

# Microfil GP

Range  
Validation Guide



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## Introduction

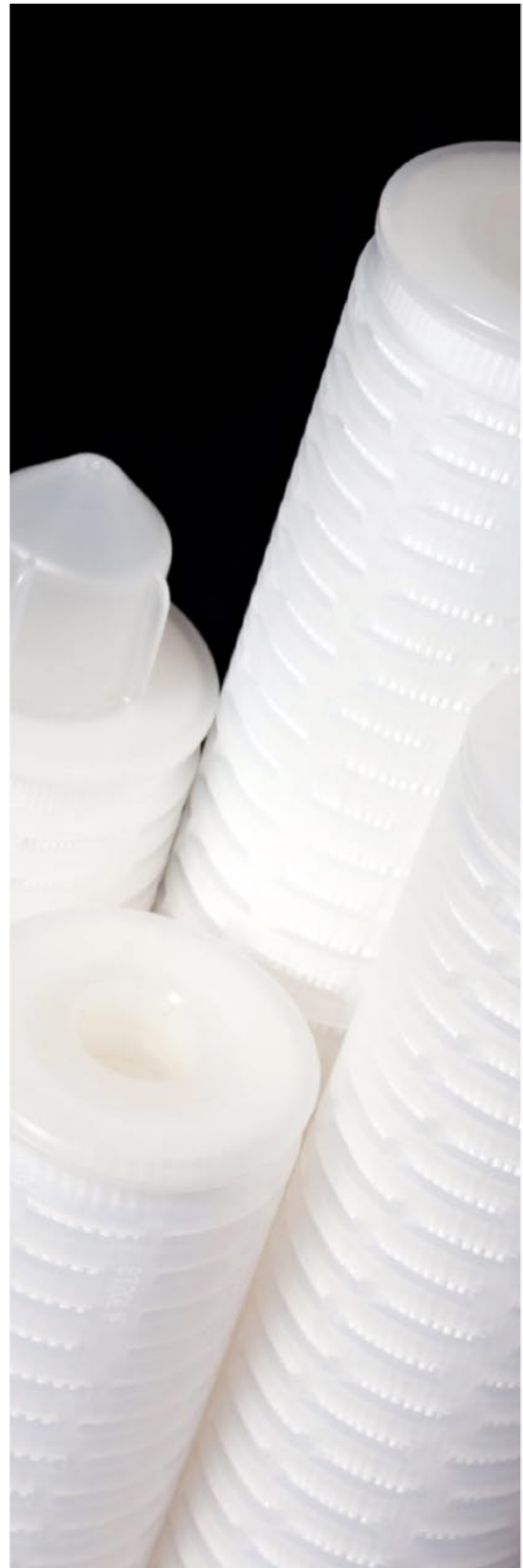
The **Porvair Filtration Group Microfil GP** range of cartridge filters combines the mechanical strength of polypropylene and glass fibre. The combined media is pleated into a cartridge assembly that is fusion bonded and supported by an injection-moulded sleeve and rigid inner core.

**Microfil GP** has been designed to safeguard products in demanding applications such as extended exposure to steam, aggressive sterilising chemicals and high differential pressures. The multi-layer media ensures a high dirt holding capacity together with accurate and reliable filtration at the rated micron size (0.4 - 5.0 microns absolute).

This validation guide demonstrates the high performance of the **Microfil GP** range and the rigorous testing that has been integral to the design and manufacture of these cartridges.

**Microfil GP** has been designed to safeguard products by employing a high efficiency melt blown polypropylene layer downstream of the glass fibre media, together with the irrigation and drainage, the whole is pleated to optimise the filtration area and minimise fin deformation. Fusion bonding is used to ensure an integral seal is achieved between the filter pack and the polypropylene end cap.

The cartridges are made from one or more modules, fusion bonded with adaptors to suit most filter housings.



## Microfil GP Materials of Construction

Porvair Microfil II cartridges are constructed in a clean room under tightly controlled conditions using advanced, highly specialised machinery. Quality and consistency of product is assured by the quality control and manufacturing procedures, which are in place throughout all stages of manufacture.

Component		FDA Number
Core:	Polypropylene	21CFR177.1520
Sleeve:	Polypropylene	21CFR177.1520
Adaptors:	Polypropylene	21CFR177.1520
End Caps:	Polypropylene Polypropylene	21CFR177.1520 21CFR121.2501
Seals:	Typically Silicone	21CFR177.2600
Media: (Polypropylene)	Polypropylene	21CFR177.1520
Media: (Glass)	Acrylic Binder	21CFR175.105
Support Materials:	Polypropylene	21CFR177.1520

Dimensions (nominal)	
Diameter:	70mm (2.8")
Length:	125mm (5") 250mm (10") 510mm (20") 760mm (30") 1020mm (40")

Operating Characteristics (maximum differential pressure)		
Normal Flow Direction at:	20°C (68°F)	6.0 bar (87lb/in <sup>2</sup> )
	80°C (176°F)	4.0 bar (57lb/in <sup>2</sup> )
	100°C (212°F)	3.0 bar (43lb/in <sup>2</sup> )
	120°C (248°F)	2.0 bar (29lb/in <sup>2</sup> )
	125°C (257°F)	1.5 bar (22lb/in <sup>2</sup> )
Reverse Flow Direction at:	20°C (68°F)	2.1 bar (30lb/in <sup>2</sup> )
	80°C (176°F)	1.0 bar (15lb/in <sup>2</sup> )
	100°C (212°F)	0.5 bar (7lb/in <sup>2</sup> )

Maximum recommended short term operating temperature: 80°C (176°F).

### Product Tracability

Every Microfil GP filter cartridge has a batch number stamped on the outer sleeve. This batch number, along with product code and general description is shown on the protective polythene bag in which the filter cartridge is sealed, and also on the outer surface of the final product packaging.

## Partical Retention ratings

**Microfil GP** cartridges are constructed using technically advanced, carefully specified, high quality media. Up to three layers are pleated together with experimentally optimised irrigation/support materials and pleat geometry. The polypropylene layers may be laminated and/or calendered, thus optimising the dirt holding capacity and efficiency.

The composite graded media packs for each rating have been designed through intensive iterative testing for efficiency and life to provide the best possible performance at repeatable and dependable absolute ratings. Some competitors rate their cartridges nominally so this data is presented for comparison. This data was compiled using ISO test dust in a single pass OSU-F2 modified test rig with PMS Liquilaze laser particle counters.

### Particle Removal Efficiency

Product Code	Absolute Rating 99.98% beta 5000 (microns)	Nominal Rating 99.9% beta 5000 (microns)	Nominal Rating 99.0% beta 5000 (microns)	Nominal Rating 98.0% beta 5000 (microns)	Nominal Rating 90.0% beta 5000 (microns)
MP4	0.4	0.3	<0.3	-	-
MP5	0.5	0.4	0.3	-	-
MP8	0.8	0.5	0.35	<0.3	-
M01	1.0	0.7	0.5	0.40	<0.3
M05	5.0	3.0	0.9	<0.6	-

## Integrity Tests

### Test Conditions (mlp 14)

The test filter was integrity tested and then flushed with 18m $\Omega$  water.

The test rig was 'flushed' by circulating clean water through the system until the particle counts reached the predetermined low levels.

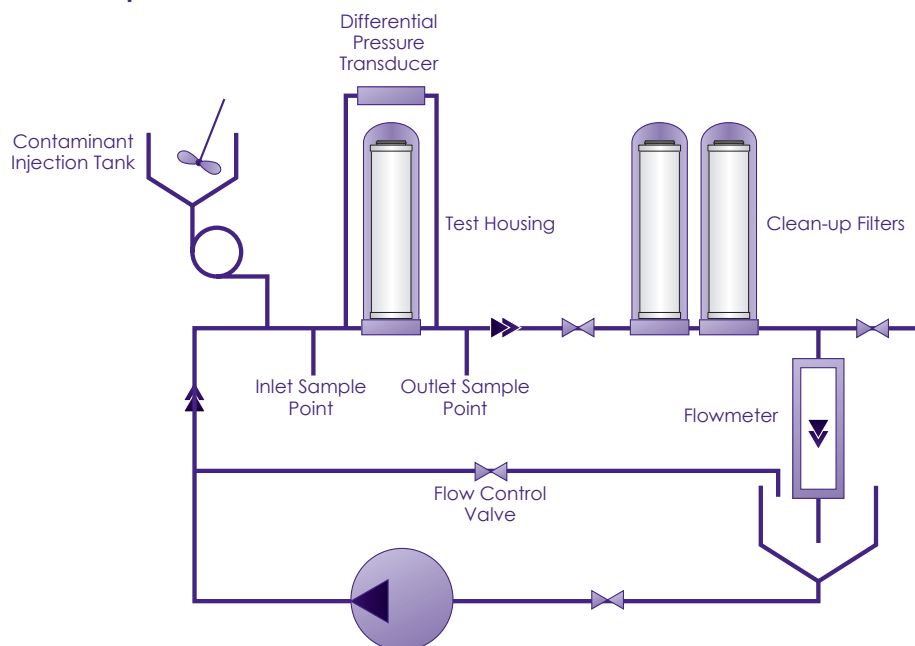
After achieving the required cleanliness, the test filter was installed in the test housing, air was purged from both test housing and clean up housing, a 0.1bar back pressure was established.

Once the system flow rate, back pressure and sensor flow rate stabilised, particle counts were taken to ensure no extraneous contaminant had been introduced into the system.

The filter test was begun by injecting the concentrated ISO Fine Test dust from the slurry tank into the system via a metering pump at a predetermined rate.

Particle counts were recorded downstream of the test filter throughout the test whilst maintaining a constant flow of 10 L/min

### Test Set-up



# Microfil GP Sterilisation by In-line Steam

## Objective

To prove the in-line multiple steaming capability of **Porvair Microfil GP** Cartridges.

## Procedure

Cartridges were sampled from routine production batches and integrity tested by using bubble point method (mlp 6) prior to in-line steaming. Cartridges were subsequently steam sterilised by dynamic in-line steam at various temperatures up to 130°C for 30 minute cycles, whilst maintaining differential pressure below 0.5 bar. Upstream and downstream condensate was drained throughout each cycle. The cartridges were air cooled between each steam cycle for 10 minutes.

The steam sterilisation procedure is summarised as follows:



## Results

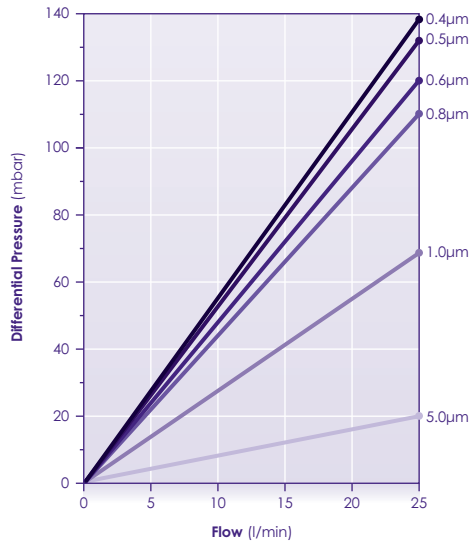
Cartridge Batch Number	Number of 20 Minute Cycles	Temperature °C	Number Tested	Number Failed
AGR 99	20	130	2	0
AGS 99	20	130	2	0
AFH 99	25	125	2	0

## Conclusion

All cartridges tested maintained their integrity throughout differing test regimes. We therefore recommend a maximum of 20 x 30-minute cycles of steam at 130°C.

# Flow Rate Characteristics

## Clean Water Flow vs Differential Pressure



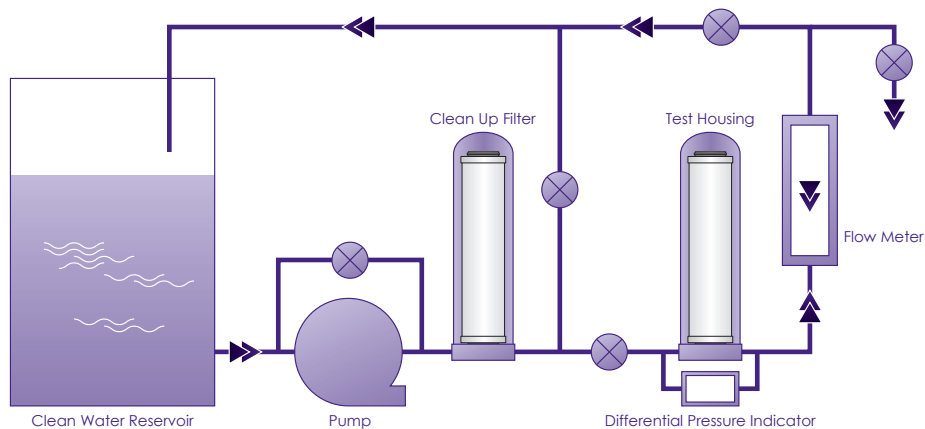
Typical clean water flow rate – based on a 250mm (10") single cartridge with a effective filtration area of between 0.39m<sup>2</sup> and 0.43m<sup>2</sup>. In situ in a **Porvair** housing exhibiting the differential pressure characteristics indicated left.

## Test Procedure

Clean water flow vs  $\Delta p$ : The test cartridges were immersed in a solution of 60% Isopropyl alcohol (IPA) 40% water for approximately 1 minute.

The water inlet valve was opened and the water allowed to circulate until the pressure differential across the clean up filter stabilised. The test filters were installed and the wetting solution flushed to waste. Water was then allowed to flow through the cartridge for approximately 10 minutes before the differential pressure across the filter/housing, at a flow of 5, 10, 15, 20, and 25 L/min, was recorded.

## Schematic of Clean Water Flow Rig









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