

# Porous Media Chip

Part Number: 3200284



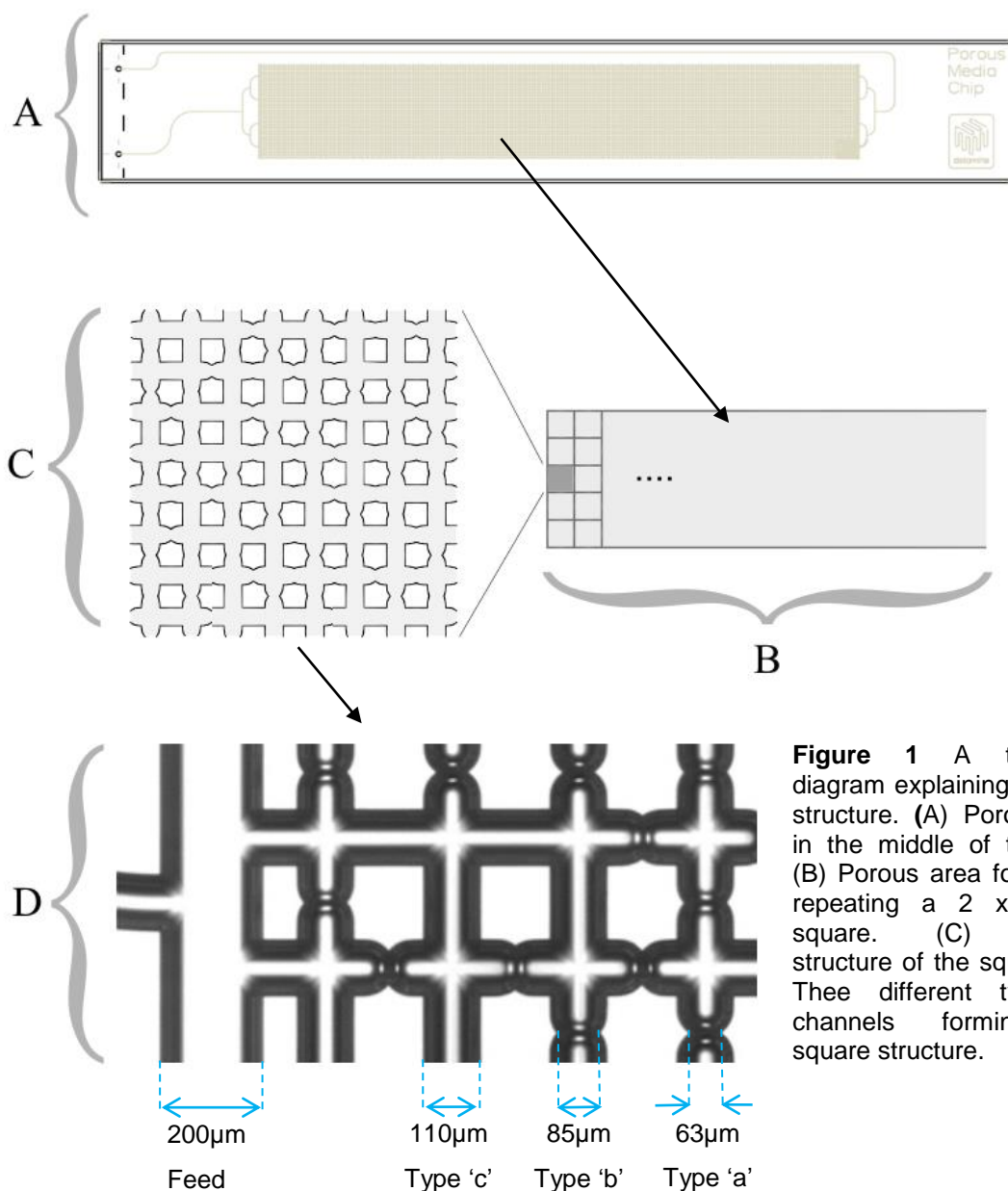
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## Description

The chip enables modelling of complex porous rock structures with research applications in oil and gas extraction, environmental testing and groundwater analysis.

The porous area of the chip has a footprint of 10 x 60 mm (Figure 1, A). The area is formed by repeating (150 times) a square 2 x 2 mm (Figure 1, C). The channel arrangement in the square is a grid (8 x 8) of channels which have a near circular cross section (channel depth = 100µm and channel width = 110µm).

The channels in the grid have constrictions or 'pores' which are distributed randomly to imitate a naturally occurring rock structure. The grid contains 38 type 'a' pores (Ø63 µm), 40 type 'b' pores (Ø85 µm) and 50 type 'c' straight channels (Figure 1, C and D).



**Figure 1** A top-down diagram explaining the chip structure. (A) Porous area in the middle of the chip. (B) Porous area formed by repeating a 2 x 2 mm square. (C) Overall structure of the square. (D) Three different types of channels forming the square structure.

## Benefits

- Enables fast evaluation of microfluidic porous rock models
- Quick connect/disconnect
- Wide temperature and pressure range
- Excellent chemical compatibility
- High visibility (excellent access for optics)
- Range of custom options

## Specification

Parameter	Standard Chip	Chip with a capillary connection (custom)
Number of inputs	1	
Number of outputs	1	
Channel cross section	100 $\mu\text{m}$ x 110 $\mu\text{m}$ (depth x width) near circular	
Pore cross section	$\text{\O}85 \mu\text{m}$ and $\text{\O}63 \mu\text{m}$	
Inlet channel length, including bifurcations (IB)	27.7 mm	
Outlet channel length (IB)	99.2 mm	
Inlet channel volume (IB)	0.9 $\mu\text{l}$	
Outlet channel volume (IB)	3.2 $\mu\text{l}$	
Porous area combined channel length	4800 mm	
Porous area volume	$\approx 38 \mu\text{l}$	
Back pressure with 100 $\mu\text{l}/\text{min}$ flow (water)	$\sim 1\text{bar}$	
Surface roughness of channels (Ra)	5 nm	
Chip size	92.5 mm x 15.0 mm	90.0 mm x 15.0 mm
Chip top layer thickness	2.0 mm	
Chip base layer thickness	2.0 mm	
Operating pressure	30 bar*	>100 bar**
Material	B270 Soda-Lime Glass	
Fabrication process	HF etching and thermal bonding	
Channel coating	None (glass is naturally hydrophilic)	

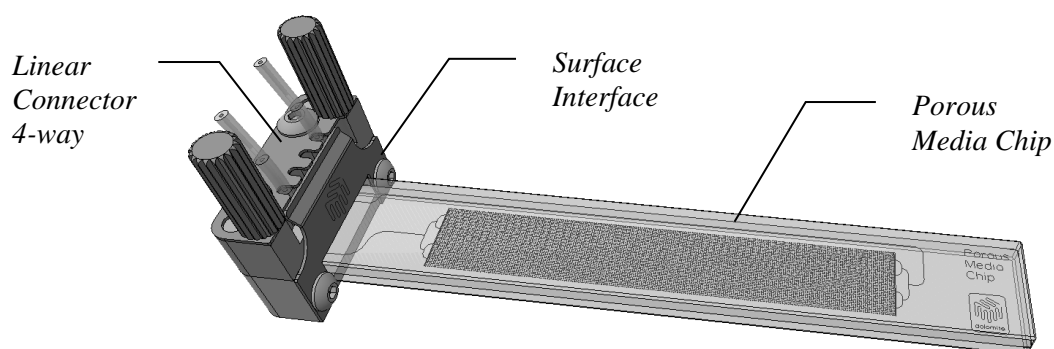
\*Based on tests at 21°C

\*\* This is a conservative estimate based on tests at 21 °C

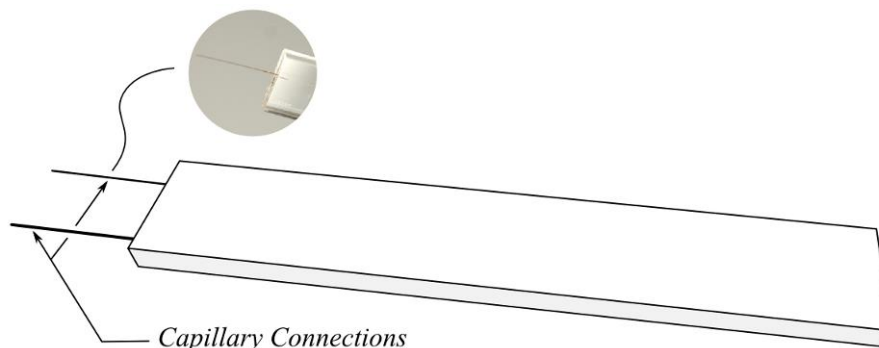
## Custom Options and Accessories

### Connectors

Normally the chip is purchased with a Top Interface 4-way (4mm) (Part No. 3000109) and a Linear Connector 4-way (Part No. 3000024) (see Figure 1). However, if requested, the chip can be provided with a capillary edge interface, which allows the Linear Connector 4-way to achieve working pressures of up to 300 Bar (Figure 2). Please note that the absolute operating pressure of the Linear Connector 4-way used with the Porous Media Chip is dependent on the lower pressure limit of either component. Top down connections with ferrules are possible with a custom connector.



**Figure 1** Porous Media Chip together with a top-down interface



**Figure 2** Glass capillary (100  $\mu\text{m}$  OD) based connection

### Etch depth

- Channel profiles are available ranging from  $10\mu\text{m} \times 20\mu\text{m}$  to up to  $700\mu\text{m} \times 710\mu\text{m}$  (depth x width).
- The top/base layer can be left un-etched giving a semi-circular channel cross-section.
- The standard grid-like pattern can be replaced with a topologically accurate cross sectional pattern of a sandstone rock obtained by the client.

### Channel surface

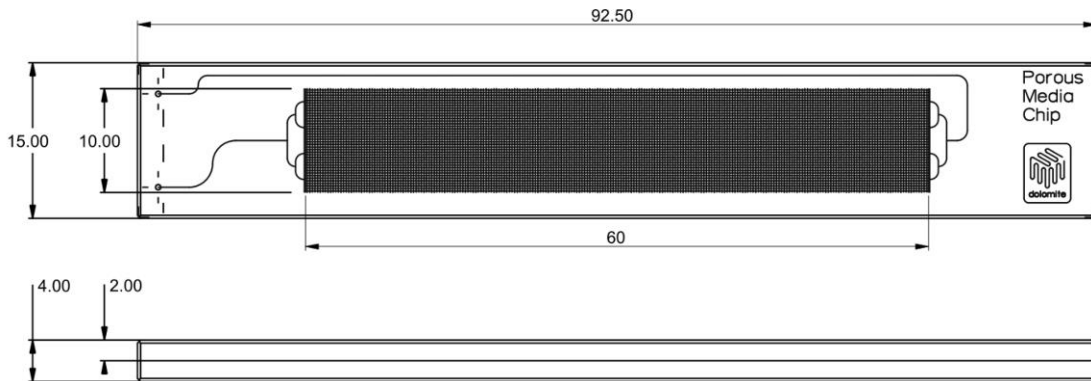
A number of different channel treatments are available:

- Platinum coating on channel surfaces (Part No. 3000089)

- Roughening of the channel surface by the use of a special etch method

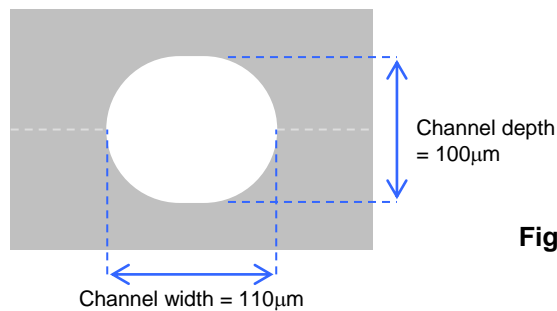
## Geometry

The standard chip configuration has a footprint of 92.5 x 15.0 mm (see Figure 3). If an edge capillary connection is needed, the chip is supplied 2.5 mm shorter on the left hand side (giving a total footprint of 90 x 15.0).



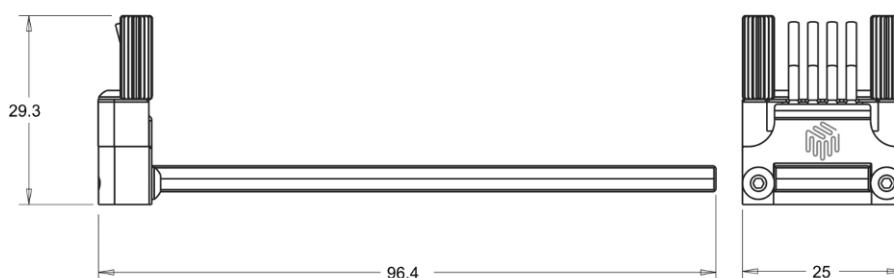
**Figure 3** Dimensions of the Porous Media Chip designed for a surface connection

All of the channels in the chip have the same profile (Figure 4) apart for the constrictions in the porous area.



**Figure 4** A typical channel profile on the chip

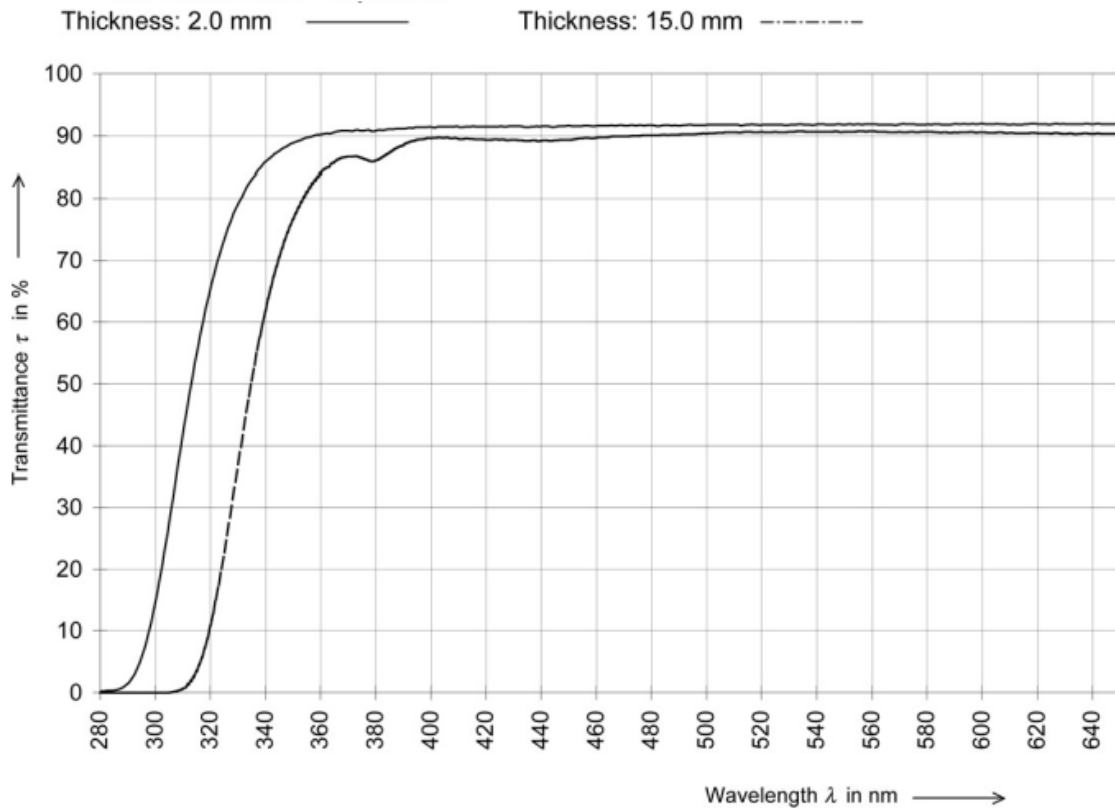
The diagram in Figure 5 shows the dimensions of the chip together with the top interface and a 4-way linear connector.



**Figure 5** Dimensions of the chip - surface connector assembly

## Optical Transmission

Please note that the diagram below is for guidance purposes only. The actual thickness of the chip is 4.0 mm, hence the actual position of the curve would fall between the 2.0 mm and 15.0 mm lines.





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