_\infty = \infty$
$\mathbf{C}_{nv}$	$\mathbf{C}_{1v} = \mathbf{m}_y$	$\mathbf{C}_{2v} = \mathbf{2}_z\mathbf{m}_x\mathbf{m}_y$	$\mathbf{C}_{\infty v} = \infty\mathbf{mm}$
$\mathbf{S}_{2n}$	$\mathbf{S}_2 = \bar{\mathbf{1}}$	$\mathbf{S}_4 = \bar{\mathbf{4}}_z$	$\mathbf{C}_{\infty h} = \infty/\mathbf{m}$
$\mathbf{C}_{nh}$	$\mathbf{C}_{1h} = \mathbf{m}_z$	$\mathbf{C}_{2h} = \mathbf{2}/\mathbf{m}_z$	$\mathbf{C}_{\infty h} = \infty/\mathbf{m}$
$\mathbf{D}_n$	$\mathbf{D}_1 = \mathbf{2}_y$	$\mathbf{D}_2 = \mathbf{2}_x\mathbf{2}_y\mathbf{2}_z$	$\mathbf{D}_\infty = \infty\mathbf{2}$
$\mathbf{D}_{nd}$	$\mathbf{D}_{1d} = \mathbf{2}_y/\mathbf{m}_y$	$\mathbf{D}_{2d} = \bar{\mathbf{4}}_z\,\mathbf{m}_x\mathbf{2}_{xy}$	$\mathbf{D}_{\infty h} = \infty/\mathbf{mmm}$
$\mathbf{D}_{nh}$	$\mathbf{D}_{1h} = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z$	$\mathbf{D}_{2h} = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z$	$\mathbf{D}_{\infty h} = \infty/\mathbf{mmm}$
$\mathbf{C}_{2n}(\mathbf{C}_n)$	$\mathbf{C}_2(\mathbf{C}_1) = \mathbf{2}_z(\mathbf{1}) = \mathbf{2}_z'$	$\mathbf{C}_4(\mathbf{C}_2) = \mathbf{4}_z(\mathbf{2}_z) = \mathbf{4}_z'$	$\mathbf{C}_\infty\mathbf{1}' = \infty\mathbf{1}'$
$\mathbf{S}_{2n}(\mathbf{C}_n)$	$\mathbf{S}_2(\mathbf{C}_1) = \bar{\mathbf{1}}(\mathbf{1}) = \bar{\mathbf{1}}'$	$\mathbf{S}_4(\mathbf{C}_2) = \bar{\mathbf{4}}_z\,(\mathbf{2}_z) = \bar{\mathbf{4}}_z\,'$	$\mathbf{C}_{\infty h}(\mathbf{C}_\infty) = \infty/\mathbf{m}'$
$\mathbf{C}_{nh}(\mathbf{C}_n)$	$\mathbf{C}_{1h}(\mathbf{C}_1) = \mathbf{m}_z(\mathbf{1}) = \mathbf{m}_z'$	$\mathbf{C}_{2h}(\mathbf{C}_2) = \mathbf{2}_z/\mathbf{m}_z(\mathbf{2}_z) = \mathbf{2}_z/\mathbf{m}_z'$	$\mathbf{C}_{\infty h}(\mathbf{C}_\infty) = \infty/\mathbf{m}'$
$\mathbf{C}_{2nh}(\mathbf{S}_{2n})$	$\mathbf{C}_{2h}(\mathbf{S}_2) = \mathbf{2}_z/\mathbf{m}_z(\bar{\mathbf{1}}) = \mathbf{2}_z'/\mathbf{m}_z'$	$\mathbf{C}_{4h}(\mathbf{S}_4) = \mathbf{4}_z/\mathbf{m}_z(\bar{\mathbf{4}}_z) = \mathbf{4}_z'/\mathbf{m}_z'$	$\mathbf{C}_{\infty h}\,\mathbf{1}' = \infty/\mathbf{m}\mathbf{1}'$

Series n = 1 **Rank 2**

n = 2

n > 2

$\mathbf{C_{2nh}(C_{nh})}$ $\mathbf{C_{2h}(C_{1h}) = 2_z/m_z(m_z) = 2_z'/m_z}$

$\mathbf{C_{4h}(C_{2h}) = 4_z/m_z(2_z/m_z) = 4_z'/m_z}$

$\mathbf{C_{\infty h}1' = \infty/m1'}$

$\mathbf{D_n(C_n)}$ $\mathbf{D_1(C_1) = 2_y(1) = 2_y'}$

$\mathbf{D_2(C_2) = 2_x2_y2_z(2_z) = 2_x'2_y'2_z}$

$\mathbf{D_\infty(C_\infty) = \infty 2'}$

$\mathbf{D_{2n}(D_n)}$ $\mathbf{D_2(D_1) = 2_x2_y2(2_y) = 2_x'2_y2_z'}$

$\mathbf{D_4(D_2) = 4_z2_x2_{xy}(2_x2_y2_z) = 4_z'2_x2_{xy}'}$

$\mathbf{D_\infty 1' = \infty 21'}$

$\mathbf{C_{nv}(C_n)}$ $\mathbf{C_{1v}(C_1) = m_y(1) = m_y'}$

$\mathbf{C_{2v}(C_2) = 2_zm_xm_y(2_z) = 2_zm_x'm_y'}$

$\mathbf{C_{\infty v}(C_\infty) = \infty m'm'}$

$\mathbf{C_{2nv}(C_{nv})}$ $\mathbf{C_{2v}(C_{1v}) = 2_zm_xm_y(m_y) = 2_z'm_x'm_y}$

$\mathbf{C_{4v}(C_{2v}) = 4_zm_xm_{xy}(2_zm_xm_y) = 4_z'm_xm_{xy}'}$

$\mathbf{C_{\infty v}1' = \infty mm1'}$

$\mathbf{D_{nd}(S_{2n})}$ $\mathbf{D_{1d}(S_2) = 2_y/m_y(\bar{1}) = 2_y'/m_y'}$

$\mathbf{D_{2d}(S_4) = \bar{4}_z\, m_x2_{xy}(\bar{4}_z) = \bar{4}_z\, m_x'2_{xy}'}$

$\mathbf{D_{\infty h}(C_{\infty h}) = \infty/mm'm'}$

$\mathbf{D_{nd}(D_n)}$ $\mathbf{D_{1d}(D_1) = 2_y/m_y(2_y) = 2_y/m_y'}$

$\mathbf{D_{2d}(D_2) = \bar{4}_z\, m_x2_{xy}(2_{xy}2_{\bar{x}y}2_z) = \bar{4}_z\, 'm_x'2_{xy}}$

$\mathbf{D_{\infty h}(D_\infty) = \infty/m'm'm'}$

$\mathbf{D_{nd}(C_{nv})}$ $\mathbf{D_{1d}(C_{1v}) = 2_y/m_y(m_y) = 2_y'/m_y}$

$\mathbf{D_{2d}(C_{2v}) = \bar{4}_z\, m_x2_{xy}(2_zm_xm_y) = \bar{4}_z\, 'm_x2_{xy}'}$

$\mathbf{D_{\infty h}(C_{\infty v}) = \infty/m'mm}$

$\mathbf{D_{nh}(C_{nh})}$ $\mathbf{D_{1h}(C_{1h}) = 2_xm_ym_z(m_z) = 2_x'm_y'm_z}$

$\mathbf{D_{2h}(C_{2h}) = m_xm_ym_z(2_z/m_z) = m_x'm_y'm_z}$

$\mathbf{D_{\infty h}(C_{\infty h}) = \infty/mm'm'}$

$\mathbf{D_{nh}(D_n)}$ $\mathbf{D_{1h}(D_1) = 2_xm_ym_z(2_x) = 2_xm_y'm_z'}$

$\mathbf{D_{2h}(D_2) = m_xm_y\, m_z(2_x2_y2_z) = m_x'm_y'\, m_z'}$

$\mathbf{D_{\infty h}(D_\infty) = \infty/m'm'm'}$

$\mathbf{D_{nh}(C_{nv})}$ $\mathbf{D_{1h}(C_{1v}) = 2_xm_y\, m_z(m_y) = 2_x'm_y\, m_z'}$

$\mathbf{D_{2h}(C_{2v}) = m_xm_y\, m_z(2_zm_xm_y) = m_xm_y\, m_z'}$

$\mathbf{D_{\infty h}(C_{\infty v}) = \infty/m'mm}$

$\mathbf{D_{2nh}(D_{nd})}$ $\mathbf{D_{2h}(D_{1d}) = m_xm_ym_z(2_y/m_y) = m_x'm_y\, m_z'}$

$\mathbf{D_{4h}(D_{2d}) = 4_z/m_zm_xm_{xy}(\bar{4}_z\, m_x2_{xy}) = 4_z'/m_z'm_xm_{xy}'}$

$\mathbf{D_{\infty h}1' = \infty/mmm1'}$

$\mathbf{D_{2nh}(D_{nh})}$ $\mathbf{D_{2h}(D_{1h}) = m_xm_ym_z(2_xm_ym_z) = m_x'm_ym_z}$

$\mathbf{D_{4h}(D_{2h}) = 4_z/m_zm_xm_{xy}(m_xm_ym_z) = 4_z'/m_zm_xm_{xy}'}$

$\mathbf{D_{\infty h}1' = \infty/mmm1'}$

Rank 3 Property Tensor Tables

Table Format:

	1	e	a	ae
V^3	V^3	eV^3	aV^3	aeV^3
$[V^3]$	$[V^3]$	$e[V^3]$	$a[V^3]$	$ae[V^3]$
$V[V^2]$	$V[V^2]$	$eV[V^2]$	$aV[V^2]$	$aeV[V^2]$
$\{V^2\}V$	$\{V^2\}V$	$e\{V^2\}V$	$a\{V^2\}V$	$ae\{V^2\}V$

Series	n = 1	n = 2	n = 3	n > 3
$\mathbf{C}_n$	$\mathbf{C}_1 = \mathbf{1}$	$\mathbf{C}_2 = \mathbf{2}_z$	$\mathbf{C}_3 = \mathbf{3}_z$	$\mathbf{C}_\infty = \infty$
$\mathbf{C}_{nv}$	$\mathbf{C}_{1v} = \mathbf{m}_y$	$\mathbf{C}_{2v} = \mathbf{2}_z\mathbf{m}_x\mathbf{m}_y$	$\mathbf{C}_{3v} = \mathbf{3}_z\mathbf{m}_x$	$\mathbf{C}_{\infty v} = \infty\mathbf{mm}$
$\mathbf{S}_{2n}$	$\mathbf{S}_2 = \bar{\mathbf{1}}$	$\mathbf{S}_4 = \bar{\mathbf{4}}_z$	$\mathbf{S}_6 = \bar{\mathbf{3}}_z$	$\mathbf{C}_{\infty h} = \infty/\mathbf{m}$
$\mathbf{C}_{nh}$	$\mathbf{C}_{1h} = \mathbf{m}_z$	$\mathbf{C}_{2h} = \mathbf{2}/\mathbf{m}_z$	$\mathbf{C}_{3h} = \bar{\mathbf{6}}_z$	$\mathbf{C}_{\infty h} = \infty/\mathbf{m}$
$\mathbf{D}_n$	$\mathbf{D}_1 = \mathbf{2}_y$	$\mathbf{D}_2 = \mathbf{2}_x\mathbf{2}_y\mathbf{2}_z$	$\mathbf{D}_3 = \mathbf{3}_z\mathbf{2}_x$	$\mathbf{D}_\infty = \infty\mathbf{2}$
$\mathbf{D}_{nd}$	$\mathbf{D}_{1d} = \mathbf{2}_y/\mathbf{m}_y$	$\mathbf{D}_{2d} = \bar{\mathbf{4}}_z\,\mathbf{m}_x\mathbf{2}_{xy}$	$\mathbf{D}_{3d} = \bar{\mathbf{3}}_z\,\mathbf{m}_x$	$\mathbf{D}_{\infty h} = \infty/\mathbf{mmm}$
$\mathbf{D}_{nh}$	$\mathbf{D}_{1h} = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z$	$\mathbf{D}_{2h} = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z$	$\mathbf{D}_{3h} = \bar{\mathbf{6}}_z\,\mathbf{m}_x\mathbf{2}_1$	$\mathbf{D}_{\infty h} = \infty/\mathbf{mmm}$

Series n = 1 **Rank 3**

n = 2

n = 3

n > 3

$\mathbf{C_{2n}(C_n)}$ $\mathbf{C_2(C_1) = 2_z(1) = 2_z'}$

$\mathbf{C_4(C_2) = 4_z(2_z) = 4_z'}$

$\mathbf{C_6(C_3) = 6_z(3_z) = 6_z'}$

$\mathbf{C_\infty 1' = \infty 1'}$

$\mathbf{S_{2n}(C_n)}$ $\mathbf{S_2(C_1) = \bar{1}(1) = \bar{1}'}$

$\mathbf{S_4(C_2) = \bar{4}_z(2_z) = \bar{4}_z'}$

$\mathbf{S_6(C_3) = \bar{3}_z(3_z) = \bar{3}_z'}$

$\mathbf{C_{\infty h}(C_\infty) = \infty/m'}$

$\mathbf{C_{nh}(C_n)}$ $\mathbf{C_{1h}(C_1) = m_z(1) = m_z'}$

$\mathbf{C_{2h}(C_2) = 2_z/m_z(2_z) = 2_z/m_z'}$

$\mathbf{C_{3h}(C_3) = \bar{6}_z(3_z) = \bar{6}_z'}$

$\mathbf{C_{\infty h}(C_\infty) = \infty/m'}$

$\mathbf{C_{2nh}(S_{2n})}$ $\mathbf{C_{2h}(S_2) = 2_z/m_z(\bar{1}) = 2_z'/m_z'}$

$\mathbf{C_{4h}(S_4) = 4_z/m_z(\bar{4}_z) = 4_z'/m_z'}$

$\mathbf{C_{6h}(S_6) = 6_z/m_z(\bar{3}_z) = 6_z'/m_z'}$

$\mathbf{C_{\infty h}\ 1' = \infty/m1'}$

$\mathbf{C_{2nh}(C_{nh})}$ $\mathbf{C_{2h}(C_{1h}) = 2_z/m_z(m_z) = 2_z'/m_z}$

$\mathbf{C_{4h}(C_{2h}) = 4_z/m_z(2_z/m_z) = 4_z'/m_z}$

$\mathbf{C_{6h}(C_{3h}) = 6_z/m_z(3_z/m_z) = 6_z'/m_z}$

$\mathbf{C_{\infty h}1' = \infty/m1'}$

$\mathbf{D_n(C_n)}$ $\mathbf{D_1(C_1) = 2_y(1) = 2_y'}$

$\mathbf{D_2(C_2) = 2_x2_y2_z(2_z) = 2_x'2_y'2_z}$

$\mathbf{D_3(C_3) = 3_z2_x(3_z) = 3_z2_x'}$

$\mathbf{D_\infty(C_\infty) = \infty 2'}$

$\mathbf{D_{2n}(D_n)}$ $\mathbf{D_2(D_1) = 2_x2_y2(2_y) = 2_x'2_y2_z'}$

$\mathbf{D_4(D_2) = 4_z2_x2_{xy}(2_x2_y2_z) = 4_z'2_x2_{xy}'}$

$\mathbf{D_6(D_3) = 6_z2_x2_1(3_z2_x) = 6_z'2_x2_1'}$

$\mathbf{D_\infty 1' = \infty 21'}$

$\mathbf{C_{nv}(C_n)}$ $\mathbf{C_{1v}(C_1) = m_y(1) = m_y'}$

$\mathbf{C_{2v}(C_2) = 2_zm_xm_y(2_z) = 2_zm_x'm_y'}$

$\mathbf{C_{3v}(C_3) = 3_zm_x(3_z) = 3_zm_x'}$

$\mathbf{C_{\infty v}(C_\infty) = \infty m'm'}$

$\mathbf{C_{2nv}(C_{nv})}$ $\mathbf{C_{2v}(C_{1v}) = 2_zm_xm_y(m_y) = 2_z'm_x'm_y}$

$\mathbf{C_{4v}(C_{2v}) = 4_zm_xm_{xy}(2_zm_xm_y) = 4_z'm_xm_{xy}'}$

$\mathbf{C_{6v}(C_{3v}) = 6_zm_xm_1(3_zm_x) = 6_z'm_xm_1'}$

$\mathbf{C_{\infty v}1' = \infty mm1'}$

$\mathbf{D_{nd}(S_{2n})}$ $\mathbf{D_{1d}(S_2) = 2_y/m_y(\bar{1}) = 2_y'/m_y'}$

$\mathbf{D_{2d}(S_4) = \bar{4}_z\, m_x2_{xy}(\bar{4}_z) = \bar{4}_z\, m_x'2_{xy}'}$

$\mathbf{D_{3d}(S_6) = \bar{3}_z\, m_x(\bar{3}_z) = \bar{3}_z\, m_x'}$

$\mathbf{D_{\infty h}(C_{\infty h}) = \infty/mm'm'}$

Series n = 1 **Rank 3**

n = 2

n = 3

n > 3

$\mathbf{D_{nd}(D_n)}$ $\mathbf{D_{1d}(D_1) = 2_y/m_y(2_y) = 2_y/m_y'}$

$\mathbf{D_{2d}(D_2) = \bar{4}_z\, m_x 2_{xy}(2_{xy} 2_{\bar{x}y} 2_z) = \bar{4}_z\, 'm_x '2_{xy}}$

$\mathbf{D_{3d}(D_3) = \bar{3}_z\, m_x(3_z 2_x) = \bar{3}_z\, 'm_x'}$

$\mathbf{D_{\infty h}(D_\infty) = \infty/m'm'm'}$

$\mathbf{D_{nd}(C_{nv})}$ $\mathbf{D_{1d}(C_{1v}) = 2_y/m_y(m_y) = 2_y'/m_y}$

$\mathbf{D_{2d}(C_{2v}) = \bar{4}_z\, m_x 2_{xy}(2_z m_x m_y) = \bar{4}_z\, 'm_x 2_{xy}'}$

$\mathbf{D_{3d}(C_{3v}) = \bar{3}_z\, m_x(3_z m_x) = \bar{3}_z\, 'm_x}$

$\mathbf{D_{\infty h}(C_{\infty v}) = \infty/m'mm}$

$\mathbf{D_{nh}(C_{nh})}$ $\mathbf{D_{1h}(C_{1h}) = 2_x m_y m_z(m_z) = 2_x 'm_y 'm_z}$

$\mathbf{D_{2h}(C_{2h}) = m_x m_y m_z(2_z/m_z) = m_x 'm_y 'm_z}$

$\mathbf{D_{3h}(C_{3h}) = \bar{6}_z\, m_x 2_1(\bar{6}_z) = \bar{6}_z\, m_x '2_1'}$

$\mathbf{D_{\infty h}(C_{\infty h}) = \infty/mm'm'}$

$\mathbf{D_{nh}(D_n)}$ $\mathbf{D_{1h}(D_1) = 2_x m_y m_z(2_x) = 2_x m_y 'm_z'}$

$\mathbf{D_{2h}(D_2) = m_x m_y\, m_z(2_x 2_y 2_z) = m_x 'm_y'\, m_z'}$

$\mathbf{D_{3h}(D_3) = \bar{6}_z\, m_x 2_1(3_z 2_1) = \bar{6}_z\, 'm_x '2_1}$

$\mathbf{D_{\infty h}(D_\infty) = \infty/m'm'm'}$

$\mathbf{D_{nh}(C_{nv})}$ $\mathbf{D_{1h}(C_{1v}) = 2_x m_y\, m_z(m_y) = 2_x 'm_y\, m_z'}$

$\mathbf{D_{2h}(C_{2v}) = m_x m_y\, m_z(2_z m_x m_y) = m_x m_y\, m_z'}$

$\mathbf{D_{3h}(C_{3v}) = \bar{6}_z\, m_x 2_1(3_z m_x) = \bar{6}_z\, 'm_x 2_1'}$

$\mathbf{D_{\infty h}(C_{\infty v}) = \infty/m'mm}$

$\mathbf{D_{2nh}(D_{nd})}$ $\mathbf{D_{2h}(D_{1d}) = m_x m_y m_z(2_y/m_y) = m_x 'm_y\, m_z'}$

$\mathbf{D_{4h}(D_{2d}) = 4_z/m_z m_x m_{xy}(\bar{4}_z\, m_x 2_{xy}) = 4_z'/m_z 'm_x m_{xy}'}$

$\mathbf{D_{6h}(D_{3d}) = 6_z/m_z m_x m_1(\bar{3}_z\, m_x) = 6_z'/m_z 'm_x m_1'}$

$\mathbf{D_{\infty h}1' = \infty/mmm1'}$

$\mathbf{D_{2nh}(D_{nh})}$ $\mathbf{D_{2h}(D_{1h}) = m_x m_y m_z(2_x m_y m_z) = m_x 'm_y m_z}$

$\mathbf{D_{4h}(D_{2h}) = 4_z/m_z m_x m_{xy}(m_x m_y m_z) = 4_z'/m_z m_x m_{xy}'}$

$\mathbf{D_{6h}(D_{3h}) = 6_z/m_z m_x m_1(\bar{6}_z\, m_x 2_1) = 6_z'/m_z m_x m_1'}$

$\mathbf{D_{\infty h}1' = \infty/mmm1'}$

Rank 4 Property Tensor Tables

Table Format:

	1	e	a	ae
V^4	V^4	eV^4	aV^4	aeV^4
$[V^4]$	$[V^4]$	$e[V^4]$	$a[V^4]$	$ae[V^4]$
$V[V^3]$	$V[V^3]$	$eV[V^3]$	$aV[V^3]$	$aeV[V^3]$
$[[V^2]^2]$	$[[V^2]^2]$	$e[[V^2]^2]$	$a[[V^2]^2]$	$ae[[V^2]^2]$
$[V^2]^2$	$[V^2]^2$	$e[V^2]^2$	$a[V^2]^2$	$ae[V^2]^2$
$[(V^2)]^2$	$[(V^2)]^2$	$e[(V^2)]^2$	$a[(V^2)]^2$	$ae[(V^2)]^2$
$[V^2]V^2$	$[V^2]V^2$	$e[V^2]V^2$	$a[V^2]V^2$	$ae[V^2]V^2$

Series	n = 1	n = 2	n = 3	n = 4	n > 4
$\mathbf{C}_n$	$\mathbf{C}_1 = \mathbf{1}$	$\mathbf{C}_2 = \mathbf{2}_z$	$\mathbf{C}_3 = \mathbf{3}_z$	$\mathbf{C}_4 = \mathbf{4}_z$	$\mathbf{C}_\infty = \infty$
$\mathbf{C}_{nv}$	$\mathbf{C}_{1v} = \mathbf{m}_y$	$\mathbf{C}_{2v} = \mathbf{2}_z\mathbf{m}_x\mathbf{m}_y$	$\mathbf{C}_{3v} = \mathbf{3}_z\mathbf{m}_x$	$\mathbf{C}_{4v} = \mathbf{4}_z\mathbf{m}_x\mathbf{m}_{xy}$	$\mathbf{C}_{\infty v} = \infty\mathbf{mm}$
$\mathbf{S}_{2n}$	$\mathbf{S}_2 = \bar{\mathbf{1}}$	$\mathbf{S}_4 = \bar{\mathbf{4}}_z$	$\mathbf{S}_6 = \bar{\mathbf{3}}_z$	$\mathbf{S}_8 = \bar{\mathbf{8}}_z$	$\mathbf{C}_{\infty h} = \infty/\mathbf{m}$

Series	n = 1				**Rank 4**
		n = 2			
			n = 3		
				n = 4	
					n > 4
$\mathbf{C_{nh}}$	$\mathbf{C_{1h} = m_z}$				
		$\mathbf{C_{2h} = 2/m_z}$			
			$\mathbf{C_{3h} = \bar{6}_z}$		
				$\mathbf{C_{4h} = 4_z/m_z}$	
					$\mathbf{C_{\infty h} = \infty/m}$
$\mathbf{D_n}$	$\mathbf{D_1 = 2_y}$				
		$\mathbf{D_2 = 2_x2_y2_z}$			
			$\mathbf{D_3 = 3_z2_x}$		
				$\mathbf{D_4 = 4_z2_x2_{xy}}$	
					$\mathbf{D_\infty = \infty 2}$
$\mathbf{D_{nd}}$	$\mathbf{D_{1d} = 2_y/m_y}$				
		$\mathbf{D_{2d} = \bar{4}_z\, m_x2_{xy}}$			
			$\mathbf{D_{3d} = \bar{3}_z\, m_x}$		
				$\mathbf{D_{4d} = \bar{8}_z\, m_{x1}2_1}$	
					$\mathbf{D_{\infty h} = \infty/mmm}$
$\mathbf{D_{nh}}$	$\mathbf{D_{1h} = 2_xm_ym_z}$				
		$\mathbf{D_{2h} = m_xm_ym_z}$			
			$\mathbf{D_{3h} = \bar{6}_z\, m_x2_1}$		
				$\mathbf{D_{4h} = 4_z/m_zm_xm_{xy}}$	
					$\mathbf{D_{\infty h} = \infty/mmm}$
$\mathbf{C_{2n}(C_n)}$	$\mathbf{C_2(C_1) = 2_z(1) = 2_z'}$				
		$\mathbf{C_4(C_2) = 4_z(2_z) = 4_z'}$			
			$\mathbf{C_6(C_3) = 6_z(3_z) = 6_z'}$		
				$\mathbf{C_8(C_4) = 8_z(4_z) = 8_z'}$	
					$\mathbf{C_\infty 1' = \infty 1'}$
$\mathbf{S_{2n}(C_n)}$	$\mathbf{S_2(C_1) = \bar{1}(1) = \bar{1}'}$				
		$\mathbf{S_4(C_2) = \bar{4}_z\,(2_z) = \bar{4}_z'}$			
			$\mathbf{S_6(C_3) = \bar{3}_z\,(3_z) = \bar{3}_z'}$		
				$\mathbf{S_8(C_4) = \bar{8}_z\,(4_z) = \bar{8}_z'}$	
					$\mathbf{C_{\infty h}(C_\infty) = \infty/m'}$
$\mathbf{C_{nh}(C_n)}$	$\mathbf{C_{1h}(C_1) = m_z(1) = m_z'}$				
		$\mathbf{C_{2h}(C_2) = 2_z/m_z(2_z) = 2_z/m_z'}$			
			$\mathbf{C_{3h}(C_3) = \bar{6}_z\,(3_z) = \bar{6}_z'}$		
				$\mathbf{C_{4h}(C_4) = 4_z/m_z(4_z) = 4_z/m_z'}$	
					$\mathbf{C_{\infty h}(C_\infty) = \infty/m'}$

Series n = 1 **Rank 4**

n = 2

n = 3

n = 4

n > 4

$C_{2nh}(S_{2n})$ **$C_{2h}(S_2) = 2_z/m_z(\bar{1}) = 2_z'/m_z'$**

$C_{4h}(S_4) = 4_z/m_z(\bar{4}_z) = 4_z'/m_z'$

$C_{6h}(S_6) = 6_z/m_z(\bar{3}_z) = 6_z'/m_z'$

$C_{8h}(S_8) = 8_z/m_z(\bar{8}_z) = 8_z'/m_z'$

$C_{\infty h}\ 1' = \infty/m1'$

$C_{2nh}(C_{nh})$ **$C_{2h}(C_{1h}) = 2_z/m_z(m_z) = 2_z'/m_z$**

$C_{4h}(C_{2h}) = 4_z/m_z(2_z/m_z) = 4_z'/m_z$

$C_{6h}(C_{3h}) = 6_z/m_z(3_z/m_z) = 6_z'/m_z$

$C_{8h}(C_{4h}) = 8_z/m_z(4_z/m_z) = 8_z'/m_z$

$C_{\infty h}1' = \infty/m1'$

$D_n(C_n)$ **$D_1(C_1) = 2_y(1) = 2_y'$**

$D_2(C_2) = 2_x2_y2_z(2_z) = 2_x'2_y'2_z$

$D_3(C_3) = 3_z2_x(3_z) = 3_z2_x'$

$D_4(C_4) = 4_z2_x2_{xy}(4_z) = 4_z2_x'2_{xy}'$

$D_\infty(C_\infty) = \infty2'$

$D_{2n}(D_n)$ **$D_2(D_1) = 2_x2_y2(2_y) = 2_x'2_y2_z'$**

$D_4(D_2) = 4_z2_x2_{xy}(2_x2_y2_z) = 4_z'2_x2_{xy}'$

$D_6(D_3) = 6_z2_x2_1(3_z2_x) = 6_z'2_x2_1'$

$D_8(D_4) = 8_z2_{x1}2_1(4_z2_{x1}2_{x2}) = 8_z'2_{x1}2_1'$

$D_\infty1' = \infty21'$

$C_{nv}(C_n)$ **$C_{1v}(C_1) = m_y(1) = m_y'$**

$C_{2v}(C_2) = 2_zm_xm_y(2_z) = 2_zm_x'm_y'$

$C_{3v}(C_3) = 3_zm_x(3_z) = 3_zm_x'$

$C_{4v}(C_4) = 4_zm_xm_{xy}(4_z) = 4_zm_x'm_{xy}'$

$C_{\infty v}(C_\infty) = \infty m'm'$

$C_{2nv}(C_{nv})$ **$C_{2v}(C_{1v}) = 2_zm_xm_y(m_y) = 2_z'm_x'm_y$**

$C_{4v}(C_{2v}) = 4_zm_xm_{xy}(2_zm_xm_y) = 4_z'm_xm_{xy}'$

$C_{6v}(C_{3v}) = 6_zm_xm_1(3_zm_x) = 6_z'm_xm_1'$

$C_{8v}(C_{4v}) = 8_zm_{x1}m_1(4_zm_xm_{xy}) = 8_z'm_{x1}m_1'$

$C_{\infty v}1' = \infty mm1'$

$D_{nd}(S_{2n})$ **$D_{1d}(S_2) = 2_y/m_y(\bar{1}) = 2_y'/m_y'$**

$D_{2d}(S_4) = \bar{4}_z\, m_x2_{xy}(\bar{4}_z) = \bar{4}_z\, m_x'2_{xy}'$

$D_{3d}(S_6) = \bar{3}_z\, m_x(\bar{3}_z) = \bar{3}_z\, m_x'$

$D_{4d}(S_8) = \bar{8}_z\, m_{x1}2_1(\bar{8}_z) = \bar{8}_z\, m_{x1}'2_1'$

$D_{\infty h}(C_{\infty h}) = \infty/mm'm'$

Series n = 1 **Rank 4**

n = 2

n = 3

n = 4

n > 4

$\mathbf{D_{nd}(D_n)}$ $\mathbf{D_{1d}(D_1) = 2_y/m_y(2_y) = 2_y/m_y'}$

$\mathbf{D_{2d}(D_2) = \bar{4}_z\, m_x 2_{xy}(2_{xy} 2_{\bar{x}y} 2_z) = \bar{4}_z\, 'm_x '2_{xy}}$

$\mathbf{D_{3d}(D_3) = \bar{3}_z\, m_x(3_z 2_x) = \bar{3}_z\, 'm_x'}$

$\mathbf{D_{4d}(D_4) = \bar{8}_z\, m_{x1} 2_1(4_z 2_x 2_{xy}) = \bar{8}_z\, 'm_{x1}' 2_1}$

$\mathbf{D_{\infty h}(D_\infty) = \infty/m'm'm'}$

$\mathbf{D_{nd}(C_{nv})}$ $\mathbf{D_{1d}(C_{1v}) = 2_y/m_y(m_y) = 2_y'/m_y}$

$\mathbf{D_{2d}(C_{2v}) = \bar{4}_z\, m_x 2_{xy}(2_z m_x m_y) = \bar{4}_z\, 'm_x 2_{xy}'}$

$\mathbf{D_{3d}(C_{3v}) = \bar{3}_z\, m_x(3_z m_x) = \bar{3}_z\, 'm_x}$

$\mathbf{D_{4d}(C_{4v}) = \bar{8}_z\, m_{x1} 2_1(4_z m_{x1} m_{x3}) = \bar{8}_z\, 'm_{x1} 2}$

$\mathbf{D_{\infty h}(C_{\infty v}) = \infty/m'mm}$

$\mathbf{D_{nh}(C_{nh})}$ $\mathbf{D_{1h}(C_{1h}) = 2_x m_y m_z(m_z) = 2_x 'm_y 'm_z}$

$\mathbf{D_{2h}(C_{2h}) = m_x m_y m_z(2_z/m_z) = m_x 'm_y 'm_z}$

$\mathbf{D_{3h}(C_{3h}) = \bar{6}_z\, m_x 2_1(\bar{6}_z) = \bar{6}_z\, m_x '2_1'}$

$\mathbf{D_{4h}(C_{4h}) = 4_z/m_z m_x m_{xy}(4_z/m_z) = 4_z/m_z m_x 'm_{xy}'}$

$\mathbf{D_{\infty h}(C_{\infty h}) = \infty/mm'm'}$

$\mathbf{D_{nh}(D_n)}$ $\mathbf{D_{1h}(D_1) = 2_x m_y m_z(2_x) = 2_x m_y 'm_z'}$

$\mathbf{D_{2h}(D_2) = m_x m_y\, m_z(2_x 2_y 2_z) = m_x 'm_y'\, m_z'}$

$\mathbf{D_{3h}(D_3) = \bar{6}_z\, m_x 2_1(3_z 2_1) = \bar{6}_z\, 'm_x '2_1}$

$\mathbf{D_{4h}(D_4) = 4_z/m_z m_x m_{xy}(4_z 2_x 2_{xy}) = 4_z/m_z 'm_x 'm_{xy}'}$

$\mathbf{D_{\infty h}(D_\infty) = \infty/m'm'm'}$

$\mathbf{D_{nh}(C_{nv})}$ $\mathbf{D_{1h}(C_{1v}) = 2_x m_y\, m_z(m_y) = 2_x 'm_y\, m_z'}$

$\mathbf{D_{2h}(C_{2v}) = m_x m_y\, m_z(2_z m_x m_y) = m_x m_y\, m_z'}$

$\mathbf{D_{3h}(C_{3v}) = \bar{6}_z\, m_x 2_1(3_z m_x) = \bar{6}_z\, 'm_x 2_1'}$

$\mathbf{D_{4h}(C_{4v}) = 4_z/m_z m_x m_{xy}(4_z m_x m_{xy}) = 4_z/m_z 'm_x m_{xy}}$

$\mathbf{D_{\infty h}(C_{\infty v}) = \infty/m'mm}$

$\mathbf{D_{2nh}(D_{nd})}$ $\mathbf{D_{2h}(D_{1d}) = m_x m_y m_z(2_y/m_y) = m_x 'm_y\, m_z'}$

$\mathbf{D_{4h}(D_{2d}) = 4_z/m_z m_x m_{xy}(\bar{4}_z\, m_x 2_{xy}) = 4_z '/m_z 'm_x m_{xy}'}$

$\mathbf{D_{6h}(D_{3d}) = 6_z/m_z m_x m_1(\bar{3}_z\, m_x) = 6_z '/m_z 'm_x m_1'}$

$\mathbf{C_{8h}(D_{4d}) = 8_z/m_z m_{x1} m_1(\bar{8}_z\, m_{x1} 2_1) = 8_z '/m_z 'm_{x1} m_1'}$

$\mathbf{D_{\infty h}1' = \infty/mmm1'}$

$\mathbf{D_{2nh}(D_{nh})}$ $\mathbf{D_{2h}(D_{1h}) = m_x m_y m_z(2_x m_y m_z) = m_x 'm_y m_z}$

$\mathbf{D_{4h}(D_{2h}) = 4_z/m_z m_x m_{xy}(m_x m_y m_z) = 4_z '/m_z m_x m_{xy}'}$

$\mathbf{D_{6h}(D_{3h}) = 6_z/m_z m_x m_1(\bar{6}_z\, m_x 2_1) = 6_z '/m_z m_x m_1'}$

$\mathbf{D_{8h}(D_{4h}) = 8_z/m_z m_{x1} m_1(4_z/m_z m_{x1} m_{x2}) = 8_z '/m_z m_{x1} m_1'}$

$\mathbf{D_{\infty h}1' = \infty/mmm1'}$

Rank 1, 2, 3, and 4 Property Tensors

Rank 1:

V	eV	aV	aeV	

Rank 2:

V^2	eV^2	aV^2	aeV^2	
$[V^2]$	$e[V^2]$	$a[V^2]$	$ae[V^2]$	ij=ji
$\{V^2\}$	$e\{V^2\}$	$a\{V^2\}$	$ae\{V^2\}$	ij=-ji

Rank 3:

V^3	eV^3	aV^3	aeV^3	
$[V^3]$	$e[V^3]$	$a[V^3]$	$ae[V^3]$	symmetric wrt all indicies
$V[V^2]$	$eV[V^2]$	$aV[V^2]$	$aeV[V^2]$	ilk=ikl
$\{V^2\}V$	$e\{V^2\}V$	$a\{V^2\}V$	$ae\{V^2\}V$	jik=-ijk

Rank 4:

V^4	eV^4	aV^4	aeV^4	
$[V^4]$	$e[V^4]$	$a[V^4]$	$ae[V^4]$	symmetric wrt all indicies
$V[V^3]$	$eV[V^3]$	$aV[V^3]$	$aeV[V^3]$	symmetric wrt to last three indicies
$[[V^2]^2]$	$e[[V^2]^2]$	$a[[V^2]^2]$	$ae[[V^2]^2]$	ijkl= jikl=ijlk=klij
$[V^2]^2$	$e[V^2]^2$	$a[V^2]^2$	$ae[V^2]^2$	ijkl=jikl=ijlk
$[(V^2)]^2$	$e[(V^2)]^2$	$a[(V^2)]^2$	$ae[(V^2)]^2$	klij=ijkl
$[V^2]V^2$	$e[V^2]V^2$	$a[V^2]V^2$	$ae[V^2]V^2$	jikl=ijkl

Printed Matrix Format of Rank 1, 2, 3, and 4 Property Tensors

Rank 1 tensors:

$$\begin{pmatrix} 1 \\ e \\ a \\ ae \end{pmatrix} V \qquad \begin{pmatrix} x \\ y \\ z \end{pmatrix}$$

Rank 2 tensors:

$$\begin{pmatrix} 1 \\ e \\ a \\ ae \end{pmatrix} V^2 \qquad \begin{pmatrix} xx & xy & xz \\ yx & yy & yz \\ zx & zy & zz \end{pmatrix}$$

$$\begin{pmatrix} 1 \\ e \\ a \\ ae \end{pmatrix} [V^2] \qquad \begin{pmatrix} xx & xy & xz \\ xy & yy & yz \\ xz & yz & zz \end{pmatrix} \qquad ij = ji$$

$$\begin{pmatrix} 1 \\ e \\ a \\ ae \end{pmatrix} \{V^2\} \qquad \begin{pmatrix} 0 & xy & xz \\ -xy & 0 & yz \\ -xz & -yz & 0 \end{pmatrix} \qquad ij = -ji$$

Rank 3 tensors:

$$\begin{pmatrix} 1 \\ e \\ a \\ ae \end{pmatrix} V^3 \qquad \begin{pmatrix} xxx & xyy & xzz & xyz & xzx & xxy & xzy & xxz & xyx \\ yxx & yyy & yzz & yyz & yzx & yxy & yzy & yxz & yyx \\ zxx & zyy & zzz & zyz & zzx & zxy & zzy & zxz & zyx \end{pmatrix}$$

$$\begin{pmatrix} 1 \\ e \\ a \\ ae \end{pmatrix} [V^3] \qquad \begin{pmatrix} xxx & xyy & xzz & xyz \\ yxx & yyy & yzz & \\ zxx & zyy & zzz & \end{pmatrix} \qquad \text{symmetric with respect to all indicies}$$

$$\begin{pmatrix} 1 \\ e \\ a \\ ae \end{pmatrix} V[V^2] \qquad \begin{pmatrix} xxx & xyy & xzz & xyz & xxz & xxy \\ yxx & yyy & yzz & yyz & yxz & yxy \\ zxx & zyy & zzz & zyz & zxz & zxy \end{pmatrix} \qquad ilk = ikl$$

$$\begin{pmatrix} 1 \\ e \\ a \\ ae \end{pmatrix} \{V^2\}V \qquad \begin{pmatrix} yzx & yzy & yzz \\ zxx & zxy & zxz \\ xyx & xyy & xyz \end{pmatrix} \qquad jik = -ijk$$

Rank 4 tensors:

$$\begin{pmatrix} 1 \\ e \\ a \\ ae \end{pmatrix} V^4 \quad \begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & xxyx \\ yyxx & yyyy & yyzz & yyyz & yyzx & yyxy & yyzy & yyxz & yyyx \\ zzxx & zzyy & zzzz & zzyz & zzzx & zzxy & zzzy & zzxz & zzyx \\ yzxx & yzyy & yzzz & yzyz & yzzx & yzxy & yzzy & yzxz & yzyx \\ zxxx & zxyy & zxzz & zxyz & zxzx & zxxy & zxzy & zxxz & zxyx \\ xyxx & xyyy & xyzz & xyyz & xyzx & xyxy & xyzy & xyxz & xyyx \\ zyxx & zyyy & zyzz & zyyz & zyzx & zyxy & zyzy & zyxz & zyyx \\ xzxx & xzyy & xzzz & xzyz & xzzx & xzxy & xzzy & xzxz & xzyx \\ yxxx & yxyy & yxzz & yxyz & yxzx & yxxy & yxzy & yxxz & yxyx \end{pmatrix}$$

$$\begin{pmatrix} 1 \\ e \\ a \\ ae \end{pmatrix} [V^4] \quad \begin{pmatrix} xxxx & xyyy & xzzz & yyzz & xxyz \\ yxxx & yyyy & yzzz & zzxx & yyxz \\ zxxx & zyyy & zzzz & xxyy & zzxy \end{pmatrix}$$

symmetric with respect to all indicies

$$\begin{pmatrix} 1 \\ e \\ a \\ ae \end{pmatrix} V[V^3] \quad \begin{pmatrix} xxxx & xyyy & xzzz & xxyy & xyzz & xzxx & xxzz & xyxx & xzyy & xxyz \\ yxxx & yyyy & yzzz & yxyy & yyzz & yzxx & yxzz & yyxx & yzyy & yxyz \\ zxxx & zyyy & zzzz & zxyy & zyzz & zzxx & zxzz & zyxx & zzyy & zxyz \end{pmatrix}$$

symmetric with respect to last three indicies

$$\begin{pmatrix} 1 \\ e \\ a \\ ae \end{pmatrix} [[V^2]^2] \quad \begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxxz & xxxy \\ & yyyy & yyzz & yyyz & yyxz & yyxy \\ & & zzzz & zzyz & zzxz & zzxy \\ & & & yzyz & yzxz & yzxy \\ & & & & xzxz & xzxy \\ & & & & & xyxy \end{pmatrix}$$

ijkl = jikl = ijlk = klij

$$\begin{pmatrix} 1 \\ e \\ a \\ ae \end{pmatrix} [V^2]^2 \quad \begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxxz & xxxy \\ yyxx & yyyy & yyzz & yyyz & yyxz & yyxy \\ zzxx & zzyy & zzzz & zzyz & zzxz & zzxy \\ yzxx & yzyy & yzzz & yzyz & yzxz & yzxy \\ xzxx & xzyy & xzzz & xzyz & xzxz & xzxy \\ xyxx & xyyy & xyzz & xyyz & xyxz & xyxy \end{pmatrix}$$

ijkl = jikl = ijlk

$$\begin{pmatrix} 1 \\ e \\ a \\ ae \end{pmatrix} [(V^2)]^2 \begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & xxyx \\ & yyyy & yyzz & yyyz & yyzx & yyxy & yyzy & yyxz & yyyx \\ & & zzzz & zzyz & zzzx & zzxy & zzzy & zzxz & zzyx \\ & & & yzyz & yzzx & yzxy & yzzy & yzxz & yzyx \\ & & & & zxzx & zxxy & zxzy & zxxz & zxyx \\ & & & & & xyxy & xyzy & xyxz & xyyx \\ & & & & & & zyzy & zyxz & zyyx \\ & & & & & & & xzxz & xzyx \\ & & & & & & & & yxyx \end{pmatrix} \qquad klij = ijkl$$

$$\begin{pmatrix} 1 \\ e \\ a \\ ae \end{pmatrix} [V^2]V^2 \begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & xxyx \\ yyxx & yyyy & yyzz & yyyz & yyzx & yyxy & yyzy & yyxz & yyyx \\ zzxx & zzyy & zzzz & zzyz & zzzx & zzxy & zzzy & zzxz & zzyx \\ yzxx & yzyy & yzzz & yzyz & yzzx & yzxy & yzzy & yzxz & yzyx \\ zxxx & zxyy & zxzz & zxyz & zxzx & zxxy & zxzy & zxxz & zxyx \\ xyxx & xyyy & xyzz & xyyz & xyzx & xyxy & xyzy & xyxz & xyyx \end{pmatrix} \qquad jikl = ijkl$$

Line Group Series and Line Groups for n = 1, 2, 3, 4 and ∞

C_n

$C_1 = 1$
$C_2 = 2_z$
$C_3 = 3_z$
$C_4 = 4_z$
$C_\infty = \infty$

C_{nv}

$C_{1v} = m_y$
$C_{2v} = 2_z m_x m_y$
$C_{3v} = 3_z m_x$
$C_{4v} = 4_z m_x m_{xy}$
$C_{\infty v} = \infty mm$

C_{nh}

$C_{1h} = m_z$
$C_{2h} = 2_z/m_z$
$C_{3h} = \bar{6}_z$
$C_{4h} = 4_z/m_z$
$C_{\infty h} = \infty/m$

S_{2n}

$S_2 = \bar{1}$
$S_4 = \bar{4}_z$
$S_6 = \bar{3}_z$
$S_8 = \bar{8}_z$
$C_{\infty h} = \infty/m$

D_n

$D_1 = 2_y$
$D_2 = 2_x 2_y 2_z$
$D_3 = 3_z 2_x$
$D_4 = 4_z 2_x 2_{xy}$
$D_\infty = \infty 2$

D_{nd}

$D_{1d} = 2_y/m_y$
$D_{2d} = \bar{4}_z m_x 2_{xy}$
$D_{3d} = \bar{3}_z m_x$
$D_{4d} = \bar{8}_z m_{x1} 2_1$
$D_{\infty h} = \infty/mmm$

D_{nh}

$D_{1h} = 2_x m_y m_z$
$D_{2h} = m_x m_y m_z$
$D_{3h} = \bar{6}_z m_x 2_1$
$D_{4h} = 4_z/m_z m_x m_{xy}$
$D_{\infty h} = \infty/mmm$

$C_{2n}(C_n)$

$C_2(C_1) = 2_z(1) = 2_z'$
$C_4(C_2) = 4_z(2_z) = 4_z'$
$C_6(C_3) = 6_z(3_z) = 6_z'$
$C_8(C_4) = 8_z(4_z) = 8_z'$
$C_\infty 1' = \infty 1'$

$S_{2n}(C_n)$

$S_2(C_1) = \bar{1}(1) = \bar{1}'$
$S_4(C_2) = \bar{4}_z(2_z) = \bar{4}_z'$
$S_6(C_3) = \bar{3}_z(3_z) = \bar{3}_z'$
$S_8(C_4) = \bar{8}_z(4_z) = \bar{8}_z'$
$C_{\infty h}(C_\infty) = \infty/m'$

$C_{nh}(C_n)$

$C_{1h}(C_1) = m_z(1) = m_z'$
$C_{2h}(C_2) = 2_z/m_z(2_z) = 2_z/m_z'$
$C_{3h}(C_3) = \bar{6}_z(3_z) = \bar{6}_z'$
$C_{4h}(C_4) = 4_z/m_z(4_z) = 4_z/m_z'$
$C_{\infty h}(C_\infty) = \infty/m'$

$C_{2nh}(S_{2n})$

$C_{2h}(S_2) = 2_z/m_z(\bar{1}) = 2_z'/m_z'$
$C_{4h}(S_4) = 4_z/m_z(\bar{4}_z) = 4_z'/m_z'$
$C_{6h}(S_6) = 6_z/m_z(\bar{3}_z) = 6_z'/m_z'$
$C_{8h}(S_8) = 8_z/m_z(\bar{8}_z) = 8_z'/m_z'$
$C_{\infty h}\ 1' = \infty/m1'$

$C_{2nh}(C_{nh})$

$C_{2h}(C_{1h}) = 2_z/m_z(m_z) = 2_z'/m_z$
$C_{4h}(C_{2h}) = 4_z/m_z(2_z/m_z) = 4_z'/m_z$
$C_{6h}(C_{3h}) = 6_z/m_z(3_z/m_z) = 6_z'/m_z$
$C_{8h}(C_{4h}) = 8_z/m_z(4_z/m_z) = 8_z'/m_z$
$C_{\infty h}1' = \infty/m1'$

$D_n(C_n)$

$D_1(C_1) = 2_y(1) = 2_y'$
$D_2(C_2) = 2_x2_y2_z(2_z) = 2_x'2_y'2_z$
$D_3(C_3) = 3_z2_x(3_z) = 3_z2_x'$
$D_4(C_4) = 4_z2_x2_{xy}(4_z) = 4_z2_x'2_{xy}'$
$D_\infty(C_\infty) = \infty 2'$

$D_{2n}(D_n)$

$D_2(D_1) = 2_x2_y2(2_y) = 2_x'2_y2_z'$
$D_4(D_2) = 4_z2_x2_{xy}(2_x2_y2_z) = 4_z'2_x2_{xy}'$
$D_6(D_3) = 6_z2_x2_1(3_z2_x) = 6_z'2_x2_1'$
$D_8(D_4) = 8_z2_{x1}2_1(4_z2_{x1}2_{x2}) = 8_z'2_{x1}2_1'$
$D_\infty 1' = \infty 21'$

$\mathbf{C_{nv}(C_n)}$

$\mathbf{C_{1v}(C_1) = m_y(1) = m_y'}$
$\mathbf{C_{2v}(C_2) = 2_z m_x m_y(2_z) = 2_z m_x' m_y'}$
$\mathbf{C_{3v}(C_3) = 3_z m_x(3_z) = 3_z m_x'}$
$\mathbf{C_{4v}(C_4) = 4_z m_x m_{xy}(4_z) = 4_z m_x' m_{xy}'}$
$\mathbf{C_{\infty v}(C_\infty) = \infty m' m'}$

$\mathbf{C_{2nv}(C_{nv})}$

$\mathbf{C_{2v}(C_{1v}) = 2_z m_x m_y(m_y) = 2_z' m_x' m_y}$
$\mathbf{C_{4v}(C_{2v}) = 4_z m_x m_{xy}(2_z m_x m_y) = 4_z' m_x m_{xy}'}$
$\mathbf{C_{6v}(C_{3v}) = 6_z m_x m_1(3_z m_x) = 6_z' m_x m_1'}$
$\mathbf{C_{8v}(C_{4v}) = 8_z m_{x1} m_1(4_z m_x m_{xy}) = 8_z' m_{x1} m_1'}$
$\mathbf{C_{\infty v} 1' = \infty m m 1'}$

$\mathbf{D_{nd}(S_{2n})}$

$\mathbf{D_{1d}(S_2) = 2_y/m_y(\bar{1}) = 2_y'/m_y'}$

$\mathbf{D_{2d}(S_4) = \bar{4}_z\, m_x 2_{xy}(\bar{4}_z) = \bar{4}_z\, m_x' 2_{xy}'}$

$\mathbf{D_{3d}(S_6) = \bar{3}_z\, m_x(\bar{3}_z) = \bar{3}_z\, m_x'}$
$\mathbf{D_{4d}(S_8) = \bar{8}_z\, m_{x1} 2_1(\bar{8}_z) = \bar{8}_z\, m_{x1}' 2_1'}$
$\mathbf{D_{\infty h}(C_{\infty h}) = \infty/m m' m'}$

$\mathbf{D_{nd}(D_n)}$

$\mathbf{D_{1d}(D_1) = 2_y/m_y(2_y) = 2_y/m_y'}$

$\mathbf{D_{2d}(D_2) = \bar{4}_z\, m_x 2_{xy}(2_{xy} 2_{\bar{x}y} 2_z) = \bar{4}_z\, 'm_x' 2_{xy}}$

$\mathbf{D_{3d}(D_3) = \bar{3}_z\, m_x(3_z 2_x) = \bar{3}_z\, 'm_x'}$
$\mathbf{D_{4d}(D_4) = \bar{8}_z\, m_{x1} 2_1(4_z 2_x 2_{xy}) = \bar{8}_z\, 'm_{x1}' 2_1}$
$\mathbf{D_{\infty h}(D_\infty) = \infty/m' m' m'}$

$\mathbf{D_{nd}(C_{nv})}$

$\mathbf{D_{1d}(C_{1v}) = 2_y/m_y(m_y) = 2_y'/m_y}$

$\mathbf{D_{2d}(C_{2v}) = \bar{4}_z\, m_x 2_{xy}(2_z m_x m_y) = \bar{4}_z\, 'm_x 2_{xy}'}$

$\mathbf{D_{3d}(C_{3v}) = \bar{3}_z\, m_x(3_z m_x) = \bar{3}_z\, 'm_x}$
$\mathbf{D_{4d}(C_{4v}) = \bar{8}_z\, m_{x1} 2_1(4_z m_{x1} m_{x3}) = \bar{8}_z\, 'm_{x1} 2}$
$\mathbf{D_{\infty h}(C_{\infty v}) = \infty/m' m m}$

$\mathbf{D_{nh}(C_{nh})}$

$\mathbf{D_{1h}(C_{1h}) = 2_x m_y m_z(m_z) = 2_x' m_y' m_z}$
$\mathbf{D_{2h}(C_{2h}) = m_x m_y m_z(2_z/m_z) = m_x' m_y' m_z}$

$\mathbf{D_{3h}(C_{3h}) = \bar{6}_z\, m_x 2_1(\bar{6}_z) = \bar{6}_z\, m_x' 2_1'}$
$\mathbf{D_{4h}(C_{4h}) = 4_z/m_z m_x m_{xy}(4_z/m_z) = 4_z/m_z m_x' m_{xy}'}$
$\mathbf{D_{\infty h}(C_{\infty h}) = \infty/m m' m'}$

$\mathbf{D_{nh}(D_n)}$

$\mathbf{D_{1h}(D_1) = 2_x m_y m_z(2_x) = 2_x m_y' m_z'}$
$\mathbf{D_{2h}(D_2) = m_x m_y\ m_z(2_x 2_y 2_z) = m_x' m_y'\ m_z'}$

$\mathbf{D_{3h}(D_3) = \bar{6}_z\, m_x 2_1(3_z 2_1) = \bar{6}_z\, 'm_x' 2_1}$
$\mathbf{D_{4h}(D_4) = 4_z/m_z m_x m_{xy}(4_z 2_x 2_{xy}) = 4_z/m_z' m_x' m_{xy}'}$
$\mathbf{D_{\infty h}(D_\infty) = \infty/m' m' m'}$

$D_{nh}(C_{nv})$

$D_{1h}(C_{1v}) = 2_x m_y\ m_z(m_y) = 2_x' m_y\ m_z'$
$D_{2h}(C_{2v}) = m_x m_y\ m_z(2_z m_x m_y) = m_x m_y\ m_z'$

$D_{3h}(C_{3v}) = \bar{6}_z\, m_x 2_1(3_z m_x) = \bar{6}_z\, ' m_x 2_1'$
$D_{4h}(C_{4v}) = 4_z/m_z m_x m_{xy}(4_z m_x m_{xy}) = 4_z/m_z' m_x m_{xy}$
$D_{\infty h}(C_{\infty v}) = \infty/m'mm$

$D_{2nh}(D_{nd})$

$D_{2h}(D_{1d}) = m_x m_y m_z(2_y/m_y) = m_x' m_y\ m_z'$

$D_{4h}(D_{2d}) = 4_z/m_z m_x m_{xy}(\bar{4}_z\, m_x 2_{xy}) = 4_z'/m_z' m_x m_{xy}'$

$D_{6h}(D_{3d}) = 6_z/m_z m_x m_1(\bar{3}_z\, m_x) = 6_z'/m_z' m_x m_1'$
$C_{8h}(D_{4d}) = 8_z/m_z m_{x1} m_1(\bar{8}_z\, m_{x1} 2_1) = 8_z'/m_z' m_{x1} m_1'$
$D_{\infty h}1' = \infty/mmm1'$

$D_{2nh}(D_{nh})$

$D_{2h}(D_{1h}) = m_x m_y m_z(2_x m_y m_z) = m_x' m_y m_z$
$D_{4h}(D_{2h}) = 4_z/m_z m_x m_{xy}(m_x m_y m_z) = 4_z'/m_z m_x m_{xy}'$

$D_{6h}(D_{3h}) = 6_z/m_z m_x m_1(\bar{6}_z\, m_x 2_1) = 6_z'/m_z m_x m_1'$
$D_{8h}(D_{4h}) = 8_z/m_z m_{x1} m_1(4_z/m_z m_{x1} m_{x2}) = 8_z'/m_z m_{x1} m_1'$
$D_{\infty h}1' = \infty/mmm1'$

	n = 1	n > 1;
$\mathbf{C}_n$	$\mathbf{C}_1 = \mathbf{1}$	$\mathbf{C}_\infty = \infty$
	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix} x \\ y \\ z \end{pmatrix} & \begin{pmatrix} x \\ y \\ z \end{pmatrix} & \begin{pmatrix} x \\ y \\ z \end{pmatrix} & \begin{pmatrix} x \\ y \\ z \end{pmatrix} \end{matrix}$	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix} 0 \\ 0 \\ z \end{pmatrix} & \begin{pmatrix} 0 \\ 0 \\ z \end{pmatrix} & \begin{pmatrix} 0 \\ 0 \\ z \end{pmatrix} & \begin{pmatrix} 0 \\ 0 \\ z \end{pmatrix} \end{matrix}$
	n = 1	n > 1
$\mathbf{C}_{nv}$	$\mathbf{C}_{1v} = \mathbf{m}_y$	$\mathbf{C}_{\infty v} = \infty\mathbf{mm}$
	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix} x \\ 0 \\ z \end{pmatrix} & \begin{pmatrix} 0 \\ y \\ 0 \end{pmatrix} & \begin{pmatrix} x \\ 0 \\ z \end{pmatrix} & \begin{pmatrix} 0 \\ y \\ 0 \end{pmatrix} \end{matrix}$	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix} 0 \\ 0 \\ z \end{pmatrix} & \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} & \begin{pmatrix} 0 \\ 0 \\ z \end{pmatrix} & \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix}$
	n = 1	n > 1
$\mathbf{S}_{2n}$	$\mathbf{S}_2 = \bar{\mathbf{1}}$	$\mathbf{C}_{\infty h} = \infty\mathbf{/m}$
	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} & \begin{pmatrix} x \\ y \\ z \end{pmatrix} & \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} & \begin{pmatrix} x \\ y \\ z \end{pmatrix} \end{matrix}$	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} & \begin{pmatrix} 0 \\ 0 \\ z \end{pmatrix} & \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} & \begin{pmatrix} 0 \\ 0 \\ z \end{pmatrix} \end{matrix}$
	n= 1	n > 1
$\mathbf{C}_{nh}$	$\mathbf{C}_{1h} = \mathbf{m}_z$	$\mathbf{C}_{\infty h} = \infty\mathbf{/m}$
	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix} x \\ y \\ 0 \end{pmatrix} & \begin{pmatrix} 0 \\ 0 \\ z \end{pmatrix} & \begin{pmatrix} x \\ y \\ 0 \end{pmatrix} & \begin{pmatrix} 0 \\ 0 \\ z \end{pmatrix} \end{matrix}$	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} & \begin{pmatrix} 0 \\ 0 \\ z \end{pmatrix} & \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} & \begin{pmatrix} 0 \\ 0 \\ z \end{pmatrix} \end{matrix}$

	n = 1	n > 1
$\mathbf{D}_n$	$\mathbf{D}_1 = \mathbf{2}_y$	$\mathbf{D}_\infty = \infty\mathbf{2}$
	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\y\\0\end{pmatrix} & \begin{pmatrix}0\\y\\0\end{pmatrix} & \begin{pmatrix}0\\y\\0\end{pmatrix} & \begin{pmatrix}0\\y\\0\end{pmatrix} \end{matrix}$	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} \end{matrix}$
	n = 1	n > 1
$\mathbf{D}_{nd}$	$\mathbf{D}_{1d} = \mathbf{2}_y\mathbf{/m}_y$	$\mathbf{D}_{\infty h} = \infty\mathbf{/mmm}$
	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\y\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\y\\0\end{pmatrix} \end{matrix}$	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} \end{matrix}$
	n = 1	n > 1
$\mathbf{D}_{nh}$	$\mathbf{D}_{1h} = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z$	$\mathbf{D}_{\infty h} = \infty\mathbf{/mmm}$
	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}x\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}x\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} \end{matrix}$	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} \end{matrix}$
	n = 1	n > 1
$\mathbf{C}_{2n}(\mathbf{C}_n)$	$\mathbf{C}_2(\mathbf{C}_1) = \mathbf{2}_z\mathbf{(1)} = \mathbf{2}_z\mathbf{'}$	$\mathbf{C}_\infty\mathbf{1'} = \infty\mathbf{1'}$
	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\z\end{pmatrix} & \begin{pmatrix}0\\0\\z\end{pmatrix} & \begin{pmatrix}x\\y\\0\end{pmatrix} & \begin{pmatrix}x\\y\\0\end{pmatrix} \end{matrix}$	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\z\end{pmatrix} & \begin{pmatrix}0\\0\\z\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} \end{matrix}$

	n = 1	n > 1
$\mathbf{S_{2n}(C_n)}$	$\mathbf{S_2(C_1) = \bar{1}(1) = \bar{1}'}$	$\mathbf{C_{\infty h}(C_\infty) = \infty/m'}$
	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}x\\y\\z\end{pmatrix} & \begin{pmatrix}x\\y\\z\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} \end{matrix}$	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\z\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\z\end{pmatrix} \end{matrix}$
	n = 1	n > 1
$\mathbf{C_{nh}(C_n)}$	$\mathbf{C_{1h}(C_1) = m_{z(}1) = m_z'}$	$\mathbf{C_{\infty h}(C_\infty) = \infty/m'}$
	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}x\\y\\0\end{pmatrix} & \begin{pmatrix}0\\0\\z\end{pmatrix} & \begin{pmatrix}0\\0\\z\end{pmatrix} & \begin{pmatrix}x\\y\\0\end{pmatrix} \end{matrix}$	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\z\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\z\end{pmatrix} \end{matrix}$
	n = 1	n > 1
$\mathbf{C_{2nh}(S_{2n})}$	$\mathbf{C_{2h}(S_2) = 2_z/m_z(\bar{1}) = 2_z'/m_z'}$	$\mathbf{C_{\infty h}\ 1' = \infty/m1'}$
	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\z\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}x\\y\\0\end{pmatrix} \end{matrix}$	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\z\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} \end{matrix}$
	n = 1	n > 1
$\mathbf{C_{2nh}(C_{nh})}$	$\mathbf{C_{2h}(C_{1h}) = 2_z/m_z(m_z) = 2_z'/m_z}$	$\mathbf{C_{\infty h}1' = \infty/m1'}$
	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\z\end{pmatrix} & \begin{pmatrix}x\\y\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} \end{matrix}$	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\z\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} \end{matrix}$

	n = 1	n > 1
$\mathbf{D}_n(\mathbf{C}_n)$	$\mathbf{D}_1(\mathbf{C}_1) = \mathbf{2}_y(\mathbf{1}) = \mathbf{2}_y'$	$\mathbf{D}_\infty(\mathbf{C}_\infty) = \infty\mathbf{2}'$
	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\y\\0\end{pmatrix} & \begin{pmatrix}0\\y\\0\end{pmatrix} & \begin{pmatrix}x\\0\\z\end{pmatrix} & \begin{pmatrix}x\\0\\z\end{pmatrix} \end{matrix}$	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\z\end{pmatrix} & \begin{pmatrix}0\\0\\z\end{pmatrix} \end{matrix}$
	n = 1	n > 1
$\mathbf{D}_{2n}(\mathbf{D}_n)$	$\mathbf{D}_2(\mathbf{D}_1) = \mathbf{2}_x\mathbf{2}_y\mathbf{2}(\mathbf{2}_y) = \mathbf{2}_x'\mathbf{2}_y\mathbf{2}_z'$	$\mathbf{D}_\infty\mathbf{1}' = \infty\mathbf{21}'$
	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\y\\0\end{pmatrix} & \begin{pmatrix}0\\y\\0\end{pmatrix} \end{matrix}$	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} \end{matrix}$
	n = 1	n > 1
$\mathbf{C}_{nv}(\mathbf{C}_n)$	$\mathbf{C}_{1v}(\mathbf{C}_1) = \mathbf{m}_y(\mathbf{1}) = \mathbf{m}_y'$	$\mathbf{C}_{\infty v}(\mathbf{C}_\infty) = \infty\mathbf{m}'\mathbf{m}'$
	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}x\\0\\z\end{pmatrix} & \begin{pmatrix}0\\y\\0\end{pmatrix} & \begin{pmatrix}0\\y\\0\end{pmatrix} & \begin{pmatrix}x\\0\\z\end{pmatrix} \end{matrix}$	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\z\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\z\end{pmatrix} \end{matrix}$
	n = 1	n > 1
$\mathbf{C}_{2nv}(\mathbf{C}_{nv})$	$\mathbf{C}_{2v}(\mathbf{C}_{1v}) = \mathbf{2}_z\mathbf{m}_x\mathbf{m}_y(\mathbf{m}_y) = \mathbf{2}_z'\mathbf{m}_x'\mathbf{m}_y$	$\mathbf{C}_{\infty v}\mathbf{1}' = \infty\mathbf{mm1}'$
	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\z\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}x\\0\\0\end{pmatrix} & \begin{pmatrix}0\\y\\0\end{pmatrix} \end{matrix}$	$V \begin{matrix} 1 & e & a & ae \\ \begin{pmatrix}0\\0\\z\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} & \begin{pmatrix}0\\0\\0\end{pmatrix} \end{matrix}$

	n = 1	n > 1
$\mathbf{D}_{nd}(\mathbf{S}_{2n})$	$\mathbf{D}_{1d}(\mathbf{S}_2) = \mathbf{2}_y/\mathbf{m}_y(\bar{\mathbf{1}}) = \mathbf{2}_y'/\mathbf{m}_y'$	$\mathbf{D}_{\infty h}(\mathbf{C}_{\infty h}) = \infty/\mathbf{mm'm'}$
	$V \begin{matrix} 1 \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix} \begin{matrix} e \\ \begin{pmatrix}0\\y\\0\end{pmatrix}\end{matrix} \begin{matrix} a \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix} \begin{matrix} ae \\ \begin{pmatrix}x\\0\\z\end{pmatrix}\end{matrix}$	$V \begin{matrix} 1 \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix} \begin{matrix} e \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix} \begin{matrix} a \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix} \begin{matrix} ae \\ \begin{pmatrix}0\\0\\z\end{pmatrix}\end{matrix}$
$\mathbf{D}_{nd}(\mathbf{D}_n)$	$\mathbf{D}_{1d}(\mathbf{D}_1) = \mathbf{2}_y/\mathbf{m}_y(\mathbf{2}_y) = \mathbf{2}_y/\mathbf{m}_y'$	$\mathbf{D}_{\infty h}(\mathbf{D}_\infty) = \infty/\mathbf{m'm'm'}$
	$V \begin{matrix} 1 \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix} \begin{matrix} e \\ \begin{pmatrix}0\\y\\0\end{pmatrix}\end{matrix} \begin{matrix} a \\ \begin{pmatrix}0\\y\\0\end{pmatrix}\end{matrix} \begin{matrix} ae \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix}$	$V \begin{matrix} 1 \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix} \begin{matrix} e \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix} \begin{matrix} a \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix} \begin{matrix} ae \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix}$
$\mathbf{D}_{nd}(\mathbf{C}_{nv})$	$\mathbf{D}_{1d}(\mathbf{C}_{1v}) = \mathbf{2}_y/\mathbf{m}_y(\mathbf{m}_y) = \mathbf{2}_y'/\mathbf{m}_y$	$\mathbf{D}_{\infty h}(\mathbf{C}_{\infty v}) = \infty/\mathbf{m'mm}$
	$V \begin{matrix} 1 \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix} \begin{matrix} e \\ \begin{pmatrix}0\\y\\0\end{pmatrix}\end{matrix} \begin{matrix} a \\ \begin{pmatrix}x\\0\\z\end{pmatrix}\end{matrix} \begin{matrix} ae \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix}$	$V \begin{matrix} 1 \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix} \begin{matrix} e \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix} \begin{matrix} a \\ \begin{pmatrix}0\\0\\z\end{pmatrix}\end{matrix} \begin{matrix} ae \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix}$
$\mathbf{D}_{nh}(\mathbf{C}_{nh})$	$\mathbf{D}_{1h}(\mathbf{C}_{1h}) = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{m}_z) = \mathbf{2}_x'\mathbf{m}_y'\mathbf{m}_z$	$\mathbf{D}_{\infty h}(\mathbf{C}_{\infty h}) = \infty/\mathbf{mm'm'}$
	$V \begin{matrix} 1 \\ \begin{pmatrix}x\\0\\0\end{pmatrix}\end{matrix} \begin{matrix} e \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix} \begin{matrix} a \\ \begin{pmatrix}0\\y\\0\end{pmatrix}\end{matrix} \begin{matrix} ae \\ \begin{pmatrix}0\\0\\z\end{pmatrix}\end{matrix}$	$V \begin{matrix} 1 \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix} \begin{matrix} e \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix} \begin{matrix} a \\ \begin{pmatrix}0\\0\\0\end{pmatrix}\end{matrix} \begin{matrix} ae \\ \begin{pmatrix}0\\0\\z\end{pmatrix}\end{matrix}$

	n = 1	n > 1
$\mathbf{D}_{nh}(\mathbf{D}_n)$	$\mathbf{D}_{1h}(\mathbf{D}_1) = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_x) = \mathbf{2}_x\mathbf{m}_y'\mathbf{m}_z'$	$\mathbf{D}_{\infty h}(\mathbf{D}_\infty) = \infty/\mathbf{m}'\mathbf{m}'\mathbf{m}'$

$$V \begin{matrix} 1 \\ \begin{pmatrix} x \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} e \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} a \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} ae \\ \begin{pmatrix} x \\ 0 \\ 0 \end{pmatrix} \end{matrix}$$

$$V \begin{matrix} 1 \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} e \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} a \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} ae \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix}$$

	n = 1	n > 1
$\mathbf{D}_{nh}(\mathbf{C}_{nv})$	$\mathbf{D}_{1h}(\mathbf{C}_{1v}) = \mathbf{2}_x\mathbf{m}_y\,\mathbf{m}_z(\mathbf{m}_y) = \mathbf{2}_x'\mathbf{m}_y\,\mathbf{m}_z'$	$\mathbf{D}_{\infty h}(\mathbf{C}_{\infty v}) = \infty/\mathbf{m}'\mathbf{m}\mathbf{m}$

$$V \begin{matrix} 1 \\ \begin{pmatrix} x \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} e \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} a \\ \begin{pmatrix} 0 \\ 0 \\ z \end{pmatrix} \end{matrix} \begin{matrix} ae \\ \begin{pmatrix} 0 \\ y \\ 0 \end{pmatrix} \end{matrix}$$

$$V \begin{matrix} 1 \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} e \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} a \\ \begin{pmatrix} 0 \\ 0 \\ z \end{pmatrix} \end{matrix} \begin{matrix} ae \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix}$$

	n = 1	n > 1
$\mathbf{D}_{2nh}(\mathbf{D}_{nd})$	$\mathbf{D}_{2h}(\mathbf{D}_{1d}) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_y/\mathbf{m}_y) = \mathbf{m}_x'\mathbf{m}_y\,\mathbf{m}_z'$	$\mathbf{D}_{\infty h}\mathbf{1}' = \infty/\mathbf{mmm1}'$

$$V \begin{matrix} 1 \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} e \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} a \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} ae \\ \begin{pmatrix} 0 \\ y \\ 0 \end{pmatrix} \end{matrix}$$

$$V \begin{matrix} 1 \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} e \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} a \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} ae \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix}$$

	n = 1	n > 1
$\mathbf{D}_{2nh}(\mathbf{D}_{nh})$	$\mathbf{D}_{2h}(\mathbf{D}_{1h}) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_x\mathbf{m}_y\mathbf{m}_z) = \mathbf{m}_x'\mathbf{m}_y\mathbf{m}_z$	$\mathbf{D}_{\infty h}\mathbf{1}' = \infty/\mathbf{mmm1}'$

$$V \begin{matrix} 1 \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} e \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} a \\ \begin{pmatrix} x \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} ae \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix}$$

$$V \begin{matrix} 1 \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} e \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} a \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix} \begin{matrix} ae \\ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \end{matrix}$$

C_n

n = 1 — **$C_1 = 1$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & xz \\ yx & yy & yz \\ zx & zy & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & xz \\ yx & yy & yz \\ zx & zy & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & xz \\ yx & yy & yz \\ zx & zy & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & xz \\ yx & yy & yz \\ zx & zy & zz \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & xy & xz \\ xy & yy & yz \\ xz & yz & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & xz \\ xy & yy & yz \\ xz & yz & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & xz \\ xy & yy & yz \\ xz & yz & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & xz \\ xy & yy & yz \\ xz & yz & zz \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & xz \\ -xy & 0 & yz \\ -xz & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & xz \\ -xy & 0 & yz \\ -xz & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & xz \\ -xy & 0 & yz \\ -xz & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & xz \\ -xy & 0 & yz \\ -xz & -yz & 0 \end{pmatrix}$

n = 2 — **$C_2 = 2_z$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ yx & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ yx & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ yx & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ yx & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & xy & 0 \\ xy & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2; **$C_\infty = \infty$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

C_{nv}

n = 1 — **$C_{1v} = m_y$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ zx & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ yx & 0 & yz \\ 0 & zy & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ zx & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ yx & 0 & yz \\ 0 & zy & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ xz & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & yz \\ 0 & yz & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ xz & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & yz \\ 0 & yz & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & yz \\ 0 & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & yz \\ 0 & -yz & 0 \end{pmatrix}$

n = 2 — **$C_{2v} = 2_z m_x m_y$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ yx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ yx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2 — **$C_{\infty v} = \infty mm$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

S_{2n}

n = 1 — **$S_2 = \bar{1}$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & xz \\ yx & yy & yz \\ zx & zy & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & xz \\ yx & yy & yz \\ zx & zy & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & xy & xz \\ xy & yy & yz \\ xz & yz & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & xz \\ xy & yy & yz \\ xz & yz & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & xz \\ -xy & 0 & yz \\ -xz & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & xz \\ -xy & 0 & yz \\ -xz & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n = 2 — **$S_4 = \bar{4}_z$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2 — **$C_{\infty h} = \infty/m$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{C}_{nh}$

n= 1 — $\mathbf{C}_{1h} = \mathbf{m}_z$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ yx & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ zx & zy & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ yx & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ zx & zy & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & xy & 0 \\ xy & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ xz & yz & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ xz & yz & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ -xz & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ -xz & -yz & 0 \end{pmatrix}$

n = 2 — $\mathbf{C}_{2h} = \mathbf{2/m}_z$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ yx & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ yx & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & xy & 0 \\ xy & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2 — $\mathbf{C}_{\infty h} = \infty\mathbf{/m}$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{n}$

n = 1 — $\mathbf{D}_{1} = \mathbf{2}_y$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ zx & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ zx & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ zx & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ zx & 0 & zz \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ xz & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ xz & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ xz & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ xz & 0 & zz \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$

n = 2 — $\mathbf{D}_{2} = \mathbf{2}_x\mathbf{2}_y\mathbf{2}_z$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2 — $\mathbf{D}_{\infty} = \infty\mathbf{2}$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{nd}$

n = 1 — $\mathbf{D}_{1d} = \mathbf{2}_y\mathbf{/m}_y$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ zx & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ zx & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ xz & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ xz & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n = 2 — $\mathbf{D}_{2d} = \bar{\mathbf{4}}_z\,\mathbf{m}_x\mathbf{2}_{xy}$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2 — $\mathbf{D}_{\infty h} = \infty\mathbf{/mmm}$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

D_{nh}

n = 1 — **$D_{1h} = 2_x m_y m_z$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & zy & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & zy & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & yz & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & yz & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & -yz & 0 \end{pmatrix}$

n = 2 — **$D_{2h} = m_x m_y m_z$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2 — **$D_{\infty h} = \infty/mmm$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$C_{2n}(C_n)$

n = 1 — **$C_2(C_1) = 2_z(1) = 2_z'$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ yx & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ yx & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ zx & zy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ zx & zy & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & xy & 0 \\ xy & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ xz & yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ xz & yz & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ -xz & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ -xz & -yz & 0 \end{pmatrix}$

n = 2 — **$C_4(C_2) = 4_z(2_z) = 4_z'$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2 — **$C_\infty 1' = \infty 1'$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$S_{2n}(C_n)$

n = 1 — **$S_2(C_1) = \bar{1}(1) = \bar{1}'$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & xz \\ yx & yy & yz \\ zx & zy & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & xz \\ yx & yy & yz \\ zx & zy & zz \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & xy & xz \\ xy & yy & yz \\ xz & yz & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & xz \\ xy & yy & yz \\ xz & yz & zz \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & xz \\ -xy & 0 & yz \\ -xz & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & xz \\ -xy & 0 & yz \\ -xz & -yz & 0 \end{pmatrix}$

n = 2 — **$S_4(C_2) = \bar{4}_z(2_z) = \bar{4}_z'$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2 — **$C_{\infty h}(C_\infty) = \infty/m'$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n = 1

$C_{nh}(C_n)$ **$C_{1h}(C_1) = m_z(1) = m_z'$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ yx & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ zx & zy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ zx & zy & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ yx & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & xy & 0 \\ xy & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ xz & yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ xz & yz & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ -xz & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ -xz & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n = 2

$C_{2h}(C_2) = 2_z/m_z(2_z) = 2_z/m_z'$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ yx & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ yx & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & xy & 0 \\ xy & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2

$C_{\infty h}(C_\infty) = \infty/m'$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n = 1

$C_{2nh}(S_{2n})$ **$C_{2h}(S_2) = 2_z/m_z(\bar{1}) = 2_z'/m_z'$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ yx & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ zx & zy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & xy & 0 \\ xy & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & yz \\ 0 & 0 & xz \\ xz & yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & yz \\ 0 & 0 & xz \\ -xz & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n = 2

$C_{4h}(S_4) = 4_z/m_z(\bar{4}_z) = 4_z'/m_z'$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2

$C_{\infty h}$ 1' = ∞/m1'

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n = 1

$C_{2nh}(C_{nh})$ **$C_{2h}(C_{1h}) = 2_z/m_z(m_z) = 2_z'/m_z$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ yx & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ zx & zy & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & xy & 0 \\ xy & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ xz & yz & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & yz \\ -xz & -yz & 0 \end{pmatrix}$

n = 2

$C_{4h}(C_{2h}) = 4_z/m_z(2_z/m_z) = 4_z'/m_z$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & xy & 0 \\ xy & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2

$C_{\infty h}$1'= ∞/m1'

	1	e	a	ae
V^2	$\begin{pmatrix} xx & xy & 0 \\ -xy & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_n(\mathbf{C}_n)$

n = 1 — $\mathbf{D}_1(\mathbf{C}_1) = \mathbf{2}_y(\mathbf{1}) = \mathbf{2}_y'$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ zx & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ zx & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ yx & 0 & yz \\ 0 & zy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ yx & 0 & yz \\ 0 & zy & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ xz & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ xz & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & yz \\ 0 & yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & yz \\ 0 & yz & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & yz \\ 0 & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & yz \\ 0 & -yz & 0 \end{pmatrix}$

n = 2 — $\mathbf{D}_2(\mathbf{C}_2) = \mathbf{2}_x\mathbf{2}_y\mathbf{2}_z(\mathbf{2}_z) = \mathbf{2}_x'\mathbf{2}_y'\mathbf{2}_z$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ yx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ yx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2 — $\mathbf{D}_\infty(\mathbf{C}_\infty) = \infty\mathbf{2}'$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{2n}(\mathbf{D}_n)$

n = 1 — $\mathbf{D}_2(\mathbf{D}_1) = \mathbf{2}_x\mathbf{2}_y\mathbf{2}(\mathbf{2}_y) = \mathbf{2}_x'\mathbf{2}_y\mathbf{2}_z'$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ zx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ zx & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ xz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ xz & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$

n = 2 — $\mathbf{D}_4(\mathbf{D}_2) = \mathbf{4}_z\mathbf{2}_x\mathbf{2}_{xy}(\mathbf{2}_x\mathbf{2}_y\mathbf{2}_z) = \mathbf{4}_z'\mathbf{2}_x\mathbf{2}_{xy}'$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2 — $\mathbf{D}_\infty\mathbf{1}' = \infty\mathbf{21}'$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{C}_{nv}(\mathbf{C}_n)$

n = 1 — $\mathbf{C}_{1v}(\mathbf{C}_1) = \mathbf{m}_y(\mathbf{1}) = \mathbf{m}_y'$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ zx & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ yx & 0 & yz \\ 0 & zy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ yx & 0 & yz \\ 0 & zy & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ zx & 0 & zz \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ xz & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & yz \\ 0 & yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & yz \\ 0 & yz & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ xz & 0 & zz \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & yz \\ 0 & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & yz \\ 0 & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$

n = 2 — $\mathbf{C}_{2v}(\mathbf{C}_2) = \mathbf{2}_z\mathbf{m}_x\mathbf{m}_y(\mathbf{2}_z) = \mathbf{2}_z\mathbf{m}_x'\mathbf{m}_y'$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ yx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ yx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2 — $\mathbf{C}_{\infty v}(\mathbf{C}_\infty) = \infty\mathbf{m}'\mathbf{m}'$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$C_{2nv}(C_{nv})$ $\quad C_{2v}(C_{1v}) = 2_z m_x m_y (m_y) = 2_z' m_x' m_y$

n = 1

V^2

$$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ yx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ zx & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & zy & 0 \end{pmatrix}$$

$[V^2]$

$$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ xz & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & yz & 0 \end{pmatrix}$$

$\{V^2\}$

$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & -yz & 0 \end{pmatrix}$$

n = 2

$C_{4v}(C_{2v}) = 4_z m_x m_{xy} (2_z m_x m_y) = 4_z' m_x m_{xy}'$

V^2

$$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} xx & 0 & 0 \\ 0 & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$[V^2]$

$$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} xx & 0 & 0 \\ 0 & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}$

$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

n > 2

$C_{\infty v}1' = \infty mm1'$

V^2

$$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$[V^2]$

$$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}$

$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$D_{nd}(S_{2n})$ $\quad D_{1d}(S_2) = 2_y/m_y(\bar{1}) = 2_y'/m_y'$

n = 1

V^2

$$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ zx & 0 & zz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ yx & 0 & yz \\ 0 & zy & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$[V^2]$

$$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ xz & 0 & zz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ xy & 0 & yz \\ 0 & yz & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}$

$$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & yz \\ 0 & -yz & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

n = 2

$D_{2d}(S_4) = \bar{4}_z m_x 2_{xy} (\bar{4}_z) = \bar{4}_z m_x' 2_{xy}'$

V^2

$$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} xx & 0 & 0 \\ 0 & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$[V^2]$

$$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}$

$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

n > 2

$D_{\infty h}(C_{\infty h}) = \infty/mm'm'$

V^2

$$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$[V^2]$

$$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}$

$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$D_{nd}(D_n)$ $\quad D_{1d}(D_1) = 2_y/m_y(2_y) = 2_y/m_y'$

n = 1

V^2

$$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ zx & 0 & zz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ zx & 0 & zz \end{pmatrix}$$

$[V^2]$

$$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ xz & 0 & zz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ xz & 0 & zz \end{pmatrix}$$

$\{V^2\}$

$$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$$

n = 2

$D_{2d}(D_2) = \bar{4}_z m_x 2_{xy} (2_{xy} 2_{\bar{x}y} 2_z) = \bar{4}_z' m_x' 2_{xy}$

V^2

$$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$$

$[V^2]$

$$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$$

$\{V^2\}$

$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

n > 2

$D_{\infty h}(D_\infty) = \infty/m'm'm'$

V^2

$$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$$

$[V^2]$

$$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$$

$\{V^2\}$

$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$\mathbf{D}_{nd}(\mathbf{C}_{nv})$

n = 1

$\mathbf{D}_{1d}(\mathbf{C}_{1v}) = \mathbf{2}_y/\mathbf{m}_y(\mathbf{m}_y) = \mathbf{2}_y'/\mathbf{m}_y$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ zx & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ yx & 0 & yz \\ 0 & zy & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & xz \\ 0 & yy & 0 \\ xz & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & yz \\ 0 & yz & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & yz \\ 0 & -yz & 0 \end{pmatrix}$

n = 2

$\mathbf{D}_{2d}(\mathbf{C}_{2v}) = \bar{\mathbf{4}}_z\,\mathbf{m}_x\mathbf{2}_{xy}(\mathbf{2}_z\mathbf{m}_x\mathbf{m}_y) = \bar{\mathbf{4}}_z\,'\mathbf{m}_x\mathbf{2}_{xy}'$

	1	e	a	ae
	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2

$\mathbf{D}_{\infty h}(\mathbf{C}_{\infty v}) = \infty/\mathbf{m}'\mathbf{mm}$

	1	e	a	ae
	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{nh}(\mathbf{C}_{nh})$

n = 1

$\mathbf{D}_{1h}(\mathbf{C}_{1h}) = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{m}_z) = \mathbf{2}_x'\mathbf{m}_y'\mathbf{m}_z$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & zy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ yx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ zx & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ xz & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$

n = 2

$\mathbf{D}_{2h}(\mathbf{C}_{2h}) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_z/\mathbf{m}_z) = \mathbf{m}_x'\mathbf{m}_y'\mathbf{m}_z$

	1	e	a	ae
	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ yx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2

$\mathbf{D}_{\infty h}(\mathbf{C}_{\infty h}) = \infty/\mathbf{mm}'\mathbf{m}'$

	1	e	a	ae
	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{nh}(\mathbf{D}_n)$

n = 1

$\mathbf{D}_{1h}(\mathbf{D}_1) = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_x) = \mathbf{2}_x\mathbf{m}_y'\mathbf{m}_z'$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & zy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & zy & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & yz & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n = 2

$\mathbf{D}_{2h}(\mathbf{D}_2) = \mathbf{m}_x\mathbf{m}_y\,\mathbf{m}_z(\mathbf{2}_x\mathbf{2}_y\mathbf{2}_z) = \mathbf{m}_x'\mathbf{m}_y'\,\mathbf{m}_z'$

	1	e	a	ae
	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$
	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$
	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2

$\mathbf{D}_{\infty h}(\mathbf{D}_\infty) = \infty/\mathbf{m}'\mathbf{m}'\mathbf{m}'$

	1	e	a	ae
	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$
	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$
	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n = 1

$D_{nh}(C_{nv})$ **$D_{1h}(C_{1v}) = 2_x m_y\ m_z(m_y) = 2_x' m_y\ m_z'$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & zy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ zx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ yx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ xz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & -yz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n = 2

$D_{2h}(C_{2v}) = m_x m_y\ m_z(2_z m_x m_y) = m_x m_y\ m_z'$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ yx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2

$D_{\infty h}(C_{\infty v}) = \infty/m'mm$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ -xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n = 1

$D_{2nh}(D_{nd})$ **$D_{2h}(D_{1d}) = m_x m_y m_z(2_y/m_y) = m_x' m_y\ m_z'$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ zx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ xz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xz \\ 0 & 0 & 0 \\ -xz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n = 2

$D_{4h}(D_{2d}) = 4_z/m_z m_x m_{xy}(\bar{4}_z\, m_x 2_{xy}) = 4_z'/m_z' m_x m_{xy}'$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xy & 0 \\ xy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n > 2

$D_{\infty h}1' = \infty/mmm1'$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n = 1

$D_{2nh}(D_{nh})$ **$D_{2h}(D_{1h}) = m_x m_y m_z(2_x m_y m_z) = m_x' m_y m_z$**

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & zy & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & yy & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & yz & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & -yz & 0 \end{pmatrix}$

n = 2

$D_{4h}(D_{2h}) = 4_z/m_z m_x m_{xy}(m_x m_y m_z) = 4_z'/m_z m_x m_{xy}'$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & -xx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & yz \\ 0 & -yz & 0 \end{pmatrix}$

n > 2

$D_{\infty h}1' = \infty/mmm1'$

	1	e	a	ae
V^2	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$[V^2]$	$\begin{pmatrix} xx & 0 & 0 \\ 0 & xx & 0 \\ 0 & 0 & zz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{C}_n$

n = 1 $\mathbf{C}_1 = \mathbf{1}$

	1	e	a	ae
V^3	$\begin{pmatrix} xxx & xyy & xzz & xyz & xzx & xxy & xzy & xxz & xyx \\ yxx & yyy & yzz & yyz & yzx & yxy & yzy & yxz & yyx \\ zxx & zyy & zzz & zyz & zzx & zxy & zzy & zxz & zyx \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & xyz & xzx & xxy & xzy & xxz & xyx \\ yxx & yyy & yzz & yyz & yzx & yxy & yzy & yxz & yyx \\ zxx & zyy & zzz & zyz & zzx & zxy & zzy & zxz & zyx \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & xyz & xzx & xxy & xzy & xxz & xyx \\ yxx & yyy & yzz & yyz & yzx & yxy & yzy & yxz & yyx \\ zxx & zyy & zzz & zyz & zzx & zxy & zzy & zxz & zyx \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & xyz & xzx & xxy & xzy & xxz & xyx \\ yxx & yyy & yzz & yyz & yzx & yxy & yzy & yxz & yyx \\ zxx & zyy & zzz & zyz & zzx & zxy & zzy & zxz & zyx \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} xxx & xyy & xzz & xyz \\ yxx & yyy & yzz & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & xyz \\ yxx & yyy & yzz & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & xyz \\ yxx & yyy & yzz & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & xyz \\ yxx & yyy & yzz & \\ zxx & zyy & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} xxx & xyy & xzz & xyz & xxz & xxy \\ yxx & yyy & yzz & yyz & yxz & yxy \\ zxx & zyy & zzz & zyz & zxz & zxy \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & xyz & xxz & xxy \\ yxx & yyy & yzz & yyz & yxz & yxy \\ zxx & zyy & zzz & zyz & zxz & zxy \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & xyz & xxz & xxy \\ yxx & yyy & yzz & yyz & yxz & yxy \\ zxx & zyy & zzz & zyz & zxz & zxy \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & xyz & xxz & xxy \\ yxx & yyy & yzz & yyz & yxz & yxy \\ zxx & zyy & zzz & zyz & zxz & zxy \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} yzx & yzy & yzz \\ zxx & zxy & zxz \\ xyx & xyy & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & yzz \\ zxx & zxy & zxz \\ xyx & xyy & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & yzz \\ zxx & zxy & zxz \\ xyx & xyy & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & yzz \\ zxx & zxy & zxz \\ xyx & xyy & xyz \end{pmatrix}$

n = 2 $\mathbf{C}_2 = \mathbf{2}_z$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & xzy & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & yzy & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & xzy & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & yzy & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & xzy & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & yzy & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & xzy & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & yzy & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & yyz & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & yyz & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & yyz & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & yyz & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} yzx & yzy & 0 \\ zxx & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ zxx & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ zxx & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ zxx & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$

$\mathbf{C}_n$

n=3 $\mathbf{C}_3 = \mathbf{3}_z$

	1	e	a	ae
V^3	$\begin{pmatrix} xxx & -xxx & 0 & xyz & xzx & -yyy & -yzx & xxz & -yyy \\ -yyy & yyy & 0 & yyz & yzx & -xxx & xzx & -xyz & -xxx \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & xyz & xzx & -yyy & -yzx & xxz & -yyy \\ -yyy & yyy & 0 & yyz & yzx & -xxx & xzx & -xyz & -xxx \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & xyz & xzx & -yyy & -yzx & xxz & -yyy \\ -yyy & yyy & 0 & yyz & yzx & -xxx & xzx & -xyz & -xxx \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & xyz & xzx & -yyy & -yzx & xxz & -yyy \\ -yyy & yyy & 0 & yyz & yzx & -xxx & xzx & -xyz & -xxx \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ -yyy & yyy & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ -yyy & yyy & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ -yyy & yyy & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ -yyy & yyy & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} xxx & -xxx & 0 & xyz & xxz & -yyy \\ -yyy & yyy & 0 & xxz & -xyz & -xxx \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & xyz & xxz & -yyy \\ -yyy & yyy & 0 & xxz & -xyz & -xxx \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & xyz & xxz & -yyy \\ -yyy & yyy & 0 & xxz & -xyz & -xxx \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & xyz & xxz & -yyy \\ -yyy & yyy & 0 & xxz & -xyz & -xxx \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$

n>3 $\mathbf{C}_\infty = \infty$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$

$\mathbf{C}_{nv}$

n=1 $\mathbf{C}_{1v} = \mathbf{m}_y$

	1	e	a	ae
V^3	$\begin{pmatrix} xxx & xyy & xzz & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy & yzy & 0 & yyx \\ zxx & zyy & zzz & 0 & zzx & 0 & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy & xzy & 0 & xyx \\ yxx & yyy & yzz & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy & zzy & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy & yzy & 0 & yyx \\ zxx & zyy & zzz & 0 & zzx & 0 & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy & xzy & 0 & xyx \\ yxx & yyy & yzz & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy & zzy & 0 & zyx \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} xxx & xyy & xzz & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy \\ zxx & zyy & zzz & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy \\ yxx & yyy & yzz & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy \\ zxx & zyy & zzz & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy \\ yxx & yyy & yzz & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & zxz \\ 0 & xyy & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & yzz \\ 0 & zxy & 0 \\ xyx & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & zxz \\ 0 & xyy & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & yzz \\ 0 & zxy & 0 \\ xyx & 0 & xyz \end{pmatrix}$

n=2 $\mathbf{C}_{2v} = \mathbf{2}_z\mathbf{m}_x\mathbf{m}_y$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & yzy & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & yzy & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$

$\mathbf{C}_{nv}$

n=3 $\mathbf{C}_{3v} = \mathbf{3}_z\mathbf{m}_x$

1

V^3

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & -yyy & 0 & yyz & -yyy \\ -yyy & yyy & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[V^3]$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ -yyy & yyy & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$$

$V[V^2]$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & -yyy \\ -yyy & yyy & 0 & xxz & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}V$

$$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

e

$$\begin{pmatrix} xxx & -xxx & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & -xxx & 0 & -xyz & -xxx \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$$

$$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$$

$$\begin{pmatrix} xxx & -xxx & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & -yyy & 0 & yyz & -yyy \\ -yyy & yyy & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ -yyy & yyy & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & -yyy \\ -yyy & yyy & 0 & xxz & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} xxx & -xxx & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & -xxx & 0 & -xyz & -xxx \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$$

$$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$$

$$\begin{pmatrix} xxx & -xxx & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$$

n>3 $\mathbf{C}_{\infty v} = \infty\mathbf{mm}$

1

V^3

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & yyz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[V^3]$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$$

$V[V^2]$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & xxz & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}V$

$$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

e

$$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0` & -zxy \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & yyz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & xxz & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0` & -zxy \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$$

$\mathbf{S}_{2n}$

n=1 $\mathbf{S}_2 = \bar{\mathbf{1}}$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & xyz & xzx & xxy & xzy & xxz & xyx \\ yxx & yyy & yzz & yyz & yzx & yxy & yzy & yxz & yyx \\ zxx & zyy & zzz & zyz & zzx & zxy & zzy & zxz & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & xyz & xzx & xxy & xzy & xxz & xyx \\ yxx & yyy & yzz & yyz & yzx & yxy & yzy & yxz & yyx \\ zxx & zyy & zzz & zyz & zzx & zxy & zzy & zxz & zyx \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & xyz \\ yxx & yyy & yzz & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & xyz \\ yxx & yyy & yzz & \\ zxx & zyy & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & xyz & xxz & xxy \\ yxx & yyy & yzz & yyz & yxz & yxy \\ zxx & zyy & zzz & zyz & zxz & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & xyz & xxz & xxy \\ yxx & yyy & yzz & yyz & yxz & yxy \\ zxx & zyy & zzz & zyz & zxz & zxy \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & yzz \\ zxx & zxy & zxz \\ xyx & xyy & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & yzz \\ zxx & zxy & zxz \\ xyx & xyy & xyz \end{pmatrix}$

n=2 $\mathbf{S}_4 = \bar{\mathbf{4}}_z$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & yzx & -yyz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & -xzx & xyz & 0 \\ zxx & -zxx & 0 & 0 & 0 & zxy & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & yyz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & yzx & -yyz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & -xzx & xyz & 0 \\ zxx & -zxx & 0 & 0 & 0 & zxy & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & yyz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ zxx & -zxx & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ zxx & -zxx & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & -xxz & xyz & 0 \\ zxx & -zxx & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & -xxz & xyz & 0 \\ zxx & -zxx & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} yzx & yzy & 0 \\ yzy & -yzx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ yzy & -yzx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$

S_{2n}

n=3 $\mathbf{S_6} = \bar{\mathbf{3}}_z$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & xyz & xzx & -yyy & -yzx & xxz & -yyy \\ -yyy & yyy & 0 & yyz & yzx & -xxx & xzx & -xyz & -xxx \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & xyz & xzx & -yyy & -yzx & xxz & -yyy \\ -yyy & yyy & 0 & yyz & yzx & -xxx & xzx & -xyz & -xxx \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ -yyy & yyy & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ -yyy & yyy & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & xyz & xxz & -yyy \\ -yyy & yyy & 0 & xxz & -xyz & -xxx \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & xyz & xxz & -yyy \\ -yyy & yyy & 0 & xxz & -xyz & -xxx \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0 \\ 0&0&0 \\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0 \\ 0&0&0 \\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$

n>3 $\mathbf{C_{\infty h} = \infty/m}$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xzx&0&-yzx&yyz&0 \\ 0&0&0&yyz&yzx&0&xzx&-xyz&0 \\ zxx&zxx&zzz&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xzx&0&-yzx&yyz&0 \\ 0&0&0&yyz&yzx&0&xzx&-xyz&0 \\ zxx&zxx&zzz&0&0&zxy&0&0&-zxy \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ zxx&zxx&zzz& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xxz&0 \\ 0&0&0&xxz&-xyz&0 \\ zxx&zxx&zzz&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xxz&0 \\ 0&0&0&xxz&-xyz&0 \\ zxx&zxx&zzz&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0 \\ 0&0&0 \\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0 \\ 0&0&0 \\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$

$\mathbf{C}_{nh}$

n=1 $\mathbf{C}_{1h} = \mathbf{m}_z$

	1	e	a	ae
V^3	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & xxy & 0 & 0 & xyx \\ yxx & yyy & yzz & 0 & 0 & yxy & 0 & 0 & yyx \\ 0 & 0 & 0 & zyz & zzx & 0 & zzy & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & xzy & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & yzy & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & xxy & 0 & 0 & xyx \\ yxx & yyy & yzz & 0 & 0 & yxy & 0 & 0 & yyx \\ 0 & 0 & 0 & zyz & zzx & 0 & zzy & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & xzy & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & yzy & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & xxy \\ yxx & yyy & yzz & 0 & 0 & yxy \\ 0 & 0 & 0 & zyz & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & yyz & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & xxy \\ yxx & yyy & yzz & 0 & 0 & yxy \\ 0 & 0 & 0 & zyz & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & yyz & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & yzz \\ 0 & 0 & zxz \\ xyx & xyy & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ zxx & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & yzz \\ 0 & 0 & zxz \\ xyx & xyy & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ zxx & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$

n=2 $\mathbf{C}_{2h} = \mathbf{2/m}_z$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & xzy & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & yzy & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & xzy & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & yzy & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & yyz & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & yyz & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ zxx & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ zxx & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$

$\mathbf{C}_{nh}$

n=3 $\mathbf{C}_{3h} = \bar{\mathbf{6}}_z$

1

V^3 $\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & -yyy & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & -xxx & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$[V^3]$ $\begin{pmatrix} xxx & -xxx & 0 & 0 \\ -yyy & yyy & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$

$V[V^2]$ $\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$\{V^2\}V$ $\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

e

$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & yyz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$

$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$

a

$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & -yyy & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & -xxx & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ -yyy & yyy & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$

$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

ae

$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & yyz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$

$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$

n>3 $\mathbf{C}_{\infty h} = \infty/\mathbf{m}$

1

V^3 $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$[V^3]$ $\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$

$V[V^2]$ $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$\{V^2\}V$ $\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

e

$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & yyz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$

$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$

a

$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

ae

$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & yyz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$

$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$

$\mathbf{D}_n$

n=1 $\mathbf{D}_1 = \mathbf{2}_y$

1

V^3 $\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy & xzy & 0 & xyx \\ yxx & yyy & yzz & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy & zzy & 0 & zyx \end{pmatrix}$

$[V^3]$ $\begin{pmatrix} 0 & 0 & 0 & xyz \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$

$V[V^2]$ $\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy \\ yxx & yyy & yzz & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy \end{pmatrix}$

$\{V^2\}V$ $\begin{pmatrix} yzx & 0 & yzz \\ 0 & zxy & 0 \\ xyx & 0 & xyz \end{pmatrix}$

e

$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy & xzy & 0 & xyx \\ yxx & yyy & yzz & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy & zzy & 0 & zyx \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & xyz \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy \\ yxx & yyy & yzz & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy \end{pmatrix}$

$\begin{pmatrix} yzx & 0 & yzz \\ 0 & zxy & 0 \\ xyx & 0 & xyz \end{pmatrix}$

a

$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy & xzy & 0 & xyx \\ yxx & yyy & yzz & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy & zzy & 0 & zyx \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & xyz \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy \\ yxx & yyy & yzz & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy \end{pmatrix}$

$\begin{pmatrix} yzx & 0 & yzz \\ 0 & zxy & 0 \\ xyx & 0 & xyz \end{pmatrix}$

ae

$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy & xzy & 0 & xyx \\ yxx & yyy & yzz & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy & zzy & 0 & zyx \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & xyz \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy \\ yxx & yyy & yzz & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy \end{pmatrix}$

$\begin{pmatrix} yzx & 0 & yzz \\ 0 & zxy & 0 \\ xyx & 0 & xyz \end{pmatrix}$

n=2 $\mathbf{D}_2 = \mathbf{2}_x\mathbf{2}_y\mathbf{2}_z$

1

V^3 $\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$

$[V^3]$ $\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$

$V[V^2]$ $\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$

$\{V^2\}V$ $\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$

e

$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$

$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$

a

$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$

$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$

ae

$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$

$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$

$\mathbf{D}_n$

n=3 $\mathbf{D}_3 = \mathbf{3}_z\mathbf{2}_x$

	1	e	a	ae
V^3	$\begin{pmatrix} xxx & -xxx & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & -xxx & 0 & -xyz & -xxx \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & -xxx & 0 & -xyz & -xxx \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & -xxx & 0 & -xyz & -xxx \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & -xxx & 0 & -xyz & -xxx \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & -yyy \\ -yyy & yyy & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & -yyy \\ -yyy & yyy & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & -yyy \\ -yyy & yyy & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & -yyy \\ -yyy & yyy & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$

n>3 $\mathbf{D}_\infty = \infty\mathbf{2}$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$

$\mathbf{D}_{nd}$

n=1 $\mathbf{D}_{1d} = \mathbf{2}_y/\mathbf{m}_y$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&xxy&xzy&0&xyx \\ yxx&yyy&yzz&0&yzx&0&0&yxz&0 \\ 0&0&0&zyz&0&zxy&zzy&0&zyx \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&xxy&xzy&0&xyx \\ yxx&yyy&yzz&0&yzx&0&0&yxz&0 \\ 0&0&0&zyz&0&zxy&zzy&0&zyx \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz \\ yxx&yyy&yzz& \\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz \\ yxx&yyy&yzz& \\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&xxy \\ yxx&yyy&yzz&0&yxz&0 \\ 0&0&0&zyz&0&zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&xxy \\ yxx&yyy&yzz&0&yxz&0 \\ 0&0&0&zyz&0&zxy \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0 \\ 0&0&0 \\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&yzz \\ 0&zxy&0 \\ xyx&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0 \\ 0&0&0 \\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&yzz \\ 0&zxy&0 \\ xyx&0&xyz \end{pmatrix}$

n=2 $\mathbf{D}_{2d} = \bar{\mathbf{4}}_z\, \mathbf{m}_x\mathbf{2}_{xy}$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&xzx&0&0&-yyz&0 \\ 0&0&0&yyz&0&0&-xzx&0&0 \\ zxx&-zxx&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0&-yzx&0&0 \\ 0&0&0&0&yzx&0&0&-xyz&0 \\ 0&0&0&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xzx&0&0&-yyz&0 \\ 0&0&0&yyz&0&0&-xzx&0&0 \\ zxx&-zxx&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0&-yzx&0&0 \\ 0&0&0&0&yzx&0&0&-xyz&0 \\ 0&0&0&0&0&zxy&0&0&-zxy \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ zxx&-zxx&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ zxx&-zxx&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&xxz&0 \\ 0&0&0&-xxz&0&0 \\ zxx&-zxx&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0 \\ 0&0&0&0&-xyz&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xxz&0 \\ 0&0&0&-xxz&0&0 \\ zxx&-zxx&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0 \\ 0&0&0&0&-xyz&0 \\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&yzy&0 \\ yzy&0&0 \\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&0 \\ 0&yzx&0 \\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&yzy&0 \\ yzy&0&0 \\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&0 \\ 0&yzx&0 \\ 0&0&xyz \end{pmatrix}$

$\mathbf{D}_{nd}$

n=3 $\mathbf{D}_{3d} = \bar{\mathbf{3}}_z \mathbf{m}_x$

1

V^3
$$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$$

$[V^3]$
$$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$$

$V[V^2]$
$$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$$

$\{V^2\}V$
$$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$$

e
$$\begin{pmatrix} xxx&-xxx&0&xyz&0&0&-yzx&0&0\\ 0&0&0&0&yzx&-xxx&0&-xyz&-xxx\\ 0&0&0&0&0&zxy&0&0&-zxy \end{pmatrix}$$

$$\begin{pmatrix} xxx&-xxx&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$$

$$\begin{pmatrix} xxx&-xxx&0&xyz&0&0\\ 0&0&0&0&-xyz&-xxx\\ 0&0&0&0&0&0 \end{pmatrix}$$

$$\begin{pmatrix} yzx&0&0\\ 0&yzx&0\\ 0&0&xyz \end{pmatrix}$$

a
$$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$$

$$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$$

$$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$$

$$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$$

ae
$$\begin{pmatrix} xxx&-xxx&0&xyz&0&0&-yzx&0&0\\ 0&0&0&0&yzx&-xxx&0&-xyz&-xxx\\ 0&0&0&0&0&zxy&0&0&-zxy \end{pmatrix}$$

$$\begin{pmatrix} xxx&-xxx&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$$

$$\begin{pmatrix} xxx&-xxx&0&xyz&0&0\\ 0&0&0&0&-xyz&-xxx\\ 0&0&0&0&0&0 \end{pmatrix}$$

$$\begin{pmatrix} yzx&0&0\\ 0&yzx&0\\ 0&0&xyz \end{pmatrix}$$

n>3 $\mathbf{D}_{\infty h} = \infty/\mathbf{mmm}$

1

V^3
$$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$$

$[V^3]$
$$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$$

$V[V^2]$
$$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$$

$\{V^2\}V$
$$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$$

e
$$\begin{pmatrix} 0&0&0&xyz&0&0&-yzx&0&0\\ 0&0&0&0&yzx&0&0&-xyz&0\\ 0&0&0&0&0&zxy&0&0&-zxy \end{pmatrix}$$

$$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$$

$$\begin{pmatrix} 0&0&0&xyz&0&0\\ 0&0&0&0&-xyz&0\\ 0&0&0&0&0&0 \end{pmatrix}$$

$$\begin{pmatrix} yzx&0&0\\ 0&zxy&0\\ 0&0&xyz \end{pmatrix}$$

a
$$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$$

$$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$$

$$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$$

$$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$$

ae
$$\begin{pmatrix} 0&0&0&xyz&0&0&-yzx&0&0\\ 0&0&0&0&yzx&0&0&-xyz&0\\ 0&0&0&0&0&zxy&0&0&-zxy \end{pmatrix}$$

$$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$$

$$\begin{pmatrix} 0&0&0&xyz&0&0\\ 0&0&0&0&-xyz&0\\ 0&0&0&0&0&0 \end{pmatrix}$$

$$\begin{pmatrix} yzx&0&0\\ 0&zxy&0\\ 0&0&xyz \end{pmatrix}$$

$\mathbf{D}_{nh}$

n=1 $\mathbf{D}_{1h} = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z$

	1	e	a	ae
V^3	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yxy & 0 & 0 & yyx \\ 0 & 0 & 0 & 0 & zzx & 0 & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yxy & 0 & 0 & yyx \\ 0 & 0 & 0 & 0 & zzx & 0 & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yxy \\ 0 & 0 & 0 & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yxy \\ 0 & 0 & 0 & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & zxz \\ 0 & xyy & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & zxz \\ 0 & xyy & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$

n=2 $\mathbf{D}_{2h} = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$

$\mathbf{D}_{nh}$

n=3 $\mathbf{D}_{3h} = \bar{\mathbf{6}}_z\,\mathbf{m}_x\mathbf{2}_1$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -yyy & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -yyy & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ -yyy & yyy & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ -yyy & yyy & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$

n>3 $\mathbf{D}_{\infty h} = \infty/\mathbf{mmm}$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$

$\mathbf{C}_{2n}(\mathbf{C}_n)$

n=1 $\mathbf{C}_2(\mathbf{C}_1) = \mathbf{2}_z(\mathbf{1}) = \mathbf{2}_z'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & xzy & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & yzy & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & xzy & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & yzy & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy & yzy & 0 & yyx \\ zxx & zyy & zzz & 0 & zzx & 0 & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy & yzy & 0 & yyx \\ zxx & zyy & zzz & 0 & zzx & 0 & 0 & zxz & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & yyz & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & yyz & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy \\ zxx & zyy & zzz & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy \\ zxx & zyy & zzz & 0 & zxz & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} yzx & yzy & 0 \\ zxx & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ zxx & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & zxz \\ 0 & xyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & zxz \\ 0 & xyy & 0 \end{pmatrix}$

n=2 $\mathbf{C}_4(\mathbf{C}_2) = \mathbf{4}_z(\mathbf{2}_z) = \mathbf{4}_z'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & yyz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & yyz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & yzx & -yyz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & -xzx & xyz & 0 \\ zxx & -zxx & 0 & 0 & 0 & zxy & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & yzx & -yyz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & -xzx & xyz & 0 \\ zxx & -zxx & 0 & 0 & 0 & zxy & 0 & 0 & zxy \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ zxx & -zxx & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ zxx & -zxx & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & -xxz & xyz & 0 \\ zxx & -zxx & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & -xxz & xyz & 0 \\ zxx & -zxx & 0 & 0 & 0 & zxy \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ yzy & -yzx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ yzy & -yzx & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{C}_{2n}(\mathbf{C}_n)$

n=3 $\mathbf{C}_6(\mathbf{C}_3) = \mathbf{6}_z(\mathbf{3}_z) = \mathbf{6}_z'$

1

V^3
$$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & yyz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$$

$[V^3]$
$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$$

$V[V^2]$
$$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}V$
$$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$$

e

V^3
$$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & yyz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$$

$[V^3]$
$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$$

$V[V^2]$
$$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}V$
$$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$$

a

V^3
$$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & -yyy & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & -xxx & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[V^3]$
$$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ -yyy & yyy & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$$

$V[V^2]$
$$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}V$
$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

ae

V^3
$$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & -yyy & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & -xxx & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[V^3]$
$$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ -yyy & yyy & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$$

$V[V^2]$
$$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}V$
$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

n>3 $\mathbf{C}_\infty\mathbf{1}' = \infty\mathbf{1}'$

1

V^3
$$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$$

$[V^3]$
$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$$

$V[V^2]$
$$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}V$
$$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$$

e

V^3
$$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$$

$[V^3]$
$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$$

$V[V^2]$
$$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}V$
$$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$$

a

V^3
$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[V^3]$
$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$$

$V[V^2]$
$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}V$
$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

ae

V^3
$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[V^3]$
$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$$

$V[V^2]$
$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}V$
$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$\mathbf{S}_{2n}(\mathbf{C}_n)$

n=1 $\mathbf{S}_2(\mathbf{C}_1) = \bar{\mathbf{1}}(\mathbf{1}) = \bar{\mathbf{1}}'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx&xyy&xzz&xyz&xzx&xxy&xzy&xxz&xyx \\ yxx&yyy&yzz&yyz&yzx&yxy&yzy&yxz&yyx \\ zxx&zyy&zzz&zyz&zzx&zxy&zzy&zxz&zyx \end{pmatrix}$	$\begin{pmatrix} xxx&xyy&xzz&xyz&xzx&xxy&xzy&xxz&xyx \\ yxx&yyy&yzz&yyz&yzx&yxy&yzy&yxz&yyx \\ zxx&zyy&zzz&zyz&zzx&zxy&zzy&zxz&zyx \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} xxx&xyy&xzz&xyz \\ yxx&yyy&yzz& \\ zxx&zyy&zzz& \end{pmatrix}$	$\begin{pmatrix} xxx&xyy&xzz&xyz \\ yxx&yyy&yzz& \\ zxx&zyy&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx&xyy&xzz&xyz&xxz&xxy \\ yxx&yyy&yzz&yyz&yxz&yxy \\ zxx&zyy&zzz&zyz&zxz&zxy \end{pmatrix}$	$\begin{pmatrix} xxx&xyy&xzz&xyz&xxz&xxy \\ yxx&yyy&yzz&yyz&yxz&yxy \\ zxx&zyy&zzz&zyz&zxz&zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0 \\ 0&0&0 \\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&yzy&yzz \\ zxx&zxy&zxz \\ xyx&xyy&xyz \end{pmatrix}$	$\begin{pmatrix} yzx&yzy&yzz \\ zxx&zxy&zxz \\ xyx&xyy&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0 \\ 0&0&0 \\ 0&0&0 \end{pmatrix}$

n=2 $\mathbf{S}_4(\mathbf{C}_2) = \bar{\mathbf{4}}_z(\mathbf{2}_z) = \bar{\mathbf{4}}_z'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&xyz&xzx&0&yzx&-yyz&0 \\ 0&0&0&yyz&yzx&0&-xzx&xyz&0 \\ zxx&-zxx&0&0&0&zxy&0&0&zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xzx&0&-yzx&yyz&0 \\ 0&0&0&yyz&yzx&0&xzx&-xyz&0 \\ zxx&zyy&zzz&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xzx&0&-yzx&yyz&0 \\ 0&0&0&yyz&yzx&0&xzx&-xyz&0 \\ zxx&zyy&zzz&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xzx&0&yzx&-yyz&0 \\ 0&0&0&yyz&yzx&0&-xzx&xyz&0 \\ zxx&-zxx&0&0&0&zxy&0&0&zxy \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&xyz \\ 0&0&0& \\ zxx&-zxx&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz \\ 0&0&0& \\ zxx&-zxx&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&xyz&xxz&0 \\ 0&0&0&-xxz&xyz&0 \\ zxx&-zxx&0&0&0&zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xxz&0 \\ 0&0&0&xxz&-xyz&0 \\ zxx&zyy&zzz&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xxz&0 \\ 0&0&0&xxz&-xyz&0 \\ zxx&zyy&zzz&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xxz&0 \\ 0&0&0&-xxz&xyz&0 \\ zxx&-zxx&0&0&0&zxy \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} yzx&yzy&0 \\ yzy&-yzx&0 \\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&yzy&0 \\ -yzy&yzx&0 \\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} yzx&yzy&0 \\ -yzy&yzx&0 \\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} yzx&yzy&0 \\ yzy&-yzx&0 \\ 0&0&0 \end{pmatrix}$

$\mathbf{S}_{2n}(\mathbf{C}_n)$

n=3 $\mathbf{S}_6(\mathbf{C}_3) = \bar{\mathbf{3}}_z(\mathbf{3}_z) = \bar{\mathbf{3}}_z'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&xyz&xzx&-yyy&-yzx&xxz&-yyy \\ -yyy&yyy&0&yyz&yzx&-xxx&xzx&-xyz&-xxx \\ zxx&zxx&zzz&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&xyz&xzx&-yyy&-yzx&xxz&-yyy \\ -yyy&yyy&0&yyz&yzx&-xxx&xzx&-xyz&-xxx \\ zxx&zxx&zzz&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&0 \\ -yyy&yyy&0& \\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&0 \\ -yyy&yyy&0& \\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&xyz&xxz&-yyy \\ -yyy&yyy&0&xxz&-xyz&-xxx \\ zxx&zxx&zzz&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&xyz&xxz&-yyy \\ -yyy&yyy&0&xxz&-xyz&-xxx \\ zxx&zxx&zzz&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0 \\ 0&0&0 \\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&yzy&0 \\ -yzy&yzx&0 \\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} yzx&yzy&0 \\ -yzy&yzx&0 \\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0 \\ 0&0&0 \\ 0&0&0 \end{pmatrix}$

n>3 $\mathbf{C}_{\infty h}(\mathbf{C}_\infty) = \infty/\mathbf{m}'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xzx&0&-yzx&yyz&0 \\ 0&0&0&yyz&yzx&0&xzx&-xyz&0 \\ zxx&zxx&zzz&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xzx&0&-yzx&yyz&0 \\ 0&0&0&yyz&yzx&0&xzx&-xyz&0 \\ zxx&zxx&zzz&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xxz&0 \\ 0&0&0&xxz&-xyz&0 \\ zxx&zxx&zzz&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xxz&0 \\ 0&0&0&xxz&-xyz&0 \\ zxx&zxx&zzz&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0 \\ 0&0&0 \\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&yzy&0 \\ -yzy&yzx&0 \\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} yzx&yzy&0 \\ -yzy&yzx&0 \\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0 \\ 0&0&0 \\ 0&0&0 \end{pmatrix}$

$\mathbf{C}_{nh}(\mathbf{C}_n)$

n=1 $\mathbf{C}_{1h}(\mathbf{C}_1) = \mathbf{m}_{z(}\mathbf{1}) = \mathbf{m}_z$'

	1	e	a	ae
V^3	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & xxy & 0 & 0 & xyx \\ yxx & yyy & yzz & 0 & 0 & yxy & 0 & 0 & yyx \\ 0 & 0 & 0 & zyz & zzx & 0 & zzy & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & xzy & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & yzy & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & xzy & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & yzy & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & xxy & 0 & 0 & xyx \\ yxx & yyy & yzz & 0 & 0 & xyy & 0 & 0 & yyx \\ 0 & 0 & 0 & yzz & zzx & 0 & zzy & zxz & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & xxy \\ yxx & yyy & yzz & 0 & 0 & yxy \\ 0 & 0 & 0 & zyz & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & yyz & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & yyz & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & xxy \\ yxx & yyy & yzz & 0 & 0 & yxy \\ 0 & 0 & 0 & zyz & zxz & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & yzz \\ 0 & 0 & zxz \\ xyx & xyy & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ zxx & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ zxx & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & yzz \\ 0 & 0 & zxz \\ xyx & xyy & 0 \end{pmatrix}$

n=2 $\mathbf{C}_{2h}(\mathbf{C}_2) = \mathbf{2}_z/\mathbf{m}_z(\mathbf{2}_z) = \mathbf{2}_z/\mathbf{m}_z$'

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & xzy & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & yzy & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & xzy & xxz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & yzy & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & yyz & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & yyz & yxz & 0 \\ zxx & zyy & zzz & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ zxx & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ zxx & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{C}_{nh}(\mathbf{C}_n)$

n=3 $\mathbf{C}_{3h}(\mathbf{C}_3) = \bar{\mathbf{6}}_z(\mathbf{3}_z) = \bar{\mathbf{6}}_z'$

	1	e	a	ae
V^3	$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & -yyy & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & -xxx & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & yyz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & yyz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & -yyy & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & -xxx & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ -yyy & yyy & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ -yyy & yyy & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n>3 $\mathbf{C}_{\infty h}(\mathbf{C}_\infty) = \infty/\mathbf{m}'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & yyz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xzx & 0 & -yzx & yyz & 0 \\ 0 & 0 & 0 & yyz & yzx & 0 & xzx & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & xxz & 0 \\ 0 & 0 & 0 & xxz & -xyz & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & yzy & 0 \\ -yzy & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{C}_{2nh}(\mathbf{S}_{2n})$

n=1 $\mathbf{C}_{2h}(\mathbf{S}_2) = \mathbf{2}_z/\mathbf{m}_z(\bar{\mathbf{1}}) = \mathbf{2}_z'/\mathbf{m}_z'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xzx&0&xzy&xxz&0\\ 0&0&0&yyz&yzx&0&yzy&yxz&0\\ zxx&zyy&zzz&0&0&zxy&0&0&zyx \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx&xyy&xzz&0&0&xxy&0&0&xyx\\ yxx&yyy&yzz&0&0&yxy&0&0&yyx\\ 0&0&0&yzz&zzx&0&zzy&zxz&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz\\ 0&0&0&\\ zxx&zyy&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} xxx&xyy&xzz&0\\ yxx&yyy&yzz&\\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xxz&0\\ 0&0&0&yyz&yxz&0\\ zxx&zyy&zzz&0&0&zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx&xyy&xzz&0&0&xxy\\ yxx&yyy&yzz&0&0&yxy\\ 0&0&0&yzz&zxz&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&yzy&0\\ zxx&zxy&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&yzz\\ 0&0&zxz\\ xyx&xyy&0 \end{pmatrix}$

n=2 $\mathbf{C}_{4h}(\mathbf{S}_4) = \mathbf{4}_z/\mathbf{m}_z(\bar{\mathbf{4}}_z) = \mathbf{4}_z'/\mathbf{m}_z'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xzx&0&-yzx&yyz&0\\ 0&0&0&yyz&yzx&0&xzx&-xyz&0\\ zxx&zyy&zzz&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xzx&0&yzx&-yyz&0\\ 0&0&0&yyz&yzx&0&-xzx&xyz&0\\ zxx&-zxx&0&0&0&zxy&0&0&zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz\\ 0&0&0&\\ zxx&-zxx&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xxz&0\\ 0&0&0&xxz&-xyz&0\\ zxx&zyy&zzz&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xxz&0\\ 0&0&0&-xxz&xyz&0\\ zxx&-zxx&0&0&0&zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&yzy&0\\ -yzy&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} yzx&yzy&0\\ yzy&-yzx&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$

$\mathbf{C}_{2nh}(\mathbf{S}_{2n})$

n=3 $\mathbf{C}_{6h}(\mathbf{S}_6) = \mathbf{6}_z/\mathbf{m}_z(\bar{\mathbf{3}}_z) = \mathbf{6}_z'/\mathbf{m}_z'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xzx&0&-yzx&yyz&0\\ 0&0&0&yyz&yzx&0&xzx&-xyz&0\\ zxx&zxx&zzz&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&0&0&-yyy&0&0&-yyy\\ -yyy&yyy&0&0&0&-xxx&0&0&-xxx\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&0\\ -yyy&yyy&0&\\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xxz&0\\ 0&0&0&xxz&-xyz&0\\ zxx&zxx&zzz&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&0&0&-yyy\\ -yyy&yyy&0&0&0&-xxx\\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&yzy&0\\ -yzy&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$

n>3 $\mathbf{C}_{\infty h}$ **1'** = ∞**/m1'**

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xzx&0&-yzx&yyz&0\\ 0&0&0&yyz&yzx&0&xzx&-xyz&0\\ zxx&zxx&zzz&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xxz&0\\ 0&0&0&xxz&-xyz&0\\ zxx&zxx&zzz&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&yzy&0\\ -yzy&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$

$\mathbf{C}_{2nh}(\mathbf{C}_{nh})$

n=1 $\mathbf{C}_{2h}(\mathbf{C}_{1h}) = \mathbf{2}_z/\mathbf{m}_z(\mathbf{m}_z) = \mathbf{2}_z'/\mathbf{m}_z$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xzx&0&xzy&xxz&0\\ 0&0&0&yyz&yzx&0&yzy&yxz&0\\ zxx&zyy&zzz&0&0&zxy&0&0&zyx \end{pmatrix}$	$\begin{pmatrix} xxx&xyy&xzz&0&0&xxy&0&0&xyx\\ yxx&yyy&yzz&0&0&yxy&0&0&yyx\\ 0&0&0&zyz&zzx&0&zzy&zxz&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0&\end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz\\ 0&0&0&\\ zxx&zyy&zzz&\end{pmatrix}$	$\begin{pmatrix} xxx&xyy&xzz&0\\ yxx&yyy&yzz&\\ 0&0&0&\end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0&\end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xxz&0\\ 0&0&0&yyz&yxz&0\\ zxx&zyy&zzz&0&0&zxy \end{pmatrix}$	$\begin{pmatrix} xxx&xyy&xzz&0&0&xxy\\ yxx&yyy&yzz&0&0&yxy\\ 0&0&0&zyz&zxz&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0\end{pmatrix}$	$\begin{pmatrix} yzx&yzy&0\\ zxx&zxy&0\\ 0&0&xyz\end{pmatrix}$	$\begin{pmatrix} 0&0&yzz\\ 0&0&zxz\\ xyx&xyy&0\end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0\end{pmatrix}$

n=2 $\mathbf{C}_{4h}(\mathbf{C}_{2h}) = \mathbf{4}_z/\mathbf{m}_z(\mathbf{2}_z/\mathbf{m}_z) = \mathbf{4}_z'/\mathbf{m}_z$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xzx&0&-yzx&yyz&0\\ 0&0&0&yyz&yzx&0&xzx&-xyz&0\\ zxx&zyy&zzz&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xzx&0&yzx&-yyz&0\\ 0&0&0&yyz&yzx&0&-xzx&xyz&0\\ zxx&-zxx&0&0&0&zxy&0&0&zxy \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0&\end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ zxx&zxx&zzz&\end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0&\end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz\\ 0&0&0&\\ zxx&-zxx&0&\end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xxz&0\\ 0&0&0&xxz&-xyz&0\\ zxx&zyy&zzz&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xxz&0\\ 0&0&0&-xxz&xyz&0\\ zxx&-zxx&0&0&0&zxy \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0\end{pmatrix}$	$\begin{pmatrix} yzx&yzy&0\\ -yzy&yzx&0\\ 0&0&xyz\end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0\end{pmatrix}$	$\begin{pmatrix} yzx&yzy&0\\ yzy&-yzx&0\\ 0&0&0\end{pmatrix}$

$C_{2nh}(C_{nh})$

n=3 $C_{6h}(C_{3h}) = 6_z/m_z(3_z/m_z) = 6_z'/m_z$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xzx&0&-yzx&yyz&0\\ 0&0&0&yyz&yzx&0&xzx&-xyz&0\\ zxx&zxx&zzz&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&0&0&-yyy&0&0&-yyy\\ -yyy&yyy&0&0&0&-xxx&0&0&-xxx\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&0\\ -yyy&yyy&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xxz&0\\ 0&0&0&xxz&-xyz&0\\ zxx&zxx&zzz&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&0&0&-yyy\\ -yyy&yyy&0&0&0&-xxx\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&yzy&0\\ -yzy&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$

n>3 $C_{\infty h}1' = \infty/m1'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xzx&0&-yzx&yyz&0\\ 0&0&0&yyz&yzx&0&xzx&-xyz&0\\ zxx&zxx&zzz&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&xxz&0\\ 0&0&0&xxz&-xyz&0\\ zxx&zxx&zzz&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&yzy&0\\ -yzy&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$

$\mathbf{D}_n(\mathbf{C}_n)$

n=1 $\mathbf{D}_1(\mathbf{C}_1) = \mathbf{2}_y(\mathbf{1}) = \mathbf{2}_y'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy & xzy & 0 & xyx \\ yxx & yyy & yzz & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy & zzy & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy & xzy & 0 & xyx \\ yxx & yyy & yzz & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy & zzy & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy & yzy & 0 & yyx \\ zxx & zyy & zzz & 0 & zzx & 0 & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy & yzy & 0 & yyx \\ zxx & zyy & zzz & 0 & zzx & 0 & 0 & zxz & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy \\ yxx & yyy & yzz & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy \\ yxx & yyy & yzz & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy \\ zxx & zyy & zzz & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy \\ zxx & zyy & zzz & 0 & zxz & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} yzx & 0 & yzz \\ 0 & zxy & 0 \\ xyx & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & yzz \\ 0 & zxy & 0 \\ xyx & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & zxz \\ 0 & xyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & zxz \\ 0 & xyy & 0 \end{pmatrix}$

n=2 $\mathbf{D}_2(\mathbf{C}_2) = \mathbf{2}_x\mathbf{2}_y\mathbf{2}_z(\mathbf{2}_z) = \mathbf{2}_x'\mathbf{2}_y'\mathbf{2}_z$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & yzy & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & yzy & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_n(\mathbf{C}_n)$

n=3 $\mathbf{D}_3(\mathbf{C}_3) = \mathbf{3}_z\mathbf{2}_x(\mathbf{3}_z) = \mathbf{3}_z\mathbf{2}_x'$

	1	e	a	ae
V^3	$\begin{pmatrix} xxx & -xxx & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & -xxx & 0 & -xyz & -xxx \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & -xxx & 0 & -xyz & -xxx \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & -yyy & 0 & yyz & -yyy \\ -yyy & yyy & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & -yyy & 0 & yyz & -yyy \\ -yyy & yyy & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ -yyy & yyy & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ -yyy & yyy & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} xxx & -xxx & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & -yyy \\ -yyy & yyy & 0 & xxz & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & -yyy \\ -yyy & yyy & 0 & xxz & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n>3 $\mathbf{D}_\infty(\mathbf{C}_\infty) = \infty\mathbf{2}'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & yyz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & yyz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & xxz & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & xxz & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{2n}(\mathbf{D}_n)$

n=1 $\mathbf{D}_2(\mathbf{D}_1) = \mathbf{2}_x\mathbf{2}_y\mathbf{2}(\mathbf{2}_y) = \mathbf{2}_x\mathbf{'2}_y\mathbf{2}_z\mathbf{'}$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxy & 0 & 0 & xyx \\ yxx & yyy & yzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & zyz & 0 & 0 & zzy & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxy & 0 & 0 & xyx \\ yxx & yyy & yzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & zyz & 0 & 0 & zzy & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxy \\ yxx & yyy & yzz & 0 & 0 & 0 \\ 0 & 0 & 0 & zyz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxy \\ yxx & yyy & yzz & 0 & 0 & 0 \\ 0 & 0 & 0 & zyz & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & yzz \\ 0 & 0 & 0 \\ xyx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & yzz \\ 0 & 0 & 0 \\ xyx & 0 & 0 \end{pmatrix}$

n=2 $\mathbf{D}_4(\mathbf{D}_2) = \mathbf{4}_z\mathbf{2}_x\mathbf{2}_{xy}(\mathbf{2}_x\mathbf{2}_y\mathbf{2}_z) = \mathbf{4}_z\mathbf{'2}_x\mathbf{2}_{xy}\mathbf{'}$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zxy \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & -yzx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & -yzx & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{2n}(\mathbf{D}_n)$

n=3 $\mathbf{D}_6(\mathbf{D}_3) = \mathbf{6}_z\mathbf{2}_x\mathbf{2}_1(\mathbf{3}_z\mathbf{2}_x) = \mathbf{6}_z\mathbf{'2}_x\mathbf{2}_1\mathbf{'}$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxx & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxx & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n>3 $\mathbf{D}_\infty\mathbf{1'} = \infty\mathbf{21'}$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0` & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0` & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{C}_{nv}(\mathbf{C}_n)$

n=1 $\mathbf{C}_{1v}(\mathbf{C}_1) = \mathbf{m}_y(\mathbf{1}) = \mathbf{m}_y'$

	1	e	a	ae
V^3	$\begin{pmatrix} xxx & xyy & xzz & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy & yzy & 0 & yyx \\ zxx & zyy & zzz & 0 & zzx & 0 & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy & xzy & 0 & xyx \\ yxx & yyy & yzz & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy & zzy & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy & xzy & 0 & xyx \\ yxx & yyy & yzz & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy & zzy & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy & yzy & 0 & yyx \\ zxx & zyy & zzz & 0 & zzx & 0 & 0 & zxz & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} xxx & xyy & xzz & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy \\ zxx & zyy & zzz & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy \\ yxx & yyy & yzz & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy \\ yxx & yyy & yzz & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy \\ zxx & zyy & zzz & 0 & zxz & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & zxz \\ 0 & xyy & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & yzz \\ 0 & zxy & 0 \\ xyx & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & yzz \\ 0 & zxy & 0 \\ xyx & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & zxz \\ 0 & xyy & 0 \end{pmatrix}$

n=2 $\mathbf{C}_{2v}(\mathbf{C}_2) = \mathbf{2}_z\mathbf{m}_x\mathbf{m}_y(\mathbf{2}_z) = \mathbf{2}_z\mathbf{m}_x'\mathbf{m}_y'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & yzy & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & yzy & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{C}_{nv}(\mathbf{C}_n)$

n=3 $\mathbf{C}_{3v}(\mathbf{C}_3) = \mathbf{3}_z\mathbf{m}_x(\mathbf{3}_z) = \mathbf{3}_z\mathbf{m}_x'$

1

V^3

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & -yyy & 0 & yyz & -yyy \\ -yyy & yyy & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[V^3]$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ -yyy & yyy & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$$

$V[V^2]$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & -yyy \\ -yyy & yyy & 0 & xxz & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}V$

$$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

e

$$\begin{pmatrix} xxx & -xxx & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & -xxx & 0 & -xyz & -xxx \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$$

$$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$$

$$\begin{pmatrix} xxx & -xxx & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$$

a

$$\begin{pmatrix} xxx & -xxx & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & -xxx & 0 & -xyz & -xxx \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$$

$$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$$

$$\begin{pmatrix} xxx & -xxx & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & -yyy & 0 & yyz & -yyy \\ -yyy & yyy & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ -yyy & yyy & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & -yyy \\ -yyy & yyy & 0 & xxz & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

n>3 $\mathbf{C}_{\infty v}(\mathbf{C}_\infty) = \infty\mathbf{m}'\mathbf{m}'$

1

V^3

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & yyz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[V^3]$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$$

$V[V^2]$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & xxz & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}V$

$$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

e

$$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0` & -zxy \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0` & -zxy \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & yyz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & xxz & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$\mathbf{C}_{2nv}(\mathbf{C}_{nv})$

n=1 $\mathbf{C}_{2v}(\mathbf{C}_{1v}) = \mathbf{2}_z\mathbf{m}_x\mathbf{m}_y(\mathbf{m}_y) = \mathbf{2}_z'\mathbf{m}_x'\mathbf{m}_y$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & yzy & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yxy & 0 & 0 & yyx \\ 0 & 0 & 0 & 0 & zzx & 0 & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxy & 0 & 0 & xyx \\ yxx & yyy & yzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & zyz & 0 & 0 & zzy & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xyy \\ 0 & 0 & 0 & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxy \\ yxx & yyy & yzz & 0 & 0 & 0 \\ 0 & 0 & 0 & zyz & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & zxz \\ 0 & xyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & yzz \\ 0 & 0 & 0 \\ xyx & 0 & 0 \end{pmatrix}$

n=2 $\mathbf{C}_{4v}(\mathbf{C}_{2v}) = \mathbf{4}_z\mathbf{m}_x\mathbf{m}_{xy}(\mathbf{2}_z\mathbf{m}_x\mathbf{m}_y) = \mathbf{4}_z'\mathbf{m}_x\mathbf{m}_{xy}'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & yyz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & -yyz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & -xzx & 0 & 0 \\ zxx & -zxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zxy \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & -zxx & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & xxz & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & -xxz & 0 & 0 \\ zxx & -zxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & -yzx & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$C_{2nv}(C_{nv})$

n=3 $\mathbf{C_{6v}(C_{3v}) = 6_z m_x m_1 (3_z m_x) = 6_z' m_x m_1'}$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & yyz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -yyy & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxx & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ -yyy & yyy & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & xxz & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n>3 $\mathbf{C_{\infty v} 1' = \infty mm 1'}$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & yyz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0` & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & xxz & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{nd}(\mathbf{S}_{2n})$

n=1 $\mathbf{D}_{1d}(\mathbf{S}_2) = \mathbf{2}_y/\mathbf{m}_y(\bar{\mathbf{1}}) = \mathbf{2}_y'/\mathbf{m}_y'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy & xzy & 0 & xyx \\ yxx & yyy & yzz & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy & zzy & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy & yzy & 0 & yyx \\ zxx & zyy & zzz & 0 & zzx & 0 & 0 & zxz & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy \\ yxx & yyy & yzz & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy \\ zxx & zyy & zzz & 0 & zxz & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & yzz \\ 0 & zxy & 0 \\ xyx & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & zxz \\ 0 & xyy & 0 \end{pmatrix}$

n=2 $\mathbf{D}_{2d}(\mathbf{S}_4) = \bar{\mathbf{4}}_z\,\mathbf{m}_x\mathbf{2}_{xy}(\bar{\mathbf{4}}_z) = \bar{\mathbf{4}}_z\,\mathbf{m}_x'\mathbf{2}_{xy}'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & -yyz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & -xzx & 0 & 0 \\ zxx & -zxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & yyz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & -zxx & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & -xxz & 0 & 0 \\ zxx & -zxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & xxz & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & yzy & 0 \\ yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & -yzx & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{nd}(\mathbf{S}_{2n})$

n=3 $\mathbf{D}_{3d}(\mathbf{S}_6) = \bar{\mathbf{3}}_z\,\mathbf{m}_x(\bar{\mathbf{3}}_z) = \bar{\mathbf{3}}_z\,\mathbf{m}_x'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&xyz&0&0&-yzx&0&0\\ 0&0&0&0&yzx&-xxx&0&-xyz&-xxx\\ 0&0&0&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xzx&-yyy&0&yyz&-yyy\\ -yyy&yyy&0&yyz&0&0&xzx&0&0\\ zxx&zxx&zzz&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ -yyy&yyy&0&\\ zxx&zxx&zzz& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&-yyy\\ -yyy&yyy&0&0&-xyz&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xxz&-yyy\\ -yyy&yyy&0&xxz&0&0\\ zxx&zyy&zzz&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&0\\ 0&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&yzy&0\\ -yzy&0&0\\ 0&0&0 \end{pmatrix}$

n>3 $\mathbf{D}_{\infty h}(\mathbf{C}_{\infty h}) = \infty\mathbf{/mm'm'}$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0&-yzx&0&0\\ 0&0&0&0&yzx&0&0&-xyz&0\\ 0&0&0&0&0&zxy&0&0`&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xzx&0&0&yyz&0\\ 0&0&0&yyz&0&0&xzx&0&0\\ zxx&zxx&zzz&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ zxx&zxx&zzz& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0\\ 0&0&0&0&-xyz&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xxz&0\\ 0&0&0&xxz&0&0\\ zxx&zxx&zzz&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&0\\ 0&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&yzy&0\\ -yzy&0&0\\ 0&0&0 \end{pmatrix}$

$\mathbf{D}_{nd}(\mathbf{D}_n)$

n=1 $\mathbf{D}_{1d}(\mathbf{D}_1) = \mathbf{2}_y/\mathbf{m}_y(\mathbf{2}_y) = \mathbf{2}_y/\mathbf{m}_y'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&xxy&xzy&0&xyx \\ yxx&yyy&yzz&0&yzx&0&0&yxz&0 \\ 0&0&0&zyz&0&zxy&zzy&0&zyx \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&xxy&xzy&0&xyx \\ yxx&yyy&yzz&0&yzx&0&0&yxz&0 \\ 0&0&0&zyz&0&zxy&zzy&0&zyx \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz \\ yxx&yyy&yzz& \\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz \\ yxx&yyy&yzz& \\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&xxy \\ yxx&yyy&yzz&0&yxz&0 \\ 0&0&0&zyz&0&zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&xxy \\ yxx&yyy&yzz&0&yxz&0 \\ 0&0&0&zyz&0&zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0 \\ 0&0&0 \\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&yzz \\ 0&zxy&0 \\ xyx&0&xyz \end{pmatrix}$	$\begin{pmatrix} yzx&0&yzz \\ 0&zxy&0 \\ xyx&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0 \\ 0&0&0 \\ 0&0&0 \end{pmatrix}$

n=2 $\mathbf{D}_{2d}(\mathbf{D}_2) = \bar{\mathbf{4}}_z\,\mathbf{m}_x\mathbf{2}_{xy}(\mathbf{2}_{xy}\mathbf{2}_{\bar{x}y}\,\mathbf{2}_z) = \bar{\mathbf{4}}_z\,'\mathbf{m}_x'\mathbf{2}_{xy}$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&xzx&0&0&-yyz&0 \\ 0&0&0&yyz&0&0&-xzx&0&0 \\ zxx&-zxx&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0&-yzx&0&0 \\ 0&0&0&0&yzx&0&0&-xyz&0 \\ 0&0&0&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0&-yzx&0&0 \\ 0&0&0&0&yzx&0&0&-xyz&0 \\ 0&0&0&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xzx&0&0&-yyz&0 \\ 0&0&0&yyz&0&0&-xzx&0&0 \\ zxx&-zxx&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ zxx&-zxx&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0 \\ 0&0&0& \\ zxx&-zxx&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&xxz&0 \\ 0&0&0&-xxz&0&0 \\ zxx&-zxx&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0 \\ 0&0&0&0&-xyz&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0 \\ 0&0&0&0&-xyz&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xxz&0 \\ 0&0&0&-xxz&0&0 \\ zxx&-zxx&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&yzy&0 \\ yzy&0&0 \\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&0 \\ 0&yzx&0 \\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} yzx&0&0 \\ 0&yzx&0 \\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&yzy&0 \\ yzy&0&0 \\ 0&0&0 \end{pmatrix}$

$\mathbf{D}_{nd}(\mathbf{D}_n)$

n=3 $\mathbf{D}_{3d}(\mathbf{D}_3) = \bar{\mathbf{3}}_z\,\mathbf{m}_x(\mathbf{3}_z\mathbf{2}_x) = \bar{\mathbf{3}}_z\,\mathbf{'m}_x\mathbf{'}$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&xyz&0&0&-yzx&0&0\\ 0&0&0&0&yzx&-xxx&0&-xyz&-xxx\\ 0&0&0&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&xyz&0&0&-yzx&0&0\\ 0&0&0&0&yzx&-xxx&0&-xyz&-xxx\\ 0&0&0&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&-yyy\\ -yyy&yyy&0&0&-xyz&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&-yyy\\ -yyy&yyy&0&0&-xyz&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&0\\ 0&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} yzx&0&0\\ 0&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$

n>3 $\mathbf{D}_{\infty h}(\mathbf{D}_\infty) = \infty\mathbf{/m'm'm'}$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0&-yzx&0&0\\ 0&0&0&0&yzx&0&0&-xyz&0\\ 0&0&0&0&0&zxy&0&0`&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0&-yzx&0&0\\ 0&0&0&0&yzx&0&0&-xyz&0\\ 0&0&0&0&0&zxy&0&0`&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0\\ 0&0&0&0&-xyz&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0\\ 0&0&0&0&-xyz&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&0\\ 0&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} yzx&0&0\\ 0&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$

$\mathbf{D}_{nd}(\mathbf{C}_{nv})$

n=1 $\mathbf{D}_{1d}(\mathbf{C}_{1v}) = \mathbf{2}_y/\mathbf{m}_y(\mathbf{m}_y) = \mathbf{2}_y'/\mathbf{m}_y$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy & xzy & 0 & xyx \\ yxx & yyy & yzz & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy & zzy & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy & yzy & 0 & yyx \\ zxx & zyy & zzz & 0 & zzx & 0 & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & xxy \\ yxx & yyy & yzz & 0 & yxz & 0 \\ 0 & 0 & 0 & zyz & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & yxy \\ zxx & zyy & zzz & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & yzz \\ 0 & zxy & 0 \\ xyx & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & zxz \\ 0 & xyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n=2 $\mathbf{D}_{2d}(\mathbf{C}_{2v}) = \bar{\mathbf{4}}_z\,\mathbf{m}_x\mathbf{2}_{xy}(\mathbf{2}_z\mathbf{m}_x\mathbf{m}_y) = \bar{\mathbf{4}}_z\,'\mathbf{m}_x\mathbf{2}_{xy}'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & -yyz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & -xzx & 0 & 0 \\ zxx & -zxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & yyz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zxy \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & -zxx & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & -xxz & 0 & 0 \\ zxx & -zxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & xxz & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & yzy & 0 \\ yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & -yzx & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{nd}(\mathbf{C}_{nv})$

n=3 $\mathbf{D}_{3d}(\mathbf{C}_{3v}) = \bar{\mathbf{3}}_z\,\mathbf{m}_x(\mathbf{3}_z\mathbf{m}_x) = \bar{\mathbf{3}}_z\,'\mathbf{m}_x$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&xyz&0&0&-yzx&0&0\\ 0&0&0&0&yzx&-xxx&0&-xyz&-xxx\\ 0&0&0&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xzx&-yyy&0&yyz&-yyy\\ -yyy&yyy&0&yyz&0&0&xzx&0&0\\ zxx&zxx&zzz&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ -yyy&yyy&0&\\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&-yyy\\ -yyy&yyy&0&0&-xyz&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xxz&-yyy\\ -yyy&yyy&0&xxz&0&0\\ zxx&zyy&zzz&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&0\\ 0&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&yzy&0\\ -yzy&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$

n>3 $\mathbf{D}_{\infty h}(\mathbf{C}_{\infty v})= \infty/\mathbf{m}'\mathbf{mm}$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0&-yzx&0&0\\ 0&0&0&0&yzx&0&0&-xyz&0\\ 0&0&0&0&0&zxy&0&0`&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xzx&0&0&yyz&0\\ 0&0&0&yyz&0&0&xzx&0&0\\ zxx&zxx&zzz&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0\\ 0&0&0&0&-xyz&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xxz&0\\ 0&0&0&xxz&0&0\\ zxx&zxx&zzz&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&0\\ 0&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&yzy&0\\ -yzy&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$

$\mathbf{D}_{nh}(\mathbf{C}_{nh})$

n=1 $\mathbf{D}_{1h}(\mathbf{C}_{1h}) = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{m}_z) = \mathbf{2}_x\mathbf{'m}_y\mathbf{'m}_z$

	1	e	a	ae
V^3	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yxy & 0 & 0 & yyx \\ 0 & 0 & 0 & 0 & zzx & 0 & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxy & 0 & 0 & xyx \\ yxx & yyy & yzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & zyz & 0 & 0 & zzy & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & yzy & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yxy \\ 0 & 0 & 0 & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxy \\ yxx & yyy & yzz & 0 & 0 & 0 \\ 0 & 0 & 0 & zyz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & zxz \\ 0 & xyy & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & yzz \\ 0 & 0 & 0 \\ xyx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n=2 $\mathbf{D}_{2h}(\mathbf{C}_{2h}) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_z/\mathbf{m}_z) = \mathbf{m}_x\mathbf{'m}_y\mathbf{'m}_z$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & yzy & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{nh}(\mathbf{C}_{nh})$

n=3 $\mathbf{D}_{3h}(\mathbf{C}_{3h}) = \bar{\mathbf{6}}_z\,\mathbf{m}_x\mathbf{2}_1(\bar{\mathbf{6}}_z) = \bar{\mathbf{6}}_z\,\mathbf{m}_x\mathbf{'2}_1\mathbf{'}$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -yyy & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxx & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & yyz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ -yyy & yyy & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & xxz & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n>3 $\mathbf{D}_{\infty h}(\mathbf{C}_{\infty h}) = \infty\mathbf{/mm'm'}$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0` & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & yyz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & xxz & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{nh}(\mathbf{D}_n)$

n=1 $\mathbf{D}_{1h}(\mathbf{D}_1) = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_x) = \mathbf{2}_x\mathbf{m}_y'\mathbf{m}_z'$

	1	e	a	ae
V^3	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yxy & 0 & 0 & yyx \\ 0 & 0 & 0 & 0 & zzx & 0 & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yxy & 0 & 0 & yyx \\ 0 & 0 & 0 & 0 & zzx & 0 & 0 & zxz & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yxy \\ 0 & 0 & 0 & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yxy \\ 0 & 0 & 0 & 0 & zxz & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & zxz \\ 0 & xyy & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & zxz \\ 0 & xyy & 0 \end{pmatrix}$

n=2 $\mathbf{D}_{2h}(\mathbf{D}_2) = \mathbf{m}_x\mathbf{m}_y\,\mathbf{m}_z(\mathbf{2}_x\mathbf{2}_y\mathbf{2}_z) = \mathbf{m}_x'\mathbf{m}_y'\,\mathbf{m}_z'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{nh}(\mathbf{D}_n)$

n=3 $\mathbf{D}_{3h}(\mathbf{D}_3) = \bar{\mathbf{6}}_z\,\mathbf{m}_x\mathbf{2}_1(\mathbf{3}_z\mathbf{2}_1) = \bar{\mathbf{6}}_z\,'\mathbf{m}_x\,'\mathbf{2}_1$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -yyy & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -yyy & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ -yyy & yyy & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ -yyy & yyy & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

n>3 $\mathbf{D}_{\infty h}(\mathbf{D}_\infty) = \infty/\mathbf{m}'\mathbf{m}'\mathbf{m}'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0` & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0` & -zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{nh}(\mathbf{C}_{nv})$

n=1 $\mathbf{D}_{1h}(\mathbf{C}_{1v}) = \mathbf{2}_x\mathbf{m}_y\ \mathbf{m}_z(\mathbf{m}_y) = \mathbf{2}_x'\mathbf{m}_y\ \mathbf{m}_z'$

	1	e	a	ae
V^3	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yxy & 0 & 0 & yyx \\ 0 & 0 & 0 & 0 & zzx & 0 & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & yzy & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxy & 0 & 0 & yxx \\ yxx & yyy & yzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & zyz & 0 & 0 & zzy & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} xxx & xyy & xzz & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ yxx & yyy & yzz & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} xxx & xyy & xzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yxy \\ 0 & 0 & 0 & 0 & zxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxy \\ yxx & yyy & yzz & 0 & 0 & 0 \\ 0 & 0 & 0 & zyz & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & zxz \\ 0 & xyy & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & yzz \\ 0 & 0 & 0 \\ xyx & 0 & 0 \end{pmatrix}$

n=2 $\mathbf{D}_{2h}(\mathbf{C}_{2v}) = \mathbf{m}_x\mathbf{m}_y\ \mathbf{m}_z(\mathbf{2}_z\mathbf{m}_x\mathbf{m}_y) = \mathbf{m}_x\mathbf{m}_y\ \mathbf{m}_z'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & xzy & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & zyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & yzy & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yxz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 \\ zxx & zyy & zzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} yzx & 0 & 0 \\ 0 & zxy & 0 \\ 0 & 0 & xyz \end{pmatrix}$	$\begin{pmatrix} 0 & yzy & 0 \\ zxx & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{nh}(\mathbf{C}_{nv})$

n=3 $\mathbf{D}_{3h}(\mathbf{C}_{3v}) = \bar{\mathbf{6}}_z\,\mathbf{m}_x\mathbf{2}_1(\mathbf{3}_z\mathbf{m}_x) = \bar{\mathbf{6}}_z\,'\mathbf{m}_x\mathbf{2}_1'$

1

V^3
$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -yyy & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[V^3]$
$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ -yyy & yyy & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$$

$V[V^2]$
$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -yyy \\ -yyy & yyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}V$
$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

e
$$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0 & -zxy \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$$

a
$$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & yyz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zyy & zzz & \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & xxz & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

ae
$$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxx & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} xxx & -xxx & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$$

$$\begin{pmatrix} xxx & -xxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxx \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

n>3 $\mathbf{D}_{\infty h}(\mathbf{C}_{\infty v}) = \infty/\mathbf{m}'\mathbf{mm}$

1

V^3
$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[V^3]$
$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$$

$V[V^2]$
$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$\{V^2\}V$
$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

e
$$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 & -yzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzx & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & zxy & 0 & 0` & -zxy \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & xyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -xyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} yzx & 0 & 0 \\ 0 & yzx & 0 \\ 0 & 0 & xyz \end{pmatrix}$$

a
$$\begin{pmatrix} 0 & 0 & 0 & 0 & xzx & 0 & 0 & yyz & 0 \\ 0 & 0 & 0 & yyz & 0 & 0 & xzx & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ zxx & zxx & zzz & \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxz & 0 \\ 0 & 0 & 0 & xxz & 0 & 0 \\ zxx & zxx & zzz & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & yzy & 0 \\ -yzy & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

ae
$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \\ 0 & 0 & 0 & \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

$\mathbf{D}_{2nh}(\mathbf{D}_{nd})$

n=1 $\mathbf{D}_{2h}(\mathbf{D}_{1d}) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_y/\mathbf{m}_y) = \mathbf{m}_x'\mathbf{m}_y\,\mathbf{m}_z'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0&xzy&0&0\\ 0&0&0&0&yzx&0&0&yxz&0\\ 0&0&0&0&0&zxy&0&0&zyx \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&xxy&0&0&xyx\\ yxx&yyy&yzz&0&0&0&0&0&0\\ 0&0&0&zyz&0&0&zzy&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ yxx&yyy&yzz&\\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0\\ 0&0&0&0&yxz&0\\ 0&0&0&0&0&zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&xxy\\ yxx&yyy&yzz&0&0&0\\ 0&0&0&zyz&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&0\\ 0&zxy&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&yzz\\ 0&0&0\\ xyx&0&0 \end{pmatrix}$

n=2 $\mathbf{D}_{4h}(\mathbf{D}_{2d}) = \mathbf{4}_z/\mathbf{m}_z\mathbf{m}_x\mathbf{m}_{xy}(\bar{\mathbf{4}}_z\,\mathbf{m}_x\mathbf{2}_{xy}) = \mathbf{4}_z'/\mathbf{m}_z'\mathbf{m}_x\mathbf{m}_{xy}'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0&-yzx&0&0\\ 0&0&0&0&yzx&0&0&-xyz&0\\ 0&0&0&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xzx&0&0&-yyz&0\\ 0&0&0&yyz&0&0&-xzx&0&0\\ zxx&-zxx&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ zxx&-zxx&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0\\ 0&0&0&0&-xyz&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xxz&0\\ 0&0&0&-xxz&0&0\\ zxx&-zxx&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&0\\ 0&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&yzy&0\\ yzy&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$

$\mathbf{D}_{2nh}(\mathbf{D}_{nd})$

n=3 $\mathbf{D}_{6h}(\mathbf{D}_{3d}) = \mathbf{6}_z/\mathbf{m}_z\mathbf{m}_x\mathbf{m}_1(\bar{\mathbf{3}}_z\,\mathbf{m}_x) = \mathbf{6}_z'/\mathbf{m}_z'\mathbf{m}_x\mathbf{m}_1'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0&-yzx&0&0\\ 0&0&0&0&yzx&0&0&-xyz&0\\ 0&0&0&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&0&0&0&0&0&0\\ 0&0&0&0&0&-xxx&0&0&-xxx\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0\\ 0&0&0&0&-xyz&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&0&0&0\\ 0&0&0&0&0&-xxx\\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&0\\ 0&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$

n>3 $\mathbf{D}_{\infty h}\mathbf{1}' = \infty/\mathbf{mmm1}'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0&-yzx&0&0\\ 0&0&0&0&yzx&0&0&-xyz&0\\ 0&0&0&0&0&zxy&0&0`&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0\\ 0&0&0&0&-xyz&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&0\\ 0&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$

$\mathbf{D}_{2nh}(\mathbf{D}_{nh})$

n=1 $\mathbf{D}_{2h}(\mathbf{D}_{1h}) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_x\mathbf{m}_y\mathbf{m}_z) = \mathbf{m}_x'\mathbf{m}_y\mathbf{m}_z$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0&xzy&0&0\\ 0&0&0&0&yzx&0&0&yxz&0\\ 0&0&0&0&0&zxy&0&0&zyx \end{pmatrix}$	$\begin{pmatrix} xxx&xyy&xzz&0&0&0&0&0&0\\ 0&0&0&0&0&yxy&0&0&yyx\\ 0&0&0&0&zzx&0&0&zxz&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} xxx&xyy&xzz&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0\\ 0&0&0&0&yxz&0\\ 0&0&0&0&0&zxy \end{pmatrix}$	$\begin{pmatrix} xxx&xyy&xzz&0&0&0\\ 0&0&0&0&0&yxy\\ 0&0&0&0&zxz&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&0\\ 0&zxy&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&zxz\\ 0&xyy&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$

n=2 $\mathbf{D}_{4h}(\mathbf{D}_{2h}) = \mathbf{4}_z/\mathbf{m}_z\mathbf{m}_x\mathbf{m}_{xy}(\mathbf{m}_x\mathbf{m}_y\mathbf{m}_z) = \mathbf{4}_z'/\mathbf{m}_z\mathbf{m}_x\mathbf{m}_{xy}'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0&-yzx&0&0\\ 0&0&0&0&yzx&0&0&-xyz&0\\ 0&0&0&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xzx&0&0&-yyz&0\\ 0&0&0&yyz&0&0&-xzx&0&0\\ zxx&-zxx&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ zxx&-zxx&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0\\ 0&0&0&0&-xyz&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xxz&0\\ 0&0&0&-xxz&0&0\\ zxx&-zxx&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&0\\ 0&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&yzy&0\\ yzy&0&0\\ 0&0&0 \end{pmatrix}$

$\mathbf{D}_{2nh}(\mathbf{D}_{nh})$

n=3 $\mathbf{D}_{6h}(\mathbf{D}_{3h}) = \mathbf{6}_z/\mathbf{m}_z\mathbf{m}_x\mathbf{m}_1(\bar{\mathbf{6}}_z\,\mathbf{m}_x\mathbf{2}_1) = \mathbf{6}_z'/\mathbf{m}_z\mathbf{m}_x\mathbf{m}_1'$

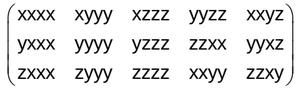
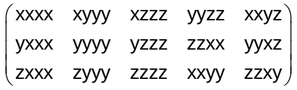
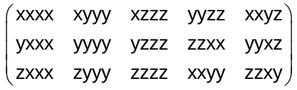
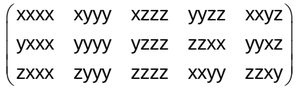
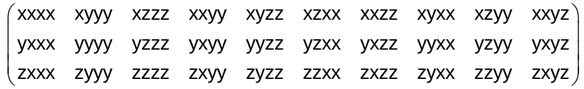
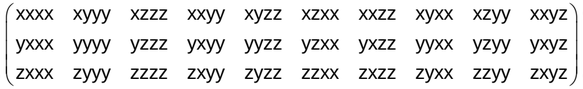
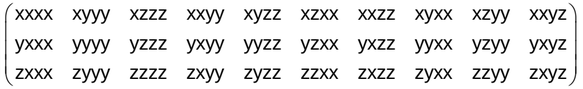
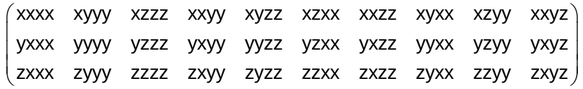
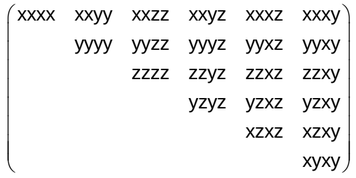
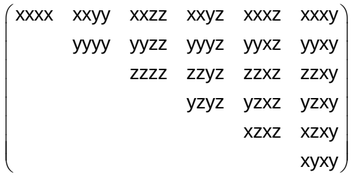
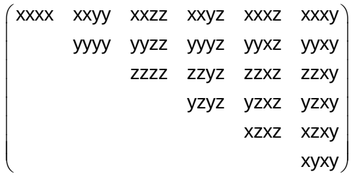
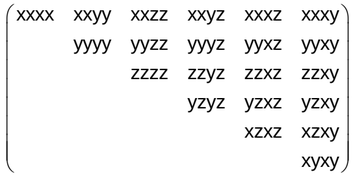
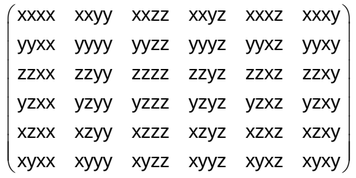
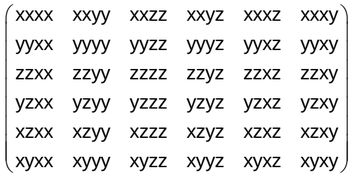
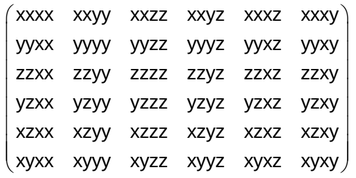
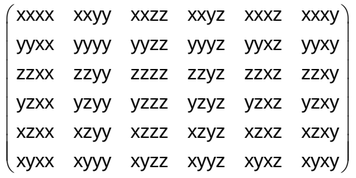
	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0&-yzx&0&0\\ 0&0&0&0&yzx&0&0&-xyz&0\\ 0&0&0&0&0&zxy&0&0&-zxy \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&0&0&0&0&0&0\\ 0&0&0&0&0&-xxx&0&0&-xxx\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0\\ 0&0&0&0&-xyz&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxx&-xxx&0&0&0&0\\ 0&0&0&0&0&-xxx\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&0\\ 0&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$

n>3 $\mathbf{D}_{\infty h}\mathbf{1}' = \infty/\mathbf{mmm1}'$

	1	e	a	ae
V^3	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0&-yzx&0&0\\ 0&0&0&0&yzx&0&0&-xyz&0\\ 0&0&0&0&0&zxy&0&0`&-zxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0\\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^3]$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ zxx&zxx&zzz& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0\\ 0&0&0&\\ 0&0&0& \end{pmatrix}$
$V[V^2]$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xyz&0&0\\ 0&0&0&0&-xyz&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0\\ 0&0&0&0&0&0\\ 0&0&0&0&0&0 \end{pmatrix}$
$\{V^2\}V$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} yzx&0&0\\ 0&yzx&0\\ 0&0&xyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0\\ 0&0&0\\ 0&0&0 \end{pmatrix}$

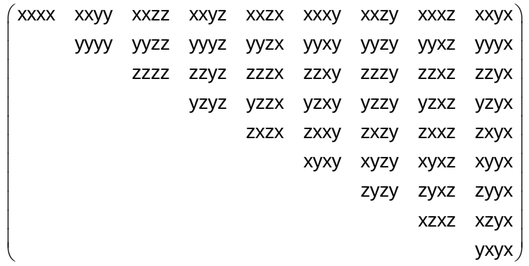
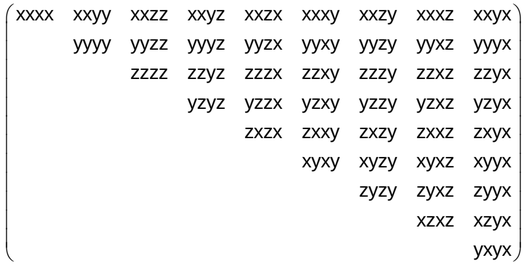
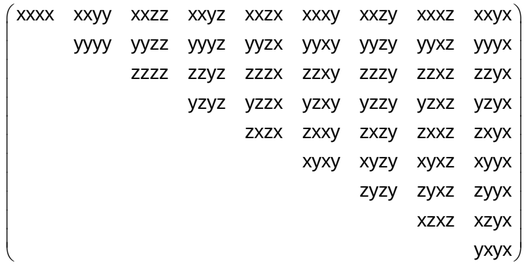
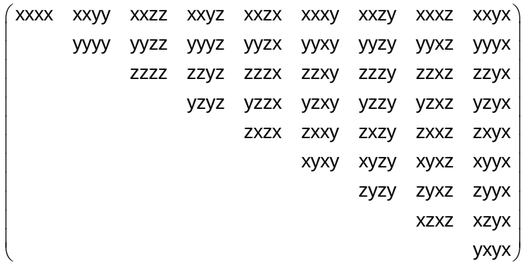
$\mathbf{C}_n$

n=1 $\mathbf{C}_1 = \mathbf{1}$

	1	e	a	ae
V^4				
$[V^4]$				
$V[V^3]$				
$[[V^2]^2]$				
$[V^2]^2$				

n=1 $\mathbf{C}_1 = \mathbf{1}$

$\mathbf{C}_n$

	1	e	a	ae
$[(V^2)]^2$				
$[V^2]V^2$				

n=2 $\mathbf{C}_2 = \mathbf{2}_z$

$\mathbf{C}_n$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & zyzx & 0 & zyzy & zyxz & 0 \\ 0 & 0 & 0 & xzyz & xzzx & 0 & xzzy & xzxz & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & zyzx & 0 & zyzy & zyxz & 0 \\ 0 & 0 & 0 & xzyz & xzzx & 0 & xzzy & xzxz & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & zyzx & 0 & zyzy & zyxz & 0 \\ 0 & 0 & 0 & xzyz & xzzx & 0 & xzzy & xzxz & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & zyzx & 0 & zyzy & zyxz & 0 \\ 0 & 0 & 0 & xzyz & xzzx & 0 & xzzy & xzxz & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & xyyy & 0 & yyzz & 0 \\ yxxx & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & zzxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & yyzz & 0 \\ yxxx & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & zzxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & yyzz & 0 \\ yxxx & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & zzxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & yyzz & 0 \\ yxxx & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & zzxy \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & xxzz & xyxx & 0 & 0 \\ yxxx & yyyy & 0 & yxyy & yyzz & 0 & yxzz & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & xxzz & xyxx & 0 & 0 \\ yxxx & yyyy & 0 & yxyy & yyzz & 0 & yxzz & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & xxzz & xyxx & 0 & 0 \\ yxxx & yyyy & 0 & yxyy & yyzz & 0 & yxzz & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & xxzz & xyxx & 0 & 0 \\ yxxx & yyyy & 0 & yxyy & yyzz & 0 & yxzz & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & yyxy \\ & & zzzz & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & yyxy \\ & & zzzz & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & yyxy \\ & & zzzz & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & yyxy \\ & & zzzz & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & xzyz & xzxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & xzyz & xzxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & xzyz & xzxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & xzyz & xzxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy \end{pmatrix}$

C_n

n=2 $C_2 = 2_z$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ & & & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ & & & & zxzx & 0 & zxzy & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & zyxz & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ & & & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ & & & & zxzx & 0 & zxzy & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & zyxz & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ & & & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ & & & & zxzx & 0 & zxzy & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & zyxz & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ & & & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ & & & & zxzx & 0 & zxzy & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & zyxz & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$

n=3 $\mathbf{C}_3 = \mathbf{3}_z$

$\mathbf{C}_n$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & -yyxy \\ yyxx & xxxx & yyzz & -xxyz & -xxzx & yyxy & -xxzy & -xxxz & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ yzxx & -yzxx & 0 & yzyz & yzzx & -xzxx & yzzy & yzxz & -xzxx \\ zxxx & -zxxx & 0 & zxyz & zxzx & zyxx & zxzy & zxxz & zyxx \\ xyxx & xyyy & xyzz & -xxxz & xxzy & xyxy & -xxzx & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & -zxzy & -zxxx & zxzx & -zxyz & -zxxx \\ xzxx & -xzxx & 0 & -yzxz & yzzy & yzxx & -yzzx & yzyz & yzxx \\ -xyyy & -xyxx & -xyzz & -xxxz & xxzy & xyyx & -xxzx & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & -yyxy \\ yyxx & xxxx & yyzz & -xxyz & -xxzx & yyxy & -xxzy & -xxxz & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ yzxx & -yzxx & 0 & yzyz & yzzx & -xzxx & yzzy & yzxz & -xzxx \\ zxxx & -zxxx & 0 & zxyz & zxzx & zyxx & zxzy & zxxz & zyxx \\ xyxx & xyyy & xyzz & -xxxz & xxzy & xyxy & -xxzx & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & -zxzy & -zxxx & zxzx & -zxyz & -zxxx \\ xzxx & -xzxx & 0 & -yzxz & yzzy & yzxx & -yzzx & yzyz & yzxx \\ -xyyy & -xyxx & -xyzz & -xxxz & xxzy & xyyx & -xxzx & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & -yyxy \\ yyxx & xxxx & yyzz & -xxyz & -xxzx & yyxy & -xxzy & -xxxz & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ yzxx & -yzxx & 0 & yzyz & yzzx & -xzxx & yzzy & yzxz & -xzxx \\ zxxx & -zxxx & 0 & zxyz & zxzx & zyxx & zxzy & zxxz & zyxx \\ xyxx & xyyy & xyzz & -xxxz & xxzy & xyxy & -xxzx & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & -zxzy & -zxxx & zxzx & -zxyz & -zxxx \\ xzxx & -xzxx & 0 & -yzxz & yzzy & yzxx & -yzzx & yzyz & yzxx \\ -xyyy & -xyxx & -xyzz & -xxxz & xxzy & xyyx & -xxzx & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & -yyxy \\ yyxx & xxxx & yyzz & -xxyz & -xxzx & yyxy & -xxzy & -xxxz & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ yzxx & -yzxx & 0 & yzyz & yzzx & -xzxx & yzzy & yzxz & -xzxx \\ zxxx & -zxxx & 0 & zxyz & zxzx & zyxx & zxzy & zxxz & zyxx \\ xyxx & xyyy & xyzz & -xxxz & xxzy & xyxy & -xxzx & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & -zxzy & -zxxx & zxzx & -zxyz & -zxxx \\ xzxx & -xzxx & 0 & -yzxz & yzzy & yzxx & -yzzx & yzyz & yzxx \\ -xyyy & -xyxx & -xyzz & -xxxz & xxzy & xyyx & -xxzx & xxyz & xyxy \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & -zxxx \\ zxxx & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & -zxxx \\ zxxx & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & -zxxx \\ zxxx & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & -zxxx \\ zxxx & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & xzxx & yyzz & xyxx & -xzxx & yzxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & yzxx & -xyzz & xxyy & -yzxx & -xzxx \\ zxxx & -zyxx & zzzz & -zxxx & 0 & zzxx & 0 & zyxx & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & xzxx & yyzz & xyxx & -xzxx & yyxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & yzxx & -xyzz & xxyy & -yzxx & -xzxx \\ zxxx & -zyxx & zzzz & -zxxx & 0 & zzxx & 0 & zyxx & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & xzxx & yyzz & xyxx & -xzxx & yzxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & yzxx & -xyzz & xxyy & -yzxx & -xzxx \\ zxxx & -zyxx & zzzz & -zxxx & 0 & zzxx & 0 & zyxx & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & xzxx & yyzz & xyxx & -xzxx & yyxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & yzxx & -xyzz & xxyy & -yzxx & -xzxx \\ zxxx & -zyxx & zzzz & -zxxx & 0 & zzxx & 0 & zyxx & zzxx & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & -yyxz & 0 \\ & xxxx & xxzz & -xxyz & yyxz & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & yyxz \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & -yyxz & 0 \\ & xxxx & xxzz & -xxyz & yyxz & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & yyxz \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & -yyxz & 0 \\ & xxxx & xxzz & -xxyz & yyxz & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & yyxz \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & -yyxz & 0 \\ & xxxx & xxzz & -xxyz & yyxz & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & yyxz \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & -yyxz & xxxy \\ xxyy & xxxx & xxzz & -xxyz & yyxz & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & yzxz & xzyy \\ -xzyy & xzyy & 0 & yzxz & yzyz & yzxx \\ -xxxy & xxxy & 0 & yyxz & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & -yyxz & xxxy \\ xxyy & xxxx & xxzz & -xxyz & yyxz & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & yzxz & xzyy \\ -xzyy & xzyy & 0 & yzxz & yzyz & yzxx \\ -xxxy & xxxy & 0 & yyxz & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & -yyxz & xxxy \\ xxyy & xxxx & xxzz & -xxyz & yyxz & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & yzxz & xzyy \\ -xzyy & xzyy & 0 & yzxz & yzyz & yzxx \\ -xxxy & xxxy & 0 & yyxz & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & -yyxz & xxxy \\ xxyy & xxxx & xxzz & -xxyz & yyxz & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & yzxz & xzyy \\ -xzyy & xzyy & 0 & yzxz & yzyz & yzxx \\ -xxxy & xxxy & 0 & yyxz & xxyz & xyxy \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)

$\mathbf{C}_n$

n=3 $\mathbf{C}_3 = \mathbf{3}_z$

$[(V^2)]^2$

1								
xxxx	xxyy	xxzz	xxyz	xxzx	xxxy	xxzy	xxxz	−xxxy
	xxxx	xxzz	−xxyz	−xxzx	xxxy	−xxzy	−xxxz	−xxxy
		zzzz	0	0	zzxy	0	0	−zzxy
			yzyz	yzzx	−xxxz	yzzy	0	−xxxz
				zxzx	xxzy	0	yzzy	xxzy
					xyxy	−xxzx	xxyz	xyyx
						zxzx	−yzzx	−xxzx
							yzyz	xxyz
								xyxy

and xxxx=xxyy+yzyz+zyzy

e								
xxxx	xxyy	xxzz	xxyz	xxzx	xxxy	xxzy	xxxz	−xxxy
	xxxx	xxzz	−xxyz	−xxzx	xxxy	−xxzy	−xxxz	−xxxy
		zzzz	0	0	zzxy	0	0	−zzxy
			yzyz	yzzx	−xxxz	yzzy	0	−xxxz
				zxzx	xxzy	0	yzzy	xxzy
					xyxy	−xxzx	xxyz	xyyx
						zxzx	−yzzx	−xxzx
							yzyz	xxyz
								xyxy

and xxxx=xxyy+yzyz+zyzy

a								
xxxx	xxyy	xxzz	xxyz	xxzx	xxxy	xxzy	xxxz	−xxxy
	xxxx	xxzz	−xxyz	−xxzx	xxxy	−xxzy	−xxxz	−xxxy
		zzzz	0	0	zzxy	0	0	−zzxy
			yzyz	yzzx	−xxxz	yzzy	0	−xxxz
				zxzx	xxzy	0	yzzy	xxzy
					xyxy	−xxzx	xxyz	xyyx
						zxzx	−yzzx	−xxzx
							yzyz	xxyz
								xyxy

and xxxx=xxyy+yzyz+zyzy

ae								
xxxx	xxyy	xxzz	xxyz	xxzx	xxxy	xxzy	xxxz	−xxxy
	xxxx	xxzz	−xxyz	−xxzx	xxxy	−xxzy	−xxxz	−xxxy
		zzzz	0	0	zzxy	0	0	−zzxy
			yzyz	yzzx	−xxxz	yzzy	0	−xxxz
				zxzx	xxzy	0	yzzy	xxzy
					xyxy	−xxzx	xxyz	xyyx
						zxzx	−yzzx	−xxzx
							yzyz	xxyz
								xyxy

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

xxxx	xxyy	xxzz	xxyz	xxzx	xxxy	xxzy	xxxz	−yyxy
xxyy	xxxx	xxzz	−xxyz	−xxzx	yyxy	−xxzy	−xxxz	−xxxy
zzxx	zzxx	zzzz	0	0	zzxy	0	0	−zzxy
yzxx	−yzxx	0	yzyz	yzzx	−zxxx	zxzx	−zxyz	−zxxx
zxxx	−zxxx	0	zxyz	zxzx	yzxx	−yzzx	yzyz	yzxx
xyxx	−xyxx	0	−xxxz	xxzy	xyxy	−xxzx	xxyz	xyyx

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

xxxx	xxyy	xxzz	xxyz	xxzx	xxxy	xxzy	xxxz	−yyxy
xxyy	xxxx	xxzz	−xxyz	−xxzx	yyxy	−xxzy	−xxxz	−xxxy
zzxx	zzxx	zzzz	0	0	zzxy	0	0	−zzxy
yzxx	−yzxx	0	yzyz	yzzx	−zxxx	zxzx	−zxyz	−zxxx
zxxx	−zxxx	0	zxyz	zxzx	yzxx	−yzzx	yzyz	yzxx
xyxx	−xyxx	0	−xxxz	xxzy	xyxy	−xxzx	xxyz	xyyx

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

xxxx	xxyy	xxzz	xxyz	xxzx	xxxy	xxzy	xxxz	−yyxy
xxyy	xxxx	xxzz	−xxyz	−xxzx	yyxy	−xxzy	−xxxz	−xxxy
zzxx	zzxx	zzzz	0	0	zzxy	0	0	−zzxy
yzxx	−yzxx	0	yzyz	yzzx	−zxxx	zxzx	−zxyz	−zxxx
zxxx	−zxxx	0	zxyz	zxzx	yzxx	−yzzx	yzyz	yzxx
xyxx	−xyxx	0	−xxxz	xxzy	xyxy	−xxzx	xxyz	xyyx

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

xxxx	xxyy	xxzz	xxyz	xxzx	xxxy	xxzy	xxxz	−yyxy
xxyy	xxxx	xxzz	−xxyz	−xxzx	yyxy	−xxzy	−xxxz	−xxxy
zzxx	zzxx	zzzz	0	0	zzxy	0	0	−zzxy
yzxx	−yzxx	0	yzyz	yzzx	−zxxx	zxzx	−zxyz	−zxxx
zxxx	−zxxx	0	zxyz	zxzx	yzxx	−yzzx	yzyz	yzxx
xyxx	−xyxx	0	−xxxz	xxzy	xyxy	−xxzx	xxyz	xyyx

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$\mathbf{C}_n$

n=4 $\mathbf{C}_4 = \mathbf{4}_z$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & -yxxx & 0 & yyzz & 0 \\ yxxx & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -yxxx & 0 & yyzz & 0 \\ yxxx & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -yxxx & 0 & yyzz & 0 \\ yxxx & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -yxxx & 0 & yyzz & 0 \\ yxxx & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & -yxxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ yxxx & xxxx & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & -yxxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ yxxx & xxxx & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & -yxxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ yxxx & xxxx & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & -yxxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ yxxx & xxxx & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy \end{pmatrix}$

C_n

n=4 $\mathbf{C}_4 = \mathbf{4}_z$

$[(V^2)]^2$

1								
xxxx	xxyy	xxzz	0	0	xxxy	0	0	−yyxy
	xxxx	xxzz	0	0	yyxy	0	0	−xxxy
		zzzz	0	0	zzxy	0	0	−zzxy
			yzyz	yzzx	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	−yzzx	0
							yzyz	0
								xyxy

e								
xxxx	xxyy	xxzz	0	0	xxxy	0	0	−yyxy
	xxxx	xxzz	0	0	yyxy	0	0	−xxxy
		zzzz	0	0	zzxy	0	0	−zzxy
			yzyz	yzzx	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	−yzzx	0
							yzyz	0
								xyxy

a								
xxxx	xxyy	xxzz	0	0	xxxy	0	0	−yyxy
	xxxx	xxzz	0	0	yyxy	0	0	−xxxy
		zzzz	0	0	zzxy	0	0	−zzxy
			yzyz	yzzx	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	−yzzx	0
							yzyz	0
								xyxy

ae								
xxxx	xxyy	xxzz	0	0	xxxy	0	0	−yyxy
	xxxx	xxzz	0	0	yyxy	0	0	−xxxy
		zzzz	0	0	zzxy	0	0	−zzxy
			yzyz	yzzx	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	−yzzx	0
							yzyz	0
								xyxy

$[V^2]V^2$

xxxx	xxyy	xxzz	0	0	xxxy	0	0	−yyxy
yyxx	xxxx	xxzz	0	0	yyxy	0	0	−xxxy
zzxx	zzxx	zzzz	0	0	zzxy	0	0	−zzxy
0	0	0	yzyz	yzzx	0	zxzx	−zxyz	0
0	0	0	zxyz	zxzx	0	−yzzx	yzyz	0
xyxx	−xyxx	0	0	0	xyxy	0	0	xyxy

xxxx	xxyy	xxzz	0	0	xxxy	0	0	−yyxy
yyxx	xxxx	xxzz	0	0	yyxy	0	0	−xxxy
zzxx	zzxx	zzzz	0	0	zzxy	0	0	−zzxy
0	0	0	yzyz	yzzx	0	zxzx	−zxyz	0
0	0	0	zxyz	zxzx	0	−yzzx	yzyz	0
xyxx	−xyxx	0	0	0	xyxy	0	0	xyxy

xxxx	xxyy	xxzz	0	0	xxxy	0	0	−yyxy
yyxx	xxxx	xxzz	0	0	yyxy	0	0	−xxxy
zzxx	zzxx	zzzz	0	0	zzxy	0	0	−zzxy
0	0	0	yzyz	yzzx	0	zxzx	−zxyz	0
0	0	0	zxyz	zxzx	0	−yzzx	yzyz	0
xyxx	−xyxx	0	0	0	xyxy	0	0	xyxy

xxxx	xxyy	xxzz	0	0	xxxy	0	0	−yyxy
yyxx	xxxx	xxzz	0	0	yyxy	0	0	−xxxy
zzxx	zzxx	zzzz	0	0	zzxy	0	0	−zzxy
0	0	0	yzyz	yzzx	0	zxzx	−zxyz	0
0	0	0	zxyz	zxzx	0	−yzzx	yzyz	0
xyxx	−xyxx	0	0	0	xyxy	0	0	xyxy

$\mathbf{C}_n$

n>4 $\mathbf{C}_\infty = \infty$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)	and xyxy=½(xxxx-xxyy)	and xyxy=½(xxxx-xxyy)	and xyxy=½(xxxx-xxyy)
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)

C_n

n>4 $C_\infty = \infty$

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & -yzzx & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

e

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & -yzzx & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

a

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & -yzzx & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

ae

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & -yzzx & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$\mathbf{C}_{nv}$

n=1 $\mathbf{C}_{1v} = \mathbf{m}_y$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & zyxy & zyzy & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & yxyz & 0 & yxxy & yxzy & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy & xxzy & 0 & xxyx \\ 0 & 0 & 0 & yyyz & 0 & yyxy & yyzy & 0 & yyyx \\ 0 & 0 & 0 & zzyz & 0 & zzxy & zzzy & 0 & zzyx \\ yzxx & yzyy & yzzz & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & zxxy & zxzy & 0 & zxyx \\ xyxx & xyyy & xyzz & 0 & xyzx & 0 & 0 & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & zyzx & 0 & 0 & zyxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & xzxy & xzzy & 0 & xzyx \\ yxxx & yxyy & yxzz & 0 & yxzx & 0 & 0 & yxxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & zyxy & zyzy & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & yxyz & 0 & yxxy & yxzy & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy & xxzy & 0 & xxyx \\ 0 & 0 & 0 & yyyz & 0 & yyxy & yyzy & 0 & yyyx \\ 0 & 0 & 0 & zzyz & 0 & zzxy & zzzy & 0 & zzyx \\ yzxx & yzyy & yzzz & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & zxxy & zxzy & 0 & zxyx \\ xyxx & xyyy & xyzz & 0 & xyzx & 0 & 0 & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & zyzx & 0 & 0 & zyxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & xzxy & xzzy & 0 & xzyx \\ yxxx & yxyy & yxzz & 0 & yxzx & 0 & 0 & yxxz & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & xzzz & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & yyxz \\ zxxx & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xxyz \\ yxxx & 0 & yzzz & 0 & 0 \\ 0 & zyyy & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xzzz & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & yyxz \\ zxxx & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xxyz \\ yxxx & 0 & yzzz & 0 & 0 \\ 0 & zyyy & 0 & 0 & zzxy \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & xzzz & xxyy & 0 & xzxx & xxzz & 0 & xzyy & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & yxyz \\ zxxx & 0 & zzzz & zxyy & 0 & zzxx & zxzz & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & xxyz \\ yxxx & 0 & yzzz & yxyy & 0 & yzxx & yxzz & 0 & yzyy & 0 \\ 0 & zyyy & 0 & 0 & zyzz & 0 & 0 & zyxx & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xzzz & xxyy & 0 & xzxx & xxzz & 0 & xzyy & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & yxyz \\ zxxx & 0 & zzzz & zxyy & 0 & zzxx & zxzz & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & xxyz \\ yxxx & 0 & yzzz & yxyy & 0 & yzxx & yxzz & 0 & yzyy & 0 \\ 0 & zyyy & 0 & 0 & zyzz & 0 & 0 & zyxx & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyxz & 0 \\ & & zzzz & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy \\ & 0 & 0 & yyyz & 0 & yyxy \\ & & 0 & zzyz & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyxz & 0 \\ & & zzzz & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy \\ & 0 & 0 & yyyz & 0 & yyxy \\ & & 0 & zzyz & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & xzxz & 0 \\ xyxx & xyyy & xyzz & xyyz & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy \\ 0 & 0 & 0 & yyyz & 0 & yyxy \\ 0 & 0 & 0 & zzyz & 0 & zzxy \\ yzxx & yzyy & yzzz & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & xzxy \\ 0 & 0 & 0 & 0 & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & xzxz & 0 \\ xyxx & xyyy & xyzz & xyyz & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy \\ 0 & 0 & 0 & yyyz & 0 & yyxy \\ 0 & 0 & 0 & zzyz & 0 & zzxy \\ yzxx & yzyy & yzzz & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & xzxy \\ 0 & 0 & 0 & 0 & xyxz & 0 \end{pmatrix}$

C_{nv}

n=1 $C_{1v} = m_y$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ & & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & xyzy & 0 & xyyx \\ & & & & & & zyzy & 0 & zyyx \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy & xxzy & 0 & xxyx \\ & 0 & 0 & yyyz & 0 & yyxy & yyzy & 0 & yyyx \\ & & 0 & zzyz & 0 & zzxy & zzzy & 0 & zzyx \\ & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\ & & & & 0 & zxxy & zxzy & 0 & zxyx \\ & & & & & 0 & 0 & xyxz & 0 \\ & & & & & & 0 & zyxz & 0 \\ & & & & & & & 0 & xzyx \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ & & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & xyzy & 0 & xyyx \\ & & & & & & zyzy & 0 & zyyx \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy & xxzy & 0 & xxyx \\ & 0 & 0 & yyyz & 0 & yyxy & yyzy & 0 & yyyx \\ & & 0 & zzyz & 0 & zzxy & zzzy & 0 & zzyx \\ & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\ & & & & 0 & zxxy & zxzy & 0 & zxyx \\ & & & & & 0 & 0 & xyxz & 0 \\ & & & & & & 0 & zyxz & 0 \\ & & & & & & & 0 & xzyx \\ & & & & & & & & 0 \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy & xxzy & 0 & xxyx \\ 0 & 0 & 0 & yyyz & 0 & yyxy & yyzy & 0 & yyyx \\ 0 & 0 & 0 & zzyz & 0 & zzxy & zzzy & 0 & zzyx \\ yzxx & yzyy & yzzz & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & zxxy & zxzy & 0 & zxyx \\ xyxx & xyyy & xyzz & 0 & xyzx & 0 & 0 & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy & xxzy & 0 & xxyx \\ 0 & 0 & 0 & yyyz & 0 & yyxy & yyzy & 0 & yyyx \\ 0 & 0 & 0 & zzyz & 0 & zzxy & zzzy & 0 & zzyx \\ yzxx & yzyy & yzzz & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & zxxy & zxzy & 0 & zxyx \\ xyxx & xyyy & xyzz & 0 & xyzx & 0 & 0 & xyxz & 0 \end{pmatrix}$

$\mathbf{C}_{nv}$

n=2 $\mathbf{C}_{2v} = \mathbf{2}_z\mathbf{m}_x\mathbf{m}_y$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zyzx & 0 & 0 & zyxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & xzzy & 0 & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zyzx & 0 & 0 & zyxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & xzzy & 0 & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & yxyy & 0 & 0 & yxzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & yxyy & 0 & 0 & yxzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & yyxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & yyxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

C_{nv}

n=2 **C_{2v} = $2_z m_x m_y$**

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\ & & & & 0 & 0 & zxzy & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & zyxz & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\ & & & & 0 & 0 & zxzy & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & zyxz & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

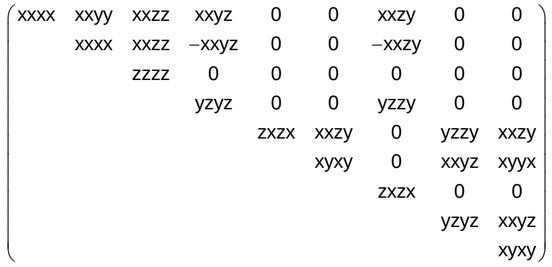
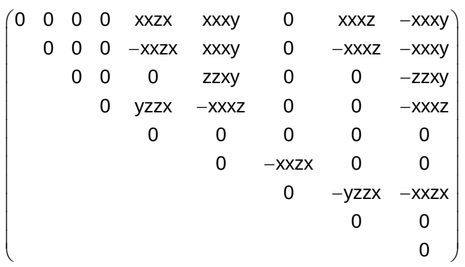
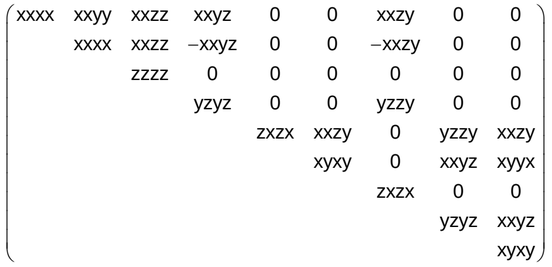
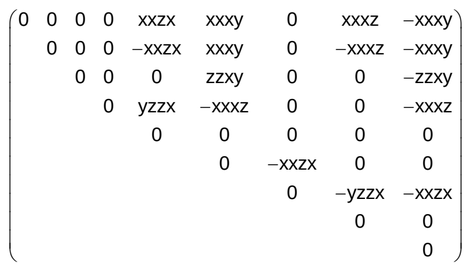
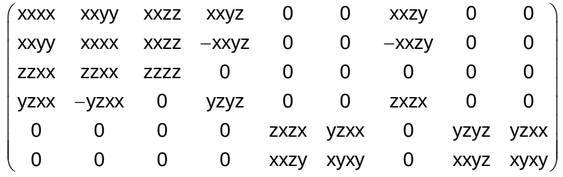
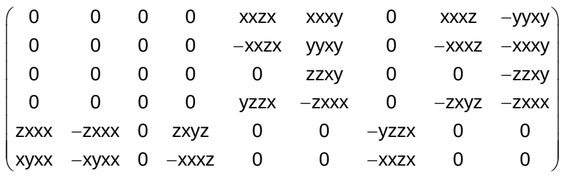
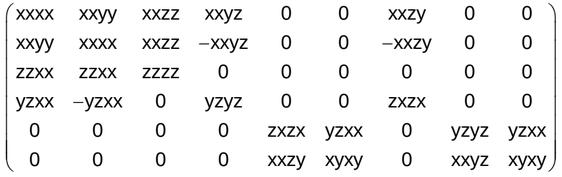
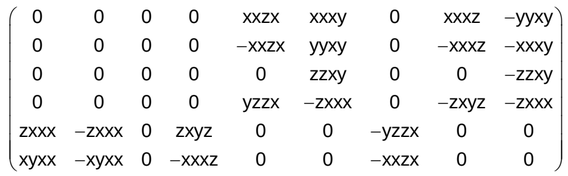
$\mathbf{C}_{nv}$

n=3 $\mathbf{C}_{3v} = \mathbf{3}_z\mathbf{m}_x$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ yyxx & xxxx & xxzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & zyxx & 0 & zxxz & zyxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyyx & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & xxxy & 0 & xxxz & -yyxy \\ 0 & 0 & 0 & 0 & -xxzx & yyxy & 0 & -xxxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & -xzxx & 0 & yzxz & -xzxx \\ zxxx & -zxxx & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & -xxxz & 0 & 0 & -xxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & -zxxx & 0 & -zxyz & -zxxx \\ xzxx & -xzxx & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ yyxx & xxxx & xxzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & zyxx & 0 & zxxz & zyxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyyx & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & xxxy & 0 & xxxz & -yyxy \\ 0 & 0 & 0 & 0 & -xxzx & yyxy & 0 & -xxxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & -xzxx & 0 & yzxz & -xzxx \\ zxxx & -zxxx & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & -xxxz & 0 & 0 & -xxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & -zxxx & 0 & -zxyz & -zxxx \\ xzxx & -xzxx & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$
	and xxxx=xxyy+xyxy+xyyx	and: xxxy-yyxy=xyyy-xyxx	and xxxx=xxyy+xyxy+xyyx	and: xxxy-yyxy=xyyy-xyxx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yzxx \\ 0 & 3xxyy & 0 & 0 & yyzz & yzxx & 0 & xxyy & -yzxx & 0 \\ 0 & -zyxx & zzzz & 0 & 0 & zzxx & 0 & zyxx & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & xzxx & 0 & xyxx & -xzxx & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & -xzxx \\ zxxx & 0 & 0 & -zxxx & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yzxx \\ 0 & 3xxyy & 0 & 0 & yyzz & yzxx & 0 & xxyy & -yzxx & 0 \\ 0 & -zyxx & zzzz & 0 & 0 & zzxx & 0 & zyxx & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & xzxx & 0 & xyxx & -xzxx & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & -xzxx \\ zxxx & 0 & 0 & -zxxx & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ & 0 & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ & 0 & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)		and xyxy=½(xxxx-xxyy)	
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & xxxy \\ 0 & 0 & 0 & 0 & yyxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & xzyy \\ -xzyy & xzyy & 0 & yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & yyxz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & xxxy \\ 0 & 0 & 0 & 0 & yyxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & xzyy \\ -xzyy & xzyy & 0 & yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & yyxz & 0 & 0 \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)		and xyxy=½(xxxx-xxyy)	

C_{nv}

n=3 $\mathbf{C_{3v} = 3_z m_x}$

	1	e	a	ae
$[(V^2)]^2$				
	add: xxxx=xxyy+xyxy+xyyx		add: xxxx=xxyy+xyxy+xyyx	
$[V^2]V^2$				
	add: xxxx=xxyy+2xyxy	and: yyxy-xxxy=2xyxx	add: xxxx=xxyy+2xyxy	and: yyxy-xxxy=2xyxx

$\mathbf{C}_{nv}$

n=4 $\mathbf{C}_{4v} = \mathbf{4}_z\mathbf{m}_x\mathbf{m}_{xy}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 \end{pmatrix}$

C_{nv}

n=4 **$C_{4v} = 4_z m_x m_{xy}$**

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & zxxz & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & 0 & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
 & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & 0 & yzzx & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & -yzzx & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\
0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & zxxz & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & 0 & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

ae

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
 & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & 0 & yzzx & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & -yzzx & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\
0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

C_{nv}

n>4 $C_{\infty v}$ = ∞**mm**

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	add: xxxx=xxyy+xyxy+xyyx	and: xxxy-yyxy=xyyy-xyxx	add: xxxx=xxyy+xyxy+xyyx	and: xxxy-yyxy=xyyy-xyxx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)		and xyxy=½(xxxx-xxyy)	
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & 0 \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)		and xyxy=½(xxxx-xxyy)	

C_{nv}

n>4 $\mathbf{C_{\infty v}}$ = ∞**mm**

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & 0 & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and: xxxx=xxyy+2xyxy

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & 0 & yzzx & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & -yzzx & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\
0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

and: yyxy-xxxy=2xyxx

a

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & 0 & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and: xxxx=xxyy+2xyxy

ae

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & 0 & yzzx & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & -yzzx & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

and: yyxy-xxxy=2xyxx

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\
0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

and: yyxy-xxxy=2xyxx

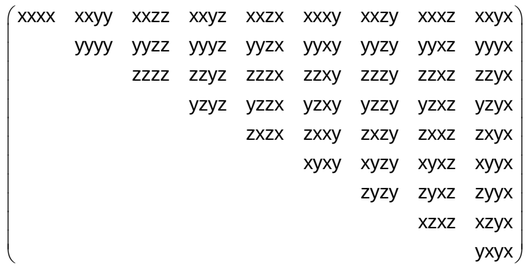
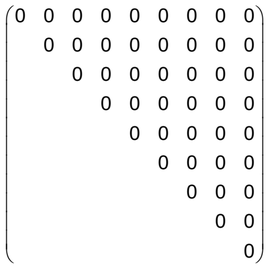
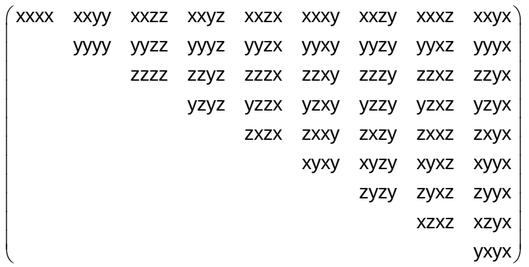
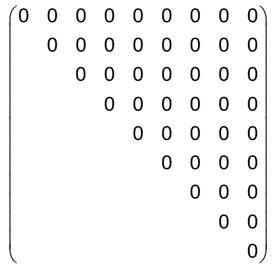
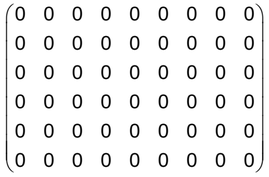
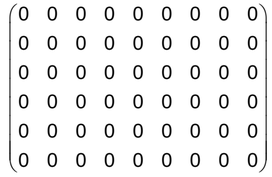
n=1 $\mathbf{S}_2 = \bar{\mathbf{1}}$

$\mathbf{S}_{2n}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & xxyx \\ yyxx & yyyy & yyzz & yyyz & yyzx & yyxy & yyzy & yyxz & yyyx \\ zzxx & zzyy & zzzz & zzyz & zzzx & zzxy & zzzy & zzxz & zzyx \\ yzxx & yzyy & yzzz & yzyz & yzzx & yzxy & yzzy & yzxz & yzyx \\ zxxx & zxyy & zxzz & zxyz & zxzx & zxxy & zxzy & zxxz & zxyx \\ xyxx & xyyy & xyzz & xyyz & xyzx & xyxy & xyzy & xyxz & xyyx \\ zyxx & zyyy & zyzz & zyyz & zyzx & zyxy & zyzy & zyxz & zyyx \\ xzxx & xzyy & xzzz & xzyz & xzzx & xzxy & xzzy & xzxz & xzyx \\ yxxx & yxyy & yxzz & yxyz & yxzx & yxxy & yxzy & yxxz & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & xxyx \\ yyxx & yyyy & yyzz & yyyz & yyzx & yyxy & yyzy & yyxz & yyyx \\ zzxx & zzyy & zzzz & zzyz & zzzx & zzxy & zzzy & zzxz & zzyx \\ yzxx & yzyy & yzzz & yzyz & yzzx & yzxy & yzzy & yzxz & yzyx \\ zxxx & zxyy & zxzz & zxyz & zxzx & zxxy & zxzy & zxxz & zxyx \\ xyxx & xyyy & xyzz & xyyz & xyzx & xyxy & xyzy & xyxz & xyyx \\ zyxx & zyyy & zyzz & zyyz & zyzx & zyxy & zyzy & zyxz & zyyx \\ xzxx & xzyy & xzzz & xzyz & xzzx & xzxy & xzzy & xzxz & xzyx \\ yxxx & yxyy & yxzz & yxyz & yxzx & yxxy & yxzy & yxxz & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & xyyy & xzzz & yyzz & xxyz \\ yxxx & yyyy & yzzz & zzxx & yyxz \\ zxxx & zyyy & zzzz & xxyy & zzxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & xzzz & yyzz & xxyz \\ yxxx & yyyy & yzzz & zzxx & yyxz \\ zxxx & zyyy & zzzz & xxyy & zzxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & xyyy & xzzz & xxyy & xyzz & xzxx & xxzz & xyxx & xzyy & xxyz \\ yxxx & yyyy & yzzz & yxyy & yyzz & yzxx & yxzz & yyxx & yzyy & yxyz \\ zxxx & zyyy & zzzz & zxyy & zyzz & zzxx & zxzz & zyxx & zzyy & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & xzzz & xxyy & xyzz & xzxx & xxzz & xyxx & xzyy & xxyz \\ yxxx & yyyy & yzzz & yxyy & yyzz & yzxx & yxzz & yyxx & yzyy & yxyz \\ zxxx & zyyy & zzzz & zxyy & zyzz & zzxx & zxzz & zyxx & zzyy & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxxz & xxxy \\ & yyyy & yyzz & yyyz & yyxz & yyxy \\ & & zzzz & zzyz & zzxz & zzxy \\ & & & yzyz & yzxz & yzxy \\ & & & & xzxz & xzxy \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxxz & xxxy \\ & yyyy & yyzz & yyyz & yyxz & yyxy \\ & & zzzz & zzyz & zzxz & zzxy \\ & & & yzyz & yzxz & yzxy \\ & & & & xzxz & xzxy \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxxz & xxxy \\ yyxx & yyyy & yyzz & yyyz & yyxz & yyxy \\ zzxx & zzyy & zzzz & zzyz & zzxz & zzxy \\ yzxx & yzyy & yzzz & yzyz & yzxz & yzxy \\ xzxx & xzyy & xzzz & xzyz & xzxz & xzxy \\ xyxx & xyyy & xyzz & xyyz & xyxz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxxz & xxxy \\ yyxx & yyyy & yyzz & yyyz & yyxz & yyxy \\ zzxx & zzyy & zzzz & zzyz & zzxz & zzxy \\ yzxx & yzyy & yzzz & yzyz & yzxz & yzxy \\ xzxx & xzyy & xzzz & xzyz & xzxz & xzxy \\ xyxx & xyyy & xyzz & xyyz & xyxz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

n=1 $\mathbf{S}_2 = \bar{\mathbf{1}}$

$\mathbf{S}_{2n}$

	1	e	a	ae
$[(V^2)]^2$				
$[V^2]V^2$				

S_{2n}

n=2 $\mathbf{S}_4 = \bar{\mathbf{4}}_z$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & xxzz & 0 & 0 & xxxy & 0 & 0 & yyxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & yyxy & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & -yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & -zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & -xyyx \\ 0 & 0 & 0 & zxxz & zxzy & 0 & -zxzx & zxyz & 0 \\ 0 & 0 & 0 & yzxz & yzzy & 0 & yzzx & -yzyz & 0 \\ xyyy & xyxx & xyzz & 0 & 0 & xyyx & 0 & 0 & -xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & yyxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & yyxy & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & -yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & -zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & -xyyx \\ 0 & 0 & 0 & zxxz & zxzy & 0 & -zxzx & zxyz & 0 \\ 0 & 0 & 0 & yzxz & yzzy & 0 & yzzx & -yzyz & 0 \\ xyyy & xyxx & xyzz & 0 & 0 & xyyx & 0 & 0 & -xyxy \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & -yxxx & 0 & yyzz & 0 \\ yxxx & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & yxxx & 0 & yyzz & 0 \\ yxxx & -xxxx & 0 & -yyzz & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} xxxx & -yxxx & 0 & yyzz & 0 \\ yxxx & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & yxxx & 0 & yyzz & 0 \\ yxxx & -xxxx & 0 & -yyzz & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & -yxxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ yxxx & xxxx & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & -yyzz & yxyy & 0 & 0 \\ xyyy & -xxxx & 0 & yxyy & yyzz & 0 & xyzz & -xxyy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zzxx & 0 & 0 & -zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & -yxxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ yxxx & xxxx & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & -yxxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ yxxx & xxxx & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & xxxx & xxzz & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & xxxy \\ & -xxxx & -xxzz & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & -yzyz & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & xxxx & xxzz & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & xxxy \\ & -xxxx & -xxzz & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & -yzyz & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & -yzyz & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & -yzyz & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 \end{pmatrix}$

S_{2n}

n=2 $\mathbf{S}_4 = \bar{\mathbf{4}}_z$

$[(V^2)]^2$

1

xxxx	xxyy	xxzz	0	0	xxxy	0	0	−yyxy
	xxxx	xxzz	0	0	yyxy	0	0	−xxxy
		zzzz	0	0	zzxy	0	0	−zzxy
			yzyz	yzzx	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	−yzzx	0
							yzyz	0
								xyxy

e

xxxx	0	xxzz	0	0	xxxy	0	0	yyxy
	−xxxx	−xxzz	0	0	yyxy	0	0	xxxy
		0	0	0	zzxy	0	0	zzxy
			yzyz	yzzx	0	yzzy	yzxz	0
				zxzx	0	zxzy	−yzzy	0
					xyxy	0	0	xyyx
						−zxzx	yzzx	0
							−yzyz	0
								−xyxy

a

xxxx	xxyy	xxzz	0	0	xxxy	0	0	−yyxy
	xxxx	xxzz	0	0	yyxy	0	0	−xxxy
		zzzz	0	0	zzxy	0	0	−zzxy
			yzyz	yzzx	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	−yzzx	0
							yzyz	0
								xyxy

ae

xxxx	0	xxzz	0	0	xxxy	0	0	yyxy
	−xxxx	−xxzz	0	0	yyxy	0	0	xxxy
		0	0	0	zzxy	0	0	zzxy
			yzyz	yzzx	0	yzzy	yzxz	0
				zxzx	0	zxzy	−yzzy	0
					xyxy	0	0	xyyx
						−zxzx	yzzx	0
							−yzyz	0
								−xyxy

$[V^2]V^2$

xxxx	xxyy	xxzz	0	0	xxxy	0	0	−yyxy
xxyy	xxxx	xxzz	0	0	yyxy	0	0	−xxxy
zzxx	zzxx	zzzz	0	0	zzxy	0	0	−zzxy
0	0	0	yzyz	yzzx	0	zxzx	−zxyz	0
0	0	0	zxyz	zxzx	0	−yzzx	yzyz	0
xyxx	−xyxx	0	0	0	xyxy	0	0	xyxy

xxxx	xxyy	xxzz	0	0	xxxy	0	0	yyxy
−xxyy	−xxxx	−xxzz	0	0	yyxy	0	0	xxxy
zzxx	−zzxx	0	0	0	zzxy	0	0	zzxy
0	0	0	yzyz	yzzx	0	−zxzx	zxyz	0
0	0	0	zxyz	zxzx	0	yzzx	−yzyz	0
xyxx	xyxx	xyzz	0	0	xyxy	0	0	−xyxy

xxxx	xxyy	xxzz	0	0	xxxy	0	0	−yyxy
xxyy	xxxx	xxzz	0	0	yyxy	0	0	−xxxy
zzxx	zzxx	zzzz	0	0	zzxy	0	0	−zzxy
0	0	0	yzyz	yzzx	0	zxzx	−zxyz	0
0	0	0	zxyz	zxzx	0	−yzzx	yzyz	0
xyxx	−xyxx	0	0	0	xyxy	0	0	xyxy

xxxx	xxyy	xxzz	0	0	xxxy	0	0	yyxy
−xxyy	−xxxx	−xxzz	0	0	yyxy	0	0	xxxy
zzxx	−zzxx	0	0	0	zzxy	0	0	zzxy
0	0	0	yzyz	yzzx	0	−zxzx	zxyz	0
0	0	0	zxyz	zxzx	0	yzzx	−yzyz	0
xyxx	xyxx	xyzz	0	0	xyxy	0	0	−xyxy

n=3 $\mathbf{S}_6 = \bar{\mathbf{3}}_z$ 1 e

$$V^4 = \begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & -yyxy \\ xxyy & xxxx & xxzz & -xxyz & -xxzx & yyxy & -xxzy & -xxxz & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ yzxx & -yzxx & 0 & yzyz & yzzx & -xzxx & yzzy & yzxz & -xzxx \\ zxxx & -zxxx & 0 & zxyz & zxzx & zyxx & zxzy & zxxz & zyxx \\ xyxx & xyyy & xyzz & -xxxz & xxzy & xyxy & -xxzx & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & -zxzy & -zxxx & zxzx & -zxyz & -zxxx \\ xzxx & -xzxx & 0 & -yzxz & yzzy & yzxx & -yzzx & yzyz & yzxx \\ -xyyy & -xyxx & -xyzz & -xxxz & xxzy & xyyx & -xxzx & xxyz & xyxy \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx

$$[V^4] \begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & -zxxx \\ zxxx & -xxyz & zzzz & xxyy & 0 \end{pmatrix} \qquad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$V[V^3] \begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & xzxx & yyzz & xyxx & -xzxx & yzxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & yzxx & -xyzz & xxyy & -yzxx & -xzxx \\ zxxx & -zyxx & zzzz & -zxxx & 0 & zzxx & 0 & zyxx & zzxx & zxyz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$[[V^2]^2] \begin{pmatrix} xxxx & xxyy & xxzz & xxyz & -yyxz & 0 \\ & xxxx & xxzz & -xxyz & yyxz & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & yyxz \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix} \qquad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

and xyxy = ½(xxxx - xxyy)

$$[V^2]^2 \begin{pmatrix} xxxx & xxyy & xxzz & xxyz & -yyxz & xxxy \\ xxyy & xxxx & xxzz & -xxyz & yyxz & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & yzxz & xzyy \\ -xzyy & xzyy & 0 & yzxz & yzyz & yzxx \\ -xxxy & xxxy & 0 & yyxz & xxyz & xyxy \end{pmatrix} \qquad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and xyxy = ½(xxxx - xxyy)

$\mathbf{S}_{2n}$

a ae

$$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & -yyxy \\ xxyy & xxxx & xxzz & -xxyz & -xxzx & yyxy & -xxzy & -xxxz & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ yzxx & -yzxx & 0 & yzyz & yzzx & -xzxx & yzzy & yzxz & -xzxx \\ zxxx & -zxxx & 0 & zxyz & zxzx & zyxx & zxzy & zxxz & zyxx \\ xyxx & xyyy & xyzz & -xxxz & xxzy & xyxy & -xxzx & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & -zxzy & -zxxx & zxzx & -zxyz & -zxxx \\ xzxx & -xzxx & 0 & -yzxz & yzzy & yzxx & -yzzx & yzyz & yzxx \\ -xyyy & -xyxx & -xyzz & -xxxz & xxzy & xyyx & -xxzx & xxyz & xyxy \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx

$$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & -zxxx \\ zxxx & -xxyz & zzzz & xxyy & 0 \end{pmatrix} \qquad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & xzxx & yyzz & xyxx & -xzxx & yzxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & yzxx & -xyzz & xxyy & -yzxx & -xzxx \\ zxxx & -zyxx & zzzz & -zxxx & 0 & zzxx & 0 & zyxx & zzxx & zxyz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & -yyxz & 0 \\ & xxxx & xxzz & -xxyz & yyxz & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & yyxz \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix} \qquad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

and xyxy = ½(xxxx - xxyy)

$$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & -yyxz & xxxy \\ xxyy & xxxx & xxzz & -xxyz & yyxz & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & yzxz & xzyy \\ -xzyy & xzyy & 0 & yzxz & yzyz & yzxx \\ -xxxy & xxxy & 0 & yyxz & xxyz & xyxy \end{pmatrix} \qquad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and xyxy = ½(xxxx - xxyy)

n=3 $\mathbf{S}_6 = \bar{\mathbf{3}}_z$

$\mathbf{S}_{2n}$

	1								e							
$[(V^2)]^2$	xxxx	xxyy	xxzz	xxyz	xxzx	xxxy	xxzy	xxxz	−xxxy	0	0	0	0	0	0	0	0
		xxxx	xxzz	−xxyz	−xxzx	xxxy	−xxzy	−xxxz	−xxxy		0	0	0	0	0	0	0
			zzzz	0	0	zzxy	0	0	−zzxy			0	0	0	0	0	0
				yzyz	yzzx	−xxxz	yzzy	0	−xxxz				0	0	0	0	0
					zxzx	xxzy	0	yzzy	xxzy					0	0	0	0
						xyxy	−xxzx	xxyz	xyyx						0	0	0
							zxzx	−yzzx	−xxzx							0	0
								yzyz	xxyz								0
									xyxy								

and xxxx=xxyy+yzyz+zyzy

	a								ae							
	xxxx	xxyy	xxzz	xxyz	xxzx	xxxy	xxzy	xxxz	−xxxy	0	0	0	0	0	0	0	0
		xxxx	xxzz	−xxyz	−xxzx	xxxy	−xxzy	−xxxz	−xxxy		0	0	0	0	0	0	0
			zzzz	0	0	zzxy	0	0	−zzxy			0	0	0	0	0	0
				yzyz	yzzx	−xxxz	yzzy	0	−xxxz				0	0	0	0	0
					zxzx	xxzy	0	yzzy	xxzy					0	0	0	0
						xyxy	−xxzx	xxyz	xyyx						0	0	0
							zxzx	−yzzx	−xxzx							0	0
								yzyz	xxyz								0
									xyxy								

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$	xxxx	xxyy	xxzz	xxyz	xxzx	xxxy	xxzy	xxxz	−yyxy	0	0	0	0	0	0	0	0
	xxyy	xxxx	xxzz	−xxyz	−xxzx	yyxy	−xxzy	−xxxz	−xxxy	0	0	0	0	0	0	0	0
	zzxx	zzxx	zzzz	0	0	zzxy	0	0	−zzxy	0	0	0	0	0	0	0	0
	yzxx	−yzxx	0	yzyz	yzzx	−zxxx	zxzx	−zxyz	−zxxx	0	0	0	0	0	0	0	0
	zxxx	−zxxx	0	zxyz	zxzx	yzxx	−yzzx	yzyz	yzxx	0	0	0	0	0	0	0	0
	xyxx	−xyxx	0	−xxxz	xxzy	xyxy	−xxzx	xxyz	xyxy	0	0	0	0	0	0	0	0

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

	xxxx	xxyy	xxzz	xxyz	xxzx	xxxy	xxzy	xxxz	−yyxy	0	0	0	0	0	0	0	0
	xxyy	xxxx	xxzz	−xxyz	−xxzx	yyxy	−xxzy	−xxxz	−xxxy	0	0	0	0	0	0	0	0
	zzxx	zzxx	zzzz	0	0	zzxy	0	0	−zzxy	0	0	0	0	0	0	0	0
	yzxx	−yzxx	0	yzyz	yzzx	−zxxx	zxzx	−zxyz	−zxxx	0	0	0	0	0	0	0	0
	zxxx	−zxxx	0	zxyz	zxzx	yzxx	−yzzx	yzyz	yzxx	0	0	0	0	0	0	0	0
	xyxx	−xyxx	0	−xxxz	xxzy	xyxy	−xxzx	xxyz	xyxy	0	0	0	0	0	0	0	0

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

n=4 $\mathbf{S}_8 = \bar{\mathbf{8}}_z$

$\mathbf{S}_{2n}$

V^4

1

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\
xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\
0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\
-xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy
\end{pmatrix}$$

e

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
-xxxx & xxxx & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx
\end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx; xxxy-yyxy=xyyy-xyxx

a

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\
xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\
0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\
-xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy
\end{pmatrix}$$

ae

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
-xxxx & xxxx & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx
\end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx; xxxy-yyxy=xyyy-xyxx

$[V^4]$

$$\begin{pmatrix}
3xxyy & 0 & 0 & yyzz & 0 \\
0 & 3xxyy & 0 & yyzz & 0 \\
0 & 0 & zzzz & xxyy & 0
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & xyyy & 0 & 0 & 0 \\
-xyyy & xxxx & 0 & 0 & 0 \\
0 & 0 & 0 & -xxxx & 0
\end{pmatrix}$$

$$\begin{pmatrix}
3xxyy & 0 & 0 & yyzz & 0 \\
0 & 3xxyy & 0 & yyzz & 0 \\
0 & 0 & zzzz & xxyy & 0
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & xyyy & 0 & 0 & 0 \\
-xyyy & xxxx & 0 & 0 & 0 \\
0 & 0 & 0 & -xxxx & 0
\end{pmatrix}$$

$V[V^3]$

$$\begin{pmatrix}
3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\
-3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\
0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & xyyy & 0 & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 \\
-xyyy & xxxx & 0 & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\
-3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\
0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & xyyy & 0 & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 \\
-xyyy & xxxx & 0 & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$[[V^2]^2]$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 \\
 & & & & yzyz & 0 \\
 & & & & & xyxy
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & -xyyy \\
 & xxxx & 0 & 0 & 0 & xyyy \\
 & & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 \\
 & & & & 0 & 0 \\
 & & & & & -xxxx
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 \\
 & & & & yzyz & 0 \\
 & & & & & xyxy
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & -xyyy \\
 & xxxx & 0 & 0 & 0 & xyyy \\
 & & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 \\
 & & & & 0 & 0 \\
 & & & & & -xxxx
\end{pmatrix}$$

add: xyxy=½(xxxx-xxyy)

add: xyxy=½(xxxx-xxyy)

$[V^2]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy \\
xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & yzxz & 0 \\
0 & 0 & 0 & -yzxz & yzyz & 0 \\
-xxxy & xxxy & 0 & 0 & 0 & xyxy
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & -xyyy \\
-xxxx & xxxx & 0 & 0 & 0 & xyyy \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
-xyyy & xyyy & 0 & 0 & 0 & -xxxx
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy \\
xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & yzxz & 0 \\
0 & 0 & 0 & -yzxz & yzyz & 0 \\
-xxxy & xxxy & 0 & 0 & 0 & xyxy
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & -xyyy \\
-xxxx & xxxx & 0 & 0 & 0 & xyyy \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
-xyyy & xyyy & 0 & 0 & 0 & -xxxx
\end{pmatrix}$$

add: xyxy=½(xxxx-xxyy)

add: xyxy=½(xxxx-xxyy)

n=4 $\mathbf{S}_8 = \bar{\mathbf{8}}_z$

$\mathbf{S}_{2n}$

1

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & -yzzx & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

e

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
 & xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & -xxxx & 0 & 0 & -xxxx \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & -xxxx
\end{pmatrix}$$

$[(V^2)]^2$

add: xxxx=xxyy+xyxy+xyyx

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
-xxxx & xxxx & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx
\end{pmatrix}$$

$[V^2]V^2$

add: xxxx=xxyy+2xyxy; yyxy-xxxy=2xyxx

a

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & -yzzx & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

ae

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
 & xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & -xxxx & 0 & 0 & -xxxx \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & -xxxx
\end{pmatrix}$$

add: xxxx=xxyy+xyxy+xyyx

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
-xxxx & xxxx & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx
\end{pmatrix}$$

add: xxxx=xxyy+2xyxy; yyxy-xxxy=2xyxx

n>4 $\mathbf{C_{\infty/m} = \infty/m}$

$\mathbf{S_{2n}}$

1 e

V^4

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx

a ae

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx

$[V^4]$

$$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$V[V^3]$

$$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[[V^2]^2]$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

and xyxy=½(xxxx-xxyy)

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

and xyxy=½(xxxx-xxyy)

$[V^2]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and xyxy = ½(xxxx - xxyy)

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and xyxy = ½(xxxx - xxyy)

n>4 $\mathbf{C_{\infty/m}} = \infty/\mathbf{m}$

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

S_{2n}

a

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$\mathbf{C}_{nh}$

n=1 $\mathbf{C}_{1h} = \mathbf{m}_z$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzxz & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & zyzx & 0 & zyzy & zyxz & 0 \\ 0 & 0 & 0 & xzyz & xzzx & 0 & xzzy & xzxz & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\ 0 & 0 & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & xyyz & xyzx & 0 & xyzy & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & 0 & zyxy & 0 & 0 & zyyx \\ zxxx & zxyy & zxzz & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & yxyz & yxzx & 0 & yxzy & yxxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & zyzx & 0 & zyzy & zyxz & 0 \\ 0 & 0 & 0 & xzyz & xzzx & 0 & xzzy & xzxz & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\ 0 & 0 & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & xyyz & xyzx & 0 & xyzy & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & 0 & zyxy & 0 & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & 0 & xzxy & 0 & 0 & xzyx \\ 0 & 0 & 0 & yxyz & yxzx & 0 & yxzy & yxxz & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & xyyy & 0 & yyzz & 0 \\ yxxx & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & zzxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & xxyz \\ 0 & 0 & yzzz & 0 & yyxz \\ zxxx & zyyy & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & yyzz & 0 \\ yxxx & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & zzxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & xxyz \\ 0 & 0 & yzzz & 0 & yyxz \\ zxxx & zyyy & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & xxzz & xyxx & 0 & 0 \\ yxxx & yyyy & 0 & yxyy & yyzz & 0 & yxzz & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 & xzxx & 0 & 0 & xzyy & xxyz \\ 0 & 0 & yzzz & 0 & 0 & yzxx & 0 & 0 & yzyy & yxyz \\ zxxx & zyyy & 0 & zxyy & zyzz & 0 & zxzz & zyxx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & xxzz & xyxx & 0 & 0 \\ yxxx & yyyy & 0 & yxyy & yyzz & 0 & yxzz & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 & xzxx & 0 & 0 & xzyy & xxyz \\ 0 & 0 & yzzz & 0 & 0 & yzxx & 0 & 0 & yzyy & yxyz \\ zxxx & zyyy & 0 & zxyy & zyzz & 0 & zxzz & zyxx & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & yyxy \\ & & zzzz & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxxz & 0 \\ & 0 & 0 & yyyz & yyxz & 0 \\ & & 0 & zzyz & zzxz & 0 \\ & & & 0 & 0 & yzxy \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & yyxy \\ & & zzzz & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxxz & 0 \\ & 0 & 0 & yyyz & yyxz & 0 \\ & & 0 & zzyz & zzxz & 0 \\ & & & 0 & 0 & yzxy \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & xzyz & xzxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxxz & 0 \\ 0 & 0 & 0 & yyyz & yyxz & 0 \\ 0 & 0 & 0 & zzyz & zzxz & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & 0 & xzxy \\ 0 & 0 & 0 & xyyz & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & xzyz & xzxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxxz & 0 \\ 0 & 0 & 0 & yyyz & yyxz & 0 \\ 0 & 0 & 0 & zzyz & zzxz & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & 0 & xzxy \\ 0 & 0 & 0 & xyyz & xyxz & 0 \end{pmatrix}$

n=1 $\mathbf{C}_{1h} = \mathbf{m}_z$

$\mathbf{C}_{nh}$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ & & & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ & & & & zxzx & 0 & zxzy & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & zyxz & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\ & & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\ & & & 0 & 0 & yzxy & 0 & 0 & yzyx \\ & & & & 0 & zxxy & 0 & 0 & zxyx \\ & & & & & 0 & xyzy & xyxz & 0 \\ & & & & & & 0 & 0 & zyyx \\ & & & & & & & 0 & xzyx \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ & & & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ & & & & zxzx & 0 & zxzy & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & zyxz & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\ & & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\ & & & 0 & 0 & yzxy & 0 & 0 & yzyx \\ & & & & 0 & zxxy & 0 & 0 & zxyx \\ & & & & & 0 & xyzy & xyxz & 0 \\ & & & & & & 0 & 0 & zyyx \\ & & & & & & & 0 & xzyx \\ & & & & & & & & 0 \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\ 0 & 0 & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & xyyz & xyzx & 0 & xyzy & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\ 0 & 0 & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & xyyz & xyzx & 0 & xyzy & xyxz & 0 \end{pmatrix}$

n=2 $\mathbf{C}_{2h} = \mathbf{2}_z/\mathbf{m}_z$

1 e

V^4

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & zyzx & 0 & zyzy & zyxz & 0 \\ 0 & 0 & 0 & xzyz & xzzx & 0 & xzzy & xzxz & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[V^4]$

$$\begin{pmatrix} xxxx & xyyy & 0 & yyzz & 0 \\ yxxx & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & zzxy \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$V[V^3]$

$$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & xxzz & xyxx & 0 & 0 \\ yxxx & yyyy & 0 & yxyy & yyzz & 0 & yxzz & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & zxyz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[[V^2]^2]$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & yyxy \\ & & zzzz & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

$[V^2]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & xzyz & xzxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$\mathbf{C}_{nh}$

a ae

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & zyzx & 0 & zyzy & zyxz & 0 \\ 0 & 0 & 0 & xzyz & xzzx & 0 & xzzy & xzxz & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xyyy & 0 & yyzz & 0 \\ yxxx & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & zzxy \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & xxzz & xyxx & 0 & 0 \\ yxxx & yyyy & 0 & yxyy & yyzz & 0 & yxzz & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & zxyz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & yyxy \\ & & zzzz & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & xzyz & xzxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

n=2 $\mathbf{C}_{2h} = \mathbf{2}_z/\mathbf{m}_z$

$\mathbf{C}_{nh}$

$[(V^2)]^2$

	1								e								
	xxxx	xxyy	xxzz	0	0	xxxy	0	0	xxyx	0	0	0	0	0	0	0	0
		yyyy	yyzz	0	0	yyxy	0	0	yyyx		0	0	0	0	0	0	0
			zzzz	0	0	zzxy	0	0	zzyx			0	0	0	0	0	0
				yzyz	yzzx	0	yzzy	yzxz	0				0	0	0	0	0
					zxzx	0	zxzy	zxxz	0					0	0	0	0
						xyxy	0	0	xyyx						0	0	0
							zyzy	zyxz	0							0	0
								xzxz	0								0
									yxyx								

$[V^2]V^2$

	xxxx	xxyy	xxzz	0	0	xxxy	0	0	xxyx	0	0	0	0	0	0	0	0
	yyxx	yyyy	yyzz	0	0	yyxy	0	0	yyyx	0	0	0	0	0	0	0	0
	zzxx	zzyy	zzzz	0	0	zzxy	0	0	zzyx	0	0	0	0	0	0	0	0
	0	0	0	yzyz	yzzx	0	yzzy	yzxz	0	0	0	0	0	0	0	0	0
	0	0	0	zxyz	zxzx	0	zxzy	zxxz	0	0	0	0	0	0	0	0	0
	xyxx	xyyy	xyzz	0	0	xyxy	0	0	xyyx	0	0	0	0	0	0	0	0

	a								ae								
	xxxx	xxyy	xxzz	0	0	xxxy	0	0	xxyx	0	0	0	0	0	0	0	0
		yyyy	yyzz	0	0	yyxy	0	0	yyyx		0	0	0	0	0	0	0
			zzzz	0	0	zzxy	0	0	zzyx			0	0	0	0	0	0
				yzyz	yzzx	0	yzzy	yzxz	0				0	0	0	0	0
					zxzx	0	zxzy	zxxz	0					0	0	0	0
						xyxy	0	0	xyyx						0	0	0
							zyzy	zyxz	0							0	0
								xzxz	0								0
									yxyx								

	xxxx	xxyy	xxzz	0	0	xxxy	0	0	xxyx	0	0	0	0	0	0	0	0
	yyxx	yyyy	yyzz	0	0	yyxy	0	0	yyyx	0	0	0	0	0	0	0	0
	zzxx	zzyy	zzzz	0	0	zzxy	0	0	zzyx	0	0	0	0	0	0	0	0
	0	0	0	yzyz	yzzx	0	yzzy	yzxz	0	0	0	0	0	0	0	0	0
	0	0	0	zxyz	zxzx	0	zxzy	zxxz	0	0	0	0	0	0	0	0	0
	xyxx	xyyy	xyzz	0	0	xyxy	0	0	xyyx	0	0	0	0	0	0	0	0

$\mathbf{C}_{nh}$

n=3 $\mathbf{C}_{3h} = \bar{\mathbf{6}}_z$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & yyzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & 0 & -xxzx & 0 & -xxzy & -xxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xzxx & 0 & 0 & -xzxx \\ zxxx & -zxxx & 0 & 0 & 0 & zyxx & 0 & 0 & zyxx \\ 0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0 \\ zyxx & -zyxx & 0 & 0 & 0 & -zxxx & 0 & 0 & -zxxx \\ xzxx & -xzxx & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\ 0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & yyzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & 0 & -xxzx & 0 & -xxzy & -xxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xzxx & 0 & 0 & -xzxx \\ zxxx & -zxxx & 0 & 0 & 0 & zyxx & 0 & 0 & zyxx \\ 0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0 \\ zyxx & -zyxx & 0 & 0 & 0 & -zxxx & 0 & 0 & -zxxx \\ xzxx & -xzxx & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\ 0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx		and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx	
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & -xxyz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & -xxyz & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xzxx & 0 & 0 & -xzxx & yzxx \\ 0 & 0 & 0 & 0 & 0 & yzxx & 0 & 0 & -yzxx & -xzxx \\ zxxx & -zyxx & 0 & -zxxx & 0 & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xzxx & 0 & 0 & -xzxx & yzxx \\ 0 & 0 & 0 & 0 & 0 & yzxx & 0 & 0 & -yzxx & -xzxx \\ zxxx & -zyxx & 0 & -zxxx & 0 & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & -yyxz & 0 \\ & 0 & 0 & -xxyz & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & xxyz \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & -yyxz & 0 \\ & 0 & 0 & -xxyz & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & xxyz \\ & & & & & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)		and xyxy = ½(xxxx - xxyy)	
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & -yyxz & 0 \\ 0 & 0 & 0 & -xxyz & yyxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & 0 & 0 & xzyy \\ -xzyy & xzyy & 0 & 0 & 0 & yzxx \\ 0 & 0 & 0 & yyxz & xxyz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & -yyxz & 0 \\ 0 & 0 & 0 & -xxyz & yyxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & 0 & 0 & xzyy \\ -xzyy & xzyy & 0 & 0 & 0 & yzxx \\ 0 & 0 & 0 & yyxz & xxyz & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)		and xyxy = ½(xxxx - xxyy)	

C_{nh}

n=3 $C_{3h} = \bar{6}_z$

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

e

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ & 0 & 0 & -xxyz & -xxzx & 0 & -xxzy & -xxxz & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & -xxxz & 0 & 0 & -xxxz \\ & & & & 0 & xxzy & 0 & 0 & xxzy \\ & & & & & 0 & -xxzx & xxyz & 0 \\ & & & & & & 0 & 0 & -xxzx \\ & & & & & & & 0 & xxyz \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ & 0 & 0 & -xxyz & -xxzx & 0 & -xxzy & -xxxz & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & -xxxz & 0 & 0 & -xxxz \\ & & & & 0 & xxzy & 0 & 0 & xxzy \\ & & & & & 0 & -xxzx & xxyz & 0 \\ & & & & & & 0 & 0 & -xxzx \\ & & & & & & & 0 & xxyz \\ & & & & & & & & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

ae

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ & 0 & 0 & -xxyz & -xxzx & 0 & -xxzy & -xxxz & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & -xxxz & 0 & 0 & -xxxz \\ & & & & 0 & xxzy & 0 & 0 & xxzy \\ & & & & & 0 & -xxzx & xxyz & 0 \\ & & & & & & 0 & 0 & -xxzx \\ & & & & & & & 0 & xxyz \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ & 0 & 0 & -xxyz & -xxzx & 0 & -xxzy & -xxxz & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & -xxxz & 0 & 0 & -xxxz \\ & & & & 0 & xxzy & 0 & 0 & xxzy \\ & & & & & 0 & -xxzx & xxyz & 0 \\ & & & & & & 0 & 0 & -xxzx \\ & & & & & & & 0 & xxyz \\ & & & & & & & & 0 \end{pmatrix}$$

n=4 $\mathbf{C}_{4h} = \mathbf{4}_z/\mathbf{m}_z$

$\mathbf{C}_{nh}$

1 e a ae

V^4

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[V^4]$

$$\begin{pmatrix} xxxx & -yxxx & 0 & yyzz & 0 \\ yxxx & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$V[V^3]$

$$\begin{pmatrix} xxxx & -yxxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ yxxx & xxxx & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[[V^2]^2]$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

$[V^2]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

n=4 $\mathbf{C_{4h}} = \mathbf{4_z/m_z}$

$\mathbf{C_{nh}}$

	1	e
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

	a	ae
	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$
	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

n>4 $\mathbf{C}_{\infty/\mathbf{m}} = \infty/\mathbf{m}$

1 e

V^4

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx

$[V^4]$

$$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$V[V^3]$

$$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[[V^2]^2]$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

and xyxy=½(xxxx-xxyy)

$[V^2]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and xyxy = ½(xxxx - xxyy)

$\mathbf{C}_{nh}$

a ae

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx

$$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

and xyxy=½(xxxx-xxyy)

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and xyxy = ½(xxxx - xxyy)

C_{nh}

n>4 $\mathbf{C_{\infty/m} = \infty/m}$

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & -yzzx & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & -yzzx & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

ae

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

n=1 $\mathbf{D}_1 = \mathbf{2}_y$

$\mathbf{D}_n$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & zyxy & zyzy & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & yxyz & 0 & yxxy & yxzy & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & zyxy & zyzy & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & yxyz & 0 & yxxy & yxzy & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & zyxy & zyzy & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & yxyz & 0 & yxxy & yxzy & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & zyxy & zyzy & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & yxyz & 0 & yxxy & yxzy & 0 & yxyx \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & xzzz & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & yyxz \\ zxxx & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xzzz & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & yyxz \\ zxxx & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xzzz & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & yyxz \\ zxxx & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xzzz & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & yyxz \\ zxxx & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & xzzz & xxyy & 0 & xzxx & xxzz & 0 & xzyy & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & yxyz \\ zxxx & 0 & zzzz & zxyy & 0 & zzxx & zxzz & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xzzz & xxyy & 0 & xzxx & xxzz & 0 & xzyy & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & yxyz \\ zxxx & 0 & zzzz & zxyy & 0 & zzxx & zxzz & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xzzz & xxyy & 0 & xzxx & xxzz & 0 & xzyy & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & yxyz \\ zxxx & 0 & zzzz & zxyy & 0 & zzxx & zxzz & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xzzz & xxyy & 0 & xzxx & xxzz & 0 & xzyy & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & yxyz \\ zxxx & 0 & zzzz & zxyy & 0 & zzxx & zxzz & 0 & zzyy & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyxz & 0 \\ & & zzzz & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyxz & 0 \\ & & zzzz & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyxz & 0 \\ & & zzzz & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyxz & 0 \\ & & zzzz & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & xzxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & xzxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & xzxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & xzxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy \end{pmatrix}$

$\mathbf{D}_n$

n=1 $\mathbf{D}_1 = \mathbf{2}_y$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ & & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & xyzy & 0 & xyyx \\ & & & & & & zyzy & 0 & zyyx \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ & & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & xyzy & 0 & xyyx \\ & & & & & & zyzy & 0 & zyyx \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ & & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & xyzy & 0 & xyyx \\ & & & & & & zyzy & 0 & zyyx \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ & & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & xyzy & 0 & xyyx \\ & & & & & & zyzy & 0 & zyyx \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \end{pmatrix}$

n=2 $\mathbf{D}_2 = \mathbf{2}_x\mathbf{2}_y\mathbf{2}_z$

$\mathbf{D}_n$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$

$\mathbf{D}_n$

n=2 $\mathbf{D}_2 = \mathbf{2}_x\mathbf{2}_y\mathbf{2}_z$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$

n=3 $\mathbf{D}_3 = \mathbf{3}_z\mathbf{2}_x$

$\mathbf{D}_n$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ yyxx & xxxx & yyzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & zyxx & 0 & zxxz & zyxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ xzxx & -xzxx & 0 & 0 & yzzy & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyyx & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ yyxx & xxxx & yyzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & zyxx & 0 & zxxz & zyxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ xzxx & -xzxx & 0 & 0 & yzzy & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyyx & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ yyxx & xxxx & yyzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & zyxx & 0 & zxxz & zyxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ xzxx & -xzxx & 0 & 0 & yzzy & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyyx & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ yyxx & xxxx & yyzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & zyxx & 0 & zxxz & zyxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ xzxx & -xzxx & 0 & 0 & yzzy & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyyx & 0 & xxyz & xyxy \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx	and: xxxx=xxyy+xyxy+xyyx	and: xxxx=xxyy+xyxy+xyyx	and: xxxx=xxyy+xyxy+xyyx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yzxx \\ 0 & 3xxyy & 0 & 0 & yyzz & yzxx & 0 & xxyy & -yzxx & 0 \\ 0 & -zyxx & zzzz & 0 & 0 & zzxx & 0 & zyxx & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yzxx \\ 0 & 3xxyy & 0 & 0 & yyzz & yzxx & 0 & xxyy & -yzxx & 0 \\ 0 & -zyxx & zzzz & 0 & 0 & zzxx & 0 & zyxx & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yzxx \\ 0 & 3xxyy & 0 & 0 & yyzz & yzxx & 0 & xxyy & -yzxx & 0 \\ 0 & -zyxx & zzzz & 0 & 0 & zzxx & 0 & zyxx & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yzxx \\ 0 & 3xxyy & 0 & 0 & yyzz & yzxx & 0 & xxyy & -yzxx & 0 \\ 0 & -zyxx & zzzz & 0 & 0 & zzxx & 0 & zyxx & zzxx & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxyz & xyxy \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)

D_n

n=3 $\mathbf{D}_3 = \mathbf{3}_z\mathbf{2}_x$

$[(V^2)]^2$

1								
xxxx	xxyy	xxzz	xxyz	0	0	xxzy	0	0
	xxxx	xxzz	−xxyz	0	0	−xxzy	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	xxzy	0	yzzy	xxzy
					xyxy	0	xxyz	xyyx
						zxzx	0	0
							yzyz	xxyz
								xyxy

and xxxx=xxyy+yzyz+zyzy

e								
xxxx	xxyy	xxzz	xxyz	0	0	xxzy	0	0
	xxxx	xxzz	−xxyz	0	0	−xxzy	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	xxzy	0	yzzy	xxzy
					xyxy	0	xxyz	xyyx
						zxzx	0	0
							yzyz	xxyz
								xyxy

and xxxx=xxyy+yzyz+zyzy

a								
xxxx	xxyy	xxzz	xxyz	0	0	xxzy	0	0
	xxxx	xxzz	−xxyz	0	0	−xxzy	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	xxzy	0	yzzy	xxzy
					xyxy	0	xxyz	xyyx
						zxzx	0	0
							yzyz	xxyz
								xyxy

and xxxx=xxyy+yzyz+zyzy

ae								
xxxx	xxyy	xxzz	xxyz	0	0	xxzy	0	0
	xxxx	xxzz	−xxyz	0	0	−xxzy	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	xxzy	0	yzzy	xxzy
					xyxy	0	xxyz	xyyx
						zxzx	0	0
							yzyz	xxyz
								xyxy

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

xxxx	xxyy	xxzz	xxyz	0	0	xxzy	0	0
xxyy	xxxx	xxzz	−xxyz	0	0	−xxzy	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
yzxx	−yzxx	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	yzxx	0	yzyz	yzxx
0	0	0	0	xxzy	xyxy	0	xxyz	xyxy

and xxxx=xxyy+2xyxy

xxxx	xxyy	xxzz	xxyz	0	0	xxzy	0	0
xxyy	xxxx	xxzz	−xxyz	0	0	−xxzy	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
yzxx	−yzxx	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	yzxx	0	yzyz	yzxx
0	0	0	0	xxzy	xyxy	0	xxyz	xyxy

and xxxx=xxyy+2xyxy

xxxx	xxyy	xxzz	xxyz	0	0	xxzy	0	0
xxyy	xxxx	xxzz	−xxyz	0	0	−xxzy	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
yzxx	−yzxx	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	yzxx	0	yzyz	yzxx
0	0	0	0	xxzy	xyxy	0	xxyz	xyxy

and xxxx=xxyy+2xyxy

xxxx	xxyy	xxzz	xxyz	0	0	xxzy	0	0
xxyy	xxxx	xxzz	−xxyz	0	0	−xxzy	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
yzxx	−yzxx	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	yzxx	0	yzyz	yzxx
0	0	0	0	xxzy	xyxy	0	xxyz	xyxy

and xxxx=xxyy+2xyxy

n=4 $\mathbf{D}_4 = \mathbf{4}_z\mathbf{2}_x\mathbf{2}_{xy}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$ $\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$

D_n

n=4 **$D_4 = 4_z 2_x 2_{xy}$**

$[(V^2)]^2$

1								
xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

e								
xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

a								
xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

ae								
xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

$[V^2]V^2$

xxxx	xxyy	xxzz	0	0	0	0	0	0
yyxx	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

xxxx	xxyy	xxzz	0	0	0	0	0	0
yyxx	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

xxxx	xxyy	xxzz	0	0	0	0	0	0
yyxx	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

xxxx	xxyy	xxzz	0	0	0	0	0	0
yyxx	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

n>4 $\mathbf{D}_{\infty} = \infty\mathbf{2}$

$\mathbf{D}_n$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx	and: xxxx=xxyy+xyxy+xyyx	and: xxxx=xxyy+xyxy+xyyx	and: xxxx=xxyy+xyxy+xyyx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)	and xyxy=½(xxxx-xxyy)	and xyxy=½(xxxx-xxyy)	and xyxy=½(xxxx-xxyy)
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)

D_n

n>4 **$D_\infty = \infty 2$**

1

$[(V^2)]^2$

xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

xxxx	xxyy	xxzz	0	0	0	0	0	0
xxyy	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

and xxxx=xxyy+2xyxy

e

xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

and xxxx=xxyy+yzyz+zyzy

xxxx	xxyy	xxzz	0	0	0	0	0	0
xxyy	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

and xxxx=xxyy+2xyxy

a

xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

and xxxx=xxyy+yzyz+zyzy

xxxx	xxyy	xxzz	0	0	0	0	0	0
xxyy	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

and xxxx=xxyy+2xyxy

ae

xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

and xxxx=xxyy+yzyz+zyzy

xxxx	xxyy	xxzz	0	0	0	0	0	0
xxyy	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

and xxxx=xxyy+2xyxy

n=1 $\mathbf{D}_{1d} = \mathbf{2}_y/\mathbf{m}_y$

$\mathbf{D}_{nd}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & zyxy & zyzy & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & yxyz & 0 & yxxy & yxzy & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & zyxy & zyzy & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & yxyz & 0 & yxxy & yxzy & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & xzzz & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & yyxz \\ zxxx & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xzzz & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & yyxz \\ zxxx & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & xzzz & xxyy & 0 & xzxx & xxzz & 0 & xzyy & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & yxyz \\ zxxx & 0 & zzzz & zxyy & 0 & zzxx & zxzz & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xzzz & xxyy & 0 & xzxx & xxzz & 0 & xzyy & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & yxyz \\ zxxx & 0 & zzzz & zxyy & 0 & zzxx & zxzz & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyxz & 0 \\ & & zzzz & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyxz & 0 \\ & & zzzz & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & xzxz & 0 \\ xyxx & xyyy & xyzz & xyyz & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & xzxz & 0 \\ xyxx & xyyy & xyzz & xyyz & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

n=1 $\mathbf{D}_{1d} = \mathbf{2}_y/\mathbf{m}_y$

$\mathbf{D}_{nd}$

1

$[(V^2)]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ & & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & xyzy & 0 & xyyx \\ & & & & & & zyzy & 0 & zyyx \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$$

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ & & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & xyzy & 0 & xyyx \\ & & & & & & zyzy & 0 & zyyx \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

D_{nd}

n=2 **D_{2d}** = $\bar{\mathbf{4}}_z$ $\mathbf{m}_x\mathbf{2}_{xy}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzy & 0 & 0 & zxyz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 & yzzx & 0 & 0 \\ xyyy & xyxx & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzy & 0 & 0 & zxyz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 & yzzx & 0 & 0 \\ xyyy & xyxx & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & yxyy & 0 & 0 \\ xyyy & 0 & 0 & yxyy & 0 & 0 & xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & yxyy & 0 & 0 \\ xyyy & 0 & 0 & yxyy & 0 & 0 & xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 \end{pmatrix}$

D_{nd}

n=2 **D_{2d}** = $\bar{\mathbf{4}}_z$ $\mathbf{m}_x\mathbf{2}_{xy}$

1

$[(V^2)]^2$

xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

$[V^2]V^2$

xxxx	xxyy	xxzz	0	0	0	0	0	0
xxyy	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

e

0	0	0	0	0	xxxy	0	0	yyxy
	0	0	0	0	yyxy	0	0	xxxy
		0	0	0	zzxy	0	0	zzxy
			0	yzzx	0	0	yzxz	0
				0	0	zxzy	0	0
					0	0	0	0
						0	yzzx	0
							0	0
								0

0	0	0	0	0	xxxy	0	0	yyxy
0	0	0	0	0	yyxy	0	0	xxxy
0	0	0	0	0	zzxy	0	0	zzxy
0	0	0	yzzx	0	0	yzxz	0	0
0	0	0	0	zxzy	0	0	0	0
0	0	0	0	0	yzzx	0	0	zxyz
0	0	0	0	0	0	yzzx	0	0
xyxx	xyxx	xyzz	0	0	0	0	0	0

a

xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

xxxx	xxyy	xxzz	0	0	0	0	0	0
xxyy	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

ae

0	0	0	0	0	xxxy	0	0	yyxy
	0	0	0	0	yyxy	0	0	xxxy
		0	0	0	zzxy	0	0	zzxy
			0	yzzx	0	0	yzxz	0
				0	0	zxzy	0	0
					0	0	0	0
						0	yzzx	0
							0	0
								0

0	0	0	0	0	xxxy	0	0	yyxy
0	0	0	0	0	yyxy	0	0	xxxy
0	0	0	0	0	zzxy	0	0	zzxy
0	0	0	0	yzzx	0	0	zxyz	0
0	0	0	zxyz	0	0	yzzx	0	0
xyxx	xyxx	xyzz	0	0	0	0	0	0

n=3 $\mathbf{D}_{3d} = \bar{\mathbf{3}}_z \mathbf{m}_x$ 1 e

V^4

$$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & zyxx & 0 & zxxz & zyxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyyx & 0 & xxyz & xyxy \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx

$[V^4]$

$$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & -xxyz & zzzz & xxyy & 0 \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$V[V^3]$

$$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yzxx \\ 0 & 3xxyy & 0 & 0 & yyzz & yzxx & 0 & xxyy & -yzxx & 0 \\ 0 & -zyxx & zzzz & 0 & 0 & zzxx & 0 & zyxx & zzxx & 0 \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[[V^2]^2]$

$$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

and xyxy = ½(xxxx - xxyy)

$[V^2]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxyz & xyxy \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and xyxy = ½(xxxx - xxyy)

$\mathbf{D}_{nd}$ a ae

$$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & zyxx & 0 & zxxz & zyxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyyx & 0 & xxyz & xyxy \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx

$$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & -xxyz & zzzz & xxyy & 0 \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yzxx \\ 0 & 3xxyy & 0 & 0 & yyzz & yzxx & 0 & xxyy & -yzxx & 0 \\ 0 & -zyxx & zzzz & 0 & 0 & zzxx & 0 & zyxx & zzxx & 0 \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

and xyxy = ½(xxxx - xxyy)

$$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxyz & xyxy \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and xyxy = ½(xxxx - xxyy)

n=3 $\mathbf{D}_{3d} = \bar{\mathbf{3}}_z \mathbf{m}_x$

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & xxzy & 0 & yzzy & xxzy \\ & & & & & xyxy & 0 & xxyz & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & xxyz \\ & & & & & & & & xyxy \end{pmatrix}$$

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyxy \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and xxxx=xxyy+2xyxy

$\mathbf{D}_{nd}$

a

$$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & xxzy & 0 & yzzy & xxzy \\ & & & & & xyxy & 0 & xxyz & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & xxyz \\ & & & & & & & & xyxy \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyxy \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and xxxx=xxyy+2xyxy

n=4 $\mathbf{D}_{4d} = \bar{\mathbf{8}}_z\,\mathbf{m}_{x1}\mathbf{2}_1$

$\mathbf{D}_{nd}$

1

V^4

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx

$[V^4]$

$$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$$

$V[V^3]$

$$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$$

$[[V^2]^2]$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$$

add: xyxy=½(xxxx-xxyy)

$[V^2]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$$

add: xyxy=½(xxxx-xxyy)

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ -xyyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 \\ -xyyy & 0 & 0 & xyyy & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy \\ & 0 & 0 & 0 & 0 & xyyy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx

$$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$$

$$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$$

add: xyxy=½(xxxx-xxyy)

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$$

add: xyxy=½(xxxx-xxyy)

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ -xyyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 \\ -xyyy & 0 & 0 & xyyy & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy \\ & 0 & 0 & 0 & 0 & xyyy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 \end{pmatrix}$$

n=4 $\mathbf{D}_{4d} = \bar{\mathbf{8}}_z\,\mathbf{m}_{x1}\mathbf{2}_1$ 1 e

$[(V^2)]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

add: xxxx=xxyy+xyxy+xyyx

$[V^2]V^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

add: xxxx=xxyy+2xyxy

$\mathbf{D}_{nd}$ a ae

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

add: xxxx=xxyy+xyxy+xyyx

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

add: xxxx=xxyy+2xyxy

D_{nd}

n>4 **$D_{\infty h}$ = ∞/mmm**

1

V^4

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\
0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy
\end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx

$[V^4]$

$$\begin{pmatrix}
3xxyy & 0 & 0 & yyzz & 0 \\
0 & 3xxyy & 0 & yyzz & 0 \\
0 & 0 & zzzz & xxyy & 0
\end{pmatrix}$$

$V[V^3]$

$$\begin{pmatrix}
3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\
0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\
0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0
\end{pmatrix}$$

$[[V^2]^2]$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 \\
 & & & & yzyz & 0 \\
 & & & & & xyxy
\end{pmatrix}$$

and xyxy=½(xxxx-xxyy)

$[V^2]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 \\
0 & 0 & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy
\end{pmatrix}$$

and xyxy = ½(xxxx - xxyy)

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 \\
 & & & & 0 & 0 \\
 & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\
0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy
\end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx

$$\begin{pmatrix}
3xxyy & 0 & 0 & yyzz & 0 \\
0 & 3xxyy & 0 & yyzz & 0 \\
0 & 0 & zzzz & xxyy & 0
\end{pmatrix}$$

$$\begin{pmatrix}
3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\
0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\
0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 \\
 & & & & yzyz & 0 \\
 & & & & & xyxy
\end{pmatrix}$$

and xyxy=½(xxxx-xxyy)

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 \\
0 & 0 & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy
\end{pmatrix}$$

and xyxy = ½(xxxx - xxyy)

ae

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 \\
 & & & & 0 & 0 \\
 & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

n>4 $\mathbf{D}_{\infty h}$ = ∞/**mmm**

1

$[(V^2)]^2$

xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

xxxx	xxyy	xxzz	0	0	0	0	0	0
xxyy	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

and xxxx=xxyy+2xyxy

e

0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
			0	0	0	0	0	0
				0	0	0	0	0
					0	0	0	0
						0	0	0
							0	0
								0

0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

a

xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

and xxxx=xxyy+yzyz+zyzy

xxxx	xxyy	xxzz	0	0	0	0	0	0
xxyy	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

and xxxx=xxyy+2xyxy

ae

0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
			0	0	0	0	0	0
				0	0	0	0	0
					0	0	0	0
						0	0	0
							0	0
								0

0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

n=1 $\mathbf{D}_{1h} = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z$

$\mathbf{D}_{nh}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & 0 & xyzx & 0 & 0 & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzxy & 0 & 0 & xzyx \\ 0 & 0 & 0 & 0 & yxzx & 0 & 0 & yxxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & 0 & xyzx & 0 & 0 & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzxy & 0 & 0 & xzyx \\ 0 & 0 & 0 & 0 & yxzx & 0 & 0 & yxxz & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & yzzz & 0 & 0 \\ 0 & zyyy & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & yzzz & 0 & 0 \\ 0 & zyyy & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & yzzz & 0 & 0 & yzxx & 0 & 0 & yzyy & 0 \\ 0 & zyyy & 0 & 0 & zyzz & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & yzzz & 0 & 0 & yzxx & 0 & 0 & yzyy & 0 \\ 0 & zyyy & 0 & 0 & zyzz & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ & 0 & 0 & yyyz & 0 & 0 \\ & & 0 & zzyz & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ & 0 & 0 & yyyz & 0 & 0 \\ & & 0 & zzyz & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzxy \\ 0 & 0 & 0 & 0 & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzxy \\ 0 & 0 & 0 & 0 & xyxz & 0 \end{pmatrix}$

$\mathbf{D}_{nh}$

n=1 $\mathbf{D}_{1h} = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z$

$[(V^2)]^2$

1

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & zxxz & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zyzy & 0 & 0 \\
 & & & & & & & xzxz & 0 \\
 & & & & & & & & yxyx
\end{pmatrix}$$

e

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\
 & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\
 & & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & zxxy & 0 & 0 & zxyx \\
 & & & & & 0 & 0 & xyxz & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & xzyx \\
 & & & & & & & & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & zxxz & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zyzy & 0 & 0 \\
 & & & & & & & xzxz & 0 \\
 & & & & & & & & yxyx
\end{pmatrix}$$

ae

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\
 & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\
 & & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & zxxy & 0 & 0 & zxyx \\
 & & & & & 0 & 0 & xyxz & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & xzyx \\
 & & & & & & & & 0
\end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\
0 & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\
0 & 0 & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\
yzxx & yzyy & yzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & zxxy & 0 & 0 & zxyx \\
0 & 0 & 0 & 0 & xyzx & 0 & 0 & xyxz & 0
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\
0 & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\
0 & 0 & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\
yzxx & yzyy & yzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & zxxy & 0 & 0 & zxyx \\
0 & 0 & 0 & 0 & xyzx & 0 & 0 & xyxz & 0
\end{pmatrix}$$

n=2 $\mathbf{D}_{2h} = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z$

$\mathbf{D}_{nh}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

n=2 $\mathbf{D}_{2h} = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z$

$\mathbf{D}_{nh}$

	1								e								
$[(V^2)]^2$	xxxx	xxyy	xxzz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		yyyy	yyzz	0	0	0	0	0	0		0	0	0	0	0	0	0	0
			zzzz	0	0	0	0	0	0			0	0	0	0	0	0	0
				yzyz	0	0	yzzy	0	0				0	0	0	0	0	0
					zxzx	0	0	zxxz	0					0	0	0	0	0
						xyxy	0	0	xyyx						0	0	0	0
							zyzy	0	0							0	0	0
								xzxz	0								0	0
									yxyx									0
$[V^2]V^2$	xxxx	xxyy	xxzz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	yyxx	yyyy	yyzz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	zzxx	zzyy	zzzz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	yzyz	0	0	yzzy	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	zxzx	0	0	zxxz	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	xyxy	0	0	xyyx	0	0	0	0	0	0	0	0	0

	a								ae								
	xxxx	xxyy	xxzz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		yyyy	yyzz	0	0	0	0	0	0		0	0	0	0	0	0	0	0
			zzzz	0	0	0	0	0	0			0	0	0	0	0	0	0
				yzyz	0	0	yzzy	0	0				0	0	0	0	0	0
					zxzx	0	0	zxxz	0					0	0	0	0	0
						xyxy	0	0	xyyx						0	0	0	0
							zyzy	0	0							0	0	0
								xzxz	0								0	0
									yxyx									0
	xxxx	xxyy	xxzz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	yyxx	yyyy	yyzz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	zzxx	zzyy	zzzz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	yzyz	0	0	yzzy	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	zxzx	0	0	zxxz	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	xyxy	0	0	xyyx	0	0	0	0	0	0	0	0	0

D_{nh}

n=3 $\mathbf{D_{3h}} = \bar{\mathbf{6}}_z\,\mathbf{m}_x\mathbf{2}_1$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & -xxzx & 0 & 0 & -xxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xzxx & 0 & 0 & -xzxx \\ zxxx & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -zxxx & 0 & 0 & -zxxx \\ xzxx & -xzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & -xxzx & 0 & 0 & -xxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xzxx & 0 & 0 & -xzxx \\ zxxx & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -zxxx & 0 & 0 & -zxxx \\ xzxx & -xzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx		and: xxxx=xxyy+xyxy+xyyx	
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xzxx & 0 & 0 & -xzxx & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -xzxx \\ zxxx & 0 & 0 & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xzxx & 0 & 0 & -xzxx & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -xzxx \\ zxxx & 0 & 0 & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ & 0 & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ & 0 & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)		and xyxy = ½(xxxx - xxyy)	
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ 0 & 0 & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzyy \\ -xzyy & xzyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yyxz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ 0 & 0 & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzyy \\ -xzyy & xzyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yyxz & 0 & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)		and xyxy = ½(xxxx - xxyy)	

D_{nh}

n=3 $\mathbf{D}_{3h} = \bar{\mathbf{6}}_z \mathbf{m}_x \mathbf{2}_1$

$[(V^2)]^2$

1

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & 0 & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\
 & 0 & 0 & 0 & -xxzx & 0 & 0 & -xxxz & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & -xxxz & 0 & 0 & -xxxz \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & -xxzx & 0 & 0 \\
 & & & & & & 0 & 0 & -xxzx \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & 0 & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

ae

$$\begin{pmatrix}
0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\
 & 0 & 0 & 0 & -xxzx & 0 & 0 & -xxxz & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & -xxxz & 0 & 0 & -xxxz \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & -xxzx & 0 & 0 \\
 & & & & & & 0 & 0 & -xxzx \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\
0 & 0 & 0 & 0 & -xxzx & 0 & 0 & -xxxz & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -zxxx \\
zxxx & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0
\end{pmatrix}$$

and xxxx=xxyy+2xyxy

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\
0 & 0 & 0 & 0 & -xxzx & 0 & 0 & -xxxz & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -zxxx \\
zxxx & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0
\end{pmatrix}$$

and xxxx=xxyy+2xyxy

n=4 $\mathbf{D_{4h}} = \mathbf{4_z/m_z m_x m_{xy}}$

$\mathbf{D_{nh}}$

1

V^4

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$$

$[V^4]$

$$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$$

$V[V^3]$

$$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$$

$[[V^2]^2]$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$$

$[V^2]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$$

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$$

$$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$$

$$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

n=4 $\mathbf{D_{4h}} = \mathbf{4_z/m_z m_x m_{xy}}$

$\mathbf{D_{nh}}$

$[(V^2)]^2$

1								
xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

e								
0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
			0	0	0	0	0	0
				0	0	0	0	0
					0	0	0	0
						0	0	0
							0	0
								0

$[V^2]V^2$

xxxx	xxyy	xxzz	0	0	0	0	0	0
yyxx	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

a								
xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

ae								
0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
			0	0	0	0	0	0
				0	0	0	0	0
					0	0	0	0
						0	0	0
							0	0
								0

xxxx	xxyy	xxzz	0	0	0	0	0	0
yyxx	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

D_{nd}

n>4 **$D_{\infty h}$ = ∞/mmm**

1

V^4

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\
0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy
\end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx

$[V^4]$

$$\begin{pmatrix}
3xxyy & 0 & 0 & yyzz & 0 \\
0 & 3xxyy & 0 & yyzz & 0 \\
0 & 0 & zzzz & xxyy & 0
\end{pmatrix}$$

$V[V^3]$

$$\begin{pmatrix}
3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\
0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\
0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0
\end{pmatrix}$$

$[[V^2]^2]$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 \\
 & & & & yzyz & 0 \\
 & & & & & xyxy
\end{pmatrix}$$

and xyxy=½(xxxx-xxyy)

$[V^2]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 \\
0 & 0 & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy
\end{pmatrix}$$

and xyxy = ½(xxxx - xxyy)

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 \\
 & & & & 0 & 0 \\
 & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\
0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy
\end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx

$$\begin{pmatrix}
3xxyy & 0 & 0 & yyzz & 0 \\
0 & 3xxyy & 0 & yyzz & 0 \\
0 & 0 & zzzz & xxyy & 0
\end{pmatrix}$$

$$\begin{pmatrix}
3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\
0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\
0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 \\
 & & & & yzyz & 0 \\
 & & & & & xyxy
\end{pmatrix}$$

and xyxy=½(xxxx-xxyy)

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 \\
0 & 0 & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy
\end{pmatrix}$$

and xyxy = ½(xxxx - xxyy)

ae

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 \\
 & & & & 0 & 0 \\
 & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

n>4 $\mathbf{D}_{\infty h}$ = ∞/**mmm**

1

$[(V^2)]^2$

xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

xxxx	xxyy	xxzz	0	0	0	0	0	0
xxyy	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

and xxxx=xxyy+2xyxy

e

0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
			0	0	0	0	0	0
				0	0	0	0	0
					0	0	0	0
						0	0	0
							0	0
								0

0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

a

xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

and xxxx=xxyy+yzyz+zyzy

xxxx	xxyy	xxzz	0	0	0	0	0	0
xxyy	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

and xxxx=xxyy+2xyxy

ae

0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
			0	0	0	0	0	0
				0	0	0	0	0
					0	0	0	0
						0	0	0
							0	0
								0

0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

n=1 $\mathbf{C}_2(\mathbf{C}_1) = \mathbf{2}_z(\mathbf{1}) = \mathbf{2}_z'$

$\mathbf{C}_{2n}(\mathbf{C}_n)$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzxz & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & zyzx & 0 & zyzy & zyxz & 0 \\ 0 & 0 & 0 & xzyz & xzzx & 0 & xzzy & xzxz & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & zyzx & 0 & zyzy & zyxz & 0 \\ 0 & 0 & 0 & xzyz & xzzx & 0 & xzzy & xzxz & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\ 0 & 0 & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & xyyz & xyzx & 0 & xyzy & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & 0 & zyxy & 0 & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & 0 & xzxy & 0 & 0 & xzyx \\ 0 & 0 & 0 & yxyz & yxzx & 0 & yxzy & yxxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\ 0 & 0 & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & xyyz & xyzx & 0 & xyzy & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & 0 & zyxy & 0 & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & 0 & xzxy & 0 & 0 & xzyx \\ 0 & 0 & 0 & yxyz & yxzx & 0 & yxzy & yxxz & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & xyyy & 0 & yyzz & 0 \\ yxxx & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & zzxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & yyzz & 0 \\ yxxx & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & zzxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & xxyz \\ 0 & 0 & yzzz & 0 & yyxz \\ zxxx & zyyy & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & xxyz \\ 0 & 0 & yzzz & 0 & yyxz \\ zxxx & zyyy & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & xxzz & xyxx & 0 & 0 \\ yxxx & yyyy & 0 & yxyy & yyzz & 0 & yxzz & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & xxzz & xyxx & 0 & 0 \\ yxxx & yyyy & 0 & yxyy & yyzz & 0 & yxzz & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 & xzxx & 0 & 0 & xzyy & xxyz \\ 0 & 0 & yzzz & 0 & 0 & yzxx & 0 & 0 & yzyy & yxyz \\ zxxx & zyyy & 0 & zxyy & zyzz & 0 & zxzz & zyxx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 & xzxx & 0 & 0 & xzyy & xxyz \\ 0 & 0 & yzzz & 0 & 0 & yzxx & 0 & 0 & yzyy & yxyz \\ zxxx & zyyy & 0 & zxyy & zyzz & 0 & zxzz & zyxx & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & yyxy \\ & & zzzz & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & yyxy \\ & & zzzz & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxxz & 0 \\ & 0 & 0 & yyyz & yyxz & 0 \\ & & 0 & zzyz & zzxz & 0 \\ & & & 0 & 0 & yzxy \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxxz & 0 \\ & 0 & 0 & yyyz & yyxz & 0 \\ & & 0 & zzyz & zzxz & 0 \\ & & & 0 & 0 & yzxy \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & xzyz & xzxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & xzyz & xzxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxxz & 0 \\ 0 & 0 & 0 & yyyz & yyxz & 0 \\ 0 & 0 & 0 & zzyz & zzxz & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & 0 & xzxy \\ 0 & 0 & 0 & xyyz & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxxz & 0 \\ 0 & 0 & 0 & yyyz & yyxz & 0 \\ 0 & 0 & 0 & zzyz & zzxz & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & 0 & xzxy \\ 0 & 0 & 0 & xyyz & xyxz & 0 \end{pmatrix}$

$C_{2n}(C_n)$

n=1 **$C_2(C_1) = 2_z(1) = 2_z'$**

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\
 & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\
 & & & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\
 & & & & zxzx & 0 & zxzy & zxxz & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zyzy & zyxz & 0 \\
 & & & & & & & xzxz & 0 \\
 & & & & & & & & yxyx
\end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\
yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\
zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\
0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\
xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx
\end{pmatrix}$$

e

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\
 & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\
 & & & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\
 & & & & zxzx & 0 & zxzy & zxxz & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zyzy & zyxz & 0 \\
 & & & & & & & xzxz & 0 \\
 & & & & & & & & yxyx
\end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\
yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\
zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\
0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\
xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx
\end{pmatrix}$$

a

$[(V^2)]^2$

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\
 & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\
 & & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\
 & & & 0 & 0 & yzxy & 0 & 0 & yzyx \\
 & & & & 0 & zxxy & 0 & 0 & zxyx \\
 & & & & & 0 & xyzy & xyxz & 0 \\
 & & & & & & 0 & 0 & zyyx \\
 & & & & & & & 0 & xzyx \\
 & & & & & & & & 0
\end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\
0 & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\
0 & 0 & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\
yzxx & yzyy & yzzz & 0 & 0 & yzxy & 0 & 0 & yzyx \\
zxxx & zxyy & zxzz & 0 & 0 & zxxy & 0 & 0 & zxyx \\
0 & 0 & 0 & xyyz & xyzx & 0 & xyzy & xyxz & 0
\end{pmatrix}$$

ae

$[(V^2)]^2$

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\
 & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\
 & & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\
 & & & 0 & 0 & yzxy & 0 & 0 & yzyx \\
 & & & & 0 & zxxy & 0 & 0 & zxyx \\
 & & & & & 0 & xyzy & xyxz & 0 \\
 & & & & & & 0 & 0 & zyyx \\
 & & & & & & & 0 & xzyx \\
 & & & & & & & & 0
\end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\
0 & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\
0 & 0 & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\
yzxx & yzyy & yzzz & 0 & 0 & yzxy & 0 & 0 & yzyx \\
zxxx & zxyy & zxzz & 0 & 0 & zxxy & 0 & 0 & zxyx \\
0 & 0 & 0 & xyyz & xyzx & 0 & xyzy & xyxz & 0
\end{pmatrix}$$

$C_{2n}(C_n)$

n=2 $\mathbf{C}_4(\mathbf{C}_2) = \mathbf{4}_z(\mathbf{2}_z) = \mathbf{4}_z'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & yyxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & yyxy & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & -yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & -zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & -xyyx \\ 0 & 0 & 0 & zxxz & zxzy & 0 & -zxzx & zxyz & 0 \\ 0 & 0 & 0 & yzxz & yzzy & 0 & yzzx & -yzyz & 0 \\ xyyy & xyxx & xyzz & 0 & 0 & xyyx & 0 & 0 & -xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & yyxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & yyxy & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & -yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & -zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & -xyyx \\ 0 & 0 & 0 & zxxz & zxzy & 0 & -zxzx & zxyz & 0 \\ 0 & 0 & 0 & yzxz & yzzy & 0 & yzzx & -yzyz & 0 \\ xyyy & xyxx & xyzz & 0 & 0 & xyyx & 0 & 0 & -xyxy \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & -yxxx & 0 & yyzz & 0 \\ yxxx & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -yxxx & 0 & yyzz & 0 \\ yxxx & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & yxxx & 0 & yyzz & 0 \\ yxxx & -xxxx & 0 & -yyzz & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} xxxx & yxxx & 0 & yyzz & 0 \\ yxxx & -xxxx & 0 & -yyzz & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & -yxxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ yxxx & xxxx & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & -yxxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ yxxx & xxxx & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & -yyzz & yxyy & 0 & 0 \\ xyyy & -xxxx & 0 & yxyy & yyzz & 0 & xyzz & -xxyy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zzxx & 0 & 0 & -zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & -yyzz & yxyy & 0 & 0 \\ xyyy & -xxxx & 0 & yxyy & yyzz & 0 & xyzz & -xxyy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zzxx & 0 & 0 & -zzxx & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & xxxy \\ & -xxxx & -xxzz & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & -yzyz & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & xxxy \\ & -xxxx & -xxzz & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & -yzyz & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & -yzyz & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & -yzyz & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 \end{pmatrix}$

$C_{2n}(C_n)$

n=2 **$C_4(C_2) = 4_z(2_z) = 4_z'$**

$[(V^2)]^2$

1								
xxxx	xxyy	xxzz	0	0	xxxy	0	0	−yyxy
	xxxx	xxzz	0	0	yyxy	0	0	−xxxy
		zzzz	0	0	zzxy	0	0	−zzxy
			yzyz	yzzx	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	−yzzx	0
							yzyz	0
								xyxy

e								
xxxx	xxyy	xxzz	0	0	xxxy	0	0	−yyxy
	xxxx	xxzz	0	0	yyxy	0	0	−xxxy
		zzzz	0	0	zzxy	0	0	−zzxy
			yzyz	yzzx	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	−yzzx	0
							yzyz	0
								xyxy

a								
xxxx	0	xxzz	0	0	xxxy	0	0	yyxy
	−xxxx	−xxzz	0	0	yyxy	0	0	xxxy
		0	0	0	zzxy	0	0	zzxy
			yzyz	yzzx	0	yzzy	yzxz	0
				zxzx	0	zxzy	−yzzy	0
					xyxy	0	0	xyyx
						−zxzx	yzzx	0
							−yzyz	0
								−xyxy

ae								
xxxx	0	xxzz	0	0	xxxy	0	0	yyxy
	−xxxx	−xxzz	0	0	yyxy	0	0	xxxy
		0	0	0	zzxy	0	0	zzxy
			yzyz	yzzx	0	yzzy	yzxz	0
				zxzx	0	zxzy	−yzzy	0
					xyxy	0	0	xyyx
						−zxzx	yzzx	0
							−yzyz	0
								−xyxy

$[V^2]V^2$

1								
xxxx	xxyy	xxzz	0	0	xxxy	0	0	−yyxy
yyxx	xxxx	xxzz	0	0	yyxy	0	0	−xxxy
zzxx	zzxx	zzzz	0	0	zzxy	0	0	−zzxy
0	0	0	yzyz	yzzx	0	zxzx	−zxyz	0
0	0	0	zxyz	zxzx	0	−yzzx	yzyz	0
xyxx	−xyxx	0	0	0	xyxy	0	0	xyxy

e								
xxxx	xxyy	xxzz	0	0	xxxy	0	0	−yyxy
yyxx	xxxx	xxzz	0	0	yyxy	0	0	−xxxy
zzxx	zzxx	zzzz	0	0	zzxy	0	0	−zzxy
0	0	0	yzyz	yzzx	0	zxzx	−zxyz	0
0	0	0	zxyz	zxzx	0	−yzzx	yzyz	0
xyxx	−xyxx	0	0	0	xyxy	0	0	xyxy

a								
xxxx	xxyy	xxzz	0	0	xxxy	0	0	yyxy
−xxyy	−xxxx	−xxzz	0	0	yyxy	0	0	xxxy
zzxx	−zzxx	0	0	0	zzxy	0	0	zzxy
0	0	0	yzyz	yzzx	0	−zxzx	zxyz	0
0	0	0	zxyz	zxzx	0	yzzx	−yzyz	0
xyxx	xyxx	xyzz	0	0	xyxy	0	0	−xyxy

ae								
xxxx	xxyy	xxzz	0	0	xxxy	0	0	yyxy
−xxyy	−xxxx	−xxzz	0	0	yyxy	0	0	xxxy
zzxx	−zzxx	0	0	0	zzxy	0	0	zzxy
0	0	0	yzyz	yzzx	0	−zxzx	zxyz	0
0	0	0	zxyz	zxzx	0	yzzx	−yzyz	0
xyxx	xyxx	xyzz	0	0	xyxy	0	0	−xyxy

$C_{2n}(C_n)$

n=3 $\mathbf{C}_6(\mathbf{C}_3) = \mathbf{6}_z(\mathbf{3}_z) = \mathbf{6}_z'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & yyzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & yyzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & 0 & -xxzx & 0 & -xxzy & -xxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -zxxx & 0 & 0 & -xzxx \\ zxxx & -zxxx & 0 & 0 & 0 & zyxx & 0 & 0 & zyxx \\ 0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0 \\ zyxx & -zyxx & 0 & 0 & 0 & -zxxx & 0 & 0 & -zxxx \\ xzxx & -xzxx & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\ 0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & 0 & -xxzx & 0 & -xxzy & -xxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xzxx & 0 & 0 & -xzxx \\ zxxx & -zxxx & 0 & 0 & 0 & zyxx & 0 & 0 & zyxx \\ 0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0 \\ zyxx & -zyxx & 0 & 0 & 0 & -zxxx & 0 & 0 & -zxxx \\ xzxx & -xzxx & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\ 0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx		
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & -xxyz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & -xxyz & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & yyxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & yyxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xzxx & 0 & 0 & -xzxx & yzxx \\ 0 & 0 & 0 & 0 & 0 & yzxx & 0 & 0 & -yzxx & -xzxx \\ zxxx & -zyxx & 0 & -zxxx & 0 & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xzxx & 0 & 0 & -xzxx & yzxx \\ 0 & 0 & 0 & 0 & 0 & yzxx & 0 & 0 & -yzxx & -xzxx \\ zxxx & -zyxx & 0 & -zxxx & 0 & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & -yyxz & 0 \\ & 0 & 0 & -xxyz & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & xxyz \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & -yyxz & 0 \\ & 0 & 0 & -xxyz & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & xxyz \\ & & & & & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)		
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & -yyxz & 0 \\ 0 & 0 & 0 & -xxyz & yyxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & 0 & 0 & xzyy \\ -xzyy & xzyy & 0 & 0 & 0 & yzxx \\ 0 & 0 & 0 & yyxz & xxyz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & -yyxz & 0 \\ 0 & 0 & 0 & -xxyz & yyxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & 0 & 0 & xzyy \\ -xzyy & xzyy & 0 & 0 & 0 & yzxx \\ 0 & 0 & 0 & yyxz & xxyz & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)		

$C_{2n}(C_n)$

n=3 $\mathbf{C}_6(\mathbf{C}_3) = \mathbf{6}_z(\mathbf{3}_z) = \mathbf{6}_z'$

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & -yzzx & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

e

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & -yzzx & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

a

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\
 & 0 & 0 & -xxyz & -xxzx & 0 & -xxzy & -xxxz & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & -xxxz & 0 & 0 & -xxxz \\
 & & & & 0 & xxzy & 0 & 0 & xxzy \\
 & & & & & 0 & -xxzx & xxyz & 0 \\
 & & & & & & 0 & 0 & -xxzx \\
 & & & & & & & 0 & xxyz \\
 & & & & & & & & 0
\end{pmatrix}$$

ae

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\
 & 0 & 0 & -xxyz & -xxzx & 0 & -xxzy & -xxxz & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & -xxxz & 0 & 0 & -xxxz \\
 & & & & 0 & xxzy & 0 & 0 & xxzy \\
 & & & & & 0 & -xxzx & xxyz & 0 \\
 & & & & & & 0 & 0 & -xxzx \\
 & & & & & & & 0 & xxyz \\
 & & & & & & & & 0
\end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\
0 & 0 & 0 & -xxyz & -xxzx & 0 & -xxzy & -xxxz & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
yzxx & -yzxx & 0 & 0 & 0 & 0 & 0 & 0 & -zxxx \\
zxxx & -zxxx & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\
0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\
0 & 0 & 0 & -xxyz & -xxzx & 0 & -xxzy & -xxxz & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
yzxx & -yzxx & 0 & 0 & 0 & 0 & 0 & 0 & -zxxx \\
zxxx & -zxxx & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\
0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0
\end{pmatrix}$$

$C_{2n}(C_n)$

n=4 $C_8(C_4) = 8_z(4_z) = 8_z'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & yyzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & yyzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ -xxxx & xxxx & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ -xxxx & xxxx & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx		
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & 0 & 0 \\ -xyyy & xxxx & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxx & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & 0 & 0 \\ -xyyy & xxxx & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxx & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & yyxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & yyxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 \\ -xyyy & xxxx & 0 & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 \\ -xyyy & xxxx & 0 & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy \\ & xxxx & 0 & 0 & 0 & xyyy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & -xxxx \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy \\ & xxxx & 0 & 0 & 0 & xyyy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & -xxxx \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)		
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy \\ -xxxx & xxxx & 0 & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & -xxxx \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy \\ -xxxx & xxxx & 0 & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & -xxxx \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)		

$C_{2n}(C_n)$

n=4 $\mathbf{C}_8(\mathbf{C}_4) = \mathbf{8}_z(\mathbf{4}_z) = \mathbf{8}_z'$

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & -yzzx & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

e

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & -yzzx & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

a

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
 & xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & -xxxx & 0 & 0 & -xxxx \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & -xxxx
\end{pmatrix}$$

ae

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
 & xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & -xxxx & 0 & 0 & -xxxx \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & -xxxx
\end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
-xxxx & xxxx & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
-xxxx & xxxx & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx
\end{pmatrix}$$

$C_{2n}(C_n)$

n>4 C_∞**1**' = = ∞**1**'

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & yyzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & yyzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx		
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & yyxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & yyxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)		
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)		

$C_{2n}(C_n)$

n>4 C_∞**1**' = = ∞**1**'

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

e

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$S_{2n}(C_n)$

n=1 $\mathbf{S}_2(\mathbf{C}_1) = \bar{\mathbf{1}}(\mathbf{1}) = \bar{\mathbf{1}}'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & xxyx \\ yyxx & yyyy & yyzz & yyyz & yyzx & yyxy & yyzy & yyxz & yyyx \\ zzxx & zzyy & zzzz & zzyz & zzzx & zzxy & zzzy & zzxz & zzyx \\ yzxx & yzyy & yzzz & yzyz & yzzx & yzxy & yzzy & yzxz & yzyx \\ zxxx & zxyy & zxzz & zxyz & zxzx & zxxy & zxzy & zxxz & zxyx \\ xyxx & xyyy & xyzz & xyyz & xyzx & xyxy & xyzy & xyxz & xyyx \\ zyxx & zyyy & zyzz & zyyz & zyzx & zyxy & zyzy & zyxz & zyyx \\ xzxx & xzyy & xzzz & xzyz & xzzx & xzxy & xzzy & xzxz & xzyx \\ yxxx & yxyy & yxzz & yxyz & yxzx & yxxy & yxzy & yxxz & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & xxyx \\ yyxx & yyyy & yyzz & yyyz & yyzx & yyxy & yyzy & yyxz & yyyx \\ zzxx & zzyy & zzzz & zzyz & zzzx & zzxy & zzzy & zzxz & zzyx \\ yzxx & yzyy & yzzz & yzyz & yzzx & yzxy & yzzy & yzxz & yzyx \\ zxxx & zxyy & zxzz & zxyz & zxzx & zxxy & zxzy & zxxz & zxyx \\ xyxx & xyyy & xyzz & xyyz & xyzx & xyxy & xyzy & xyxz & xyyx \\ zyxx & zyyy & zyzz & zyyz & zyzx & zyxy & zyzy & zyxz & zyyx \\ xzxx & xzyy & xzzz & xzyz & xzzx & xzxy & xzzy & xzxz & xzyx \\ yxxx & yxyy & yxzz & yxyz & yxzx & yxxy & yxzy & yxxz & yxyx \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & xyyy & xzzz & yyzz & xxyz \\ yxxx & yyyy & yzzz & zzxx & yyxz \\ zxxx & zyyy & zzzz & xxyy & zzxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & xzzz & yyzz & xxyz \\ yxxx & yyyy & yzzz & zzxx & yyxz \\ zxxx & zyyy & zzzz & xxyy & zzxy \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & xyyy & xzzz & xxyy & xyzz & xzxx & xxzz & xyxx & xzyy & xxyz \\ yxxx & yyyy & yzzz & yxyy & yyzz & yzxx & yxzz & yyxx & yzyy & yxyz \\ zxxx & zyyy & zzzz & zxyy & zyzz & zzxx & zxzz & zyxx & zzyy & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & xzzz & xxyy & xyzz & xzxx & xxzz & xyxx & xzyy & xxyz \\ yxxx & yyyy & yzzz & yxyy & yyzz & yzxx & yxzz & yyxx & yzyy & yxyz \\ zxxx & zyyy & zzzz & zxyy & zyzz & zzxx & zxzz & zyxx & zzyy & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxxz & xxxy \\ & yyyy & yyzz & yyyz & yyxz & yyxy \\ & & zzzz & zzyz & zzxz & zzxy \\ & & & yzyz & yzxz & yzxy \\ & & & & xzxz & xzxy \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxxz & xxxy \\ & yyyy & yyzz & yyyz & yyxz & yyxy \\ & & zzzz & zzyz & zzxz & zzxy \\ & & & yzyz & yzxz & yzxy \\ & & & & xzxz & xzxy \\ & & & & & xyxy \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxxz & xxxy \\ yyxx & yyyy & yyzz & yyyz & yyxz & yyxy \\ zzxx & zzyy & zzzz & zzyz & zzxz & zzxy \\ yzxx & yzyy & yzzz & yzyz & yzxz & yzxy \\ xzxx & xzyy & xzzz & xzyz & xzxz & xzxy \\ xyxx & xyyy & xyzz & xyyz & xyxz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxxz & xxxy \\ yyxx & yyyy & yyzz & yyyz & yyxz & yyxy \\ zzxx & zzyy & zzzz & zzyz & zzxz & zzxy \\ yzxx & yzyy & yzzz & yzyz & yzxz & yzxy \\ xzxx & xzyy & xzzz & xzyz & xzxz & xzxy \\ xyxx & xyyy & xyzz & xyyz & xyxz & xyxy \end{pmatrix}$

$S_{2n}(C_n)$

n=1 $\mathbf{S}_2(\mathbf{C}_1) = \bar{\mathbf{1}}(\mathbf{1}) = \bar{\mathbf{1}}'$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & xxyx \\ & yyyy & yyzz & yyyz & yyzx & yyxy & yyzy & yyxz & yyyx \\ & & zzzz & zzyz & zzzx & zzxy & zzzy & zzxz & zzyx \\ & & & yzyz & yzzx & yzxy & yzzy & yzxz & yzyx \\ & & & & zxzx & zxxy & zxzy & zxxz & zxyx \\ & & & & & xyxy & xyzy & xyxz & xyyx \\ & & & & & & zyzy & zyxz & zyyx \\ & & & & & & & xzxz & xzyx \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & xxyx \\ & yyyy & yyzz & yyyz & yyzx & yyxy & yyzy & yyxz & yyyx \\ & & zzzz & zzyz & zzzx & zzxy & zzzy & zzxz & zzyx \\ & & & yzyz & yzzx & yzxy & yzzy & yzxz & yzyx \\ & & & & zxzx & zxxy & zxzy & zxxz & zxyx \\ & & & & & xyxy & xyzy & xyxz & xyyx \\ & & & & & & zyzy & zyxz & zyyx \\ & & & & & & & xzxz & xzyx \\ & & & & & & & & yxyx \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & xxyx \\ yyxx & yyyy & yyzz & yyyz & yyzx & yyxy & yyzy & yyxz & yyyx \\ zzxx & zzyy & zzzz & zzyz & zzzx & zzxy & zzzy & zzxz & zzyx \\ yzxx & yzyy & yzzz & yzyz & yzzx & yzxy & yzzy & yzxz & yzyx \\ zxxx & zxyy & zxzz & zxyz & zxzx & zxxy & zxzy & zxxz & zxyx \\ xyxx & xyyy & xyzz & xyyz & xyzx & xyxy & xyzy & xyxz & xyyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & xxyx \\ yyxx & yyyy & yyzz & yyyz & yyzx & yyxy & yyzy & yyxz & yyyx \\ zzxx & zzyy & zzzz & zzyz & zzzx & zzxy & zzzy & zzxz & zzyx \\ yzxx & yzyy & yzzz & yzyz & yzzx & yzxy & yzzy & yzxz & yzyx \\ zxxx & zxyy & zxzz & zxyz & zxzx & zxxy & zxzy & zxxz & zxyx \\ xyxx & xyyy & xyzz & xyyz & xyzx & xyxy & xyzy & xyxz & xyyx \end{pmatrix}$

$S_{2n}(C_n)$

n=2 $S_4(C_2) = \bar{4}_z\,(2_z) = \bar{4}_z$ '

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & xxzz & 0 & 0 & xxxy & 0 & 0 & yyxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & yyxy & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & -yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & -zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & -xyyx \\ 0 & 0 & 0 & zxxz & zxzy & 0 & -zxzx & zxyz & 0 \\ 0 & 0 & 0 & yzxz & yzzy & 0 & yzzx & -yzyz & 0 \\ xyyy & xyxx & xyzz & 0 & 0 & xyyx & 0 & 0 & -xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & yyxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & yyxy & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & -yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & -zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & -xyyx \\ 0 & 0 & 0 & zxxz & zxzy & 0 & -zxzx & zxyz & 0 \\ 0 & 0 & 0 & yzxz & yzzy & 0 & yzzx & -yzyz & 0 \\ xyyy & xyxx & xyzz & 0 & 0 & xyyx & 0 & 0 & -xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & -yxxx & 0 & yyzz & 0 \\ yxxx & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & yxxx & 0 & yyzz & 0 \\ yxxx & -xxxx & 0 & -yyzz & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} xxxx & yxxx & 0 & yyzz & 0 \\ yxxx & -xxxx & 0 & -yyzz & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} xxxx & -yxxx & 0 & yyzz & 0 \\ yxxx & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & -yxxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ yxxx & xxxx & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & -yyzz & yxyy & 0 & 0 \\ xyyy & -xxxx & 0 & yxyy & yyzz & 0 & xyzz & -xxyy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zzxx & 0 & 0 & -zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & -yyzz & yxyy & 0 & 0 \\ xyyy & -xxxx & 0 & yxyy & yyzz & 0 & xyzz & -xxyy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zzxx & 0 & 0 & -zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & -yxxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ yxxx & xxxx & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & xxxy \\ & -xxxx & -xxzz & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & -yzyz & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & xxxy \\ & -xxxx & -xxzz & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & -yzyz & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & -yzyz & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & -yzyz & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy \end{pmatrix}$

$\mathbf{S}_{2n}(\mathbf{C}_n)$

n=2 $\mathbf{S}_4(\mathbf{C}_2) = \bar{\mathbf{4}}_z\,(\mathbf{2}_z) = \bar{\mathbf{4}}_z$ '

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & xxxy & 0 & 0 & yyxy \\ & -xxxx & -xxzz & 0 & 0 & yyxy & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ & & & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ & & & & zxzx & 0 & zxzy & -yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & -zxzx & yzzx & 0 \\ & & & & & & & -yzyz & 0 \\ & & & & & & & & -xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & xxxy & 0 & 0 & yyxy \\ & -xxxx & -xxzz & 0 & 0 & yyxy & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ & & & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ & & & & zxzx & 0 & zxzy & -yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & -zxzx & yzzx & 0 \\ & & & & & & & -yzyz & 0 \\ & & & & & & & & -xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & yyxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & yyxy & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & -zxzx & zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & yzzx & -yzyz & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & xyxy & 0 & 0 & -xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & yyxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & yyxy & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & -zxzx & zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & yzzx & -yzyz & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & xyxy & 0 & 0 & -xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$

$S_{2n}(C_n)$

n=3 $S_6(C_3) = \bar{3}_z\,(3_z) = \bar{3}_z$'

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & -yyxy \\ yyxx & xxxx & yyzz & -xxyz & -xxzx & yyxy & -xxzy & -xxxz & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ yzxx & -yzxx & 0 & yzyz & yzzx & -xzxx & yzzy & yzxz & -xzxx \\ zxxx & -zxxx & 0 & zxyz & zxzx & zyxx & zxzy & zxxz & zyxx \\ xyxx & xyyy & xyzz & -xxxz & xxzy & xyxy & -xxzx & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & -zxzy & -zxxx & zxzx & -zxyz & -zxxx \\ xzxx & -xzxx & 0 & -yzxz & yzzy & yzxx & -yzzx & yzyz & yzxx \\ -xyyy & -xyxx & -xyzz & -xxxz & xxzy & xyyx & -xxzx & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & xxzx & xxxy & xxzy & xxxz & -yyxy \\ yyxx & xxxx & yyzz & -xxyz & -xxzx & yyxy & -xxzy & -xxxz & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ yzxx & -yzxx & 0 & yzyz & yzzx & -xzxx & yzzy & yzxz & -xzxx \\ zxxx & -zxxx & 0 & zxyz & zxzx & zyxx & zxzy & zxxz & zyxx \\ xyxx & xyyy & xyzz & -xxxz & xxzy & xyxy & -xxzx & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & -zxzy & -zxxx & zxzx & -zxyz & -zxxx \\ xzxx & -xzxx & 0 & -yzxz & yzzy & yzxx & -yzzx & yzyz & yzxx \\ -xyyy & -xyxx & -xyzz & -xxxz & xxzy & xyyx & -xxzx & xxyz & xyxy \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx			and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & -zxxx \\ zxxx & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & -zxxx \\ zxxx & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & xzxx & yyzz & xyxx & -xzxx & yyxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & yzxx & -xyzz & xxyy & -yzxx & -xzxx \\ zxxx & -zyxx & zzzz & -zxxx & 0 & zzxx & 0 & zyxx & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & xzxx & yyzz & xyxx & -xzxx & yyxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & yzxx & -xyzz & xxyy & -yzxx & -xzxx \\ zxxx & -zyxx & zzzz & -zxxx & 0 & zzxx & 0 & zyxx & zzxx & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & -yyxz & 0 \\ & xxxx & xxzz & -xxyz & yyxz & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & yyxz \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ & &0&0&0&0 \\ & & &0&0&0 \\ & & & &0&0 \\ & & & & &0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ & &0&0&0&0 \\ & & &0&0&0 \\ & & & &0&0 \\ & & & & &0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & -yyxz & 0 \\ & xxxx & xxzz & -xxyz & yyxz & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & yyxz \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			and xyxy = ½(xxxx - xxyy)
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & -yyxz & xxxy \\ xxyy & xxxx & xxzz & -xxyz & yyxz & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & yzxz & xzyy \\ -xzyy & xzyy & 0 & yzxz & yzyz & yzxx \\ -xxxy & xxxy & 0 & yyxz & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & -yyxz & xxxy \\ xxyy & xxxx & xxzz & -xxyz & yyxz & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & yzxz & xzyy \\ -xzyy & xzyy & 0 & yzxz & yzyz & yzxx \\ -xxxy & xxxy & 0 & yyxz & xxyz & xyxy \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			and xyxy = ½(xxxx - xxyy)

$S_{2n}(C_n)$

n=3 $\mathbf{S}_6(\mathbf{C}_3) = \bar{\mathbf{3}}_z\,(\mathbf{3}_z) = \bar{\mathbf{3}}_z{}'$

1

$[(V^2)]^2$

xxxx	xxyy	xxzz	xxyz	xxzx	xxxy	xxzy	xxxz	−xxxy
	xxxx	xxzz	−xxyz	−xxzx	xxxy	−xxzy	−xxxz	−xxxy
		zzzz	0	0	zzxy	0	0	−zzxy
			yzyz	yzzx	−xxxz	yzzy	0	−xxxz
				zxzx	xxzy	0	yzzy	xxzy
					xyxy	−xxzx	xxyz	xyyx
						zxzx	−yzzx	−xxzx
							yzyz	xxyz
								xyxy

and xxxx=xxyy+yzyz+zyzy

e

0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
			0	0	0	0	0	0
				0	0	0	0	0
					0	0	0	0
						0	0	0
							0	0
								0

a

0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
			0	0	0	0	0	0
				0	0	0	0	0
					0	0	0	0
						0	0	0
							0	0
								0

ae

xxxx	xxyy	xxzz	xxyz	xxzx	xxxy	xxzy	xxxz	−xxxy
	xxxx	xxzz	−xxyz	−xxzx	xxxy	−xxzy	−xxxz	−xxxy
		zzzz	0	0	zzxy	0	0	−zzxy
			yzyz	yzzx	−xxxz	yzzy	0	−xxxz
				zxzx	xxzy	0	yzzy	xxzy
					xyxy	−xxzx	xxyz	xyyx
						zxzx	−yzzx	−xxzx
							yzyz	xxyz
								xyxy

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

xxxx	xxyy	xxzz	xxyz	xxzx	xxxy	xxzy	xxxz	−yyxy
xxyy	xxxx	xxzz	−xxyz	−xxzx	yyxy	−xxzy	−xxxz	−xxxy
zzxx	zzxx	zzzz	0	0	zzxy	0	0	−zzxy
yzxx	−yzxx	0	yzyz	yzzx	−zxxx	zxzx	−zxyz	−zxxx
zxxx	−zxxx	0	zxyz	zxzx	yzxx	−yzzx	yzyz	yzxx
xyxx	−xyxx	0	−xxxz	xxzy	xyxy	−xxzx	xxyz	xyxy

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

xxxx	xxyy	xxzz	xxyz	xxzx	xxxy	xxzy	xxxz	−yyxy
xxyy	xxxx	xxzz	−xxyz	−xxzx	yyxy	−xxzy	−xxxz	−xxxy
zzxx	zzxx	zzzz	0	0	zzxy	0	0	−zzxy
yzxx	−yzxx	0	yzyz	yzzx	−zxxx	zxzx	−zxyz	−zxxx
zxxx	−zxxx	0	zxyz	zxzx	yzxx	−yzzx	yzyz	yzxx
xyxx	−xyxx	0	−xxxz	xxzy	xyxy	−xxzx	xxyz	xyxy

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$S_{2n}(C_n)$

n=4 $S_8(C_4) = \bar{8}_z\,(4_z) = \bar{8}_z{}'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & yyzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ -xxxx & xxxx & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ -xxxx & xxxx & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & yyzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx			and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & 0 & 0 \\ -xyyy & xxxx & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxx & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & 0 & 0 \\ -xyyy & xxxx & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxx & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & yyxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 \\ -xyyy & xxxx & 0 & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 \\ -xyyy & xxxx & 0 & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & yyxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy \\ & xxxx & 0 & 0 & 0 & xyyy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & -xxxx \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy \\ & xxxx & 0 & 0 & 0 & xyyy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & -xxxx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			and xyxy = ½(xxxx - xxyy)
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy \\ -xxxx & xxxx & 0 & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & -xxxx \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy \\ -xxxx & xxxx & 0 & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & -xxxx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			and xyxy = ½(xxxx - xxyy)

$S_{2n}(C_n)$

n=4 $S_8(C_4) = \bar{8}_z\,(4_z) = \bar{8}_z{}'$

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & -yzzx & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

e

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
 & xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & -xxxx & 0 & 0 & -xxxx \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & -xxxx
\end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
-xxxx & xxxx & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx
\end{pmatrix}$$

a

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
 & xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & -xxxx & 0 & 0 & -xxxx \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & -xxxx
\end{pmatrix}$$

ae

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & -yzzx & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

n>4 $\mathbf{C}_{\infty h}(\mathbf{C}_\infty) = \infty/\mathbf{m}'$

$\mathbf{S}_{2n}(\mathbf{C}_n)$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx			and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)			and xyxy=½(xxxx-xxyy)
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)			and xyxy=½(xxxx-xxyy)

n>4 $\mathbf{C}_{\infty h}(\mathbf{C}_{\infty}) = \infty/\mathbf{m}'$

$\mathbf{S}_{2n}(\mathbf{C}_n)$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$
	and xxxx=xxyy+yzyz+zyzy			and xxxx=xxyy+yzyz+zyzy
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$
	and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx			and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$C_{nh}(C_n)$

n=1 $C_{1h}(C_1) = m_z(1) = m_z'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & zyzx & 0 & zyzy & zyxz & 0 \\ 0 & 0 & 0 & xzyz & xzzx & 0 & xzzy & xzxz & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\ 0 & 0 & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & xyyz & xyzx & 0 & xyzy & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & 0 & zyxy & 0 & 0 & zyyx \\ zxxx & zxyy & zxzz & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & yxyz & yxzx & 0 & yxzy & yxxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\ 0 & 0 & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & xyyz & xyzx & 0 & xyzy & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & 0 & zyxy & 0 & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & 0 & xzxy & 0 & 0 & xzyx \\ 0 & 0 & 0 & yxyz & yxzx & 0 & yxzy & yxxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & zyzx & 0 & zyzy & zyxz & 0 \\ 0 & 0 & 0 & xzyz & xzzx & 0 & xzzy & xzxz & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & xyyy & 0 & yyzz & 0 \\ yxxx & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & zzxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & xxyz \\ 0 & 0 & yzzz & 0 & yyxz \\ zxxx & zyyy & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & xxyz \\ 0 & 0 & yzzz & 0 & yyxz \\ zxxx & zyyy & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & yyzz & 0 \\ yxxx & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & zzxy \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & xxzz & xyxx & 0 & 0 \\ yxxx & yyyy & 0 & yxyy & yyzz & 0 & yxzz & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 & xzxx & 0 & 0 & xzyy & xxyz \\ 0 & 0 & yzzz & 0 & 0 & yzxx & 0 & 0 & yzyy & yxyz \\ zxxx & zyyy & 0 & zxyy & zyzz & 0 & zxzz & zyxx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 & xzxx & 0 & 0 & xzyy & xxyz \\ 0 & 0 & yzzz & 0 & 0 & yzxx & 0 & 0 & yzyy & yxyz \\ zxxx & zyyy & 0 & zxyy & zyzz & 0 & zxzz & zyxx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & xxzz & xyxx & 0 & 0 \\ yxxx & yyyy & 0 & yxyy & yyzz & 0 & yxzz & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & yyxy \\ & & zzzz & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxxz & 0 \\ & 0 & 0 & yyyz & yyxz & 0 \\ & & 0 & zzyz & zzxz & 0 \\ & & & 0 & 0 & yzxy \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxxz & 0 \\ & 0 & 0 & yyyz & yyxz & 0 \\ & & 0 & zzyz & zzxz & 0 \\ & & & 0 & 0 & yzxy \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & yyxy \\ & & zzzz & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & xzyz & xzxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxxz & 0 \\ 0 & 0 & 0 & yyyz & yyxz & 0 \\ 0 & 0 & 0 & zzyz & zzxz & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & 0 & xzxy \\ 0 & 0 & 0 & xyyz & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxxz & 0 \\ 0 & 0 & 0 & yyyz & yyxz & 0 \\ 0 & 0 & 0 & zzyz & zzxz & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & 0 & xzxy \\ 0 & 0 & 0 & xyyz & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & xzyz & xzxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy \end{pmatrix}$

$C_{nh}(C_n)$

n=1 **$C_{1h}(C_1) = m_z(1) = m_z'$**

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ & & & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ & & & & zxzx & 0 & zxzy & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & zyxz & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$$

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$$

e

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\ & & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\ & & & 0 & 0 & yzxy & 0 & 0 & yzyx \\ & & & & 0 & zxxy & 0 & 0 & zxyx \\ & & & & & 0 & xyzy & xyxz & 0 \\ & & & & & & 0 & 0 & zyyx \\ & & & & & & & 0 & xzyx \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\ 0 & 0 & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & xyyz & xyzx & 0 & xyzy & xyxz & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\ & & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\ & & & 0 & 0 & yzxy & 0 & 0 & yzyx \\ & & & & 0 & zxxy & 0 & 0 & zxyx \\ & & & & & 0 & xyzy & xyxz & 0 \\ & & & & & & 0 & 0 & zyyx \\ & & & & & & & 0 & xzyx \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\ 0 & 0 & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & xyyz & xyzx & 0 & xyzy & xyxz & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ & & & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ & & & & zxzx & 0 & zxzy & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & zyxz & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$$

n=2 $\mathbf{C_{2h}(C_2) = 2_z/m_z(2_z) = 2_z/m_z'}$

$\mathbf{C_{nh}(C_n)}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & zyzx & 0 & zyzy & zyxz & 0 \\ 0 & 0 & 0 & xzyz & xzzx & 0 & xzzy & xzxz & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & zyzx & 0 & zyzy & zyxz & 0 \\ 0 & 0 & 0 & xzyz & xzzx & 0 & xzzy & xzxz & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & xyyy & 0 & yyzz & 0 \\ yxxx & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & zzxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & yyzz & 0 \\ yxxx & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & zzxy \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & xxzz & xyxx & 0 & 0 \\ yxxx & yyyy & 0 & yxyy & yyzz & 0 & yxzz & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & xxzz & xyxx & 0 & 0 \\ yxxx & yyyy & 0 & yxyy & yyzz & 0 & yxzz & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & yyxy \\ & & zzzz & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & yyxy \\ & & zzzz & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & xzyz & xzxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & xzyz & xzxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy \end{pmatrix}$

$C_{nh}(C_n)$

n=2 **$C_{2h}(C_2) = 2_z/m_z(2_z) = 2_z/m_z'$**

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\
 & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\
 & & & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\
 & & & & zxzx & 0 & zxzy & zxxz & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zyzy & zyxz & 0 \\
 & & & & & & & xzxz & 0 \\
 & & & & & & & & yxyx
\end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\
yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\
zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\
0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\
xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx
\end{pmatrix}$$

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

ae

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\
 & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\
 & & & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\
 & & & & zxzx & 0 & zxzy & zxxz & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zyzy & zyxz & 0 \\
 & & & & & & & xzxz & 0 \\
 & & & & & & & & yxyx
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\
yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\
zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\
0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\
xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx
\end{pmatrix}$$

$C_{nh}(C_n)$

n=3 $C_{3h}(C_3) = \bar{6}_z\,(3_z) = \bar{6}_z'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & yyzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & 0 & -xxzx & 0 & -xxzy & -xxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xzxx & 0 & 0 & -xzxx \\ zxxx & -zxxx & 0 & 0 & 0 & zyxx & 0 & 0 & zyxx \\ 0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0 \\ zyxx & -zyxx & 0 & 0 & 0 & -zxxx & 0 & 0 & -zxxx \\ xzxx & -xzxx & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\ 0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & 0 & -xxzx & 0 & -xxzy & -xxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xzxx & 0 & 0 & -xzxx \\ zxxx & -zxxx & 0 & 0 & 0 & zyxx & 0 & 0 & zyxx \\ 0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0 \\ zyxx & -zyxx & 0 & 0 & 0 & -zxxx & 0 & 0 & -zxxx \\ xzxx & -xzxx & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\ 0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & yyzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx			and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & -xxyz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & -xxyz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & yyxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xzxx & 0 & 0 & -xzxx & yzxx \\ 0 & 0 & 0 & 0 & 0 & yzxx & 0 & 0 & -yzxx & -xzxx \\ zxxx & -zyxx & 0 & -zxxx & 0 & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xzxx & 0 & 0 & -xzxx & yzxx \\ 0 & 0 & 0 & 0 & 0 & yzxx & 0 & 0 & -yzxx & -xzxx \\ zxxx & -zyxx & 0 & -zxxx & 0 & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & yyxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & -yyxz & 0 \\ & 0 & 0 & -xxyz & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & xxyz \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & -yyxz & 0 \\ & 0 & 0 & -xxyz & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & xxyz \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			and xyxy = ½(xxxx - xxyy)
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & -yyxz & 0 \\ 0 & 0 & 0 & -xxyz & yyxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & 0 & 0 & xzyy \\ -xzyy & xzyy & 0 & 0 & 0 & yzxx \\ 0 & 0 & 0 & yyxz & xxyz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & -yyxz & 0 \\ 0 & 0 & 0 & -xxyz & yyxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & 0 & 0 & xzyy \\ -xzyy & xzyy & 0 & 0 & 0 & yzxx \\ 0 & 0 & 0 & yyxz & xxyz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			and xyxy = ½(xxxx - xxyy)

$\mathbf{C}_{nh}(\mathbf{C}_n)$

n=3 $\mathbf{C}_{3h}(\mathbf{C}_3) = \bar{\mathbf{6}}_z(\mathbf{3}_z) = \bar{\mathbf{6}}_z'$

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & -yzzx & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

e

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\
 & 0 & 0 & -xxyz & -xxzx & 0 & -xxzy & -xxxz & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & -xxxz & 0 & 0 & -xxxz \\
 & & & & 0 & xxzy & 0 & 0 & xxzy \\
 & & & & & 0 & -xxzx & xxyz & 0 \\
 & & & & & & 0 & 0 & -xxzx \\
 & & & & & & & 0 & xxyz \\
 & & & & & & & & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\
 & 0 & 0 & -xxyz & -xxzx & 0 & -xxzy & -xxxz & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & -xxxz & 0 & 0 & -xxxz \\
 & & & & 0 & xxzy & 0 & 0 & xxzy \\
 & & & & & 0 & -xxzx & xxyz & 0 \\
 & & & & & & 0 & 0 & -xxzx \\
 & & & & & & & 0 & xxyz \\
 & & & & & & & & 0
\end{pmatrix}$$

ae

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & -yzzx & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\
0 & 0 & 0 & -xxyz & -xxzx & 0 & -xxzy & -xxxz & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
yzxx & -yzxx & 0 & 0 & 0 & 0 & 0 & 0 & -zxxx \\
zxxx & -zxxx & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\
0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\
0 & 0 & 0 & -xxyz & -xxzx & 0 & -xxzy & -xxxz & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
yzxx & -yzxx & 0 & 0 & 0 & 0 & 0 & 0 & -zxxx \\
zxxx & -zxxx & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\
0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$C_{nh}(C_n)$

n=4 **$C_{4h}(C_4) = 4_z/m_z(4_z) = 4_z/m_z'$**

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & -yxxx & 0 & yyzz & 0 \\ yxxx & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -yxxx & 0 & yyzz & 0 \\ yxxx & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & -yxxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ yxxx & xxxx & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -yxxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ yxxx & xxxx & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy \end{pmatrix}$

n=4 $\mathbf{C}_{4h}(\mathbf{C}_4) = \mathbf{4}_z/\mathbf{m}_z(\mathbf{4}_z) = \mathbf{4}_z/\mathbf{m}_z'$

$\mathbf{C}_{nh}(\mathbf{C}_n)$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$

n>4 $\mathbf{C}_{\infty h}(\mathbf{C}_{\infty}) = \infty/\mathbf{m}'$

$\mathbf{C}_{nh}(\mathbf{C}_n)$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx			and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)			and xyxy=½(xxxx-xxyy)
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)			and xyxy=½(xxxx-xxyy)

n>4 $\mathbf{C}_{\infty h}(\mathbf{C}_{\infty}) = \infty/\mathbf{m}'$

$\mathbf{C}_{nh}(\mathbf{C}_n)$

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

n=1 $\mathbf{C}_{2h}(\mathbf{S}_2) = \mathbf{2}_z/\mathbf{m}_z(\bar{\mathbf{1}}) = \mathbf{2}_z'/\mathbf{m}_z'$

$\mathbf{C}_{2nh}(\mathbf{S}_{2n})$

1

V^4

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & zyzx & 0 & zyzy & zyxz & 0 \\ 0 & 0 & 0 & xzyz & xzzx & 0 & xzzy & xzxz & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$$

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\ 0 & 0 & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & xyyz & xyzx & 0 & xyzy & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & 0 & zyxy & 0 & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & 0 & xzxy & 0 & 0 & xzyx \\ 0 & 0 & 0 & yxyz & yxzx & 0 & yxzy & yxxz & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[V^4]$

$$\begin{pmatrix} xxxx & xyyy & 0 & yyzz & 0 \\ yxxx & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & zzxy \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & xzzz & 0 & xxyz \\ 0 & 0 & yzzz & 0 & yyxz \\ zxxx & zyyy & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$V[V^3]$

$$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & xxzz & xyxx & 0 & 0 \\ yxxx & yyyy & 0 & yxyy & yyzz & 0 & yxzz & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & zxyz \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 & xzxx & 0 & 0 & xzyy & xxyz \\ 0 & 0 & yzzz & 0 & 0 & yzxx & 0 & 0 & yzyy & yxyz \\ zxxx & zyyy & 0 & zxyy & zyzz & 0 & zxzz & zyxx & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$[[V^2]^2]$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & yyxy \\ & & zzzz & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxxz & 0 \\ & 0 & 0 & yyyz & yyxz & 0 \\ & & 0 & zzyz & zzxz & 0 \\ & & & 0 & 0 & yzxy \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

$[V^2]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & xzyz & xzxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxxz & 0 \\ 0 & 0 & 0 & yyyz & yyxz & 0 \\ 0 & 0 & 0 & zzyz & zzxz & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & 0 & xzxy \\ 0 & 0 & 0 & xyyz & xyxz & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

n=1 $\mathbf{C}_{2h}(\mathbf{S}_2) = \mathbf{2}_z/\mathbf{m}_z(\bar{\mathbf{1}}) = \mathbf{2}_z'/\mathbf{m}_z'$

$\mathbf{C}_{2nh}(\mathbf{S}_{2n})$

$[(V^2)]^2$

1								
xxxx	xxyy	xxzz	0	0	xxxy	0	0	xxyx
	yyyy	yyzz	0	0	yyxy	0	0	yyyx
		zzzz	0	0	zzxy	0	0	zzyx
			yzyz	yzzx	0	yzzy	yzxz	0
				zxzx	0	zxzy	zxxz	0
					xyxy	0	0	xyyx
						zyzy	zyxz	0
							xzxz	0
								yxyx

e								
0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
			0	0	0	0	0	0
				0	0	0	0	0
					0	0	0	0
						0	0	0
							0	0
								0

a								
0	0	0	xxyz	xxzx	0	xxzy	xxxz	0
	0	0	yyyz	yyzx	0	yyzy	yyxz	0
		0	zzyz	zzzx	0	zzzy	zzxz	0
			0	0	yzxy	0	0	yzyx
				0	zxxy	0	0	zxyx
					0	xyzy	xyxz	0
						0	0	zyyx
							0	xzyx
								0

ae								
0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
			0	0	0	0	0	0
				0	0	0	0	0
					0	0	0	0
						0	0	0
							0	0
								0

$[V^2]V^2$

xxxx	xxyy	xxzz	0	0	xxxy	0	0	xxyx
yyxx	yyyy	yyzz	0	0	yyxy	0	0	yyyx
zzxx	zzyy	zzzz	0	0	zzxy	0	0	zzyx
0	0	0	yzyz	yzzx	0	yzzy	yzxz	0
0	0	0	zxyz	zxzx	0	zxzy	zxxz	0
xyxx	xyyy	xyzz	0	0	xyxy	0	0	xyyx

0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

0	0	0	xxyz	xxzx	0	xxzy	xxxz	0
0	0	0	yyyz	yyzx	0	yyzy	yyxz	0
0	0	0	zzyz	zzzx	0	zzzy	zzxz	0
yzxx	yzyy	yzzz	0	0	yzxy	0	0	yzyx
zxxx	zxyy	zxzz	0	0	zxxy	0	0	zxyx
0	0	0	xyyz	xyzx	0	xyzy	xyxz	0

0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

$C_{2nh}(S_{2n})$

n=2 **$C_{4h}(S_4) = 4_z/m_z(\bar{4}_z) = 4_z'/m_z'$**

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & yyxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & yyxy & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & -yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & -zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & -xyyx \\ 0 & 0 & 0 & zxxz & zxzy & 0 & -zxzx & zxyz & 0 \\ 0 & 0 & 0 & yzxz & yzzy & 0 & yzzx & -yzyz & 0 \\ xyyy & xyxx & xyzz & 0 & 0 & xyyx & 0 & 0 & -xyxy \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & -yxxx & 0 & yyzz & 0 \\ yxxx & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & yxxx & 0 & yyzz & 0 \\ yxxx & -xxxx & 0 & -yyzz & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & -yxxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ yxxx & xxxx & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & -yyzz & yxyy & 0 & 0 \\ xyyy & -xxxx & 0 & yxyy & yyzz & 0 & xyzz & -xxyy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zzxx & 0 & 0 & -zzxx & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & xxxy \\ & -xxxx & -xxzz & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & -yzyz & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & -yzyz & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 \end{pmatrix}$

$C_{2nh}(S_{2n})$

n=2 **$C_{4h}(S_4) = 4_z/m_z(\bar{4}_z) = 4_z'/m_z'$**

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & xxxy & 0 & 0 & yyxy \\ & -xxxx & -xxzz & 0 & 0 & yyxy & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ & & & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ & & & & zxzx & 0 & zxzy & -yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & -zxzx & yzzx & 0 \\ & & & & & & & -yzyz & 0 \\ & & & & & & & & -xyxy \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & yyxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & yyxy & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & -zxzx & zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & yzzx & -yzyz & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & xyxy & 0 & 0 & -xyxy \end{pmatrix}$

n=3 $\mathbf{C}_{6h}(\mathbf{S}_6) = \mathbf{6}_z/\mathbf{m}_z(\bar{\mathbf{3}}_z) = \mathbf{6}_z'/\mathbf{m}_z'$

$\mathbf{C}_{2nh}(\mathbf{S}_{2n})$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & yyzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & 0 & -xxzx & 0 & -xxzy & -xxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xzxx & 0 & 0 & -xzxx \\ zxxx & -zxxx & 0 & 0 & 0 & zyxx & 0 & 0 & zyxx \\ 0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0 \\ zyxx & -zyxx & 0 & 0 & 0 & -zxxx & 0 & 0 & -zxxx \\ xzxx & -xzxx & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\ 0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx			
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & -xxyz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & yyxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xzxx & 0 & 0 & -xzxx & yzxx \\ 0 & 0 & 0 & 0 & 0 & yzxx & 0 & 0 & -yzxx & -xzxx \\ zxxx & -zyxx & 0 & -zxxx & 0 & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & -yyxz & 0 \\ & 0 & 0 & -xxyz & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & xxyz \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & -yyxz & 0 \\ 0 & 0 & 0 & -xxyz & yyxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & 0 & 0 & xzyy \\ -xzyy & xzyy & 0 & 0 & 0 & yzxx \\ 0 & 0 & 0 & yyxz & xxyz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			

n=3 $\mathbf{C}_{6h}(\mathbf{S}_6) = \mathbf{6}_z/\mathbf{m}_z(\bar{\mathbf{3}}_z) = \mathbf{6}_z'/\mathbf{m}_z'$

$\mathbf{C}_{2nh}(\mathbf{S}_{2n})$

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & -yzzx & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\
 & 0 & 0 & -xxyz & -xxzx & 0 & -xxzy & -xxxz & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & -xxxz & 0 & 0 & -xxxz \\
 & & & & 0 & xxzy & 0 & 0 & xxzy \\
 & & & & & 0 & -xxzx & xxyz & 0 \\
 & & & & & & 0 & 0 & -xxzx \\
 & & & & & & & 0 & xxyz \\
 & & & & & & & & 0
\end{pmatrix}$$

ae

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\
0 & 0 & 0 & -xxyz & -xxzx & 0 & -xxzy & -xxxz & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
yzxx & -yzxx & 0 & 0 & 0 & 0 & 0 & 0 & -zxxx \\
zxxx & -zxxx & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\
0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$C_{2nh}(S_{2n})$

n=4 $C_{8h}(S_8) = 8_z/m_z(\bar{8}_z) = 8_z'/m_z'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & yyzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0&0&0 & -xyyy & 0&0 & -xyyy \\ -xxxx & xxxx & 0&0&0 & xyyy & 0&0 & xyyy \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ -xyyy & xyyy & 0&0&0 & -xxxx & 0&0 & -xxxx \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ -xyyy & xyyy & 0&0&0 & -xxxx & 0&0 & -xxxx \end{pmatrix}$

and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx

$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & 0 & 0 \\ -xyyy & xxxx & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxx & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & yyxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & -xxxx & 0&0&0 & -xyyy & 0&0 \\ -xyyy & xxxx & 0 & xyyy & 0&0&0 & -xxxx & 0&0 \\ 0 & 0 & 0 & 0 & 0&0&0 & 0 & 0&0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0&0&0 & -xyyy \\ & xxxx & 0&0&0 & xyyy \\ & & 0&0&0 & 0 \\ & & &0&0 & 0 \\ & & &&0 & 0 \\ & & &&& -xxxx \end{pmatrix}$

and xyxy = ½(xxxx - xxyy)

$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0&0&0 & -xyyy \\ -xxxx & xxxx & 0&0&0 & xyyy \\ 0 & 0 & 0&0&0 & 0 \\ 0 & 0 & 0&0&0 & 0 \\ 0 & 0 & 0&0&0 & 0 \\ -xyyy & xyyy & 0&0&0 & -xxxx \end{pmatrix}$

and xyxy = ½(xxxx - xxyy)

$C_{2nh}(S_{2n})$

n=4 $C_{8h}(S_8) = 8_z/m_z(\bar{8}_z) = 8_z'/m_z'$

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ & xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & -xxxx & 0 & 0 & -xxxx \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & -xxxx \end{pmatrix}$$

$$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ -xxxx & xxxx & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \end{pmatrix}$$

$\mathbf{C}_{2nh}(\mathbf{S}_{2n})$

n>4 $\mathbf{C}_{\infty/\mathbf{m}}\mathbf{1}' = \infty/\mathbf{m}\mathbf{1}'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$

and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx

$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$

and xyxy=½(xxxx-xxyy)

$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$

and xyxy = ½(xxxx - xxyy)

$C_{2nh}(S_{2n})$

n>4 $\mathbf{C}_{\infty/\mathbf{m}}\mathbf{1}' = \infty/\mathbf{m}\mathbf{1}'$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

n=1 $\mathbf{C}_{2h}(\mathbf{C}_{1h}) = \mathbf{2}_z/\mathbf{m}_z(\mathbf{m}_z) = \mathbf{2}_z'/\mathbf{m}_z$

$\mathbf{C}_{2nh}(\mathbf{C}_{nh})$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & zyzx & 0 & zyzy & zyxz & 0 \\ 0 & 0 & 0 & xzyz & xzzx & 0 & xzzy & xzxz & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xxyz&xxzx&0&xxzy&xxxz&0 \\ 0&0&0&yyyz&yyzx&0&yyzy&yyxz&0 \\ 0&0&0&zzyz&zzzx&0&zzzy&zzxz&0 \\ yzxx&yzyy&yzzz&0&0&yzxy&0&0&yzyx \\ zxxx&zxyy&zxzz&0&0&zxxy&0&0&zxyx \\ 0&0&0&xyyz&xyzx&0&xyzy&xyxz&0 \\ zyxx&zyyy&zyzz&0&0&zyxy&0&0&zyyx \\ xzxx&xzyy&xzzz&0&0&xzxy&0&0&xzyx \\ 0&0&0&yxyz&yxzx&0&yxzy&yxxz&0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & xyyy & 0 & yyzz & 0 \\ yxxx & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & zzxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&xzzz&0&xxyz \\ 0&0&yzzz&0&yyxz \\ zxxx&zyyy&0&0&0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & xxzz & xyxx & 0 & 0 \\ yxxx & yyyy & 0 & yxyy & yyzz & 0 & yxzz & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & zxyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&xzzz&0&0&xzxx&0&0&xzyy&xxyz \\ 0&0&yzzz&0&0&yzxx&0&0&yzyy&yxyz \\ zxxx&zyyy&0&zxyy&zyzz&0&zxzz&zyxx&0&0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & yyxy \\ & & zzzz & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xxyz&xxxz&0 \\ &0&0&yyyz&yyxz&0 \\ &&0&zzyz&zzxz&0 \\ &&&0&0&yzxy \\ &&&&0&xzxy \\ &&&&&0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & yyyy & yyzz & 0 & 0 & yyxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & xzyz & xzxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xxyz&xxxz&0 \\ 0&0&0&yyyz&yyxz&0 \\ 0&0&0&zzyz&zzxz&0 \\ yzxx&yzyy&yzzz&0&0&yzxy \\ xzxx&xzyy&xzzz&0&0&xzxy \\ 0&0&0&xyyz&xyxz&0 \end{pmatrix}$

n=1 $\mathbf{C}_{2h}(\mathbf{C}_{1h}) = \mathbf{2}_z/\mathbf{m}_z(\mathbf{m}_z) = \mathbf{2}_z'/\mathbf{m}_z$

$\mathbf{C}_{2nh}(\mathbf{C}_{nh})$

$[(V^2)]^2$

1

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\
 & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\
 & & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\
 & & & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\
 & & & & zxzx & 0 & zxzy & zxxz & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zyzy & zyxz & 0 \\
 & & & & & & & xzxz & 0 \\
 & & & & & & & & yxyx
\end{pmatrix}$$

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

ae

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\
 & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\
 & & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\
 & & & 0 & 0 & yzxy & 0 & 0 & yzyx \\
 & & & & 0 & zxxy & 0 & 0 & zxyx \\
 & & & & & 0 & xyzy & xyxz & 0 \\
 & & & & & & 0 & 0 & zyyx \\
 & & & & & & & 0 & xzyx \\
 & & & & & & & & 0
\end{pmatrix}$$

$[V^2]V^2$

1

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & xxyx \\
yyxx & yyyy & yyzz & 0 & 0 & yyxy & 0 & 0 & yyyx \\
zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & zzyx \\
0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\
0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\
xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx
\end{pmatrix}$$

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

ae

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\
0 & 0 & 0 & yyyz & yyzx & 0 & yyzy & yyxz & 0 \\
0 & 0 & 0 & zzyz & zzzx & 0 & zzzy & zzxz & 0 \\
yzxx & yzyy & yzzz & 0 & 0 & yzxy & 0 & 0 & yzyx \\
zxxx & zxyy & zxzz & 0 & 0 & zxxy & 0 & 0 & zxyx \\
0 & 0 & 0 & xyyz & xyzx & 0 & xyzy & xyxz & 0
\end{pmatrix}$$

n=2 $\mathbf{C}_{4h}(\mathbf{C}_{2h}) = \mathbf{4}_z/\mathbf{m}_z(\mathbf{2}_z/\mathbf{m}_z) = \mathbf{4}_z'/\mathbf{m}_z$

$\mathbf{C}_{2nh}(\mathbf{C}_{nh})$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & yyxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & yyxy & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & -yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & -zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & -xyyx \\ 0 & 0 & 0 & zxxz & zxzy & 0 & -zxzx & zxyz & 0 \\ 0 & 0 & 0 & yzxz & yzzy & 0 & yzzx & -yzyz & 0 \\ xyyy & xyxx & xyzz & 0 & 0 & xyyx & 0 & 0 & -xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & -yxxx & 0 & yyzz & 0 \\ yxxx & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & yxxx & 0 & yyzz & 0 \\ yxxx & -xxxx & 0 & -yyzz & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & -yxxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ yxxx & xxxx & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & xxyy & xyzz & 0 & -yyzz & yxyy & 0 & 0 \\ xyyy & -xxxx & 0 & yxyy & yyzz & 0 & xyzz & -xxyy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zzxx & 0 & 0 & -zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ & yyyy & yyzz & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ & &0&0&0&0 \\ & & &0&0&0 \\ & & & &0&0 \\ & & & & &0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & xxxy \\ & -xxxx & -xxzz & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy \\ & & & yzyz & yzxz & 0 \\ & & & & -yzyz & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ & &0&0&0&0 \\ & & &0&0&0 \\ & & & &0&0 \\ & & & & &0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ yyxx & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ -xxyy & -xxxx & -xxzz & 0 & 0 & xxxy \\ zzxx & -zzxx & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & -yzyz & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$

n=2 $\mathbf{C}_{4h}(\mathbf{C}_{2h}) = \mathbf{4}_z/\mathbf{m}_z(\mathbf{2}_z/\mathbf{m}_z) = \mathbf{4}_z'/\mathbf{m}_z$

$\mathbf{C}_{2nh}(\mathbf{C}_{nh})$

$[(V^2)]^2$

1								
xxxx	xxyy	xxzz	0	0	xxxy	0	0	−yyxy
	xxxx	xxzz	0	0	yyxy	0	0	−xxxy
		zzzz	0	0	zzxy	0	0	−zzxy
			yzyz	yzzx	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	−yzzx	0
							yzyz	0
								xyxy

e								
0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
			0	0	0	0	0	0
				0	0	0	0	0
					0	0	0	0
						0	0	0
							0	0
								0

$[V^2]V^2$

xxxx	xxyy	xxzz	0	0	xxxy	0	0	−yyxy
yyxx	xxxx	xxzz	0	0	yyxy	0	0	−xxxy
zzxx	zzxx	zzzz	0	0	zzxy	0	0	−zzxy
0	0	0	yzyz	yzzx	0	zxzx	−zxyz	0
0	0	0	zxyz	zxzx	0	−yzzx	yzyz	0
xyxx	−xyxx	0	0	0	xyxy	0	0	xyxy

0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

a								
xxxx	0	xxzz	0	0	xxxy	0	0	yyxy
	−xxxx	−xxzz	0	0	yyxy	0	0	xxxy
		0	0	0	zzxy	0	0	zzxy
			yzyz	yzzx	0	yzzy	yzxz	0
				zxzx	0	zxzy	−yzzy	0
					xyxy	0	0	xyyx
						−zxzx	yzzx	0
							−yzyz	0
								−xyxy

ae								
0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
			0	0	0	0	0	0
				0	0	0	0	0
					0	0	0	0
						0	0	0
							0	0
								0

xxxx	xxyy	xxzz	0	0	xxxy	0	0	yyxy
−xxyy	−xxxx	−xxzz	0	0	yyxy	0	0	xxxy
zzxx	−zzxx	0	0	0	zzxy	0	0	zzxy
0	0	0	yzyz	yzzx	0	−zxzx	zxyz	0
0	0	0	zxyz	zxzx	0	yzzx	−yzyz	0
xyxx	xyxx	xyzz	0	0	xyxy	0	0	−xyxy

0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

n=3 $\mathbf{C_{6h}(C_{3h})} = \mathbf{6_z/m_z(3_z/m_z)} = \mathbf{6_z'/m_z}$

$\mathbf{C_{2nh}(C_{nh})}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & yyzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xxzx&0&xxzy&xxxz&0 \\ 0&0&0&0&-xxzx&0&-xxzy&-xxxz&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&-xzxx&0&0&-xzxx \\ zxxx&-zxxx&0&0&0&zyxx&0&0&zyxx \\ 0&0&0&-xxxz&xxzy&0&-xxzx&xxyz&0 \\ zyxx&-zyxx&0&0&0&-zxxx&0&0&-zxxx \\ xzxx&-xzxx&0&0&0&yzxx&0&0&yzxx \\ 0&0&0&-xxxz&xxzy&0&-xxzx&xxyz&0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx			
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xxyz \\ 0&0&0&0&-zxxx \\ zxxx&-xxyz&0&0&0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & yyxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&xzxx&0&0&-xzxx&yzxx \\ 0&0&0&0&0&yzxx&0&0&-yzxx&-xzxx \\ zxxx&-zyxx&0&-zxxx&0&0&0&zyxx&0&0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xxyz&-yyxz&0 \\ &0&0&-xxyz&yyxz&0 \\ &&0&0&0&0 \\ &&&0&0&yyxz \\ &&&&0&xxyz \\ &&&&&0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xxyz&-yyxz&0 \\ 0&0&0&-xxyz&yyxz&0 \\ 0&0&0&0&0&0 \\ yzxx&-yzxx&0&0&0&xzyy \\ -xzyy&xzyy&0&0&0&yzxx \\ 0&0&0&yyxz&xxyz&0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			

n=3 $\mathbf{C}_{6h}(\mathbf{C}_{3h}) = \mathbf{6}_z/\mathbf{m}_z(\mathbf{3}_z/\mathbf{m}_z) = \mathbf{6}_z'/\mathbf{m}_z$

$\mathbf{C}_{2nh}(\mathbf{C}_{nh})$

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ & 0 & 0 & -xxyz & -xxzx & 0 & -xxzy & -xxxz & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & -xxxz & 0 & 0 & -xxxz \\ & & & & 0 & xxzy & 0 & 0 & xxzy \\ & & & & & 0 & -xxzx & xxyz & 0 \\ & & & & & & 0 & 0 & -xxzx \\ & & & & & & & 0 & xxyz \\ & & & & & & & & 0 \end{pmatrix}$$

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & xxzx & 0 & xxzy & xxxz & 0 \\ 0 & 0 & 0 & -xxyz & -xxzx & 0 & -xxzy & -xxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & 0 & 0 & 0 & 0 & 0 & -zxxx \\ zxxx & -zxxx & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\ 0 & 0 & 0 & -xxxz & xxzy & 0 & -xxzx & xxyz & 0 \end{pmatrix}$$

n=4 $\mathbf{C_{8h}(C_{4h})} = \mathbf{8_z/m_z(4_z/m_z)} = \mathbf{8_z'/m_z}$

$\mathbf{C_{2nh}(C_{nh})}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & yyzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ -xxxx & xxxx & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$

and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx

$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & 0 & 0 \\ -xyyy & xxxx & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & yyxx \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xyyy & 0 & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 \\ -xyyy & xxxx & 0 & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy \\ & xxxx & 0 & 0 & 0 & xyyy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & -xxxx \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$

and xyxy = ½(xxxx - xxyy)

$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy \\ -xxxx & xxxx & 0 & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & -xxxx \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$

and xyxy = ½(xxxx - xxyy)

n=4 $\mathbf{C_{8h}(C_{4h})} = \mathbf{8_z/m_z(4_z/m_z)} = \mathbf{8_z'/m_z}$

$\mathbf{C_{2nh}(C_{nh})}$

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ & xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & -xxxx & 0 & 0 & -xxxx \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & -xxxx \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ -xxxx & xxxx & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

n>4 $\mathbf{C}_{\infty/\mathbf{m}}\mathbf{1}' = \infty/\mathbf{m}1'$

$\mathbf{C}_{2nh}(\mathbf{C}_{nh})$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ yyxx & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzyy & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & yzzy & yzxz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & zxzy & zxxz & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & -zxzy & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & yzzy & 0 & -yzzx & yzyz & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$

and: xxxx=xxyy+xyxy+xyyx ; xxxy-yyxy=xyyy-xyxx

$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 3xyxx & 0 & xxyy & xyzz & 0 & yyzz & xyxx & 0 & 0 \\ -3xyxx & 3xxyy & 0 & -xyxx & yyzz & 0 & -xyzz & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & zxyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$

and xyxy=½(xxxx-xxyy)

$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy \\ xxyy & xxxx & xxzz & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & yzyz & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$

and xyxy = ½(xxxx - xxyy)

$C_{2nh}(C_{nh})$

n>4 **$C_{\infty/m}$1'= ∞/m1'**

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & xxxx & xxzz & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & yzyz & yzzx & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & -yzzx & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ xxyy & xxxx & xxzz & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ zzxx & zzxx & zzzz & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & yzyz & yzzx & 0 & zxzx & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & zxzx & 0 & -yzzx & yzyz & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and xxxx=xxyy+2xyxy ; yyxy-xxxy=2xyxx

$\mathbf{D}_n(\mathbf{C}_n)$

n=1 $\mathbf{D}_1(\mathbf{C}_1) = \mathbf{2}_y(\mathbf{1}) = \mathbf{2}_y'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & zyxy & zyzy & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & yxyz & 0 & yxxy & yxzy & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & zyxy & zyzy & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & yxyz & 0 & yxxy & yxzy & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy & xxzy & 0 & xxyx \\ 0 & 0 & 0 & yyyz & 0 & yyxy & yyzy & 0 & yyyx \\ 0 & 0 & 0 & zzyz & 0 & zzxy & zzzy & 0 & zzyx \\ yzxx & yzyy & yzzz & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & zxxy & zxzy & 0 & zxyx \\ xyxx & xyyy & xyzz & 0 & xyzx & 0 & 0 & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & zyzx & 0 & 0 & zyxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & xzxy & xzzy & 0 & xzyx \\ yxxx & yxyy & yxzz & 0 & yxzx & 0 & 0 & yxxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy & xxzy & 0 & xxyx \\ 0 & 0 & 0 & yyyz & 0 & yyxy & yyzy & 0 & yyyx \\ 0 & 0 & 0 & zzyz & 0 & zzxy & zzzy & 0 & zzyx \\ yzxx & yzyy & yzzz & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & zxxy & zxzy & 0 & zxyx \\ xyxx & xyyy & xyzz & 0 & xyzx & 0 & 0 & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & zyzx & 0 & 0 & zyxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & xzxy & xzzy & 0 & xzyx \\ yxxx & yxyy & yxzz & 0 & yxzx & 0 & 0 & yxxz & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & xzzz & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & yyxz \\ zxxx & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xzzz & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & yyxz \\ zxxx & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xxyz \\ yxxx & 0 & yzzz & 0 & 0 \\ 0 & zyyy & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xxyz \\ yxxx & 0 & yzzz & 0 & 0 \\ 0 & zyyy & 0 & 0 & zzxy \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & xzzz & xxyy & 0 & xzxx & xxzz & 0 & xzyy & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & yxyz \\ zxxx & 0 & zzzz & zxyy & 0 & zzxx & zxzz & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xzzz & xxyy & 0 & xzxx & xxzz & 0 & xzyy & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & yxyz \\ zxxx & 0 & zzzz & zxyy & 0 & zzxx & zxzz & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & xxyz \\ yxxx & 0 & yzzz & yxyy & 0 & yzxx & yxzz & 0 & yzyy & 0 \\ 0 & zyyy & 0 & 0 & zyzz & 0 & 0 & zyxx & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & xxyz \\ yxxx & 0 & yzzz & yxyy & 0 & yzxx & yxzz & 0 & yzyy & 0 \\ 0 & zyyy & 0 & 0 & zyzz & 0 & 0 & zyxx & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyxz & 0 \\ & & zzzz & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyxz & 0 \\ & & zzzz & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy \\ & 0 & 0 & yyyz & 0 & yyxy \\ & & 0 & zzyz & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy \\ & 0 & 0 & yyyz & 0 & yyxy \\ & & 0 & zzyz & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & xzxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & xzxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy \\ 0 & 0 & 0 & yyyz & 0 & yyxy \\ 0 & 0 & 0 & zzyz & 0 & zzxy \\ yzxx & yzyy & yzzz & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & xzxy \\ 0 & 0 & 0 & 0 & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy \\ 0 & 0 & 0 & yyyz & 0 & yyxy \\ 0 & 0 & 0 & zzyz & 0 & zzxy \\ yzxx & yzyy & yzzz & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & xzxy \\ 0 & 0 & 0 & 0 & xyxz & 0 \end{pmatrix}$

$D_n(C_n)$

n=1 **$D_1(C_1) = 2_y(1) = 2_y'$**

1

$[(V^2)]^2$

xxxx	xxyy	xxzz	0	xxzx	0	0	xxxz	0
	yyyy	yyzz	0	yyzx	0	0	yyxz	0
		zzzz	0	zzzx	0	0	zzxz	0
			yzyz	0	yzxy	yzzy	0	yzyx
				zxzx	0	0	zxxz	0
					xyxy	xyzy	0	xyyx
						zyzy	0	zyyx
							xzxz	0
								yxyx

$[V^2]V^2$

xxxx	xxyy	xxzz	0	xxzx	0	0	xxxz	0
yyxx	yyyy	yyzz	0	yyzx	0	0	yyxz	0
zzxx	zzyy	zzzz	0	zzzx	0	0	zzxz	0
0	0	0	yzyz	0	yzxy	yzzy	0	yzyx
zxxx	zxyy	zxzz	0	zxzx	0	0	zxxz	0
0	0	0	xyyz	0	xyxy	xyzy	0	xyyx

e

$[(V^2)]^2$

xxxx	xxyy	xxzz	0	xxzx	0	0	xxxz	0
	yyyy	yyzz	0	yyzx	0	0	yyxz	0
		zzzz	0	zzzx	0	0	zzxz	0
			yzyz	0	yzxy	yzzy	0	yzyx
				zxzx	0	0	zxxz	0
					xyxy	xyzy	0	xyyx
						zyzy	0	zyyx
							xzxz	0
								yxyx

$[V^2]V^2$

xxxx	xxyy	xxzz	0	xxzx	0	0	xxxz	0
yyxx	yyyy	yyzz	0	yyzx	0	0	yyxz	0
zzxx	zzyy	zzzz	0	zzzx	0	0	zzxz	0
0	0	0	yzyz	0	yzxy	yzzy	0	yzyx
zxxx	zxyy	zxzz	0	zxzx	0	0	zxxz	0
0	0	0	xyyz	0	xyxy	xyzy	0	xyyx

a

$[(V^2)]^2$

0	0	0	xxyz	0	xxxy	xxzy	0	xxyx
	0	0	yyyz	0	yyxy	yyzy	0	yyyx
		0	zzyz	0	zzxy	zzzy	0	zzyx
			0	yzzx	0	0	yzxz	0
				0	zxxy	zxzy	0	zxyx
					0	0	xyxz	0
						0	zyxz	0
							0	xzyx
								0

$[V^2]V^2$

0	0	0	xxyz	0	xxxy	xxzy	0	xxyx
0	0	0	yyyz	0	yyxy	yyzy	0	yyyx
0	0	0	zzyz	0	zzxy	zzzy	0	zzyx
yzxx	yzyy	yzzz	0	yzzx	0	0	yzxz	0
0	0	0	xzyz	0	zxxy	zxzy	0	zxyx
xyxx	xyyy	xyzz	0	xyzx	0	0	xyxz	0

ae

$[(V^2)]^2$

0	0	0	xxyz	0	xxxy	xxzy	0	xxyx
	0	0	yyyz	0	yyxy	yyzy	0	yyyx
		0	zzyz	0	zzxy	zzzy	0	zzyx
			0	yzzx	0	0	yzxz	0
				0	zxxy	zxzy	0	zxyx
					0	0	xyxz	0
						0	zyxz	0
							0	xzyx
								0

$[V^2]V^2$

0	0	0	xxyz	0	xxxy	xxzy	0	xxyx
0	0	0	yyyz	0	yyxy	yyzy	0	yyyx
0	0	0	zzyz	0	zzxy	zzzy	0	zzyx
yzxx	yzyy	yzzz	0	yzzx	0	0	yzxz	0
0	0	0	xzyz	0	zxxy	zxzy	0	zxyx
xyxx	xyyy	xyzz	0	xyzx	0	0	xyxz	0

$D_n(C_n)$

n=2 $\mathbf{D}_2(\mathbf{C}_2) = \mathbf{2}_x\mathbf{2}_y\mathbf{2}_z(\mathbf{2}_z) = \mathbf{2}_x'\mathbf{2}_y'\mathbf{2}_z$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zyzx & 0 & 0 & zyxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & xzzy & 0 & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zyzx & 0 & 0 & zyxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & xzzy & 0 & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & yxyy & 0 & 0 & yxzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & yxyy & 0 & 0 & yxzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & yyxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & yyxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$D_n(C_n)$

n=2 $\mathbf{D}_2(\mathbf{C}_2) = \mathbf{2}_x\mathbf{2}_y\mathbf{2}_z(\mathbf{2}_z) = \mathbf{2}_x'\mathbf{2}_y'\mathbf{2}_z$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\ & & & & 0 & 0 & zxzy & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & zyxz & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\ & & & & 0 & 0 & zxzy & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & zyxz & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & 0 & yzzx & 0 & yzxz & 0 \\ 0 & 0 & 0 & 0 & xzyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & 0 & yzzx & 0 & yzxz & 0 \\ 0 & 0 & 0 & 0 & xzyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$D_n(C_n)$

n=3 **$D_3(C_3) = 3_z2_x(3_z) = 3_z2_{x'}$**

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ yyxx & xxxx & yyzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & zyxx & 0 & zxxz & zyxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ xzxx & -xzxx & 0 & 0 & yzzy & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyyx & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ yyxx & xxxx & yyzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & zyxx & 0 & zxxz & zyxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ xzxx & -xzxx & 0 & 0 & yzzy & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyyx & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & xxxy & 0 & xxxz & -yyxy \\ 0 & 0 & 0 & 0 & -xxzx & yyxy & 0 & -xxxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & -xzxx & 0 & yzxz & -xzxx \\ zxxx & -zxxx & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & -xxxz & 0 & 0 & -xxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & -zxxx & 0 & -zxyz & -zxxx \\ xzxx & -xzxx & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & xxxy & 0 & xxxz & -yyxy \\ 0 & 0 & 0 & 0 & -xxzx & yyxy & 0 & -xxxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & -xzxx & 0 & yzxz & -xzxx \\ zxxx & -zxxx & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & -xxxz & 0 & 0 & -xxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & -zxxx & 0 & -zxyz & -zxxx \\ xzxx & -xzxx & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx	and: xxxx=xxyy+xyxy+xyyx	and: xxxy-yyxy=xyyy-xyxx	and: xxxy-yyxy=xyyy-xyxx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yzxx \\ 0 & 3xxyy & 0 & 0 & yyzz & yzxx & 0 & xxyy & -yzxx & 0 \\ 0 & -zyxx & zzzz & 0 & 0 & zzxx & 0 & zyxx & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yzxx \\ 0 & 3xxyy & 0 & 0 & yyzz & yzxx & 0 & xxyy & -yzxx & 0 \\ 0 & -zyxx & zzzz & 0 & 0 & zzxx & 0 & zyxx & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & xzxx & 0 & xyxx & -xzxx & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & -xzxx \\ zxxx & 0 & 0 & -zxxx & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & xzxx & 0 & xyxx & -xzxx & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & -xzxx \\ zxxx & 0 & 0 & -zxxx & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ & 0 & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ & 0 & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)		
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & xxxy \\ 0 & 0 & 0 & 0 & yyxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & xzyy \\ -xzyy & xzyy & 0 & yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & yyxz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & xxxy \\ 0 & 0 & 0 & 0 & yyxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & xzyy \\ -xzyy & xzyy & 0 & yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & yyxz & 0 & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)		

$D_n(C_n)$

n=3 $\mathbf{D}_3(\mathbf{C}_3) = \mathbf{3}_z\mathbf{2}_x(\mathbf{3}_z) = \mathbf{3}_z\mathbf{2}_x'$

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & xxzy & 0 & yzzy & xxzy \\ & & & & & xyxy & 0 & xxyz & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & xxyz \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

e

$$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & xxzy & 0 & yzzy & xxzy \\ & & & & & xyxy & 0 & xxyz & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & xxyz \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & xxxy & 0 & xxxz & -xxxy \\ & 0 & 0 & 0 & -xxzx & xxxy & 0 & -xxxz & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & -xxxz & 0 & 0 & -xxxz \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & -xxzx & 0 & 0 \\ & & & & & & 0 & -yzzx & -xxzx \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & xxxy & 0 & xxxz & -xxxy \\ & 0 & 0 & 0 & -xxzx & xxxy & 0 & -xxxz & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & -xxxz & 0 & 0 & -xxxz \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & -xxzx & 0 & 0 \\ & & & & & & 0 & -yzzx & -xxzx \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy

$$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & xxxy & 0 & xxxz & -yyxy \\ 0 & 0 & 0 & 0 & -xxzx & yyxy & 0 & -xxxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & -zxxx & 0 & -zxyz & -zxxx \\ zxxx & -zxxx & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$$

and: yyxy-xxxy=2xyxx

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & xxxy & 0 & xxxz & -yyxy \\ 0 & 0 & 0 & 0 & -xxzx & yyxy & 0 & -xxxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & -zxxx & 0 & -zxyz & -zxxx \\ zxxx & -zxxx & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$$

and: yyxy-xxxy=2xyxx

$D_n(C_n)$

n=4 $\mathbf{D}_4(\mathbf{C}_4) = \mathbf{4}_z\mathbf{2}_x\mathbf{2}_{xy}(\mathbf{4}_z) = \mathbf{4}_z\mathbf{2}_x'\mathbf{2}_{xy}'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 \end{pmatrix}$

$D_n(C_n)$

n=4 $\mathbf{D}_4(\mathbf{C}_4) = \mathbf{4}_z\mathbf{2}_x\mathbf{2}_{xy}(\mathbf{4}_z) = \mathbf{4}_z\mathbf{2}_x'\mathbf{2}_{xy}'$

$[(V^2)]^2$

1

xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

e

xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

a

0	0	0	0	0	xxxy	0	0	−yyxy
	0	0	0	0	yyxy	0	0	−xxxy
		0	0	0	zzxy	0	0	−zzxy
			0	yzzx	0	0	0	0
				0	0	0	0	0
					0	0	0	0
						0	−yzzx	0
							0	0
								0

ae

0	0	0	0	0	xxxy	0	0	−yyxy
	0	0	0	0	yyxy	0	0	−xxxy
		0	0	0	zzxy	0	0	−zzxy
			0	yzzx	0	0	0	0
				0	0	0	0	0
					0	0	0	0
						0	−yzzx	0
							0	0
								0

$[V^2]V^2$

xxxx	xxyy	xxzz	0	0	0	0	0	0
yyxx	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

xxxx	xxyy	xxzz	0	0	0	0	0	0
yyxx	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

0	0	0	0	0	xxxy	0	0	−yyxy
0	0	0	0	0	yyxy	0	0	−xxxy
0	0	0	0	0	zzxy	0	0	−zzxy
0	0	0	0	yzzx	0	0	−zxyz	0
0	0	0	zxyz	0	0	−yzzx	0	0
xyxx	−xyxx	0	0	0	0	0	0	0

0	0	0	0	0	xxxy	0	0	−yyxy
0	0	0	0	0	yyxy	0	0	−xxxy
0	0	0	0	0	zzxy	0	0	−zzxy
0	0	0	0	yzzx	0	0	−zxyz	0
0	0	0	zxyz	0	0	−yzzx	0	0
xyxx	−xyxx	0	0	0	0	0	0	0

n>4 $\mathbf{D}_{\infty}(\mathbf{C}_{\infty})= \infty\mathbf{2}'$

$\mathbf{D}_n(\mathbf{C}_n)$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$ and: xxxx=xxyy+xyxy+xyyx	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$ and: xxxx=xxyy+xyxy+xyyx	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ and: xxxy-yyxy=xyyy-xyxx	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ and: xxxy-yyxy=xyyy-xyxx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$ and xyxy=½(xxxx-xxyy)	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$ and xyxy=½(xxxx-xxyy)	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$ and xyxy = ½(xxxx - xxyy)	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$ and xyxy = ½(xxxx - xxyy)	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & 0 \end{pmatrix}$

$D_n(C_n)$

n>4 **$D_\infty(C_\infty)= \infty 2'$**

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & 0 & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

e

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & 0 & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

a

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & 0 & yzzx & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & -yzzx & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

ae

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & 0 & yzzx & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & -yzzx & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\
0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

and: yyxy-xxxy=2xyxx

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\
0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

and xxxx=xxyy+2xyxy

$D_{2n}(D_n)$

n=1 $\mathbf{D}_2(\mathbf{D}_1) = \mathbf{2}_x\mathbf{2}_y\mathbf{2}_z(\mathbf{2}_y) = \mathbf{2}_x'\mathbf{2}_y\mathbf{2}_z'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & yyzx & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & xyyz & 0 & 0 & xyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zyxy & 0 & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yxyz & 0 & 0 & yxzy & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & yyzx & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & xyyz & 0 & 0 & xyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zyxy & 0 & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yxyz & 0 & 0 & yxzy & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 \\ 0 & 0 & 0 & 0 & yyxz \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 \\ 0 & 0 & 0 & 0 & yyxz \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 & xzxx & 0 & 0 & xzyy & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & yxyz \\ zxxx & 0 & 0 & zxyy & 0 & 0 & zxzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 & xzxx & 0 & 0 & xzyy & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & yxyz \\ zxxx & 0 & 0 & zxyy & 0 & 0 & zxzz & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxxz & 0 \\ & 0 & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & zzxz & 0 \\ & & & 0 & 0 & yzxy \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxxz & 0 \\ & 0 & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & zzxz & 0 \\ & & & 0 & 0 & yzxy \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & xyyz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & xyyz & 0 & 0 \end{pmatrix}$

$D_{2n}(D_n)$

n=1 $D_2(D_1) = 2_x 2_y 2_z(2_y) = 2_x' 2_y 2_z'$

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$$

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$$

e

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ & 0 & 0 & 0 & yyzx & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & zzzx & 0 & 0 & zzxz & 0 \\ & & & 0 & 0 & yzxy & 0 & 0 & yzyx \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & xyzy & 0 & 0 \\ & & & & & & 0 & 0 & zyyx \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & yyzx & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & 0 & yzxy & 0 & 0 & yzyx & 0 \\ 0 & 0 & 0 & 0 & xyzy & 0 & 0 & xyyx & 0 \\ 0 & 0 & 0 & 0 & zyyx & 0 & 0 & zyyx & 0 \\ 0 & 0 & 0 & 0 & xxxz & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & yyxz & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & zzxz & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & 0 & yzyx & 0 & 0 & yzyx & 0 \\ 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyyx & 0 \\ 0 & 0 & 0 & 0 & zyyx & 0 & 0 & zyyx & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ & 0 & 0 & 0 & yyzx & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & zzzx & 0 & 0 & zzxz & 0 \\ & & & 0 & 0 & yzxy & 0 & 0 & yzyx \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & xyzy & 0 & 0 \\ & & & & & & 0 & 0 & zyyx \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & yyzx & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & 0 & yzxy & 0 & 0 & yzyx & 0 \\ 0 & 0 & 0 & 0 & xyzy & 0 & 0 & xyyx & 0 \\ 0 & 0 & 0 & 0 & zyyx & 0 & 0 & zyyx & 0 \\ 0 & 0 & 0 & 0 & xxxz & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & yyxz & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & zzxz & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & 0 & yzyx & 0 & 0 & yzyx & 0 \\ 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyyx & 0 \\ 0 & 0 & 0 & 0 & zyyx & 0 & 0 & zyyx & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

n=2 $\mathbf{D}_4(\mathbf{D}_2) = \mathbf{4}_z\mathbf{2}_x\mathbf{2}_{xy}(\mathbf{2}_x\mathbf{2}_y\mathbf{2}_z) = \mathbf{4}_z'\mathbf{2}_x\mathbf{2}_{xy}'$

$\mathbf{D}_{2n}(\mathbf{D}_n)$

1

V^4

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0\\
yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0\\
zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0\\
0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0\\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0\\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx\\
0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0\\
0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0\\
0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy
\end{pmatrix}$$

$[V^4]$

$$\begin{pmatrix}
xxxx & 0 & 0 & yyzz & 0\\
0 & xxxx & 0 & yyzz & 0\\
0 & 0 & zzzz & xxyy & 0
\end{pmatrix}$$

$V[V^3]$

$$\begin{pmatrix}
xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0\\
0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0\\
0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0
\end{pmatrix}$$

$[[V^2]^2]$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0\\
 & yyyy & yyzz & 0 & 0 & 0\\
 & & zzzz & 0 & 0 & 0\\
 & & & yzyz & 0 & 0\\
 & & & & yzyz & 0\\
 & & & & & xyxy
\end{pmatrix}$$

$[V^2]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0\\
yyxx & xxxx & xxzz & 0 & 0 & 0\\
zzxx & zzxx & zzzz & 0 & 0 & 0\\
0 & 0 & 0 & yzyz & 0 & 0\\
0 & 0 & 0 & 0 & yzyz & 0\\
0 & 0 & 0 & 0 & 0 & xyxy
\end{pmatrix}$$

e

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0\\
yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0\\
zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0\\
0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0\\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0\\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx\\
0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0\\
0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0\\
0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & 0 & 0 & yyzz & 0\\
0 & xxxx & 0 & yyzz & 0\\
0 & 0 & zzzz & xxyy & 0
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0\\
0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0\\
0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0\\
 & yyyy & yyzz & 0 & 0 & 0\\
 & & zzzz & 0 & 0 & 0\\
 & & & yzyz & 0 & 0\\
 & & & & yzyz & 0\\
 & & & & & xyxy
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0\\
yyxx & xxxx & xxzz & 0 & 0 & 0\\
zzxx & zzxx & zzzz & 0 & 0 & 0\\
0 & 0 & 0 & yzyz & 0 & 0\\
0 & 0 & 0 & 0 & yzyz & 0\\
0 & 0 & 0 & 0 & 0 & xyxy
\end{pmatrix}$$

a

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0\\
-xxyy & -xxxx & -xxzz & 0 & 0 & 0 & 0 & 0 & 0\\
zzxx & -zzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0\\
0 & 0 & 0 & yzyz & 0 & 0 & -yzzy & 0 & 0\\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & -zxxz & 0\\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & -xyyx\\
0 & 0 & 0 & zxxz & 0 & 0 & -zxzx & 0 & 0\\
0 & 0 & 0 & 0 & yzzy & 0 & 0 & -yzyz & 0\\
0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & -xyxy
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & 0 & 0 & yyzz & 0\\
0 & -xxxx & 0 & -yyzz & 0\\
0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & 0 & 0 & xxyy & 0 & 0 & -yyzz & 0 & 0 & 0\\
0 & -xxxx & 0 & 0 & yyzz & 0 & 0 & -xxyy & 0 & 0\\
0 & 0 & 0 & 0 & 0 & zzxx & 0 & 0 & -zzxx & 0
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & 0 & xxzz & 0 & 0 & 0\\
 & -xxxx & -xxzz & 0 & 0 & 0\\
 & & 0 & 0 & 0 & 0\\
 & & & yzyz & 0 & 0\\
 & & & & -yzyz & 0\\
 & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0\\
-xxyy & -xxxx & -xxzz & 0 & 0 & 0\\
zzxx & -zzxx & 0 & 0 & 0 & 0\\
0 & 0 & 0 & yzyz & 0 & 0\\
0 & 0 & 0 & 0 & -yzyz & 0\\
0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

ae

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0\\
-xxyy & -xxxx & -xxzz & 0 & 0 & 0 & 0 & 0 & 0\\
zzxx & -zzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0\\
0 & 0 & 0 & yzyz & 0 & 0 & -yzzy & 0 & 0\\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & -zxxz & 0\\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & -xyyx\\
0 & 0 & 0 & zxxz & 0 & 0 & -zxzx & 0 & 0\\
0 & 0 & 0 & 0 & yzzy & 0 & 0 & -yzyz & 0\\
0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & -xyxy
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & 0 & 0 & yyzz & 0\\
0 & -xxxx & 0 & -yyzz & 0\\
0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & 0 & 0 & xxyy & 0 & 0 & -yyzz & 0 & 0 & 0\\
0 & -xxxx & 0 & 0 & yyzz & 0 & 0 & -xxyy & 0 & 0\\
0 & 0 & 0 & 0 & 0 & zzxx & 0 & 0 & -zzxx & 0
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & 0 & xxzz & 0 & 0 & 0\\
 & -xxxx & -xxzz & 0 & 0 & 0\\
 & & 0 & 0 & 0 & 0\\
 & & & yzyz & 0 & 0\\
 & & & & -yzyz & 0\\
 & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0\\
-xxyy & -xxxx & -xxzz & 0 & 0 & 0\\
zzxx & -zzxx & 0 & 0 & 0 & 0\\
0 & 0 & 0 & yzyz & 0 & 0\\
0 & 0 & 0 & 0 & -yzyz & 0\\
0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$D_{2n}(D_n)$

n=2 $\mathbf{D}_4(\mathbf{D}_2) = \mathbf{4}_z\mathbf{2}_x\mathbf{2}_{xy}(\mathbf{2}_x\mathbf{2}_y\mathbf{2}_z) = \mathbf{4}_z'\mathbf{2}_x\mathbf{2}_{xy}'$

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$$

e

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$$

a

$$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & -xxxx & -xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & -yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & -zxzx & 0 & 0 \\ & & & & & & & -yzyz & 0 \\ & & & & & & & & -xyxy \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ -xxyy & -xxxx & -xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & -zzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & -zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & -yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & -xyxy \end{pmatrix}$$

ae

$$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & -xxxx & -xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & -yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & -zxzx & 0 & 0 \\ & & & & & & & -yzyz & 0 \\ & & & & & & & & -xyxy \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ -xxyy & -xxxx & -xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & -zzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & -zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & -yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & -xyxy \end{pmatrix}$$

n=3 $\mathbf{D}_6(\mathbf{D}_3) = \mathbf{6}_z\mathbf{2}_x\mathbf{2}_1(\mathbf{3}_z\mathbf{2}_x) = \mathbf{6}_z'\mathbf{2}_x\mathbf{2}_1'$

$\mathbf{D}_{2n}(\mathbf{D}_n)$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -xxzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zyxx & 0 & 0 & zyxx \\ 0 & 0 & 0 & 0 & xxzy & 0 & 0 & xxyz & 0 \\ zyxx & -zyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & xxzy & 0 & 0 & xxyz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -xxzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zyxx & 0 & 0 & zyxx \\ 0 & 0 & 0 & 0 & xxzy & 0 & 0 & xxyz & 0 \\ zyxx & -zyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & xxzy & 0 & 0 & xxyz & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & 0 & 0 & 0 \\ 0 & -xxyz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & 0 & 0 & 0 \\ 0 & -xxyz & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yyxx \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yyxx \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & 0 & yzxx & 0 & 0 & -yzxx & 0 \\ 0 & -zyxx & 0 & 0 & 0 & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & 0 & yzxx & 0 & 0 & -yzxx & 0 \\ 0 & -zyxx & 0 & 0 & 0 & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$ and xyxy = ½(xxxx - xxyy)	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$ and xyxy = ½(xxxx - xxyy)	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ & 0 & 0 & -xxyz & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & xxyz \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ & 0 & 0 & -xxyz & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & xxyz \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$ and xyxy = ½(xxxx - xxyy)	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$ and xyxy = ½(xxxx - xxyy)	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ 0 & 0 & 0 & -xxyz & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & xxyz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ 0 & 0 & 0 & -xxyz & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & xxyz & 0 \end{pmatrix}$

$D_{2n}(D_n)$

n=3 $\mathbf{D}_6(\mathbf{D}_3) = \mathbf{6}_z\mathbf{2}_x\mathbf{2}_1(\mathbf{3}_z\mathbf{2}_x) = \mathbf{6}_z'\mathbf{2}_x\mathbf{2}_1'$

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

e

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

a

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & 0 & 0 & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & xxzy & 0 & 0 & xxzy \\ & & & & & 0 & 0 & xxyz & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & xxyz \\ & & & & & & & & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & 0 & 0 & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & xxzy & 0 & 0 & xxzy \\ & & & & & 0 & 0 & xxyz & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & xxyz \\ & & & & & & & & 0 \end{pmatrix}$$

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & xxzy & 0 & 0 & xxyz & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & xxzy & 0 & 0 & xxyz & 0 \end{pmatrix}$$

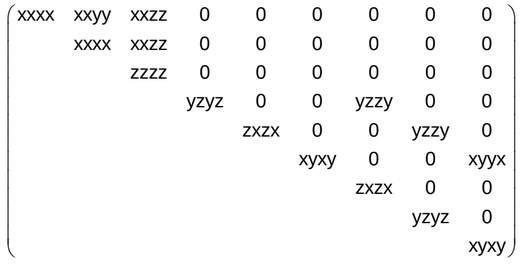
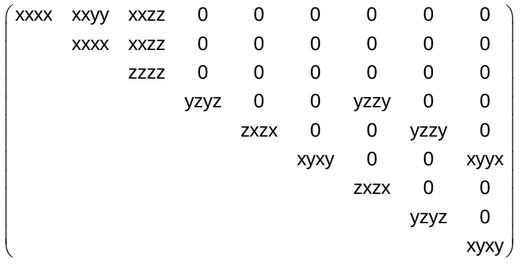
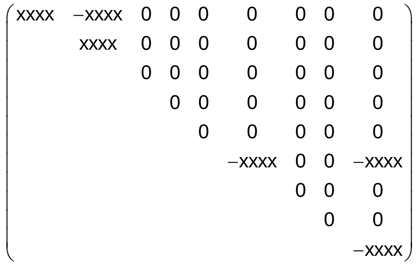
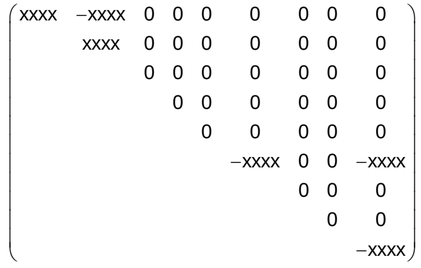
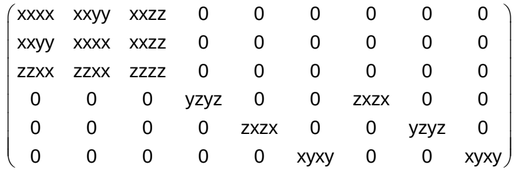
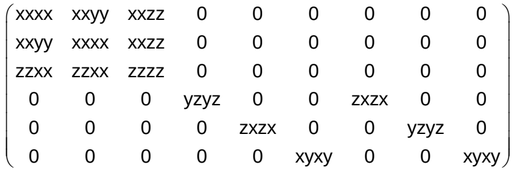
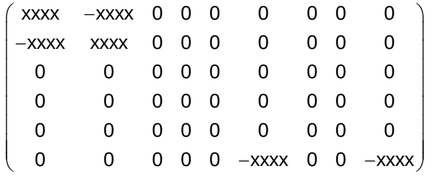
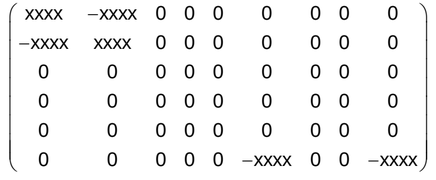
$D_{2n}(D_n)$

n=4 $\mathbf{D_8(D_4)} = \mathbf{8_z 2_{x1} 2_1 (4_z 2_{x1} 2_{x2})} = \mathbf{8_z' 2_{x1} 2_1'}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xxxx & xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xxxx & xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx	and: xxxx=xxyy+xyxy+xyyx		
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxx & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxx & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yyxx \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yyxx \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & -xxxx & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & -xxxx & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 \\ & xxxx & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & -xxxx \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 \\ & xxxx & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & -xxxx \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)		
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 \\ -xxxx & xxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 \\ -xxxx & xxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)		

$D_{2n}(D_n)$

n=4 $\mathbf{D}_8(\mathbf{D}_4) = \mathbf{8}_z\mathbf{2}_{x1}\mathbf{2}_1(\mathbf{4}_z\mathbf{2}_{x1}\mathbf{2}_{x2}) = \mathbf{8}_z'\mathbf{2}_{x1}\mathbf{2}_1'$

	1	e	a	ae
$[(V^2)]^2$				
	and xxxx=xxyy+yzyz+zyzy	and xxxx=xxyy+yzyz+zyzy		
$[V^2]V^2$				
	and xxxx=xxyy+2xyxy	and xxxx=xxyy+2xyxy		

$D_{2n}(D_n)$

n>4 **D_∞1'= ∞21'**

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx	and: xxxx=xxyy+xyxy+xyyx		
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)	and xyxy=½(xxxx-xxyy)		
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)		

$D_{2n}(D_n)$

n>4 **D_∞ 1'= ∞21'**

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & 0 & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

e

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & 0 & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

a

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

ae

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$C_{nv}(C_n)$

n=1 $\mathbf{C}_{1v}(\mathbf{C}_1) = \mathbf{m}_y(\mathbf{1}) = \mathbf{m}_y'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & zyxy & zyzy & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & yxyz & 0 & yxxy & yxzy & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy & xxzy & 0 & xxyx \\ 0 & 0 & 0 & yyyz & 0 & yyxy & yyzy & 0 & yyyx \\ 0 & 0 & 0 & zzyz & 0 & zzxy & zzzy & 0 & zzyx \\ yzxx & yzyy & yzzz & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & zxxy & zxzy & 0 & zxyx \\ xyxx & xyyy & xyzz & 0 & xyzx & 0 & 0 & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & zyzx & 0 & 0 & zyxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & xzxy & xzzy & 0 & xzyx \\ yxxx & yxyy & yxzz & 0 & yxzx & 0 & 0 & yxxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy & xxzy & 0 & xxyx \\ 0 & 0 & 0 & yyyz & 0 & yyxy & yyzy & 0 & yyyx \\ 0 & 0 & 0 & zzyz & 0 & zzxy & zzzy & 0 & zzyx \\ yzxx & yzyy & yzzz & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & zxxy & zxzy & 0 & zxyx \\ xyxx & xyyy & xyzz & 0 & xyzx & 0 & 0 & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & zyzx & 0 & 0 & zyxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & xzxy & xzzy & 0 & xzyx \\ yxxx & yxyy & yxzz & 0 & yxzx & 0 & 0 & yxxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & zyxy & zyzy & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & yxyz & 0 & yxxy & yxzy & 0 & yxyx \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & xzzz & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & yyxz \\ zxxx & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xxyz \\ yxxx & 0 & yzzz & 0 & 0 \\ 0 & zyyy & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xxyz \\ yxxx & 0 & yzzz & 0 & 0 \\ 0 & zyyy & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xzzz & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & yyxz \\ zxxx & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & xzzz & xxyy & 0 & xzxx & xxzz & 0 & xzyy & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & yxyz \\ zxxx & 0 & zzzz & zxyy & 0 & zzxx & zxzz & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & xxyz \\ yxxx & 0 & yzzz & yxyy & 0 & yzxx & yxzz & 0 & yzyy & 0 \\ 0 & zyyy & 0 & 0 & zyzz & 0 & 0 & zyxx & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & xxyz \\ yxxx & 0 & yzzz & yxyy & 0 & yzxx & yxzz & 0 & yzyy & 0 \\ 0 & zyyy & 0 & 0 & zyzz & 0 & 0 & zyxx & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xzzz & xxyy & 0 & xzxx & xxzz & 0 & xzyy & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & yxyz \\ zxxx & 0 & zzzz & zxyy & 0 & zzxx & zxzz & 0 & zzyy & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyxz & 0 \\ & & zzzz & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy \\ & 0 & 0 & yyyz & 0 & yyxy \\ & & 0 & zzyz & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy \\ & 0 & 0 & yyyz & 0 & yyxy \\ & & 0 & zzyz & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyxz & 0 \\ & & zzzz & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & xzxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy \\ 0 & 0 & 0 & yyyz & 0 & yyxy \\ 0 & 0 & 0 & zzyz & 0 & zzxy \\ yzxx & yzyy & yzzz & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & xzxy \\ 0 & 0 & 0 & 0 & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy \\ 0 & 0 & 0 & yyyz & 0 & yyxy \\ 0 & 0 & 0 & zzyz & 0 & zzxy \\ yzxx & yzyy & yzzz & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & xzxy \\ 0 & 0 & 0 & 0 & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & xzxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy \end{pmatrix}$

$C_{nv}(C_n)$

n=1 $C_{1v}(C_1) = m_y(1) = m_y'$

'

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ & & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & xyzy & 0 & xyyx \\ & & & & & & zyzy & 0 & zyyx \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy & xxzy & 0 & xxyx \\ & 0 & 0 & yyyz & 0 & yyxy & yyzy & 0 & yyyx \\ & & 0 & zzyz & 0 & zzxy & zzzy & 0 & zzyx \\ & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\ & & & & 0 & zxxy & zxzy & 0 & zxyx \\ & & & & & 0 & 0 & xyxz & 0 \\ & & & & & & 0 & zyxz & 0 \\ & & & & & & & 0 & xzyx \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy & xxzy & 0 & xxyx \\ & 0 & 0 & yyyz & 0 & yyxy & yyzy & 0 & yyyx \\ & & 0 & zzyz & 0 & zzxy & zzzy & 0 & zzyx \\ & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\ & & & & 0 & zxxy & zxzy & 0 & zxyx \\ & & & & & 0 & 0 & xyxz & 0 \\ & & & & & & 0 & zyxz & 0 \\ & & & & & & & 0 & xzyx \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ & & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ & & & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & xyzy & 0 & xyyx \\ & & & & & & zyzy & 0 & zyyx \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy & xxzy & 0 & xxyx \\ 0 & 0 & 0 & yyyz & 0 & yyxy & yyzy & 0 & yyyx \\ 0 & 0 & 0 & zzyz & 0 & zzxy & zzzy & 0 & zzyx \\ yzxx & yzyy & yzzz & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & xzxy & xzzy & 0 & xzyx \\ xyxx & xyyy & xyzz & 0 & xyzx & 0 & 0 & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & xxxy & xxzy & 0 & xxyx \\ 0 & 0 & 0 & yyyz & 0 & yyxy & yyzy & 0 & yyyx \\ 0 & 0 & 0 & zzyz & 0 & zzxy & zzzy & 0 & zzyx \\ yzxx & yzyy & yzzz & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & xzxy & xzzy & 0 & xzyx \\ xyxx & xyyy & xyzz & 0 & xyzx & 0 & 0 & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & xxzx & 0 & 0 & xxxz & 0 \\ yyxx & yyyy & yyzz & 0 & yyzx & 0 & 0 & yyxz & 0 \\ zzxx & zzyy & zzzz & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & yzyz & 0 & yzxy & yzzy & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & xyyz & 0 & xyxy & xyzy & 0 & xyyx \end{pmatrix}$

$\mathbf{C}_{nv}(\mathbf{C}_n)$

n=2 $\mathbf{C}_{2v}(\mathbf{C}_2) = \mathbf{2}_z\mathbf{m}_x\mathbf{m}_y(\mathbf{2}_z) = \mathbf{2}_z\mathbf{m}_x'\mathbf{m}_y'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zyzx & 0 & 0 & zyxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & xzzy & 0 & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zyzx & 0 & 0 & zyxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & xzzy & 0 & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & yxyy & 0 & 0 & yxzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & yxyy & 0 & 0 & yxzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & yyxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & yyxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$

$C_{nv}(C_n)$

n=2 $\mathbf{C}_{2v}(\mathbf{C}_2) = \mathbf{2}_z\mathbf{m}_x\mathbf{m}_y(\mathbf{2}_z) = \mathbf{2}_z\mathbf{m}_x'\mathbf{m}_y'$

1

$[(V^2)]^2$

xxxx	xxyy	xxzz	0	0	0	0	0	0
	yyyy	yyzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	zxxz	0
					xyxy	0	0	xyyx
						zyzy	0	0
							xzxz	0
								yxyx

$[V^2]V^2$

xxxx	xxyy	xxzz	0	0	0	0	0	0
yyxx	yyyy	yyzz	0	0	0	0	0	0
zzxx	zzyy	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	yzzy	0	0
0	0	0	0	zxzx	0	0	zxxz	0
0	0	0	0	0	xyxy	0	0	xyyx

e

0	0	0	0	0	xxxy	0	0	xxyx
	0	0	0	0	yyxy	0	0	yyyx
		0	0	0	zzxy	0	0	zzyx
			0	yzzx	0	0	yzxz	0
				0	0	zxzy	0	0
					0	0	0	0
						0	zyxz	0
							0	0
								0

0	0	0	0	0	xxxy	0	0	xxyx
0	0	0	0	0	yyxy	0	0	yyyx
0	0	0	0	0	zzxy	0	0	zzyx
0	0	0	yzzx	0	0	yzxz	0	0
0	0	0	0	zxzy	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	zyxz	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

a

0	0	0	0	0	xxxy	0	0	xxyx
	0	0	0	0	yyxy	0	0	yyyx
		0	0	0	zzxy	0	0	zzyx
			0	yzzx	0	0	yzxz	0
				0	0	zxzy	0	0
					0	0	0	0
						0	zyxz	0
							0	0
								0

0	0	0	0	0	xxxy	0	0	xxyx
0	0	0	0	0	yyxy	0	0	yyyx
0	0	0	0	0	zzxy	0	0	zzyx
0	0	0	0	yzzx	0	0	yzxz	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

ae

xxxx	xxyy	xxzz	0	0	0	0	0	0
	yyyy	yyzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	zxxz	0
					xyxy	0	0	xyyx
						zyzy	0	0
							xzxz	0
								yxyx

xxxx	xxyy	xxzz	0	0	0	0	0	0
yyxx	yyyy	yyzz	0	0	0	0	0	0
zzxx	zzyy	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	yzzy	0	0
0	0	0	0	zxzx	0	0	zxxz	0
0	0	0	0	0	xyxy	0	0	xyyx

$\mathbf{C}_{nv}(\mathbf{C}_n)$

n=3 $\mathbf{C}_{3v}(\mathbf{C}_3) = \mathbf{3}_z\mathbf{m}_x(\mathbf{3}_z) = \mathbf{3}_z\mathbf{m}_x'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ yyxx & xxxx & yyzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & zyxx & 0 & zxxz & zyxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ xzxx & -xzxx & 0 & 0 & yzzy & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyyx & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & xxxy & 0 & xxxz & -yyxy \\ 0 & 0 & 0 & 0 & -xxzx & yyxy & 0 & -xxxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & -xzxx & 0 & yzxz & -xzxx \\ zxxx & -zxxx & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & -xxxz & 0 & 0 & -xxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & -zxxx & 0 & -zxyz & -zxxx \\ xzxx & -xzxx & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & xxxy & 0 & xxxz & -yyxy \\ 0 & 0 & 0 & 0 & -xxzx & yyxy & 0 & -xxxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & -xzxx & 0 & yzxz & -xzxx \\ zxxx & -zxxx & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & -xxxz & 0 & 0 & -xxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & -zxxx & 0 & -zxyz & -zxxx \\ xzxx & -xzxx & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ yyxx & xxxx & yyzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & zyxx & 0 & zxxz & zyxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ xzxx & -xzxx & 0 & 0 & yzzy & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyyx & 0 & xxyz & xyxy \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx	and: xxxy-yyxy=xyyy-xyxx	and: xxxy-yyxy=xyyy-xyxx	and: xxxx=xxyy+xyxy+xyyx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yzxx \\ 0 & 3xxyy & 0 & 0 & yyzz & yzxx & 0 & xxyy & -yzxx & 0 \\ 0 & -zyxx & zzzz & 0 & 0 & zzxx & 0 & zyxx & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & xzxx & 0 & xyxx & -xzxx & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & -xzxx \\ zxxx & 0 & 0 & -zxxx & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & xzxx & 0 & xyxx & -xzxx & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & -xzxx \\ zxxx & 0 & 0 & -zxxx & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yzxx \\ 0 & 3xxyy & 0 & 0 & yyzz & yzxx & 0 & xxyy & -yzxx & 0 \\ 0 & -zyxx & zzzz & 0 & 0 & zzxx & 0 & zyxx & zzxx & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ & 0 & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ & 0 & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			and xyxy = ½(xxxx - xxyy)
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & xxxy \\ 0 & 0 & 0 & 0 & yyxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & xzyy \\ -xzyy & xzyy & 0 & yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & yyxz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & xxxy \\ 0 & 0 & 0 & 0 & yyxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & xzyy \\ -xzyy & xzyy & 0 & yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & yyxz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxyz & xyxy \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			and xyxy = ½(xxxx - xxyy)

n=3 $\mathbf{C}_{3v}(\mathbf{C}_3) = \mathbf{3}_z\mathbf{m}_x(\mathbf{3}_z) = \mathbf{3}_z\mathbf{m}_x'$

$\mathbf{C}_{nv}(\mathbf{C}_n)$

1

$[(V^2)]^2$

xxxx	xxyy	xxzz	xxyz	0	0	xxzy	0	0
	xxxx	xxzz	−xxyz	0	0	−xxzy	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	xxzy	0	yzzy	xxzy
					xyxy	0	xxyz	xyyx
						zxzx	0	0
							yzyz	xxyz
								xyxy

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

xxxx	xxyy	xxzz	xxyz	0	0	xxzy	0	0
xxyy	xxxx	xxzz	−xxyz	0	0	−xxzy	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
yzxx	−yzxx	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	yzxx	0	yzyz	yzxx
0	0	0	0	xxzy	xyxy	0	xxyz	xyxy

and xxxx=xxyy+2xyxy

e

0	0	0	0	xxzx	xxxy	0	xxxz	−xxxy
	0	0	0	−xxzx	xxxy	0	−xxxz	−xxxy
		0	0	0	zzxy	0	0	−zzxy
			0	yzzx	−xxxz	0	0	−xxxz
				0	0	0	0	0
					0	−xxzx	0	0
						0	−yzzx	−xxzx
							0	0
								0

0	0	0	0	xxzx	xxxy	0	xxxz	−yyxy
0	0	0	0	−xxzx	yyxy	0	−xxxz	−xxxy
0	0	0	0	0	zzxy	0	0	−zzxy
0	0	0	0	yzzx	−zxxx	0	−zxyz	−zxxx
zxxx	−zxxx	0	zxyz	0	0	−yzzx	0	0
xyxx	−xyxx	0	−xxxz	0	0	−xxzx	0	0

and: yyxy-xxxy=2xyxx

a

0	0	0	0	xxzx	xxxy	0	xxxz	−xxxy
	0	0	0	−xxzx	xxxy	0	−xxxz	−xxxy
		0	0	0	zzxy	0	0	−zzxy
			0	yzzx	−xxxz	0	0	−xxxz
				0	0	0	0	0
					0	−xxzx	0	0
						0	−yzzx	−xxzx
							0	0
								0

0	0	0	0	xxzx	xxxy	0	xxxz	−yyxy
0	0	0	0	−xxzx	yyxy	0	−xxxz	−xxxy
0	0	0	0	0	zzxy	0	0	−zzxy
0	0	0	0	yzzx	−zxxx	0	−zxyz	−zxxx
zxxx	−zxxx	0	zxyz	0	0	−yzzx	0	0
xyxx	−xyxx	0	−xxxz	0	0	−xxzx	0	0

and: yyxy-xxxy=2xyxx

ae

xxxx	xxyy	xxzz	xxyz	0	0	xxzy	0	0
	xxxx	xxzz	−xxyz	0	0	−xxzy	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	xxzy	0	yzzy	xxzy
					xyxy	0	xxyz	xyyx
						zxzx	0	0
							yzyz	xxyz
								xyxy

and xxxx=xxyy+yzyz+zyzy

xxxx	xxyy	xxzz	xxyz	0	0	xxzy	0	0
xxyy	xxxx	xxzz	−xxyz	0	0	−xxzy	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
yzxx	−yzxx	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	yzxx	0	yzyz	yzxx
0	0	0	0	xxzy	xyxy	0	xxyz	xyxy

and xxxx=xxyy+2xyxy

$C_{nv}(C_n)$

n=4 $\mathbf{C_{4v}(C_4)} = \mathbf{4_z m_x m_{xy}(4_z)} = \mathbf{4_z m_x' m_{xy}'}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$

$\mathbf{C}_{nv}(\mathbf{C}_n)$

n=4 $\mathbf{C}_{4v}(\mathbf{C}_4) = \mathbf{4}_z\mathbf{m}_x\mathbf{m}_{xy}(\mathbf{4}_z) = \mathbf{4}_z\mathbf{m}_x{}'\mathbf{m}_{xy}{}'$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & -yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & -yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$

$\mathbf{C}_{nv}(\mathbf{C}_n)$

n>4 $\mathbf{C}_{\infty v}(\mathbf{C}_\infty) = \infty\mathbf{m}'\mathbf{m}'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx	and: xxxy-yyxy=xyyy-xyxx	and: xxxy-yyxy=xyyy-xyxx	and: xxxx=xxyy+xyxy+xyyx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)			and xyxy=½(xxxx-xxyy)
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			and xyxy = ½(xxxx - xxyy)

$\mathbf{C}_{nv}(\mathbf{C}_n)$

n>4 $\mathbf{C}_{\infty v}(\mathbf{C}_\infty)= \infty\mathbf{m}'\mathbf{m}'$

1

$[(V^2)]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & -yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & -yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and: yyxy-xxxy=2xyxx

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and: yyxy-xxxy=2xyxx

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy

n=1 $\mathbf{C}_{2v}(\mathbf{C}_{1v}) = \mathbf{2}_z\mathbf{m}_x\mathbf{m}_y(\mathbf{m}_y) = \mathbf{2}_z'\mathbf{m}_x'\mathbf{m}_y$

$\mathbf{C}_{2nv}(\mathbf{C}_{nv})$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zyzx & 0 & 0 & zyxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & xzzy & 0 & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & yyzx & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & xyyz & 0 & 0 & xyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zyxy & 0 & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yxyz & 0 & 0 & yxzy & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & 0 & xyzx & 0 & 0 & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzxy & 0 & 0 & xzyx \\ 0 & 0 & 0 & 0 & yxzx & 0 & 0 & yxxz & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 \\ 0 & 0 & 0 & 0 & yyxz \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & yzzz & 0 & 0 \\ 0 & zyyy & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & yxyy & 0 & 0 & yxzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 & xzxx & 0 & 0 & xzyy & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & yxyz \\ zxxx & 0 & 0 & zxyy & 0 & 0 & zxzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & yzzz & 0 & 0 & yzxx & 0 & 0 & yzyy & 0 \\ 0 & zyyy & 0 & 0 & zyzz & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & yyxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxxz & 0 \\ & 0 & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & zzxz & 0 \\ & & & 0 & 0 & yzxy \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ & 0 & 0 & yyyz & 0 & 0 \\ & & 0 & zzyz & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & xyyz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzxy \\ 0 & 0 & 0 & 0 & xyxz & 0 \end{pmatrix}$

$\mathbf{C}_{2nv}(\mathbf{C}_{nv})$

n=1 $\mathbf{C}_{2v}(\mathbf{C}_{1v}) = \mathbf{2}_z\mathbf{m}_x\mathbf{m}_y(\mathbf{m}_y) = \mathbf{2}_z{}'\mathbf{m}_x{}'\mathbf{m}_y$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\ & & & & 0 & 0 & zxzy & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & zyxz & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ & 0 & 0 & 0 & yyzx & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & zzzx & 0 & 0 & zzxz & 0 \\ & & & 0 & 0 & yzxy & 0 & 0 & yzyx \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & xyzy & 0 & 0 \\ & & & & & & 0 & 0 & zyyx \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\ & & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & zxxy & 0 & 0 & zxyx \\ & & & & & 0 & 0 & xyxz & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & xzyx \\ & & & & & & & & 0 \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & yyzx & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & xyyz & 0 & 0 & xyzy & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & 0 & xyzx & 0 & 0 & xyxz & 0 \end{pmatrix}$

$C_{2nv}(C_{nv})$

n=2 $\mathbf{C_{4v}(C_{2v}) = 4_z m_x m_{xy}(2_z m_x m_y) = 4_z' m_x m_{xy}'}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ -xxyy & -xxxx & -xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & -zzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & -yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & -zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & -xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & -zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & -yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & -xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzy & 0 & 0 & zxyz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 & yzzx & 0 & 0 \\ xyyy & xyxx & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & -xxxx & 0 & -yyzz & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & -yyzz & 0 & 0 & 0 \\ 0 & -xxxx & 0 & 0 & yyzz & 0 & 0 & -xxyy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zzxx & 0 & 0 & -zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & yxyy & 0 & 0 \\ xyyy & 0 & 0 & yxyy & 0 & 0 & xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & 0 \\ & -xxxx & -xxzz & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & -yzyz & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ -xxyy & -xxxx & -xxzz & 0 & 0 & 0 \\ zzxx & -zzxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 \end{pmatrix}$

$\mathbf{C}_{2nv}(\mathbf{C}_{nv})$

n=2 $\mathbf{C}_{4v}(\mathbf{C}_{2v}) = \mathbf{4}_z\mathbf{m}_x\mathbf{m}_{xy}(\mathbf{2}_z\mathbf{m}_x\mathbf{m}_y) = \mathbf{4}_z'\mathbf{m}_x\mathbf{m}_{xy}'$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & -yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & -xxxx & -xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & -yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & -zxzx & 0 & 0 \\ & & & & & & & -yzyz & 0 \\ & & & & & & & & -xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & yyxy \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\ & & & & 0 & 0 & zxzy & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ -xxyy & -xxxx & -xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & -zzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & -zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & -yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & -xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & yzzx & 0 & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$\mathbf{C_{2nv}(C_{nv})}$

n=3 $\mathbf{C_{6v}(C_{3v})} = \mathbf{6_z m_x m_1 (3_z m_x)} = \mathbf{6_z' m_x m_1'}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -xxzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zyxx & 0 & 0 & zyxx \\ 0 & 0 & 0 & 0 & xxzy & 0 & 0 & xxyz & 0 \\ zyxx & -zyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ xzxx & -xzxx & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & xxzy & 0 & 0 & xxyz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & -xxzx & 0 & 0 & -xxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xzxx & 0 & 0 & -xzxx \\ zxxx & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -zxxx & 0 & 0 & -zxxx \\ zxxx & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx	and: xxxy-yyxy=xyyy-xyxx		
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & 0 & 0 & 0 \\ 0 & -xxyz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yyxx \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & 0 & yzxx & 0 & 0 & -yzxx & 0 \\ 0 & -zyxx & 0 & 0 & 0 & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xzxx & 0 & 0 & -xzxx & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -xzxx \\ zxxx & 0 & 0 & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ & 0 & 0 & -xxyz & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & xxyz \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ & 0 & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ 0 & 0 & 0 & -xxyz & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & xxyz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ 0 & 0 & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzyy \\ -xzyy & xzyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yyxz & 0 & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)	and xyxy = ½(xxxx - xxyy)		

n=3 $\mathbf{C}_{6v}(\mathbf{C}_{3v}) = \mathbf{6}_z\mathbf{m}_x\mathbf{m}_1(\mathbf{3}_z\mathbf{m}_x) = \mathbf{6}_z'\mathbf{m}_x\mathbf{m}_1'$

$\mathbf{C}_{2nv}(\mathbf{C}_{nv})$

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e

a

ae

$$[(V^2)]^2 \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & -yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & 0 & 0 & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & xxzy & 0 & 0 & xxzy \\ & & & & & 0 & 0 & xxyz & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & xxyz \\ & & & & & & & & 0 \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ & 0 & 0 & 0 & -xxzx & 0 & 0 & -xxxz & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & -xxxz & 0 & 0 & -xxxz \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & -xxzx & 0 & 0 \\ & & & & & & 0 & 0 & -xxzx \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$[V^2]V^2 \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & xxzy & 0 & 0 & xxyz & 0 \end{pmatrix} \quad \begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & -xxzx & 0 & 0 & -xxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -zxxx \\ zxxx & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$$

and xxxx=xxyy+2xyxy

and yyxy-xxxy=2xyxx

$C_{2nv}(C_{nv})$

n=4 $C_{8v}(C_{4v}) = 8_z m_{x1} m_1 (4_z m_x m_{xy}) = 8_z' m_{x1} m_1'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xxxx & xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and xxxy-yyxy=xyyy-xyxx	and: xxxy-yyxy=xyyy-xyxx		
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ -xyyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yyxx \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & -xxxx & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 \\ -xyyy & 0 & 0 & xyyy & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 \\ & xxxx & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & -xxxx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy \\ & 0 & 0 & 0 & 0 & xyyy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 \\ -xxxx & xxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			

$C_{2nv}(C_{nv})$

n=4 $\mathbf{C}_{8v}(\mathbf{C}_{4v}) = \mathbf{8}_z\mathbf{m}_{x1}\mathbf{m}_1(\mathbf{4}_z\mathbf{m}_x\mathbf{m}_{xy}) = \mathbf{8}_z'\mathbf{m}_{x1}\mathbf{m}_1'$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & -yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & -xxxx & 0 & 0 & -xxxx \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & -xxxx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$
	and xxxx=xxyy+yzyz+zyzy			
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xxxx & xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and xxxx=xxyy+2xyxy	and yyxy-xxxy=2xyxx		

$C_{2nv}(C_{nv})$

n>4 $C_{\infty v}1' = \infty mm1'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx	and: xxxy-yyxy=xyyy-xyxx		
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)			
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

and xyxy = ½(xxxx - xxyy)

$\mathbf{C}_{2nv}(\mathbf{C}_{nv})$

n>4 $\mathbf{C}_{\infty v}\mathbf{1}' = \infty\mathbf{mm1}'$

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & -yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$D_{nd}(S_{2n})$

n=1 $\mathbf{D}_{1d}(\mathbf{S}_2) = \mathbf{2}_y/\mathbf{m}_y(\bar{\mathbf{1}}) = \mathbf{2}_y'/\mathbf{m}_{y'}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xxxy&0&0&xxyx \\ 0&0&0&0&yyxy&0&0&yyyx \\ 0&0&0&0&zzxy&0&0&zzyx \\ 0&0&0&yzzx&0&0&yzxz&0 \\ 0&0&0&zxyz&0&0&zxzy&0&0 \\ xyxx&xyyy&xyzz&0&0&0&0&0&0 \\ 0&0&0&0&zyzx&0&0&zyxz&0 \\ 0&0&0&xzyz&0&0&xzzy&0&0 \\ yxxx&yxyy&yxzz&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx&0&0&yyzz&0 \\ 0&yyyy&0&zzxx&0 \\ 0&0&zzzz&xxyy&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&xyyy&0&0&0 \\ yxxx&0&0&0&0 \\ 0&0&0&0&zzxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx&0&0&xxyy&0&0&xxzz&0&0&0 \\ 0&yyyy&0&0&yyzz&0&0&yyxx&0&0 \\ 0&0&zzzz&0&0&zzxx&0&0&zzyy&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&xyyy&0&0&xyzz&0&0&xyxx&0&0 \\ yxxx&0&0&yxyy&0&0&yxzz&0&0&0 \\ 0&0&0&0&0&0&0&0&0&zxyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx&xxyy&xxzz&0&0&0 \\ &yyyy&yyzz&0&0&0 \\ &&zzzz&0&0&0 \\ &&&yzyz&0&0 \\ &&&&xzxz&0 \\ &&&&&xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&xxxy \\ &0&0&0&0&yyxy \\ &&0&0&0&zzxy \\ &&&0&yzxz&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx&xxyy&xxzz&0&0&0 \\ yyxx&yyyy&yyzz&0&0&0 \\ zzxx&zzyy&zzzz&0&0&0 \\ 0&0&0&yzyz&0&0 \\ 0&0&0&0&xzxz&0 \\ 0&0&0&0&0&xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&xxxy \\ 0&0&0&0&0&yyxy \\ 0&0&0&0&0&zzxy \\ 0&0&0&0&yzxz&0 \\ 0&0&0&xzyz&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$

$D_{nd}(S_{2n})$

n=1 $\mathbf{D}_{1d}(\mathbf{S}_2) = \mathbf{2}_y/\mathbf{m}_y(\bar{\mathbf{1}}) = \mathbf{2}_y'/\mathbf{m}_y'$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\ & & & & 0 & 0 & zxzy & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & zyxz & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

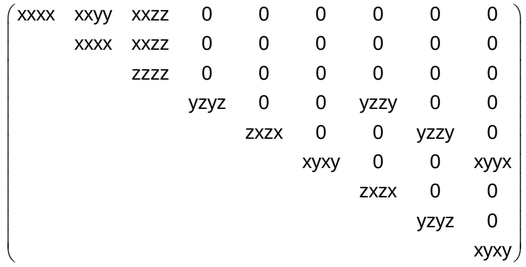
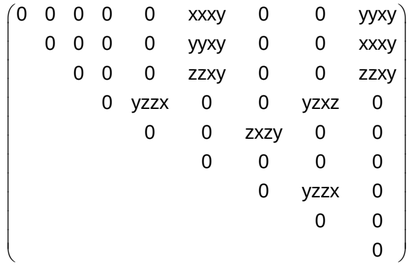
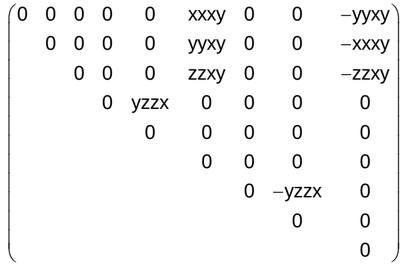
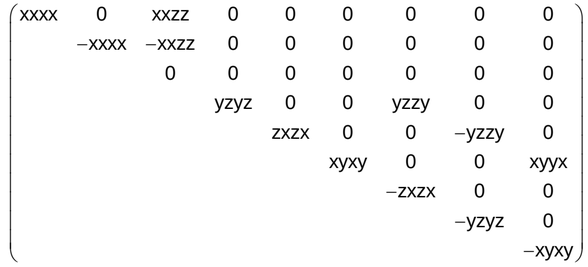
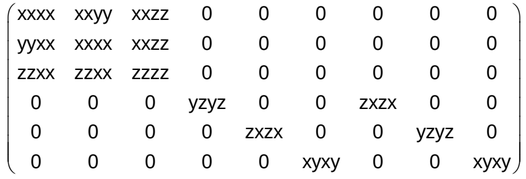
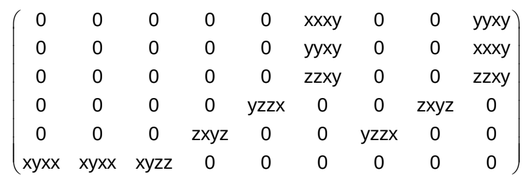
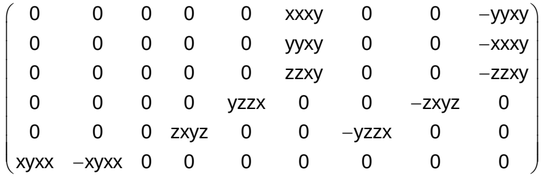
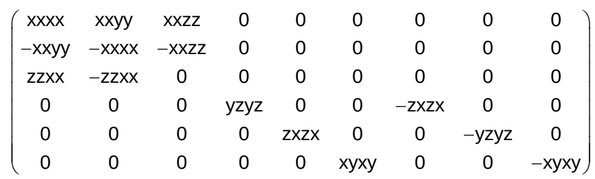
$\mathbf{D}_{nd}(\mathbf{S}_{2n})$

n=2 $\mathbf{D}_{2d}(\mathbf{S}_4) = \bar{\mathbf{4}}_z\,\mathbf{m}_x\mathbf{2}_{xy}(\bar{\mathbf{4}}_z) = \bar{\mathbf{4}}_z\,\mathbf{m}_x{'}\mathbf{2}_{xy}{'}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzy & 0 & 0 & zxyz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 & yzzx & 0 & 0 \\ xyyy & xyxx & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ -xxyy & -xxxx & -xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & -zzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & -yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & -zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & -xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & -zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & -yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & -xyxy \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & -xxxx & 0 & -yyzz & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & yxyy & 0 & 0 \\ xyyy & 0 & 0 & yxyy & 0 & 0 & xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & -yyzz & 0 & 0 & 0 \\ 0 & -xxxx & 0 & 0 & yyzz & 0 & 0 & -xxyy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zzxx & 0 & 0 & -zzxx & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & 0 \\ & -xxxx & -xxzz & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & -yzyz & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ -xxyy & -xxxx & -xxzz & 0 & 0 & 0 \\ zzxx & -zzxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{nd}(\mathbf{S}_{2n})$

n=2 $\mathbf{D}_{2d}(\mathbf{S}_4) = \bar{\mathbf{4}}_z\,\mathbf{m}_x\mathbf{2}_{xy}(\bar{\mathbf{4}}_z) = \bar{\mathbf{4}}_z\,\mathbf{m}_x{}'\mathbf{2}_{xy}{}'$

	1	e	a	ae
$[(V^2)]^2$				
$[V^2]V^2$				

$\mathbf{D}_{nd}(\mathbf{S}_{2n})$

n=3 $\mathbf{D}_{3d}(\mathbf{S}_6) = \bar{\mathbf{3}}_z\,\mathbf{m}_x(\bar{\mathbf{3}}_z) = \bar{\mathbf{3}}_z\,\mathbf{m}_{x'}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ yyxx & xxxx & yyzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & zyxx & 0 & zxxz & zyxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ xzxx & -xzxx & 0 & 0 & yzzy & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyyx & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & xxxy & 0 & xxxz & -yyxy \\ 0 & 0 & 0 & 0 & -xxzx & yyxy & 0 & -xxxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & -xzxx & 0 & yzxz & -xzxx \\ zxxx & -zxxx & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & -xxxz & 0 & 0 & -xxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & -zxxx & 0 & -zxyz & -zxxx \\ xzxx & -xzxx & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx		and: xxxy-yyxy=xyyy-xyxx	
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yzxx \\ 0 & 3xxyy & 0 & 0 & yyzz & yzxx & 0 & xxyy & -yzxx & 0 \\ 0 & -zyxx & zzzz & 0 & 0 & zzxx & 0 & zyxx & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & xzxx & 0 & xyxx & -xzxx & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & -xzxx \\ zxxx & 0 & 0 & -zxxx & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ & 0 & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & xxxy \\ 0 & 0 & 0 & 0 & yyxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & xzyy \\ -xzyy & xzyy & 0 & yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & yyxz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			

$\mathbf{D}_{nd}(\mathbf{S}_{2n})$

n=3 $\mathbf{D}_{3d}(\mathbf{S}_6) = \bar{\mathbf{3}}_z\,\mathbf{m}_x(\bar{\mathbf{3}}_z) = \bar{\mathbf{3}}_z\,\mathbf{m}_x$

1

$[(V^2)]^2$

xxxx	xxyy	xxzz	xxyz	0	0	xxzy	0	0
	xxxx	xxzz	−xxyz	0	0	−xxzy	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	xxzy	0	yzzy	xxzy
					xyxy	0	xxyz	xyyx
						zxzx	0	0
							yzyz	xxyz
								xyxy

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

xxxx	xxyy	xxzz	xxyz	0	0	xxzy	0	0
xxyy	xxxx	xxzz	−xxyz	0	0	−xxzy	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
yzxx	−yzxx	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	yzxx	0	yzyz	yzxx
0	0	0	0	xxzy	xyxy	0	xxyz	xyxy

and xxxx=xxyy+2xyxy

e

0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
			0	0	0	0	0	0
				0	0	0	0	0
					0	0	0	0
						0	0	0
							0	0
								0

a

0	0	0	0	xxzx	xxxy	0	xxxz	−xxxy
	0	0	0	−xxzx	xxxy	0	−xxxz	−xxxy
		0	0	0	zzxy	0	0	−zzxy
			0	yzzx	−xxxz	0	0	−xxxz
				0	0	0	0	0
					0	−xxzx	0	0
						0	−yzzx	−xxzx
							0	0
								0

ae

0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
			0	0	0	0	0	0
				0	0	0	0	0
					0	0	0	0
						0	0	0
							0	0
								0

0	0	0	0	xxzx	xxxy	0	xxxz	−yyxy
0	0	0	0	−xxzx	yyxy	0	−xxxz	−xxxy
0	0	0	0	0	zzxy	0	0	−zzxy
0	0	0	0	yzzx	−zxxx	0	−zxyz	−zxxx
zxxx	−zxxx	0	zxyz	0	0	−yzzx	0	0
xyxx	−xyxx	0	−xxxz	0	0	−xxzx	0	0

and: yyxy-xxxy=2xyxx

0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

$\mathbf{D}_{nd}(\mathbf{S}_{2n})$

n=4 $\mathbf{D}_{4d}(\mathbf{S}_8) = \bar{\mathbf{8}}_z\,\mathbf{m}_{x1}\mathbf{2}_1(\bar{\mathbf{8}}_z) = \bar{\mathbf{8}}_z\,\mathbf{m}_{x1}{}'\mathbf{2}_1{}'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$ and: xxxy-yyxy=xyyy-xyxx	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xxxx & xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ -xyyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxx & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yyxx \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 \\ -xyyy & 0 & 0 & xyyy & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & -xxxx & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy \\ & 0 & 0 & 0 & 0 & xyyy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$ and xyxy = ½(xxxx - xxyy)	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 \\ & xxxx & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & -xxxx \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & 0 \end{pmatrix}$ and xyxy = ½(xxxx - xxyy)	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 \\ -xxxx & xxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx \end{pmatrix}$

$D_{nd}(S_{2n})$

n=4 $\mathbf{D}_{4d}(\mathbf{S}_8) = \bar{\mathbf{8}}_z\,\mathbf{m}_{x1}\mathbf{2}_1(\bar{\mathbf{8}}_z) = \bar{\mathbf{8}}_z\,\mathbf{m}_{x1}{}'\mathbf{2}_1{}'$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & -yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & -xxxx & 0 & 0 & -xxxx \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & -xxxx \end{pmatrix}$
	and xxxx=xxyy+yzyz+zyzy			
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xxxx & xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \end{pmatrix}$
	and xxxx=xxyy+2xyxy		and yyxy-xxxy=2xyxx	

n>4 $\mathbf{D}_{\infty h}(\mathbf{C}_{\infty h})$ = ∞/**mm'm'**

$\mathbf{D}_{nd}(\mathbf{S}_{2n})$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx		and: xxxy-yyxy=xyyy-xyxx	
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)			
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)			

n>4 $\mathbf{D}_{\infty h}(\mathbf{C}_{\infty h}) = \infty/\mathbf{mm'm'}$

$\mathbf{D}_{nd}(\mathbf{S}_{2n})$

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & -yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and: yyxy-xxxy=2xyxx

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$\mathbf{D}_{nd}(\mathbf{D}_n)$

n=1 $\mathbf{D}_{1d}(\mathbf{D}_1) = \mathbf{2}_y/\mathbf{m}_y(\mathbf{2}_y) = \mathbf{2}_y/\mathbf{m}_y'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$

$D_{nd}(D_n)$

n=1 $\mathbf{D}_{1d}(\mathbf{D}_1) = \mathbf{2}_y/\mathbf{m}_y(\mathbf{2}_y) = \mathbf{2}_y/\mathbf{m}_y'$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$

$D_{nd}(D_n)$

n=2 $D_{2d}(D_2) = \bar{4}_z\, m_x 2_{xy}(2_{xy} 2_{\bar{x}\bar{y}} 2_z) = \bar{4}_z\, 'm_x' 2_{xy}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzy & 0 & 0 & zxyz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 & yzzx & 0 & 0 \\ xyyy & xyxx & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzy & 0 & 0 & zxyz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 & yzzx & 0 & 0 \\ xyyy & xyxx & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} 0 & yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & yxyy & 0 & 0 \\ xyyy & 0 & 0 & yxyy & 0 & 0 & xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & yxyy & 0 & 0 \\ xyyy & 0 & 0 & yxyy & 0 & 0 & xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$

$D_{nd}(D_n)$

n=2 $\mathbf{D}_{2d}(\mathbf{D}_2) = \bar{\mathbf{4}}_z\,\mathbf{m}_x\mathbf{2}_{xy}(\mathbf{2}_{xy}\mathbf{2}_{\bar{x}y}\mathbf{2}_z) = \bar{\mathbf{4}}_z\,'\mathbf{m}_x\,'\mathbf{2}_{xy}$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & yyxy \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\ & & & & 0 & 0 & zxzy & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & yyxy \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\ & & & & 0 & 0 & zxzy & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & yzzx & 0 & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & yzzx & 0 & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$

$D_{nd}(D_n)$

n=3 $D_{3d}(D_3) = \bar{3}_z m_x(3_z 2_x) = \bar{3}_z$ 'm_x'

1	e	a	ae
V^4			
$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ yyxx & xxxx & yyzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & zyxx & 0 & zxxz & zyxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ xzxx & -xzxx & 0 & 0 & yzzy & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyyx & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ yyxx & xxxx & yyzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & zyxx & 0 & zxxz & zyxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ xzxx & -xzxx & 0 & 0 & yzzy & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyyx & 0 & xxyz & xyxy \end{pmatrix}$
and: xxxx=xxyy+xyxy+xyyx			and: xxxx=xxyy+xyxy+xyyx
$[V^4]$			
$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$			
$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yzxx \\ 0 & 3xxyy & 0 & 0 & yyzz & yzxx & 0 & xxyy & -yzxx & 0 \\ 0 & -zyxx & zzzz & 0 & 0 & zzxx & 0 & zyxx & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yzxx \\ 0 & 3xxyy & 0 & 0 & yyzz & yzxx & 0 & xxyy & -yzxx & 0 \\ 0 & -zyxx & zzzz & 0 & 0 & zzxx & 0 & zyxx & zzxx & 0 \end{pmatrix}$
$[[V^2]^2]$			
$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$
and xyxy = ½(xxxx - xxyy)			and xyxy = ½(xxxx - xxyy)
$[V^2]^2$			
$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxyz & xyxy \end{pmatrix}$
and xyxy = ½(xxxx - xxyy)			and xyxy = ½(xxxx - xxyy)

$D_{nd}(D_n)$

n=3 $\mathbf{D}_{3d}(\mathbf{D}_3) = \bar{\mathbf{3}}_z\,\mathbf{m}_x(\mathbf{3}_z\mathbf{2}_x) = \bar{\mathbf{3}}_z\,'\mathbf{m}_x'$

1

$[(V^2)]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & xxzy & 0 & yzzy & xxzy \\ & & & & & xyxy & 0 & xxyz & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & xxyz \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & xxzy & 0 & yzzy & xxzy \\ & & & & & xyxy & 0 & xxyz & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & xxyz \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy

$\mathbf{D}_{nd}(\mathbf{D}_n)$

n=4 $\mathbf{D}_{4d}(\mathbf{D}_4) = \bar{\mathbf{8}}_z\,\mathbf{m}_{x1}\mathbf{2}_1(\mathbf{4}_z\mathbf{2}_x\mathbf{2}_{xy}) = \bar{\mathbf{8}}_z\,'\mathbf{m}_{x1}\,'\mathbf{2}_1$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$ and xxxy-yyxy=xyyy-xyxx	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$ and xxxy-yyxy=xyyy-xyxx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ -xyyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ -xyyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yyxx \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 \\ -xyyy & 0 & 0 & xyyy & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 \\ -xyyy & 0 & 0 & xyyy & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yyxx \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$ and xyxy = ½(xxxx - xxyy)	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy \\ & 0 & 0 & 0 & 0 & xyyy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy \\ & 0 & 0 & 0 & 0 & xyyy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$ and xyxy = ½(xxxx - xxyy)
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$ and xyxy = ½(xxxx - xxyy)	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$ and xyxy = ½(xxxx - xxyy)

$\mathbf{D}_{nd}(\mathbf{D}_n)$

n=4 $\mathbf{D}_{4d}(\mathbf{D}_4) = \bar{\mathbf{8}}_z\,\mathbf{m}_{x1}\mathbf{2}_1(\mathbf{4}_z\mathbf{2}_x\mathbf{2}_{xy}) = \bar{\mathbf{8}}_z\,'\mathbf{m}_{x1}\,'\mathbf{2}_1$

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & 0 & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
0 & 0 & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
0 & 0 & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

ae

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & 0 & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy

$\mathbf{D}_{nd}(\mathbf{D}_n)$

n>4 $\mathbf{D}_{\infty h}(\mathbf{D}_\infty) = \infty/m'm'm'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx			and: xxxx=xxyy+xyxy+xyyx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)			and xyxy=½(xxxx-xxyy)
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)			and xyxy=½(xxxx-xxyy)

$D_{nd}(D_n)$

n>4 $D_{\infty h}(D_\infty) = \infty/m'm'm'$

1

$[(V^2)]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy

$D_{nd}(C_{nv})$

n=1 $D_{1d}(C_{1v}) = 2_y/m_y(m_y) = 2_y'/m_y$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zyzx & 0 & 0 & zyxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & xzzy & 0 & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & yxyy & 0 & 0 & yxzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & yyxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$D_{nd}(C_{nv})$

n=1 **$D_{1d}(C_{1v})$** = **$2_y/m_y(m_y)$** = **$2_y'/m_y$**

1

$[(V^2)]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$$

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\ & & & & 0 & 0 & zxzy & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & zyxz & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$\mathbf{D}_{nd}(\mathbf{C}_{nv})$

n=2 $\mathbf{D}_{2d}(\mathbf{C}_{2v}) = \bar{\mathbf{4}}_z\,\mathbf{m}_x\mathbf{2}_{xy}(\mathbf{2}_z\mathbf{m}_x\mathbf{m}_y) = \bar{\mathbf{4}}_z\,'\mathbf{m}_x\mathbf{2}_{xy}'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzy & 0 & 0 & zxyz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 & yzzx & 0 & 0 \\ xyyy & xyxx & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ -xxyy & -xxxx & -xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & -zzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & -yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & -zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & -xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & -zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & -yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & -xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & -xxxx & 0 & -yyzz & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & yxyy & 0 & 0 \\ xyyy & 0 & 0 & yxyy & 0 & 0 & xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & -yyzz & 0 & 0 & 0 \\ 0 & -xxxx & 0 & 0 & yyzz & 0 & 0 & -xxyy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zzxx & 0 & 0 & -zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & 0 \\ & -xxxx & -xxzz & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & -yzyz & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ -xxyy & -xxxx & -xxzz & 0 & 0 & 0 \\ zzxx & -zzxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 \end{pmatrix}$

$D_{nd}(C_{nv})$

n=2 $D_{2d}(C_{2v}) = \bar{4}_z\, m_x 2_{xy}(2_z m_x m_y) = \bar{4}_z\, 'm_x 2_{xy}'$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & yyxy \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\ & & & & 0 & 0 & zxzy & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & -xxxx & -xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & -yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & -zxzx & 0 & 0 \\ & & & & & & & -yzyz & 0 \\ & & & & & & & & -xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & -yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & yzzx & 0 & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ -xxyy & -xxxx & -xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & -zzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & -zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & -yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & -xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$D_{nd}(C_{nv})$

n=3 $D_{3d}(C_{3v}) = \bar{3}_z\, m_x(3_z m_x) = \bar{3}_z \text{'} m_x$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ yyxx & xxxx & yyzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & zyxx & 0 & zxxz & zyxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyyx \\ zyxx & -zyxx & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ xzxx & -xzxx & 0 & 0 & yzzy & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyyx & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & xxxy & 0 & xxxz & -yyxy \\ 0 & 0 & 0 & 0 & -xxzx & yyxy & 0 & -xxxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & -xzxx & 0 & yzxz & -xzxx \\ zxxx & -zxxx & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & -xxxz & 0 & 0 & -xxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & -zxxx & 0 & -zxyz & -zxxx \\ xzxx & -xzxx & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx			and: xxxy-yyxy=xyyy-xyxx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & xxyz \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & -xxyz & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yzxx \\ 0 & 3xxyy & 0 & 0 & yyzz & yzxx & 0 & xxyy & -yzxx & 0 \\ 0 & -zyxx & zzzz & 0 & 0 & zzxx & 0 & zyxx & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & xzxx & 0 & xyxx & -xzxx & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & -xzxx \\ zxxx & 0 & 0 & -zxxx & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & xxyz \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ & 0 & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxyz & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & xxxy \\ 0 & 0 & 0 & 0 & yyxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & xzyy \\ -xzyy & xzyy & 0 & yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & yyxz & 0 & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			

$D_{nd}(C_{nv})$

n=3 $D_{3d}(C_{3v}) = \bar{3}_z m_x(3_z m_x) = \bar{3}_z{}' m_x$

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & xxxx & xxzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & xxzy & 0 & yzzy & xxzy \\ & & & & & xyxy & 0 & xxyz & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & xxyz \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & xxyz & 0 & 0 & xxzy & 0 & 0 \\ xxyy & xxxx & xxzz & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & yzxx & 0 & yzyz & yzxx \\ 0 & 0 & 0 & 0 & xxzy & xyxy & 0 & xxyz & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & xxxy & 0 & xxxz & -xxxy \\ & 0 & 0 & 0 & -xxzx & xxxy & 0 & -xxxz & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & -xxxz & 0 & 0 & -xxxz \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & -xxzx & 0 & 0 \\ & & & & & & 0 & -yzzx & -xxzx \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & xxxy & 0 & xxxz & -yyxy \\ 0 & 0 & 0 & 0 & -xxzx & yyxy & 0 & -xxxz & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & -zxxx & 0 & -zxyz & -zxxx \\ zxxx & -zxxx & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$$

and: yyxy-xxxy=2xyxx

$D_{nd}(C_{nv})$

n=4 $D_{4d}(C_{4v}) = \bar{8}_z\, m_{x1} 2_1 (4_z m_{x1} m_{x3}) = \bar{8}_z\, 'm_{x1} 2$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xxxx & xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and xxxy-yyxy=xyyy-xyxx			and: xxxy-yyxy=xyyy-xyxx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ -xyyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yyxx \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 \\ -xyyy & 0 & 0 & xyyy & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & -xxxx & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy \\ & 0 & 0 & 0 & 0 & xyyy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 \\ & xxxx & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & -xxxx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 \\ -xxxx & xxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			

$D_{nd}(C_{nv})$

n=4 $\mathbf{D_{4d}(C_{4v})} = \bar{\mathbf{8}}_z\,\mathbf{m}_{x1}\mathbf{2}_1(\mathbf{4}_z\mathbf{m}_{x1}\mathbf{m}_{x3}) = \bar{\mathbf{8}}_z\,'\mathbf{m}_{x1}\mathbf{2}_1'$

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & 0 & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & -xxxx & 0 & 0 & -xxxx \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & -xxxx
\end{pmatrix}$$

ae

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & 0 & yzzx & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & -yzzx & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\
0 & 0 & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & -xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-xxxx & xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\
0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

and xxxx=xxyy+2xyxy

and yyxy-xxxy=2xyxx

$D_{nd}(C_{nv})$

n>4 $\mathbf{D_{\infty h}(C_{\infty v})}$ = **∞/m'mm**

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx			and: xxxy-yyxy=xyyy-xyxx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)			
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & 0 \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)			

$D_{nd}(C_{nv})$

n>4 $\mathbf{D_{\infty h}(C_{\infty v})}$ = **∞/m'mm**

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & 0 & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

ae

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & 0 & yzzx & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & -yzzx & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\
0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

and: yyxy-xxxy=2xyxx

$D_{nh}(C_{nh})$

n=1 $\mathbf{D_{1h}(C_{1h})} = \mathbf{2_x m_y m_z(m_z)} = \mathbf{2_x' m_y' m_z}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & 0 & xyzx & 0 & 0 & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzxy & 0 & 0 & xzyx \\ 0 & 0 & 0 & 0 & yxzx & 0 & 0 & yxxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zyzx & 0 & 0 & zyxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & xzzy & 0 & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & yyzx & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & xyyz & 0 & 0 & xyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zyxy & 0 & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yxyz & 0 & 0 & yxzy & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & yzzz & 0 & 0 \\ 0 & zyyy & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 \\ 0 & 0 & 0 & 0 & yyxz \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & yzzz & 0 & 0 & yzxx & 0 & 0 & yzyy & 0 \\ 0 & zyyy & 0 & 0 & zyzz & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & yxyy & 0 & 0 & yxzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 & xzxx & 0 & 0 & xzyy & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & yxyz \\ zxxx & 0 & 0 & zxyy & 0 & 0 & zxzz & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ & 0 & 0 & yyyz & 0 & 0 \\ & & 0 & zzyz & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & yyxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxxz & 0 \\ & 0 & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & zzxz & 0 \\ & & & 0 & 0 & yzxy \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzxy \\ 0 & 0 & 0 & 0 & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & xyyz & 0 & 0 \end{pmatrix}$

$D_{nh}(C_{nh})$

n=1 $\mathbf{D}_{1h}(\mathbf{C}_{1h}) = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{m}_z) = \mathbf{2}_x'\mathbf{m}_y'\mathbf{m}_z$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\ & & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & zxxy & 0 & 0 & zxyx \\ & & & & & 0 & 0 & xyxz & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & xzyx \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\ & & & & 0 & 0 & zxzy & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & zyxz & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ & 0 & 0 & 0 & yyzx & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & zzzx & 0 & 0 & zzxz & 0 \\ & & & 0 & 0 & yzxy & 0 & 0 & yzyx \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & xyzy & 0 & 0 \\ & & & & & & 0 & 0 & zyyx \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & 0 & xyzx & 0 & 0 & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & yyzx & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & xyyz & 0 & 0 & xyzy & 0 & 0 \end{pmatrix}$

n=2 $\mathbf{D}_{2h}(\mathbf{C}_{2h}) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_z/\mathbf{m}_z) = \mathbf{m}_x'\mathbf{m}_y'\mathbf{m}_z$

$\mathbf{D}_{nh}(\mathbf{C}_{nh})$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zyzx & 0 & 0 & zyxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & xzzy & 0 & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & yxyy & 0 & 0 & yxzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & yyxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

n=2 $\mathbf{D}_{2h}(\mathbf{C}_{2h}) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_z/\mathbf{m}_z) = \mathbf{m}_{x'}\mathbf{m}_{y'}\mathbf{m}_z$

$\mathbf{D}_{nh}(\mathbf{C}_{nh})$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\ & & & & 0 & 0 & zxzy & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & zyxz & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$D_{nh}(C_{nh})$

n=3 $\mathbf{D}_{3h}(\mathbf{C}_{3h}) = \bar{\mathbf{6}}_z\,\mathbf{m}_x\mathbf{2}_1(\bar{\mathbf{6}}_z) = \bar{\mathbf{6}}_z\,\mathbf{m}_x{}'\mathbf{2}_1{}'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & -xxzx & 0 & 0 & -xxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xzxx & 0 & 0 & -xzxx \\ zxxx & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -zxxx & 0 & 0 & -zxxx \\ xzxx & -xzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -xxzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zyxx & 0 & 0 & zyxx \\ 0 & 0 & 0 & 0 & xxzy & 0 & 0 & xxyz & 0 \\ zyxx & -zyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ xzxx & -xzxx & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & xxzy & 0 & 0 & xxyz & 0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx		and: xxxy-yyxy=xyyy-xyxx	
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & 0 & 0 & 0 \\ 0 & -xxyz & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yyxx \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$ $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xzxx & 0 & 0 & -xzxx & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -xzxx \\ zxxx & 0 & 0 & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$		$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & 0 & yzxx & 0 & 0 & -yzxx & 0 \\ 0 & -zyxx & 0 & 0 & 0 & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ & 0 & 0 & -xxyz & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & xxyz \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ & 0 & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ 0 & 0 & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzyy \\ -xzyy & xzyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yyxz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ 0 & 0 & 0 & -xxyz & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & xxyz & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)		and xyxy = ½(xxxx - xxyy)	

$\mathbf{D}_{nh}(\mathbf{C}_{nh})$

n=3 $\mathbf{D}_{3h}(\mathbf{C}_{3h}) = \bar{\mathbf{6}}_z\,\mathbf{m}_x\mathbf{2}_1(\bar{\mathbf{6}}_z) = \bar{\mathbf{6}}_z\,\mathbf{m}_x{}'\mathbf{2}_1{}'$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ & 0 & 0 & 0 & -xxzx & 0 & 0 & -xxxz & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & -xxxz & 0 & 0 & -xxxz \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & -xxzx & 0 & 0 \\ & & & & & & 0 & 0 & -xxzx \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & -yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & 0 & 0 & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & xxzy & 0 & 0 & xxzy \\ & & & & & 0 & 0 & xxyz & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & xxyz \\ & & & & & & & & 0 \end{pmatrix}$
	and xxxx=xxyy+yzyz+zyzy			
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & -xxzx & 0 & 0 & -xxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -zxxx \\ zxxx & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & xxzy & 0 & 0 & xxyz & 0 \end{pmatrix}$
	and xxxx=xxyy+2xyxy		and yyxy-xxxy=2xyxx	

$D_{nh}(C_{nh})$

n=4 $D_{4h}(C_{4h}) = 4_z/m_z m_x m_{xy}(4_z/m_z) = 4_z/m_z m_x' m_{xy}'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&xxxy&0&0&-yyxy \\ 0&0&0&0&0&yyxy&0&0&-xxxy \\ 0&0&0&0&0&zzxy&0&0&-zzxy \\ 0&0&0&0&yzzx&0&0&yzxz&0 \\ 0&0&0&zxyz&0&0&zxzy&0&0 \\ xyxx&xyyy&xyzz&0&0&0&0&0&0 \\ 0&0&0&0&-zxzy&0&0&-zxyz&0 \\ 0&0&0&-yzxz&0&0&-yzzx&0&0 \\ -xyyy&-xyxx&-xyzz&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ & 0&0&0&0&0 \\ & & 0&0&0&0 \\ & & & 0&0&0 \\ & & & & 0&0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&xxxy \\ & 0&0&0&0&-xxxy \\ & & 0&0&0&0 \\ & & & 0&0&0 \\ & & & & 0&0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ & 0&0&0&0&0 \\ & & 0&0&0&0 \\ & & & 0&0&0 \\ & & & & 0&0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&xxxy \\ 0&0&0&0&0&-xxxy \\ 0&0&0&0&0&0 \\ 0&0&0&0&yzxz&0 \\ 0&0&0&-yzxz&0&0 \\ xyxx&-xyxx&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$

$D_{nh}(C_{nh})$

n=4 $D_{4h}(C_{4h}) = 4_z/m_z m_x m_{xy}(4_z/m_z) = 4_z/m_z m_x' m_{xy}'$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & -yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{nh}(\mathbf{C}_{nh})$

n>4 $\mathbf{D}_{\infty h}(\mathbf{C}_{\infty h})$ = ∞/**mm'm'**

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx		and: xxxy-yyxy=xyyy-xyxx	
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)			
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)			

$D_{nh}(C_{nh})$

n>4 $\mathbf{D_{\infty h}(C_{\infty h})}$ = **∞/mm'm'**

1

$[(V^2)]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & -yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and: yyxy-xxxy=2xyxx

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$D_{nh}(D_n)$

n=1 $\mathbf{D}_{1h}(\mathbf{D}_1) = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_x) = \mathbf{2}_x\mathbf{m}_y'\mathbf{m}_z'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & 0 & xyzx & 0 & 0 & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzxy & 0 & 0 & xzyx \\ 0 & 0 & 0 & 0 & yxzx & 0 & 0 & yxxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & 0 & xyzx & 0 & 0 & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzxy & 0 & 0 & xzyx \\ 0 & 0 & 0 & 0 & yxzx & 0 & 0 & yxxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & yzzz & 0 & 0 \\ 0 & zyyy & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & yzzz & 0 & 0 \\ 0 & zyyy & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & yzzz & 0 & 0 & yzxx & 0 & 0 & yzyy & 0 \\ 0 & zyyy & 0 & 0 & zyzz & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & yzzz & 0 & 0 & yzxx & 0 & 0 & yzyy & 0 \\ 0 & zyyy & 0 & 0 & zyzz & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ & 0 & 0 & yyyz & 0 & 0 \\ & & 0 & zzyz & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ & 0 & 0 & yyyz & 0 & 0 \\ & & 0 & zzyz & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzxy \\ 0 & 0 & 0 & 0 & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzxy \\ 0 & 0 & 0 & 0 & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$

$D_{nh}(D_n)$

n=1 $\mathbf{D}_{1h}(\mathbf{D}_1) = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_x) = \mathbf{2}_x\mathbf{m}_y'\mathbf{m}_z'$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\ & & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & zxxy & 0 & 0 & zxyx \\ & & & & & 0 & 0 & xyxz & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & xzyx \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\ & & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & zxxy & 0 & 0 & zxyx \\ & & & & & 0 & 0 & xyxz & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & xzyx \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & 0 & xyzx & 0 & 0 & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & 0 & xyzx & 0 & 0 & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$

n=2 $\mathbf{D}_{2h}(\mathbf{D}_2) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_x\mathbf{2}_y\mathbf{2}_z) = \mathbf{m}_x'\mathbf{m}_y'\mathbf{m}_z'$

$\mathbf{D}_{nh}(\mathbf{D}_n)$

1

V^4

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$$

$[V^4]$

$$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$$

$V[V^3]$

$$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$$

$[[V^2]^2]$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$$

$[V^2]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$$

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$$

$$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$$

$$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$$

$D_{nh}(D_n)$

n=2 $\mathbf{D}_{2h}(\mathbf{D}_2) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_x\mathbf{2}_y\mathbf{2}_z) = \mathbf{m}_x'\mathbf{m}_y'\mathbf{m}_z'$

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & zxxz & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zyzy & 0 & 0 \\
 & & & & & & & xzxz & 0 \\
 & & & & & & & & yxyx
\end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx
\end{pmatrix}$$

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

ae

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & zxxz & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zyzy & 0 & 0 \\
 & & & & & & & xzxz & 0 \\
 & & & & & & & & yxyx
\end{pmatrix}$$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx
\end{pmatrix}$$

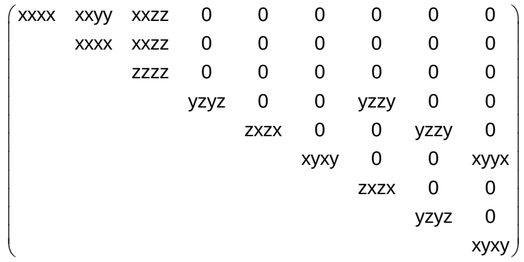
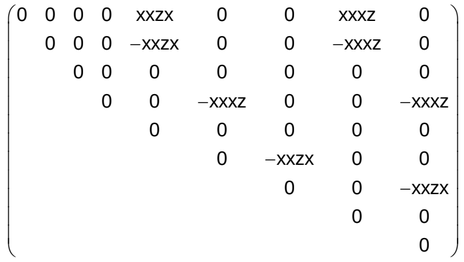
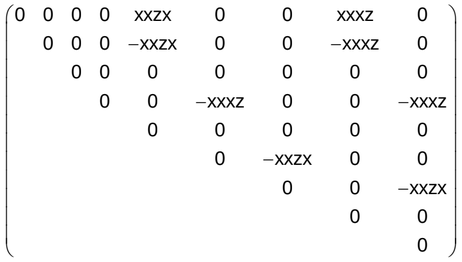
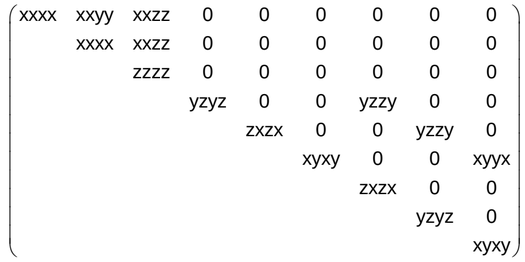
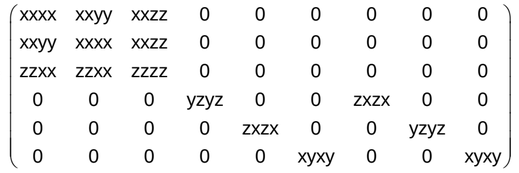
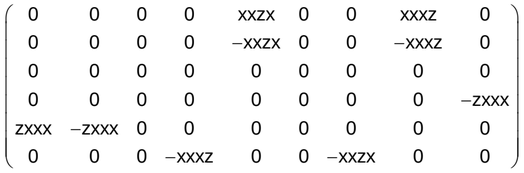
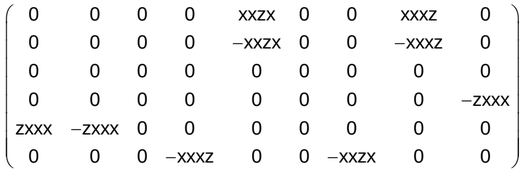
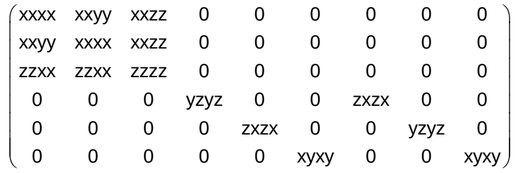
$\mathbf{D}_{nh}(\mathbf{D}_n)$

n=3 $\mathbf{D}_{3h}(\mathbf{D}_3) = \bar{\mathbf{6}}_z\,\mathbf{m}_x\mathbf{2}_1(\mathbf{3}_z\mathbf{2}_1) = \bar{\mathbf{6}}_z\,'\mathbf{m}_x\,'\mathbf{2}_1$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & -xxzx & 0 & 0 & -xxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -zxxx & 0 & 0 & -xzxx \\ zxxx & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -zxxx & 0 & 0 & -zxxx \\ xzxx & -xzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & -xxzx & 0 & 0 & -xxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -zxxx & 0 & 0 & -xzxx \\ zxxx & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -zxxx & 0 & 0 & -zxxx \\ xzxx & -xzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -xxzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zyxx & 0 & 0 & zyxx \\ 0 & 0 & 0 & 0 & xxzy & 0 & 0 & xxyz & 0 \\ zyxx & -zyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ xzxx & -xzxx & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & xxzy & 0 & 0 & xxyz & 0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx			and: xxxx=xxyy+xyxy+xyyx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yyxx \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$ $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xzxx & 0 & 0 & -xzxx & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -xzxx \\ zxxx & 0 & 0 & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xzxx & 0 & 0 & -xzxx & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -xzxx \\ zxxx & 0 & 0 & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ & 0 & 0 & -xxyz & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & xxyz \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ & 0 & 0 & -xxyz & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & xxyz \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			and xyxy = ½(xxxx - xxyy)
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ 0 & 0 & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzyy \\ -xzyy & xzyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yyxz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ 0 & 0 & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzyy \\ -xzyy & xzyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yyxz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			and xyxy = ½(xxxx - xxyy)

$D_{nh}(D_n)$

n=3 $\mathbf{D_{3h}(D_3)} = \bar{\mathbf{6}}_z\,\mathbf{m}_x\mathbf{2}_1(\mathbf{3}_z\mathbf{2}_1) = \bar{\mathbf{6}}_z\,'\mathbf{m}_x\,'\mathbf{2}_1$

	1	e	a	ae
$[(V^2)]^2$				
	and xxxx=xxyy+yzyz+zyzy			and xxxx=xxyy+yzyz+zyzy
$[V^2]V^2$				
	and xxxx=xxyy+2xyxy			and xxxx=xxyy+2xyxy

$D_{nh}(D_n)$

n=4 $D_{4h}(D_4) = 4_z/m_z m_x m_{xy}(4_z 2_x 2_{xy}) = 4_z/m_z' m_x' m_{xy}'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$

$D_{nh}(D_n)$

n=4 $\mathbf{D}_{4h}(\mathbf{D}_4) = \mathbf{4}_z/\mathbf{m}_z\mathbf{m}_x\mathbf{m}_{xy}(\mathbf{4}_z\mathbf{2}_x\mathbf{2}_{xy}) = \mathbf{4}_z/\mathbf{m}_z'\mathbf{m}_x'\mathbf{m}_{xy}'$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$

n>4 $\mathbf{D}_{\infty h}(\mathbf{D}_{\infty})$ = ∞**/m'm'm'**

$\mathbf{D}_{nh}(\mathbf{D}_n)$

1

$$V^4 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx

$$[V^4] = \begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$$

$$V[V^3] = \begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$$

$$[[V^2]^2] = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$$

and xyxy=½(xxxx-xxyy)

$$[V^2]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$$

and xyxy=½(xxxx-xxyy)

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx

$$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$$

$$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$$

and xyxy=½(xxxx-xxyy)

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$$

and xyxy=½(xxxx-xxyy)

$\mathbf{D}_{nh}(\mathbf{D}_n)$

n>4 $\mathbf{D}_{\infty h}(\mathbf{D}_\infty) = \infty/\mathbf{m}'\mathbf{m}'\mathbf{m}'$

1

$[(V^2)]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy

$D_{nh}(C_{nv})$

n=1 $\mathbf{D}_{1h}(\mathbf{C}_{1v}) = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{m}_y) = \mathbf{2}_x'\mathbf{m}_y\mathbf{m}_z'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & 0 & xyzx & 0 & 0 & xyxz & 0 \\ zyxx & zyyy & zyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzxy & 0 & 0 & xzyx \\ 0 & 0 & 0 & 0 & yxzx & 0 & 0 & yxxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & yyzx & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & xyyz & 0 & 0 & xyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zyxy & 0 & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yxyz & 0 & 0 & yxzy & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zyzx & 0 & 0 & zyxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & xzzy & 0 & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & yzzz & 0 & 0 \\ 0 & zyyy & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 \\ 0 & 0 & 0 & 0 & yyxz \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & yzzz & 0 & 0 & yzxx & 0 & 0 & yzyy & 0 \\ 0 & zyyy & 0 & 0 & zyzz & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 & xzxx & 0 & 0 & xzyy & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & yxyz \\ zxxx & 0 & 0 & zxyy & 0 & 0 & zxzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & yxyy & 0 & 0 & yxzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ & 0 & 0 & yyyz & 0 & 0 \\ & & 0 & zzyz & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & xzxy \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxxz & 0 \\ & 0 & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & zzxz & 0 \\ & & & 0 & 0 & yzxy \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & yyxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzxy \\ 0 & 0 & 0 & 0 & xyxz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & xyyz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$D_{nh}(C_{nv})$

n=1 $\mathbf{D}_{1h}(\mathbf{C}_{1v}) = \mathbf{2}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{m}_y) = \mathbf{2}_x'\mathbf{m}_y\mathbf{m}_z'$

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & zxxz & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zyzy & 0 & 0 \\
 & & & & & & & xzxz & 0 \\
 & & & & & & & & yxyx
\end{pmatrix}$$

e

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\
 & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\
 & & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & zxxy & 0 & 0 & zxyx \\
 & & & & & 0 & 0 & xyxz & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & xzyx \\
 & & & & & & & & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\
 & 0 & 0 & 0 & yyzx & 0 & 0 & yyxz & 0 \\
 & & 0 & 0 & zzzx & 0 & 0 & zzxz & 0 \\
 & & & 0 & 0 & yzxy & 0 & 0 & yzyx \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & xyzy & 0 & 0 \\
 & & & & & & 0 & 0 & zyyx \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

ae

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\
 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\
 & & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\
 & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\
 & & & & 0 & 0 & zxzy & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & zyxz & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\
0 & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\
0 & 0 & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\
yzxx & yzyy & yzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & zxxy & 0 & 0 & zxyx \\
0 & 0 & 0 & 0 & xyzx & 0 & 0 & xyxz & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\
0 & 0 & 0 & 0 & yyzx & 0 & 0 & yyxz & 0 \\
0 & 0 & 0 & 0 & zzzx & 0 & 0 & zzxz & 0 \\
0 & 0 & 0 & 0 & 0 & yzxy & 0 & 0 & yzyx \\
zxxx & zxyy & zxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & xyyz & 0 & 0 & xyzy & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\
0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\
0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\
0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\
0 & 0 & 0 & xzyz & 0 & 0 & zxzy & 0 & 0 \\
xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

n=2 $\mathbf{D}_{2h}(\mathbf{C}_{2v}) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_z\mathbf{m}_x\mathbf{m}_y) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z'$

$\mathbf{D}_{nh}(\mathbf{C}_{nv})$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zyzx & 0 & 0 & zyxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 & xzzy & 0 & 0 \\ yxxx & yxyy & yxzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & yxyy & 0 & 0 & yxzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & yyxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & xzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{nh}(\mathbf{C}_{nv})$

n=2 $\mathbf{D}_{2h}(\mathbf{C}_{2v}) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_z\mathbf{m}_x\mathbf{m}_y) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z'$

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & zxxz & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zyzy & 0 & 0 \\
 & & & & & & & xzxz & 0 \\
 & & & & & & & & yxyx
\end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx
\end{pmatrix}$$

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

ae

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\
 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\
 & & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\
 & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\
 & & & & 0 & 0 & zxzy & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & zyxz & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & xxyx \\
0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & yyyx \\
0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzyx \\
0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\
0 & 0 & 0 & xzyz & 0 & 0 & zxzy & 0 & 0 \\
xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$\mathbf{D}_{nh}(\mathbf{C}_{nv})$

n=3 $\mathbf{D}_{3h}(\mathbf{C}_{3v}) = \bar{\mathbf{6}}_z\,\mathbf{m}_x\mathbf{2}_1(\mathbf{3}_z\mathbf{m}_x) = \bar{\mathbf{6}}_z\,'\mathbf{m}_x\mathbf{2}_1'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & -xxzx & 0 & 0 & -xxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xzxx & 0 & 0 & -xzxx \\ zxxx & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -zxxx & 0 & 0 & -zxxx \\ xzxx & -xzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -xxzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zyxx & 0 & 0 & zyxx \\ 0 & 0 & 0 & 0 & xxzy & 0 & 0 & xxyz & 0 \\ zyxx & -zyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ xzxx & -xzxx & 0 & 0 & 0 & yzxx & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & xxzy & 0 & 0 & xxyz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx			and: xxxy-yyxy=xyyy-xyxx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxxx \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxyz \\ 0 & 0 & 0 & 0 & 0 \\ 0 & -xxyz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yyxx \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xzxx & 0 & 0 & -xzxx & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -xzxx \\ zxxx & 0 & 0 & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & 0 & yzxx & 0 & 0 & -yzxx & 0 \\ 0 & -zyxx & 0 & 0 & 0 & 0 & 0 & zyxx & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ & 0 & 0 & -xxyz & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & xxyz \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ & 0 & 0 & 0 & yyxz & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & yyxz \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & -yyxz & 0 \\ 0 & 0 & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & xzyy \\ -xzyy & xzyy & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yyxz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 \\ 0 & 0 & 0 & -xxyz & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ yzxx & -yzxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxx \\ 0 & 0 & 0 & 0 & xxyz & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & 0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			and xyxy = ½(xxxx - xxyy)

$D_{nh}(C_{nv})$

n=3 $\mathbf{D}_{3h}(\mathbf{C}_{3v}) = \bar{\mathbf{6}}_z\,\mathbf{m}_x\mathbf{2}_1(\mathbf{3}_z\mathbf{m}_x) = \bar{\mathbf{6}}_z\,'\mathbf{m}_x\mathbf{2}_1'$

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ & 0 & 0 & 0 & -xxzx & 0 & 0 & -xxxz & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & -xxxz & 0 & 0 & -xxxz \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & -xxzx & 0 & 0 \\ & & & & & & 0 & 0 & -xxzx \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & 0 & 0 & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & xxzy & 0 & 0 & xxzy \\ & & & & & 0 & 0 & xxyz & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & xxyz \\ & & & & & & & & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & -yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

and yyxy-xxxy=2xyxx

$\mathbf{D}_{nh}(\mathbf{C}_{nv})$

n=4 $\mathbf{D}_{4h}(\mathbf{C}_{4v}) = \mathbf{4}_z/\mathbf{m}_z\mathbf{m}_x\mathbf{m}_{xy}(\mathbf{4}_z\mathbf{m}_x\mathbf{m}_{xy}) = \mathbf{4}_z/\mathbf{m}_{z'}\mathbf{m}_x\mathbf{m}_{xy}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & -yxxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ yxxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 \end{pmatrix}$

$\mathbf{D}_{nh}(\mathbf{C}_{nv})$

n=4 $\mathbf{D}_{4h}(\mathbf{C}_{4v}) = \mathbf{4}_z/\mathbf{m}_z\mathbf{m}_x\mathbf{m}_{xy}(\mathbf{4}_z\mathbf{m}_x\mathbf{m}_{xy}) = \mathbf{4}_z/\mathbf{m}_z'\mathbf{m}_x\mathbf{m}_{xy}$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ & & & 0 & yzzx & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & -yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\ xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

$D_{nh}(C_{nv})$

n>4 $D_{\infty h}(C_{\infty v})$ = **∞/m'mm**

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -zxzy & 0 & 0 & -zxyz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 & -yzzx & 0 & 0 \\ -xyyy & -xyxx & -xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx			and: xxxy-yyxy=xyyy-xyxx
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 3xyxx & 0 & 0 & xyzz & 0 & 0 & xyxx & 0 & 0 \\ -3xyxx & 0 & 0 & -xyxx & 0 & 0 & -xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)			
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & -xxxy \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & -yzxz & 0 & 0 \\ -xxxy & xxxy & 0 & 0 & 0 & 0 \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)			

$D_{nh}(C_{nv})$

n>4 $\mathbf{D_{\infty h}(C_{\infty v})}$ = **∞/m'mm**

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & 0 & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

ae

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -xxxy \\
 & & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
 & & & 0 & yzzx & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & -yzzx & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & -yyxy \\
0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & -xxxy \\
0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & -zzxy \\
0 & 0 & 0 & 0 & yzzx & 0 & 0 & -zxyz & 0 \\
0 & 0 & 0 & zxyz & 0 & 0 & -yzzx & 0 & 0 \\
xyxx & -xyxx & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

and: yyxy-xxxy=2xyxx

n=1 $\mathbf{D}_{2h}(\mathbf{D}_{1d}) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_y/\mathbf{m}_y) = \mathbf{m}_x'\mathbf{m}_y\mathbf{m}_z'$

$\mathbf{D}_{2nh}(\mathbf{D}_{nd})$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & yyzx & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & zzzx & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxy & 0 & 0 & yzyx \\ zxxx & zxyy & zxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & xyyz & 0 & 0 & xyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zyxy & 0 & 0 & zyyx \\ xzxx & xzyy & xzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yxyz & 0 & 0 & yxzy & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & yyyy & 0 & zzxx & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 \\ 0 & 0 & 0 & 0 & yyxz \\ zxxx & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & xxzz & 0 & 0 & 0 \\ 0 & yyyy & 0 & 0 & yyzz & 0 & 0 & yyxx & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & xzzz & 0 & 0 & xzxx & 0 & 0 & xzyy & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & yxyz \\ zxxx & 0 & 0 & zxyy & 0 & 0 & zxzz & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & xzxz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ & &0&0&0&0 \\ & & &0&0&0 \\ & & & &0&0 \\ & & & & &0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xxxz&0 \\ &0&0&0&yyxz&0 \\ & &0&0&zzxz&0 \\ & & &yzxy&0&0 \\ & & & &0&0 \\ & & & & &0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ & &0&0&0&0 \\ & & &0&0&0 \\ & & & &0&0 \\ & & & & &0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & xxxz & 0 \\ 0 & 0 & 0 & 0 & yyxz & 0 \\ 0 & 0 & 0 & 0 & zzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yzxy \\ xzxx & xzyy & xzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & xyyz & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$

n=1 $\mathbf{D}_{2h}(\mathbf{D}_{1d}) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_y/\mathbf{m}_y) = \mathbf{m}_x'\mathbf{m}_y\mathbf{m}_z'$

$\mathbf{D}_{2nh}(\mathbf{D}_{nd})$

	1									e								
$[(V^2)]^2$	xxxx	xxyy	xxzz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		yyyy	yyzz	0	0	0	0	0	0		0	0	0	0	0	0	0	0
			zzzz	0	0	0	0	0	0			0	0	0	0	0	0	0
				yzyz	0	0	yzzy	0	0				0	0	0	0	0	0
					zxzx	0	0	zxxz	0					0	0	0	0	0
						xyxy	0	0	xyyx						0	0	0	0
							zyzy	0	0							0	0	0
								xzxz	0								0	0
									yxyx									0
$[V^2]V^2$	xxxx	xxyy	xxzz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	yyxx	yyyy	yyzz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	zzxx	zzyy	zzzz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	yzyz	0	0	yzzy	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	zxzx	0	0	zxxz	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	xyxy	0	0	xyyx	0	0	0	0	0	0	0	0	0

	a									ae								
	0	0	0	0	xxzx	0	0	xxxz	0	0	0	0	0	0	0	0	0	0
		0	0	0	yyzx	0	0	yyxz	0		0	0	0	0	0	0	0	0
			0	0	zzzx	0	0	zzxz	0			0	0	0	0	0	0	0
				0	0	yzxy	0	0	yzyx				0	0	0	0	0	0
					0	0	0	0	0					0	0	0	0	0
						0	xyzy	0	0						0	0	0	0
							0	0	zyyx							0	0	0
								0	0								0	0
									0									0
	0	0	0	0	xxzx	0	0	xxxz	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	yyzx	0	0	yyxz	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	zzzx	0	0	zzxz	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	yzxy	0	0	yzyx	0	0	0	0	0	0	0	0	0
	zxxx	zxyy	zxzz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	xyyz	0	0	xyzy	0	0	0	0	0	0	0	0	0	0	0

$D_{2nh}(D_{nd})$

n=2 $D_{4h}(D_{2d}) = 4_z/m_z m_x m_{xy}(\bar{4}_z\, m_x 2_{xy}) = 4_z'/m_z' m_x m_{xy}'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & zxzy & 0 & 0 \\ xyxx & xyyy & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzy & 0 & 0 & zxyz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 & yzzx & 0 & 0 \\ xyyy & xyxx & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & yxxx & 0 & 0 & 0 \\ yxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & zzxy \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & xyyy & 0 & 0 & xyzz & 0 & 0 & yxyy & 0 & 0 \\ xyyy & 0 & 0 & yxyy & 0 & 0 & xyzz & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & zxyz \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ & 0 & 0 & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy \\ & & & 0 & yzxz & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzxz & 0 \\ 0 & 0 & 0 & yzxz & 0 & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 \end{pmatrix}$

$D_{2nh}(D_{nd})$

n=2 $\mathbf{D}_{4h}(\mathbf{D}_{2d}) = \mathbf{4}_z/\mathbf{m}_z\mathbf{m}_x\mathbf{m}_{xy}(\bar{\mathbf{4}}_z\,\mathbf{m}_x\mathbf{2}_{xy}) = \mathbf{4}_z'/\mathbf{m}_z'\mathbf{m}_x\mathbf{m}_{xy}'$

1

$[(V^2)]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

$[V^2]V^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & yyxy \\ & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & xxxy \\ & & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ & & & 0 & yzzx & 0 & 0 & yzxz & 0 \\ & & & & 0 & 0 & zxzy & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & yzzx & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & xxxy & 0 & 0 & yyxy \\ 0 & 0 & 0 & 0 & 0 & yyxy & 0 & 0 & xxxy \\ 0 & 0 & 0 & 0 & 0 & zzxy & 0 & 0 & zzxy \\ 0 & 0 & 0 & 0 & yzzx & 0 & 0 & zxyz & 0 \\ 0 & 0 & 0 & zxyz & 0 & 0 & yzzx & 0 & 0 \\ xyxx & xyxx & xyzz & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$D_{2nh}(D_{nd})$

n=3 $\mathbf{D_{6h}(D_{3d})} = \mathbf{6_z/m_z m_x m_1(\bar{3}_z\, m_x)} = \mathbf{6_z'/m_z' m_x m_1'}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&xxzy&0&0 \\ 0&0&0&0&0&0&-xxzy&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&zyxx&0&0&zyxx \\ 0&0&0&0&xxzy&0&0&xxyz&0 \\ zyxx&-zyxx&0&0&0&0&0&0&0 \\ xzxx&-xzxx&0&0&0&yzxx&0&0&yzxx \\ 0&0&0&0&xxzy&0&0&xxyz&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx			
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xxyz \\ 0&0&0&0&0 \\ 0&-xxyz&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yyxx \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&yzxx \\ 0&0&0&0&0&yzxx&0&0&-yzxx&0 \\ 0&-zyxx&0&0&0&0&0&zyxx&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ & 0&0&0&0&0 \\ & & 0&0&0&0 \\ & & & 0&0&0 \\ & & & & 0&0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ & 0&0&0&0&0 \\ & & 0&0&0&0 \\ & & & 0&0&0 \\ & & & & 0&0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ & 0&0&0&0&0 \\ & & 0&0&0&0 \\ & & & 0&0&0 \\ & & & & 0&0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xxyz&0&0 \\ 0&0&0&-xxyz&0&0 \\ 0&0&0&0&0&0 \\ yzxx&-yzxx&0&0&0&0 \\ 0&0&0&0&0&yzxx \\ 0&0&0&0&xxyz&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$

and xyxy = ½(xxxx - xxyy)

$D_{2nh}(D_{nd})$

n=3 $\mathbf{D}_{6h}(\mathbf{D}_{3d}) = \mathbf{6}_z/\mathbf{m}_z\mathbf{m}_x\mathbf{m}_1(\bar{\mathbf{3}}_z\,\mathbf{m}_x) = \mathbf{6}_z'/\mathbf{m}_z'\mathbf{m}_x\mathbf{m}_1'$

1

$[(V^2)]^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

$$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & 0 & 0 & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & xxzy & 0 & 0 & xxzy \\ & & & & & 0 & 0 & xxyz & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & xxyz \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & 0 & 0 & -xxyz & 0 & 0 & -xxzy & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & xxzy & 0 & 0 & xxzy \\ & & & & & 0 & 0 & xxyz & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & xxyz \\ & & & & & & & & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$\mathbf{D}_{2nh}(\mathbf{D}_{nd})$

n=4 $\mathbf{C}_{8h}(\mathbf{D}_{4d}) = \mathbf{8}_z/\mathbf{m}_z\mathbf{m}_{x1}\mathbf{m}_1(\bar{\mathbf{8}}_z\,\mathbf{m}_{x1}\mathbf{2}_1) = \mathbf{8}_z'/\mathbf{m}_z'\mathbf{m}_{x1}\mathbf{m}_1'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&-xyyy&0&0&-xyyy \\ 0&0&0&0&0&xyyy&0&0&xyyy \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ -xyyy&xyyy&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ -xyyy&xyyy&0&0&0&0&0&0&0 \end{pmatrix}$
	and xxxy-yyxy=xyyy-xyxx			
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&xyyy&0&0&0 \\ -xyyy&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yyxx \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&xyyy&0&0&0&0&0&-xyyy&0&0 \\ -xyyy&0&0&xyyy&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&-xyyy \\ &0&0&0&0&xyyy \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&-xyyy \\ 0&0&0&0&0&xyyy \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ -xyyy&xyyy&0&0&0&0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			

$D_{2nh}(D_{nd})$

n=4 $C_{8h}(D_{4d}) = 8_z/m_z m_{x1} m_1(\bar{8}_z\, m_{x1} 2_1) = 8_z'/m_z' m_{x1} m_1'$

1

$$[(V^2)]^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$$[V^2]V^2 = \begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$$

and xxxx=xxyy+2xyxy

e

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

a

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

ae

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & -xyyy & 0 & 0 & -xyyy \\ 0 & 0 & 0 & 0 & 0 & xyyy & 0 & 0 & xyyy \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xyyy & xyyy & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

n>4 $\mathbf{D_{\infty h}1'} = \infty$**/mmm1'**

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and: xxxx=xxyy+xyxy+xyyx			
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & 0 \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)			
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$
	and xyxy=½(xxxx-xxyy)			

$D_{2nh}(D_{nd})$

n>4 **$D_{\infty h}$1' = ∞/mmm1'**

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & yzzy & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zxzx & 0 & 0 \\ & & & & & & & yzyz & 0 \\ & & & & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

and xxxx=xxyy+2xyxy

n=1 $\mathbf{D}_{2h}(\mathbf{D}_{1h}) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_x\mathbf{m}_y\mathbf{m}_z) = \mathbf{m}_x{}'\mathbf{m}_y\mathbf{m}_z$

$\mathbf{D}_{2nh}(\mathbf{D}_{nh})$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zyyz & 0 & 0 & zyzy & 0 & 0 \\ 0 & 0 & 0 & 0 & xzzx & 0 & 0 & xzxz & 0 \\ 0 & 0 & 0 & 0 & 0 & yxxy & 0 & 0 & yxyx \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xxyz&0&0&xxzy&0&0 \\ 0&0&0&yyyz&0&0&yyzy&0&0 \\ 0&0&0&zzyz&0&0&zzzy&0&0 \\ yzxx&yzyy&yzzz&0&0&0&0&0&0 \\ 0&0&0&0&0&zxxy&0&0&zxyx \\ 0&0&0&0&xyzx&0&0&xyxz&0 \\ zyxx&zyyy&zyzz&0&0&0&0&0&0 \\ 0&0&0&0&0&xzxy&0&0&xzyx \\ 0&0&0&0&yxzx&0&0&yxxz&0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx&0&0&yyzz&0 \\ 0&yyyy&0&zzxx&0 \\ 0&0&zzzz&xxyy&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xxyz \\ 0&0&yzzz&0&0 \\ 0&zyyy&0&0&0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx&0&0&xxyy&0&0&xxzz&0&0&0 \\ 0&yyyy&0&0&yyzz&0&0&yyxx&0&0 \\ 0&0&zzzz&0&0&zzxx&0&0&zzyy&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&xxyz \\ 0&0&yzzz&0&0&yzxx&0&0&yzyy&0 \\ 0&zyyy&0&0&zyzz&0&0&zyxx&0&0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx&xxyy&xxzz&0&0&0 \\ &yyyy&yyzz&0&0&0 \\ &&zzzz&0&0&0 \\ &&&yzyz&0&0 \\ &&&&xzxz&0 \\ &&&&&xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xxyz&0&0 \\ &0&0&yyyz&0&0 \\ &&0&zzyz&0&0 \\ &&&0&0&0 \\ &&&&0&xzxy \\ &&&&&0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx&xxyy&xxzz&0&0&0 \\ yyxx&yyyy&yyzz&0&0&0 \\ zzxx&zzyy&zzzz&0&0&0 \\ 0&0&0&yzyz&0&0 \\ 0&0&0&0&xzxz&0 \\ 0&0&0&0&0&xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xxyz&0&0 \\ 0&0&0&yyyz&0&0 \\ 0&0&0&zzyz&0&0 \\ yzxx&yzyy&yzzz&0&0&0 \\ 0&0&0&0&0&xzxy \\ 0&0&0&0&xyxz&0 \end{pmatrix}$

n=1 $\mathbf{D}_{2h}(\mathbf{D}_{1h}) = \mathbf{m}_x\mathbf{m}_y\mathbf{m}_z(\mathbf{2}_x\mathbf{m}_y\mathbf{m}_z) = \mathbf{m}_x{}'\mathbf{m}_y\mathbf{m}_z$

$\mathbf{D}_{2nh}(\mathbf{D}_{nh})$

	1	e	a	ae
$[(V^2)]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\ & & & & zxzx & 0 & 0 & zxxz & 0 \\ & & & & & xyxy & 0 & 0 & xyyx \\ & & & & & & zyzy & 0 & 0 \\ & & & & & & & xzxz & 0 \\ & & & & & & & & yxyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & 0 & 0 & 0 & 0 \\ & & & & & 0 & 0 & 0 & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & 0 \\ & & & & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\ & & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\ & & & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & 0 & zxxy & 0 & 0 & zxyx \\ & & & & & 0 & 0 & xyxz & 0 \\ & & & & & & 0 & 0 & 0 \\ & & & & & & & 0 & xzyx \\ & & & & & & & & 0 \end{pmatrix}$
$[V^2]V^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & yyyy & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0 & 0 & 0 & xxyz & 0 & 0 & xxzy & 0 & 0 \\ 0 & 0 & 0 & yyyz & 0 & 0 & yyzy & 0 & 0 \\ 0 & 0 & 0 & zzyz & 0 & 0 & zzzy & 0 & 0 \\ yzxx & yzyy & yzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zxxy & 0 & 0 & zxyx \\ 0 & 0 & 0 & 0 & xyzx & 0 & 0 & xyxz & 0 \end{pmatrix}$

$D_{2nh}(D_{nh})$

n=2 $D_{4h}(D_{2h}) = 4_z/m_z m_x m_{xy}(m_z m_x m_y) = 4_z'/m_z m_x m_{xy}'$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ -xxyy & -xxxx & -xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & -zzxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & -yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & -zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & -xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & -zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & -yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & -xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[V^4]$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & xxxx & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & yyzz & 0 \\ 0 & -xxxx & 0 & -yyzz & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & xxyy & 0 & 0 & -yyzz & 0 & 0 & 0 \\ 0 & -xxxx & 0 & 0 & yyzz & 0 & 0 & -xxyy & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & zzxx & 0 & 0 & -zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & yyyy & yyzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ & 0&0&0&0&0 \\ & & 0&0&0&0 \\ & & & 0&0&0 \\ & & & & 0&0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & xxzz & 0 & 0 & 0 \\ & -xxxx & -xxzz & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & -yzyz & 0 \\ & & & & & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ & 0&0&0&0&0 \\ & & 0&0&0&0 \\ & & & 0&0&0 \\ & & & & 0&0 \\ & & & & & 0 \end{pmatrix}$
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ yyxx & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ -xxyy & -xxxx & -xxzz & 0 & 0 & 0 \\ zzxx & -zzxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & -yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$

$D_{2nh}(D_{nh})$

n=2 $\mathbf{D_{4h}(D_{2h})} = \mathbf{4_z/m_z m_x m_{xy}(m_z m_x m_y)} = \mathbf{4_z'/m_z m_x m_{xy}'}$

1

$[(V^2)]^2$

xxxx	xxyy	xxzz	0	0	0	0	0	0
	xxxx	xxzz	0	0	0	0	0	0
		zzzz	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	yzzy	0
					xyxy	0	0	xyyx
						zxzx	0	0
							yzyz	0
								xyxy

$[V^2]V^2$

xxxx	xxyy	xxzz	0	0	0	0	0	0
yyxx	xxxx	xxzz	0	0	0	0	0	0
zzxx	zzxx	zzzz	0	0	0	0	0	0
0	0	0	yzyz	0	0	zxzx	0	0
0	0	0	0	zxzx	0	0	yzyz	0
0	0	0	0	0	xyxy	0	0	xyxy

e

0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
			0	0	0	0	0	0
				0	0	0	0	0
					0	0	0	0
						0	0	0
							0	0
								0

0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

a

xxxx	0	xxzz	0	0	0	0	0	0
	−xxxx	−xxzz	0	0	0	0	0	0
		0	0	0	0	0	0	0
			yzyz	0	0	yzzy	0	0
				zxzx	0	0	−yzzy	0
					xyxy	0	0	xyyx
						−zxzx	0	0
							−yzyz	0
								−xyxy

xxxx	xxyy	xxzz	0	0	0	0	0	0
−xxyy	−xxxx	−xxzz	0	0	0	0	0	0
zzxx	−zzxx	0	0	0	0	0	0	0
0	0	0	yzyz	0	0	−zxzx	0	0
0	0	0	0	zxzx	0	0	−yzyz	0
0	0	0	0	0	xyxy	0	0	−xyxy

ae

0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
			0	0	0	0	0	0
				0	0	0	0	0
					0	0	0	0
						0	0	0
							0	0
								0

0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

$D_{2nh}(D_{nh})$

n=3 $\mathbf{D_{6h}(D_{3h})} = \mathbf{6_z/m_z m_x m_1(\bar{6}_z\, m_x 2_1) = 6_z'/m_z m_x m_1'}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&xxzx&0&0&xxxz&0 \\ 0&0&0&0&-xxzx&0&0&-xxxz&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&-xzxx&0&0&-xzxx \\ zxxx&-zxxx&0&0&0&0&0&0&0 \\ 0&0&0&-xxxz&0&0&-xxzx&0&0 \\ 0&0&0&0&0&-zxxx&0&0&-zxxx \\ xzxx&-xzxx&0&0&0&0&0&0&0 \\ 0&0&0&-xxxz&0&0&-xxzx&0&0 \end{pmatrix}$

and: xxxx=xxyy+xyxy+xyyx

$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&-zxxx \\ zxxx&0&0&0&0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yyxx \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&xzxx&0&0&-xzxx&0 \\ 0&0&0&0&0&0&0&0&0&-xzxx \\ zxxx&0&0&-zxxx&0&0&0&0&0&0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&0 \\ &&&&&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&xxyz&0&0 \\ &0&0&-xxyz&0&0 \\ &&0&0&0&0 \\ &&&0&0&0 \\ &&&&0&xxyz \\ &&&&&0 \end{pmatrix}$

and xyxy = ½(xxxx - xxyy)

$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&-yyxz&0 \\ 0&0&0&0&yyxz&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&xzyy \\ -xzyy&xzyy&0&0&0&0 \\ 0&0&0&yyxz&0&0 \end{pmatrix}$

and xyxy = ½(xxxx - xxyy)

$\mathbf{D}_{2nh}(\mathbf{D}_{nh})$

n=3 $\mathbf{D}_{6h}(\mathbf{D}_{3h}) = \mathbf{6}_z/\mathbf{m}_z\mathbf{m}_x\mathbf{m}_1(\bar{\mathbf{6}}_z\,\mathbf{m}_x\mathbf{2}_1) = \mathbf{6}_z'/\mathbf{m}_z\mathbf{m}_x\mathbf{m}_1'$

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & 0 & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

ae

$$\begin{pmatrix}
0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\
 & 0 & 0 & 0 & -xxzx & 0 & 0 & -xxxz & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & -xxxz & 0 & 0 & -xxxz \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & -xxzx & 0 & 0 \\
 & & & & & & 0 & 0 & -xxzx \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & xxzx & 0 & 0 & xxxz & 0 \\
0 & 0 & 0 & 0 & -xxzx & 0 & 0 & -xxxz & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & -zxxx \\
zxxx & -zxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & -xxxz & 0 & 0 & -xxzx & 0 & 0
\end{pmatrix}$$

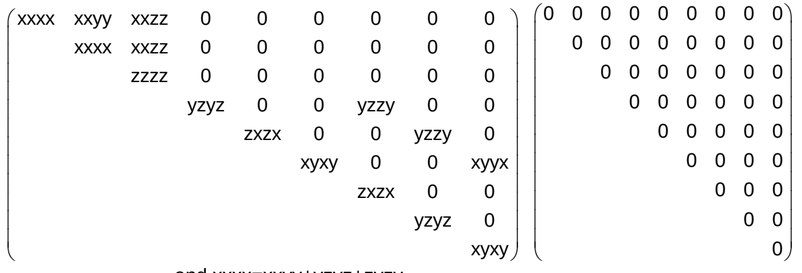
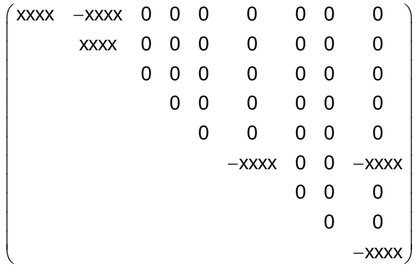
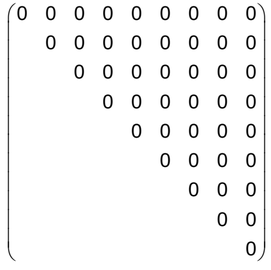
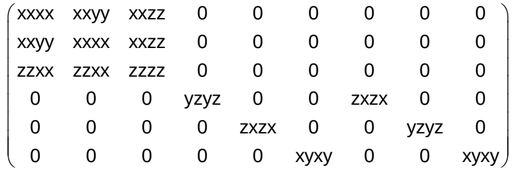
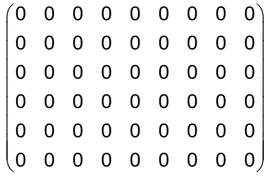
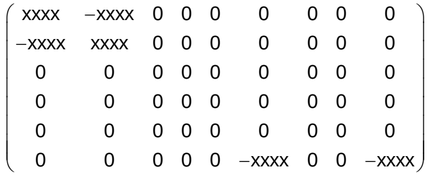
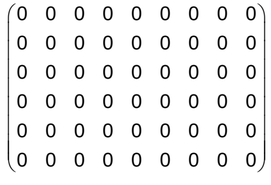
n=4 $\mathbf{D_{8h}(D_{4h})} = \mathbf{8_z/m_z m_{x1} m_1 (4_z/m_z m_{x1} m_{x2})} = \mathbf{8_z'/m_z m_{x1} m_1'}$

$\mathbf{D_{2nh}(D_{nh})}$

	1	e	a	ae
V^4	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\ yyxx & xxxx & yyzz & 0 & 0 & 0 & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\ 0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\ 0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\ 0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -xxxx & xxxx & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 & -xxxx \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0 \end{pmatrix}$
	and xxxy-yyxy=xyyy-xyxx			
$[V^4]$	$\begin{pmatrix} 3xxyy & 0 & 0 & yyzz & 0 \\ 0 & 3xxyy & 0 & yyzz & 0 \\ 0 & 0 & zzzz & xxyy & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & 0 \\ 0 & 0 & 0 & -xxxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0 \\ 0&0&0&0&0 \\ 0&0&0&0&0 \end{pmatrix}$
$V[V^3]$	$\begin{pmatrix} 3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & yyxx \\ 0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\ 0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & 0 & 0 & -xxxx & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & xxxx & 0 & 0 & 0 & 0 & 0 & -xxxx & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \\ 0&0&0&0&0&0&0&0&0&0 \end{pmatrix}$
$[[V^2]^2]$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ & xxxx & xxzz & 0 & 0 & 0 \\ & & zzzz & 0 & 0 & 0 \\ & & & yzyz & 0 & 0 \\ & & & & yzyz & 0 \\ & & & & & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ & &0&0&0&0 \\ & & &0&0&0 \\ & & & &0&0 \\ & & & & &0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 \\ & xxxx & 0 & 0 & 0 & 0 \\ & & 0 & 0 & 0 & 0 \\ & & & 0 & 0 & 0 \\ & & & & 0 & 0 \\ & & & & & -xxxx \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ &0&0&0&0&0 \\ & &0&0&0&0 \\ & & &0&0&0 \\ & & & &0&0 \\ & & & & &0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			
$[V^2]^2$	$\begin{pmatrix} xxxx & xxyy & xxzz & 0 & 0 & 0 \\ xxyy & xxxx & xxzz & 0 & 0 & 0 \\ zzxx & zzxx & zzzz & 0 & 0 & 0 \\ 0 & 0 & 0 & yzyz & 0 & 0 \\ 0 & 0 & 0 & 0 & yzyz & 0 \\ 0 & 0 & 0 & 0 & 0 & xyxy \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$	$\begin{pmatrix} xxxx & -xxxx & 0 & 0 & 0 & 0 \\ -xxxx & xxxx & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -xxxx \end{pmatrix}$	$\begin{pmatrix} 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \\ 0&0&0&0&0&0 \end{pmatrix}$
	and xyxy = ½(xxxx - xxyy)			

n=4 $\mathbf{D}_{8h}(\mathbf{D}_{4h}) = \mathbf{8}_z/\mathbf{m}_z\mathbf{m}_{x1}\mathbf{m}_1(\mathbf{4}_z/\mathbf{m}_z\mathbf{m}_{x1}\mathbf{m}_{x2}) = \mathbf{8}_z'/\mathbf{m}_z\mathbf{m}_{x1}\mathbf{m}_1'$

$\mathbf{D}_{2nh}(\mathbf{D}_{nh})$

	1	e	a	ae
$[(V^2)]^2$				
$[V^2]V^2$				

and xxxx=xxyy+yzyz+zyzy

and xxxx=xxyy+2xyxy

n>4 **D**$_{\infty h}$**1'** = ∞**/mmm1'**

1

V^4

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
yyxx & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzyy & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & yzzy & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & zxxz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyyx \\
0 & 0 & 0 & zxxz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & yzzy & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyyx & 0 & 0 & xyxy
\end{pmatrix}$$

and: xxxx=xxyy+xyxy+xyyx

$[V^4]$

$$\begin{pmatrix}
3xxyy & 0 & 0 & yyzz & 0 \\
0 & 3xxyy & 0 & yyzz & 0 \\
0 & 0 & zzzz & xxyy & 0
\end{pmatrix}$$

$V[V^3]$

$$\begin{pmatrix}
3xxyy & 0 & 0 & xxyy & 0 & 0 & yyzz & 0 & 0 & 0 \\
0 & 3xxyy & 0 & 0 & yyzz & 0 & 0 & xxyy & 0 & 0 \\
0 & 0 & zzzz & 0 & 0 & zzxx & 0 & 0 & zzxx & 0
\end{pmatrix}$$

$[[V^2]^2]$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 \\
 & & & & yzyz & 0 \\
 & & & & & xyxy
\end{pmatrix}$$

and xyxy=½(xxxx-xxyy)

$[V^2]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 \\
0 & 0 & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy
\end{pmatrix}$$

and xyxy=½(xxxx-xxyy)

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 \\
 & & & & 0 & 0 \\
 & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 \\
 & & & & 0 & 0 \\
 & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

ae

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 \\
 & & & & 0 & 0 \\
 & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

n>4 $\mathbf{D_{\infty h}1'} = \infty\mathbf{/mmm1'}$

1

$[(V^2)]^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & yzyz & 0 & 0 & yzzy & 0 & 0 \\
 & & & & zxzx & 0 & 0 & yzzy & 0 \\
 & & & & & xyxy & 0 & 0 & xyyx \\
 & & & & & & zxzx & 0 & 0 \\
 & & & & & & & yzyz & 0 \\
 & & & & & & & & xyxy
\end{pmatrix}$$

and xxxx=xxyy+yzyz+zyzy

$[V^2]V^2$

$$\begin{pmatrix}
xxxx & xxyy & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
xxyy & xxxx & xxzz & 0 & 0 & 0 & 0 & 0 & 0 \\
zzxx & zzxx & zzzz & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & yzyz & 0 & 0 & zxzx & 0 & 0 \\
0 & 0 & 0 & 0 & zxzx & 0 & 0 & yzyz & 0 \\
0 & 0 & 0 & 0 & 0 & xyxy & 0 & 0 & xyxy
\end{pmatrix}$$

and xxxx=xxyy+2xyxy

e

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

a

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

ae

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & 0 & 0 & 0 & 0 & 0 & 0 \\
 & & & & 0 & 0 & 0 & 0 & 0 \\
 & & & & & 0 & 0 & 0 & 0 \\
 & & & & & & 0 & 0 & 0 \\
 & & & & & & & 0 & 0 \\
 & & & & & & & & 0
\end{pmatrix}$$

$$\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
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0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$