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Supporting information for article:

A temperature-controlled single-crystal growth cell for the *in situ* measurement and analysis of face-specific growth rates

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Abstract

This supplementary material provides the following information;

1. Comprehensive list of peripheral components required for optimal working of the growth cell.
2. Detailed description of the mechanical components of the cell
3. Mechanical drawings of the assembled growth cell and all the individual components; this consists of Nozzle, Main Body Assembly and End Cap provided with dimensions in mm.

List of Peripheral Components

1. Borosilicate glass windows 101.9 mm diameter, 1.65 mm thickness, supplier example: UQG Optics¹
2. Silicon gaskets; individually cut from a single piece of silicon
3. Rubber o-rings; 98.73 mm OD, 91.67 mm ID and 3.53 mm thickness
4. Cuvette cell; 45 mm height, 12.5 mm diameter, 1 mm path length, supplier example: Spectronic Camspec Ltd²
5. Pt 100 thermocouple, supplier example: Omega³
6. 3/8" Heavy Duty Male SAE type Swagelock fitting for PT100 thermocouple (fitting internal diameter is dependent on the diameter of the PT100 probe, as a guide 2mm probe would need a 2mm internal diameter SAE type connector), supplier example; Swagelock⁴

Single Crystal Growth Cell Design

The single crystal growth cell consists of a 0.5ml, 54 x 10 x 1 mm borosilicate glass cuvette cell, which is held inside the main cell housing with a plastic cell holder. The main cell housing is constructed from stainless steel and consists of three components; 1 x main body assembly, 2 x end caps and 2 x nozzles. The stainless steel end caps are machined to an outside diameter (OD) of 109 mm and an inside diameter (ID) of 84.5 mm and screw onto the main body through 1 mm pitch threads. The main role of the end caps is to house the 2 x borosilicate glass windows⁵ which are 101.9 mm diameter with a thickness of 1.65 mm, these allow image capture of the growing crystals within the cuvette and also act to keep the cell water tight. The plastic cap of the cuvette was modified by cutting one side flat in so the cuvette may lay flat to improve image capture. To achieve this the end caps contain glass cushions which are cut from a single piece of silicon and sit between the inside steel edge and the glass windows to prevent excessive application of pressure to the windows once screwed to the main body during use.

The main body assembly is machined from stainless steel which has an OD of 103 mm and is 22.5 mm in depth. The top and bottom of the main cell body have machined 1mm pitch threads onto which the end caps are secured. Additionally the top and bottom of the main cell body contains O-ring grooves to house 2 x rubber O-rings of dimensions 98.73 mm OD, 91.67 mm ID and 3.53 mm thickness. The sides of the main body contains 3 x 3/8" British standard fine tapped holes into which screw 2 x 3/8" water bath nozzles and 1 x Pt100 3/8" housing plug. The nozzles allow connection of the cell to a water/oil circulator to vary the temperature of the cell contents.

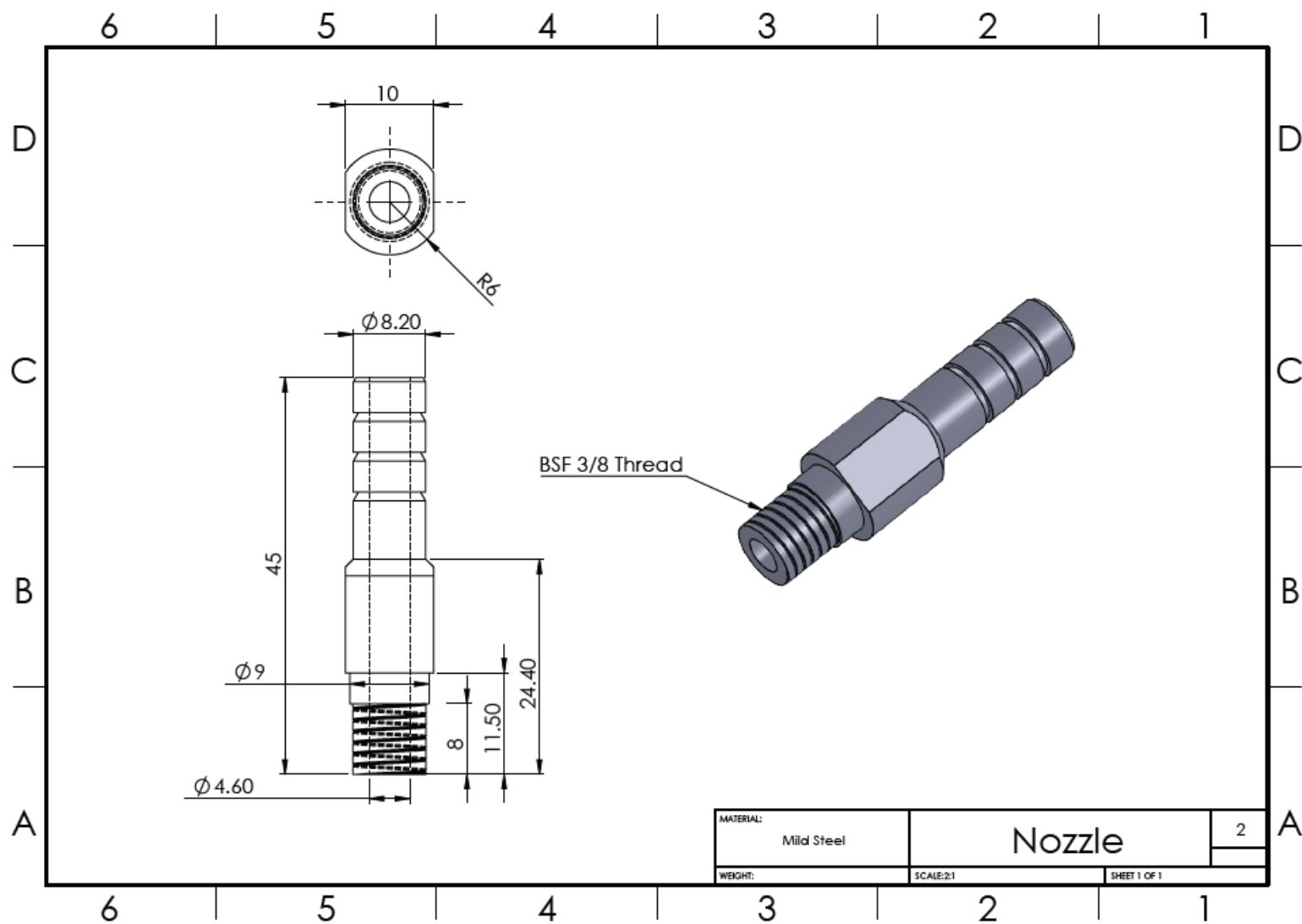


Figure 1 Mechanical drawing of the nozzle component with dimensions (mm)

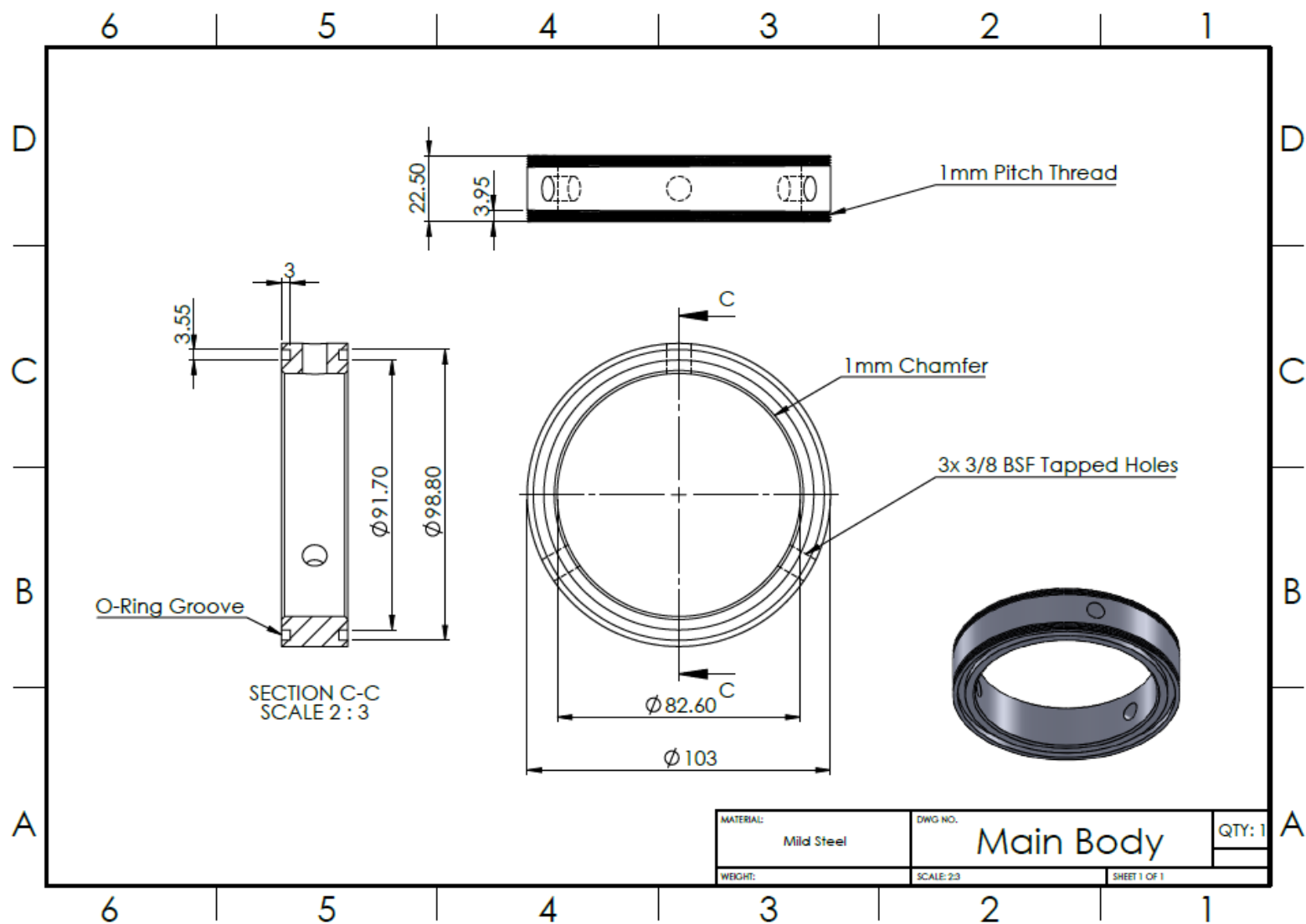


Figure 2 Mechanical drawing of the main body component with dimensions (mm)

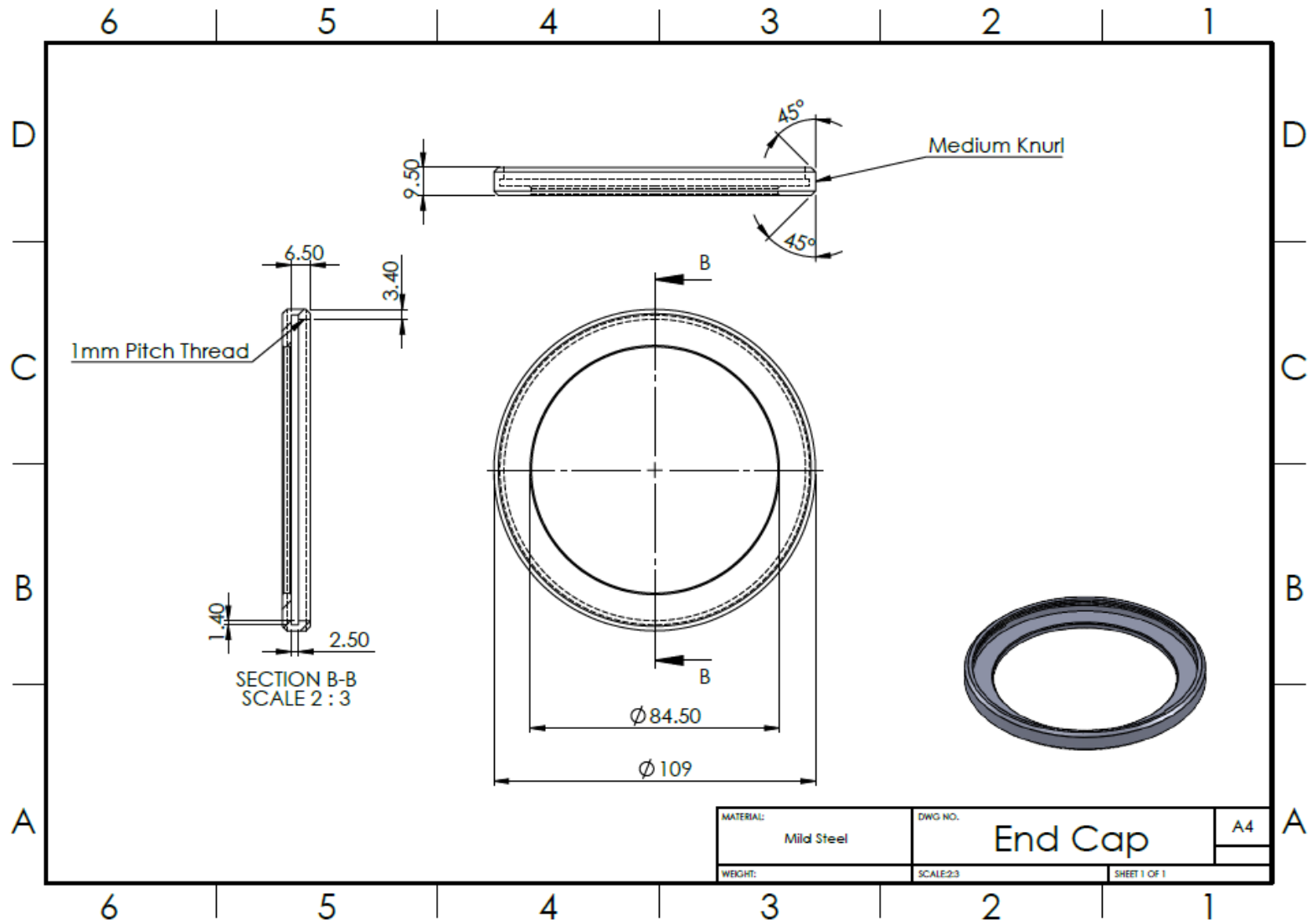


Figure 3 Mechanical drawing of the end cap component with dimensions (mm)

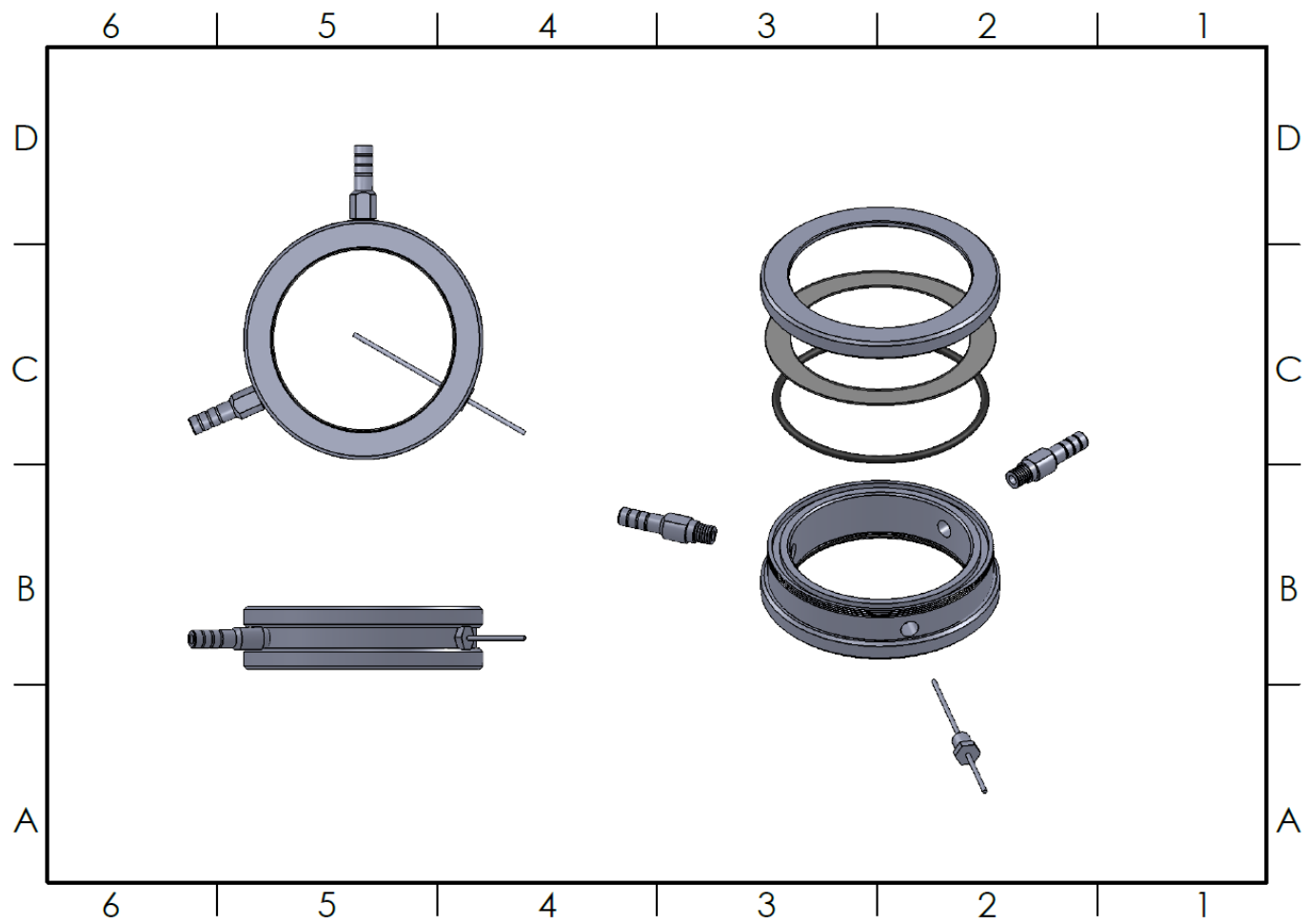


Figure 4 Mechanical drawing of the full assembly for the cell

References

- 1 <http://www.uqgoptics.com/> (accessed June 2018)
- 2 <https://www.spectronic-camspec.co.uk/Standard-spectrophotometer-cells/> (accessed June 2018)
- 3 <https://www.omega.co.uk/> (accessed June 2018)
- 4 <https://www.swagelok.com/en> (accessed June 2018)
- 5 <http://www.uqgoptics.com/> (accessed June 2018)