VALIDATION GUIDE

TETPOR LIQUID

Pharmaceutical Grade
Cartridge & Capsule Filters

Contents

1. Introduction

Sterilization grade filters that come into contact with pharmaceutical products, such as injectable or infusion liquids, must conform to strictly defined quality standards.

By using filter technology that conforms to the standards laid down by the various certifying bodies, the quality of the final product can be assured. Contamination can also be prevented from entering the final product by its comprehensive removal at each stage of the primary and secondary process.

When sterilizing grade filters are used in the manufacture of products, the interactions between product, filter and process must be fully investigated and validated.

Guidelines for validation can be sourced from publications issued by the FDA, EMEA, USP, EP, BP, PDA[1], etc. This validation document has been produced with these guidelines in mind to enable the end user to incorporate this information within their own validation documentation or standard operating instructions for the process.

NOTE

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Registered Holder Information	
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Department:	……
Address:	……
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	……
Registered No.	……
Date Issued:	……
Signed	……

[1] FDA, EMEA, USP, EP, BP, PDA – Food and Drug Administration, European Medicines Evaluation Agency, United States, European and British Pharmacopoeia, Parenteral Drug Association.

2. Quality Assurance

Quality is built into all Parker domnick hunter filtration products through a rigorous product design process, careful selection of suppliers and materials, and manufacture within a highly controlled environment using validated production technologies in adherence to cGMP.

2.1. Quality and Environmental Management Systems

Parker domnick hunter is certified by Lloyds Register Quality Assurance to current versions of the following quality standards:

- BS EN ISO9001 Quality Management Systems
- BS EN ISO14001 Environmental Management Standard
- BS EN ISO13485 Medical Devices

Copies of the original certificates are available upon request.

2.2. Manufacturing Facilities

Parker domnick hunter continues to invest substantially in installation of the latest clean room and manufacturing technology. All manufacturing systems are validated using statistical methodologies (process, product and software) and constantly monitored using statistical process control charts. All personnel within the manufacturing operations are fully trained in cGMP and against competency frameworks to ensure their suitability to operate within specific manufacturing areas.

2.3. Material Conformity

Parker domnick hunter works closely with suppliers to ensure materials supplied are of a consistently high quality and also to develop new materials as part of our ongoing product development activity. In addition to supplier certificates of conformity and analysis, incoming raw materials, including moulded parts, membranes and supports, and elastomeric seals, are subject to an appropriate level of incoming inspection. This includes bacterial challenge on each lot of membrane used in the manufacture of sterilizing grade filter cartridges and capsules.

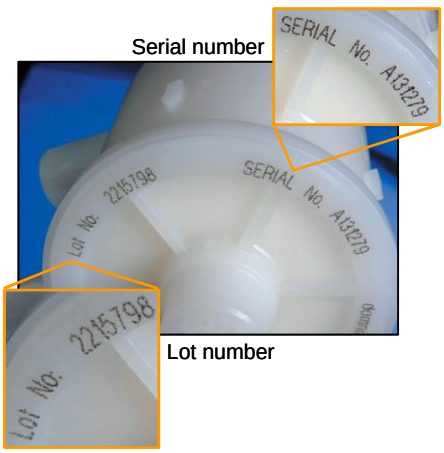
2.4. Product and Lot Release Criteria

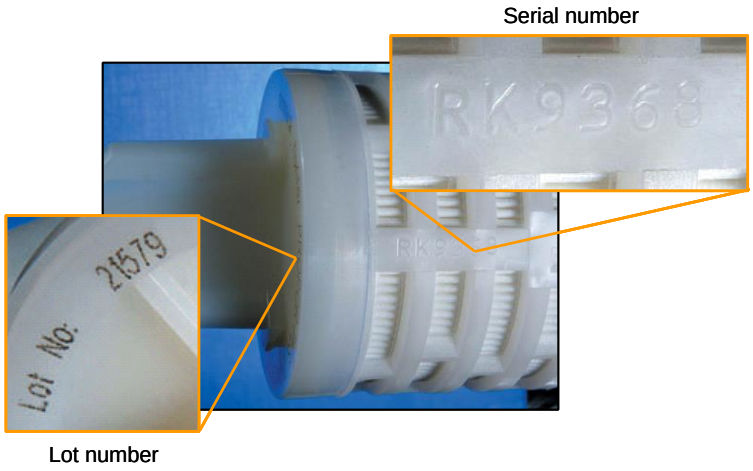
Prior to shipment all Parker domnick hunter cartridges and capsules undergo final product quality control. 100% of testable products undergo a non-destructive integrity test (diffusional flow). This includes a high volume flush with water that meets or exceeds the current EP and USP standards for purified water. Products are dried using HEPA filtered air and sealed in a protective polyethylene bag within the controlled manufacturing environment prior to final pack and despatch.

In addition a sample is taken from each production lot and tested to demonstrate conformity to validated claims.

2.5. Product Traceability

The product code and type, lot number and unique capsule serial number are printed on all products. Additionally, the lot number is identified on the protective bag label and the box label within which the cartridge / capsule is packed. The serial number provides complete traceability back to pleated materials used in the manufacture of each capsule and the manufacturing processes through the module routing sheet.





2.6. Product Shelf Life

The shelf life for TETPOR LIQUID is 5 years for cartridges and 3 years for capsules.

3. Product Description

All products within the TETPOR LIQUID range have been designed for use in bioprocessing and pharmaceutical applications. All jointed surfaces are assembled by the use of heat sealing technology. No resins or binders are used in the manufacture of the filter and no surfactants are added to aid wetting.

3.1. Materials of construction

All materials meet the FDA requirements as defined in Title 21 Code of Federal Regulations and the BioSafety Tests as defined in the current USP including the Class VI Plastics Testing.

Filtration membrane	Polytetrafluoroethylene (PTFE)
Upstream support	Polypropylene
Downstream support	Polypropylene
Inner core	Polypropylene
Sleeve	Polypropylene
Endcaps (cartridge)	Polypropylene
Endcaps insert	316 Stainless Steel
Capsule body (DEMICAP)	Polypropylene
Capsule body (MURUS)	Polypropylene
Capsule vent seals	Silicone
Cartridge o-rings (standard)	Viton
Filling bell	Polycarbonate

3.2. Product Coding

Product code structures indicate the cartridge / capsule sizes, micron ratings, endcap configurations and o-rings that are available within the product range.

Cartridges

Example ZCMT2-020C-PV — 500 mm (20”) 0.2 micron TETPOR LIQUID filter cartridge, pharmaceutical grade with ‘C’ style endcap and Viton o-rings.

ZCMT [ ] - [ ][ ][ ] [ ] - [ ] [ ]

Code	Length (mm)	Length (inch)	Diameter (mm)
B	65	2.5	56
A	125	5	56
K	125	5	72
1	250	10	72
2	500	20	72
3	750	30	72
4	1000	40	72

Code	Micron Rating
010	0.1
020	0.2
045	0.45
100	1.0

Code	10” Endcap Style
B	Pdh DOE
C	P-7
G	M-0
R	S-28

Code	Endcap (Demi)
T	TRUESEAL
Y	Demi MCY
Z	Demi A & B Std

Code	Variant Ref
L	Liquid
P	Pharmaceutical

Code	o-rings
E	EPDM[2]
P	FEP encapsulated silicone
V	Viton™[3]
S	Silicone

Small Scale DEMICAP Capsules

Example ZEMTB-045TT-PN3 — B size 0.45 micron TETPOR LIQUID DEMICAP capsule, pharmaceutical grade with tri-clamp connections supplied non-sterile in packs of 3.

ZEMT [ ] - [ ][ ][ ] [ ] [ ] - [ ] [ ] [ ] - [ ]

Code	Accessory
FB	Filling Bell*
*with G and H styles only	

Code	Length (mm)	Length (inch)
E	113	4.4
B	140	5.5
A	200	7.9

Code	Micron Rating
010	0.1
020	0.2
045	0.45
100	1.0

Code	Inlet Connection Type
T	1” Tri-clamp
N	½” NPT Male
H	½” Hosebarb
G	Stepped 6 mm – 12 mm Hosebarb
M	¼” NPT Male
Q	Walther QRC Male
R	Grommel QRC Male
V	3/8” NPT Female

Code	Outlet Connection Type
T	1” Tri-clamp
N	½” NPT Male
H	½” Hosebarb
G	Stepped 6 mm – 12 mm Hosebarb
M	¼” NPT Male
Q	Walther QRC Male
R	Grommel QRC Male
V	3/8” NPT Female

Code	Variant Ref
P	Pharmaceutical

Code	Sterilisation Grade
N	Supplied non sterile

Code	Additional Specification
3	Pack of 3

[2] **EPDM** – Ethylene Propylene Diene Monomer Rubber
[3] **Viton™** is a registered trademark of DuPont Dow Corporation

Large Scale MURUS capsules

Example ZLMT1-020TT-PN-L-S 10 “ 0.2 micron TETPOR LIQUID MURUS capsule with tri-clamp connections, pharmaceutical grade, supplied non-sterile with inline design and silicone o-rings.

ZLMT [ ] - [ ][ ][ ] [ ] [ ] - [ ] [ ] - [ ] - [ ]

Code	O-rings
S	Silicone
E	EPDM[4]
V	Viton™[5]

Code	Length (mm)	Length (inch)
K	125	5
1	250	10
2	500	20
3	750	30
4	1000	40

Code	Micron Rating
010	0.1
020	0.2
045	0.45
100	1.0

Code	Inlet Connection Type
T	1” Tri-clamp
A	¾” Tri-clamp
B	1½” Tri-clamp
D	1” Hosebarb

Code	Outlet Connection Type
T	1” Tri-clamp
A	¾” Tri-clamp
B	1½” Tri-clamp
D	1” Hosebarb

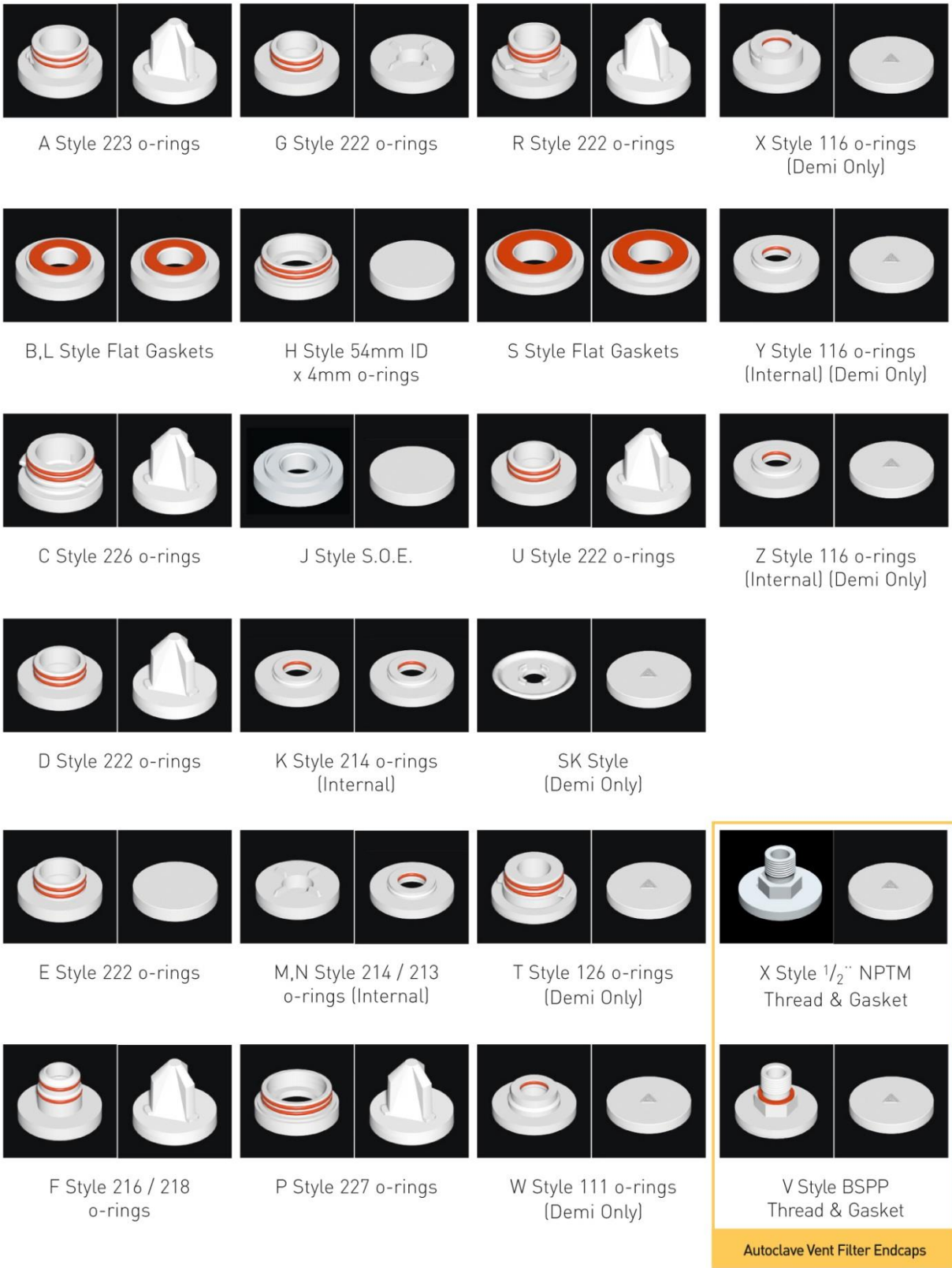
Code	Variant Ref
P	Pharmaceutical

Code	Sterilisation Grade
N	Supplied non sterile

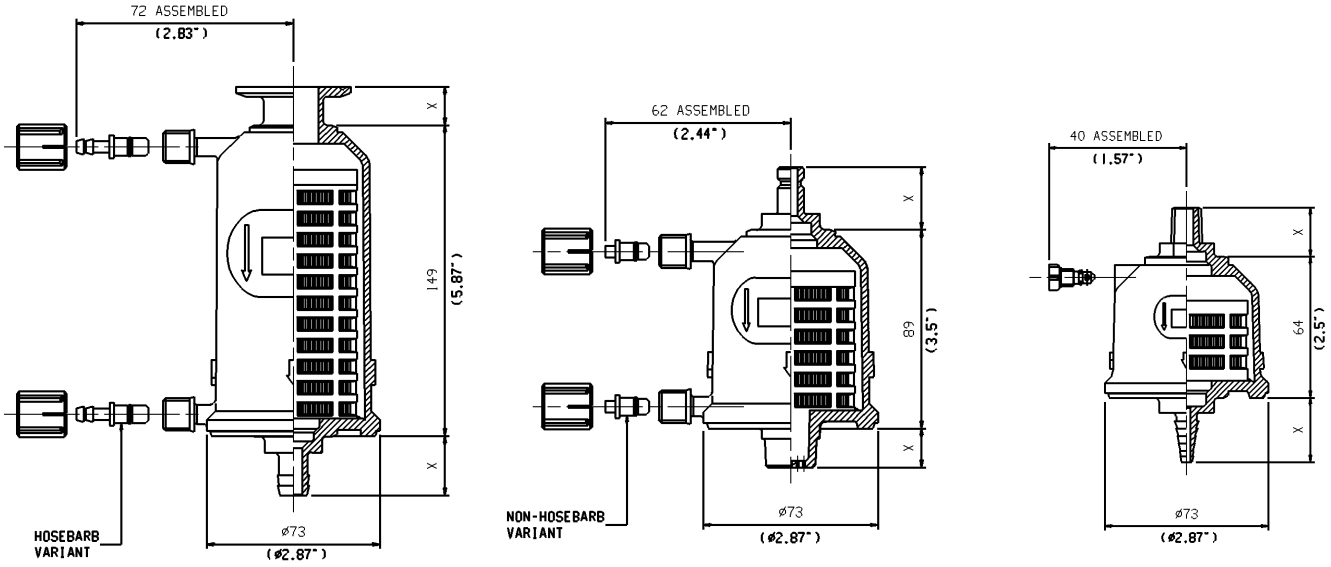
Code	Design
L	In-line
T	T-port

[4] EPDM – Ethylene Propylene Diene Momomer Rubber.
[5] Viton is a registered trademark of DuPont Dow Corporation.

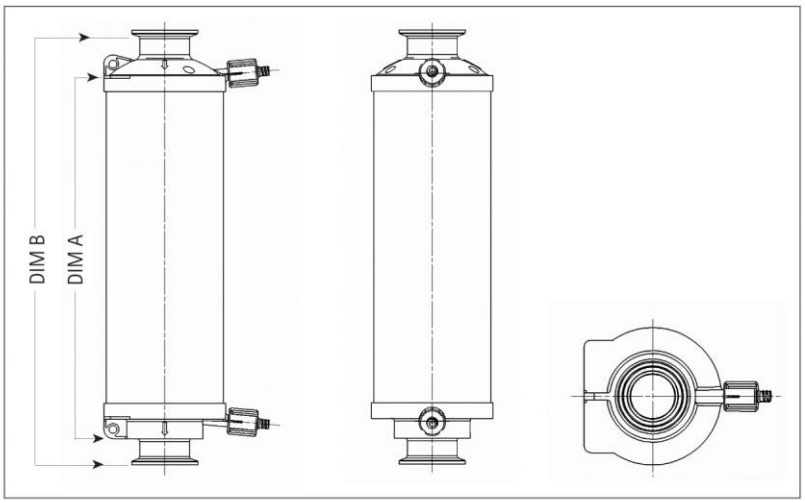
3.3. Cartridge Endcap Configurations



3.4. Capsule Dimensions



Dimensions



Cartidge Type	Dimension A	Dimension B
10" 250mm	10.30" 262mm	13.07" 332mm
20" 500mm	20.04" 509mm	22.79" 579mm
30" 750mm	29.80" 757mm	32.56" 827mm

Dimensions shown are typical lengths for $1^{1}/_{2}$" Tri-Clamp. Further dimensions available from domnick hunter.

DEMICAP Inlet / Outlet Connection Styles

1″ Tri-Clamp | Stepped Hosebarb | 1/4″ NPTM Thread | 1/2″ Hosebarb | 1/2″ NPTM Thread

MURUS Inlet/Outlet Connection Styles

1 1/2″ Tri-Clamp | 1″ Hosebarb | 1″ Tri-Clamp | 1″ Tri-Clamp T-Port | 3/4″ Tri-Clamp

4. Product Specifications

4.1. Cartridge Operating Differential Pressures and Temperatures

The recommended maximum differential operating pressures at various temperatures for products in the TETPOR LIQUID range are shown below.

Temperature		Max forward dP	
°C	°F	bar	psi
20	68	5.0	72.5
40	104	4.0	58.0
60	140	3.0	43.5
80	176	2.0	29.0
90	194	1.7	24.6

4.2. Recommended capsule operating conditions

Small-Scale DEMICAP Capsules

The TETPOR LIQUID range of DEMICAP capsules can be operated up to 40°C (104°F) at line pressures up to 5.0 barg (72psig).

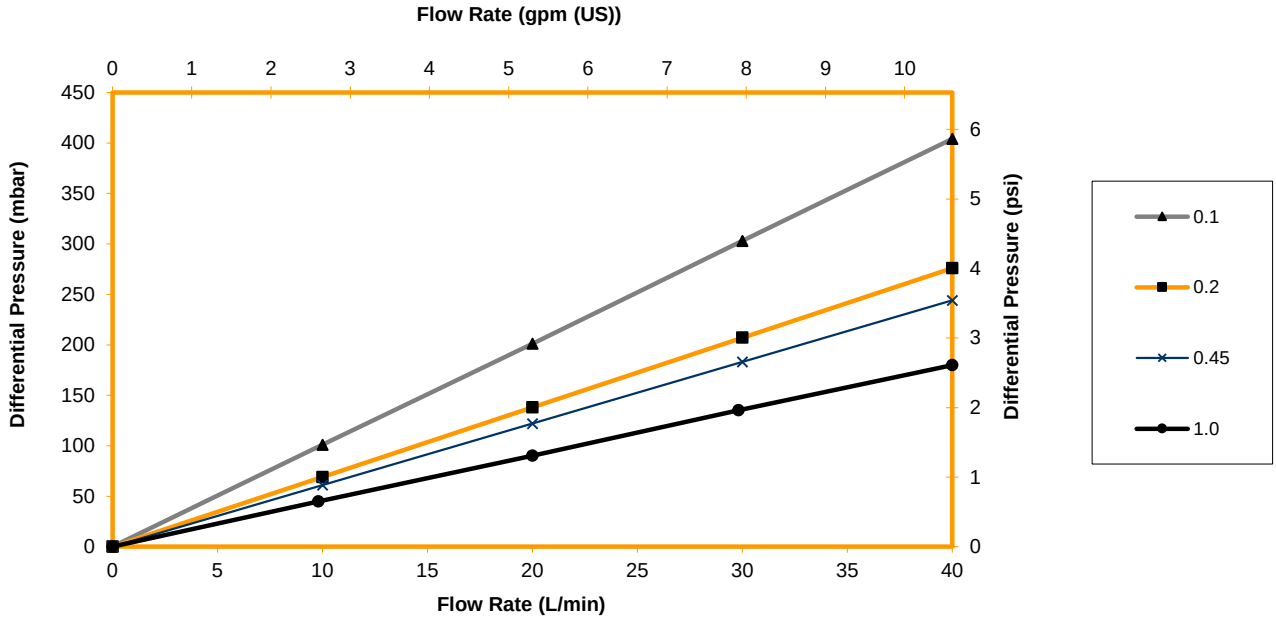
Large-Scale MURUS Capsules

The TETPOR LIQUID range of MURUS capsules can be operated up to 25°C (77°F) at line pressures of 5.5 barg (79.7 psig) or up to 60°C (140°F) at line pressures of 2.8 barg (40.6 psig).

4.3. Flow Rates

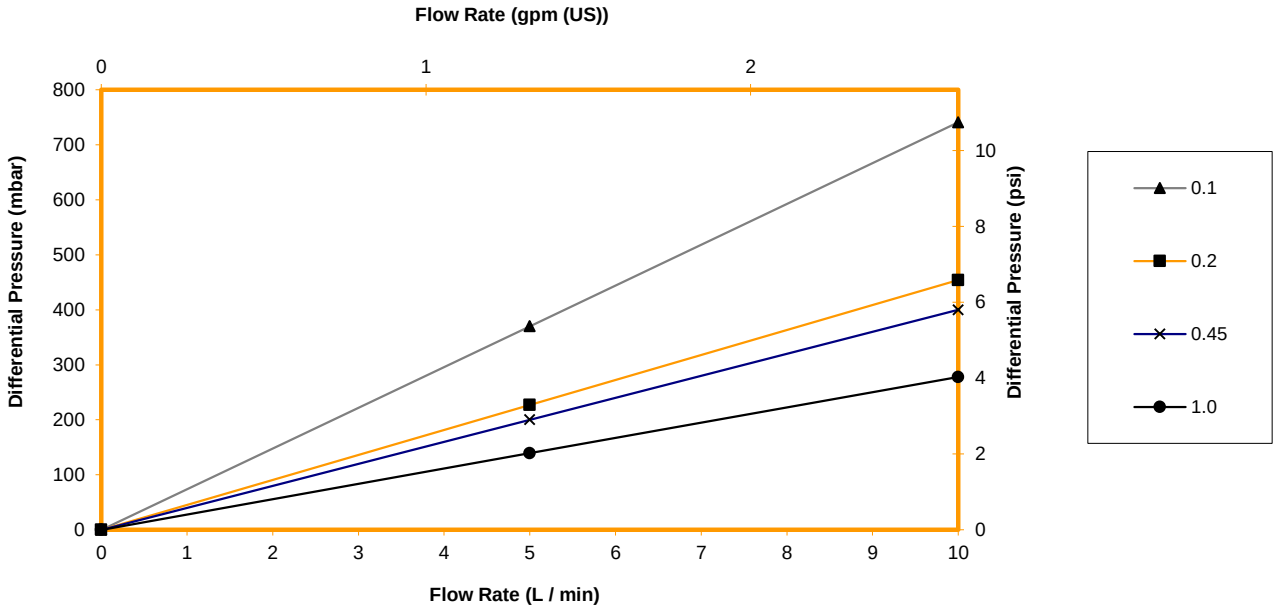
Cartridge flow rates were determined for filters from three separate lots. The flow rates for the MURUS capsule range are the same as those for the equivalent size cartridge

Water Flow Characteristics for 10 inch Cartridges and Capsules*



* *Capsule fitted with 1½" triclover connection*

Water Flow Characteristics for B Size Cartridges and Capsules



4.4. Effective Filtration Area (EFA)

Product Size	Surface Area (m^2)	Surface Area (ft^2)
3	2.31	24.86
2	1.54	16.58
1	0.77	8.28
K	0.36	3.87
A	0.25	2.69
B	0.12	1.29
E	0.06	0.64

4.5. Autoclave Life

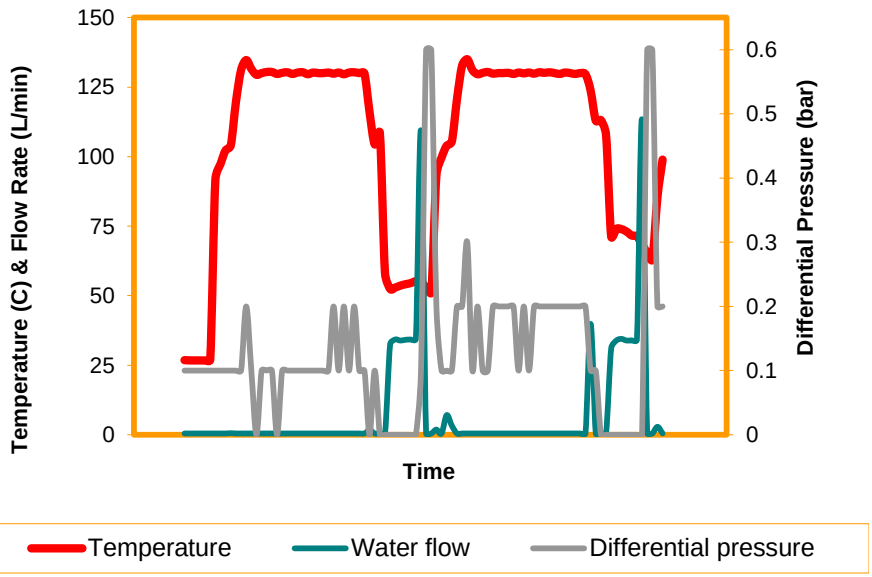
The autoclave life of TETPOR LIQUID products was determined using a porous load cycle.

Product Format	SIP Temp		Number of Cycles	Cycle Time (minutes at temperature)
	°C	°F		
Cartridges	142	288	120	30
MURUS capsules	130	266	5	30
DEMICAP capsules	135	266	100	30

To maximize cartridge and capsule life, a slow exhaust cycle is recommended.

4.6. Cartridge Steam Life

The steam life of cartridges was determined using the Steam in Place (SIP) cycle shown below, which replicates extreme conditions. This includes a combination of steaming for 30 minutes at temperature followed by ambient water flow during the cooling phase of each cycle.



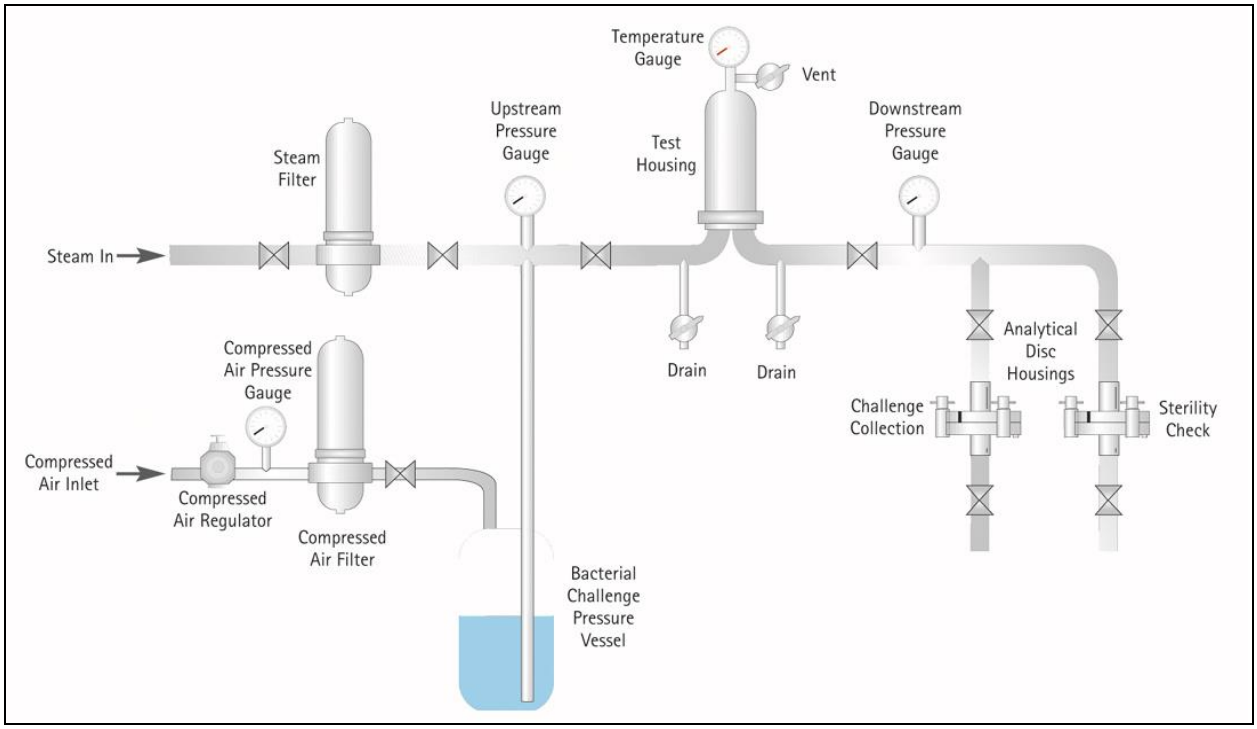
Product Format	SIP Temp °C	SIP Temp °F	Number of Cycles	Cycle Time (minutes at temperature)
Cartridges	142	288	120	30
Capsules	Do not steam in place			

To maximize the life of the cartridge, the differential pressure across the cartridge should not exceed 0.3 bar (4.4 psi) at 142ºC (288ºC). For new applications it is recommended that the Parker domnick hunter guidance for the method of steam sterilization is followed.

4.7. Retention

The correlation between bacterial challenge and a non-destructive integrity test has been demonstrated using the procedure documented in the current revision of ASTM F838 'Standard Test Method for Determining Bacterial Retention of Membrane Filters Utilized for Liquid Filtration'[6].

Liquid Bacterial Challenge Schematic



Under these test conditions, the test filter is challenged with a minimum of 10^7 viable *Brevundimonas diminuta* (ATCC 19146) per square centimetre of effective filtration area. Any organisms that pass through the test filter are collected and cultured on the surface of analytical discs. In this way colonies may be counted and bacterial species identified. The filter retention is quantified by expressing the filter's efficiency to remove the challenge organism from the challenge suspension as a Log Reduction Value (LRV).

$$LRV = Log_{10} \left({}^{\text{Number of organisms in the challenge}} / _{\text{Number of organisms in the filtrate}} \right)$$

[6] Previous reference to the guidance document *Microbial Evaluation of Filters for Sterilising Liquids*, HIMA Document No. 3 Vol. 4, April 1982, referred to in USP<1211> *Sterilisation by Filtration* has been superseded by the equivalent ASTM F838.

4.8. Diffusional Flow Correlation Data

The correlation between diffusional flow and bacterial challenge for TETPOR LIQUID 0.2 micron cartridges is shown in the table below. This data shows that a 250mm (10") TETPOR LIQUID 0.20 micron filter exhibiting a diffusional flow of <22.0 ml/min when completely wetted with 60:40$_{v/v}$ IPA / Water at a test pressure of 0.80 barg (11.6 psig) at 20°C (68°F) will produce a sterile filtrate.

Filter type: ZCMT1-020C-L TETPOR LIQUID 0.2 µm 10" cartridge

Challenge organism: *Brevundimonas diminuta* (ATCC 19146)

Serial No.	Diffusional Flow (Air in Water) @ 0.80 barg (11.6 psig) ml/min	Total Challenge Level (cfu)	Organisms Passed (cfu)	LRV[7]
M32898	0.5	1.70	0	11.23
M36067	2.0	2.50	0	11.40
M32903	2.2	1.34	0	11.13
M32914	2.2	2.64	0	11.42
M36065	2.3	0.31	0	11.49
M32894	3.1	1.64	0	11.21
M32902	3.1	1.77	0	10.25
M41707	3.5	0.14	0	10.10
M32908	3.7	2.41	0	11.38
M41710	5.1	0.15	0	10.18
M36069	6.1	1.57	0	11.20
N008205	6.6	2.88	0	11.46
M37703	6.7	3.25	0	11.51
M32916	6.7	2.32	0	11.37
M32910	6.8	1.65	0	11.22
M41722	6.8	0.13	0	10.11
N008204	7.0	1.99	0	11.30
M37700	7.2	3.08	0	11.49
J29578	7.9	1.80	0	11.26
J29577	7.9	3.02	0	11.48
S000143	9.9	2.87	0	11.46
M36064	11.0	3.11	0	11.49
M37710	11.0	2.01	0	11.30
E92447	22.0	0.52	0	10.72
M38639	22.4	3.29	15	10.31
M41723	36.5	0.40	333	8.08

Conclusion

A maximum diffusional flow of 18ml/min for a 60:40 IPA / Water wetted 10" TETPOR LIQUID filter cartridge provides complete assurance of a sterile effluent incorporating as it does a safety margin in relation to the correlation data above.

[7] Where organisms passed = 0, LRV is stated as *greater than*.

4.9. Bubble Point Correlation Data

The correlation between bubble point and bacterial challenge for TETPOR LIQUID 0.2 micron cartridges is shown in the table below. This data shows that a 250mm (10") TETPOR LIQUID 0.20 micron filter exhibiting a bubble point of ≥1009mbar when completely wetted with 60:40$_{v/v}$ IPA / Water at 20°C (68°F) will produce a sterile filtrate.

Filter type: ZCMT1-020C-L TETPOR LIQUID 0.2 µm 10" cartridge

Challenge organism: *Brevundimonas diminuta* (ATCC 19146)

Serial No.	Bubble Point in 60:40 IPA/Water @ 20°C (mbar)	Total Challenge Level (cfu)	Organisms Passed (cfu)	LRV[8]
N558182	1009	1.2×10^{11}	0	11
N561311	1447	1.2×10^{11}	0	11
N567597	1476	2.0×10^{11}	0	11.3
N558164	1509	1.0×10^{11}	0	11
N567613	1514	1.4×10^{11}	0	11.1
N586194	1535	2.2×10^{11}	0	11.3
N564400	1546	1.0×10^{11}	0	11
N557706	1563	1.6×10^{11}	0	11.2
EE0481	1601	1.9×10^{11}	0	11.2
N564406	1607	1.2×10^{11}	0	11
N567607	1614	1.2×10^{11}	0	11
N566093	1619	1.2×10^{11}	0	11
EE0499	1622	1.9×10^{11}	0	11.2
ED6082	1628	1.5×10^{11}	0	11.1
N561321	1630	1.5×10^{11}	0	11.1
N561333	1649	1.4×10^{11}	0	11.1
N569287	1656	1.0×10^{11}	0	11
N569298	1666	8.0×10^{10}	0	10.9
N564397	1672	8.8×10^{10}	0	10.9
N562489	1697	1.7×10^{11}	0	11.2
ED6094	1724	1.1×10^{12}	0	12
N573687	1750	1.1×10^{11}	0	11
EE0491	1796	4.8×10^{11}	0	11.6
N560087	2084	1.8×10^{11}	0	11.2

Conclusion

A minimum bubble point of 1009 mbar for a 60:40 IPA / Water wetted 10" TETPOR LIQUID filter cartridge provides complete assurance of a sterile effluent.

[8] Where organisms passed = 0, LRV is stated as *greater than*.

4.10. Integrity Testing Data

The following integrity test limits have been determined from the 10 inch cartridge correlation data. Limits for other sizes have been calculated directly from effective filtration area ratios for each variant. These limits are for 60:40$_{v/v}$ IPA / Water wet cartridges using air as the test gas.

Micron Rating	Minimum Bubble point[9]		Diffusional Flow Test Pressure		Maximum Diffusional Flow (ml / min)				
	bar	psi	bar	psi	10”	K	A	B	E
0.1	1.30	19.0	1.0	14.5	27.0	12.7	9.0	4.5	2.3
0.2	1.009	14.5	0.8	11.6	18.0	8.5	6.0	3.0	1.5
0.45	0.70	10.0	0.4	5.8	18.0	8.5	6.0	3.0	1.5
1.0	0.30	4.0	-	-	-	-	-	-	-

[9] Parker domnick hunter does not recommend the use of bubble point as an integrity test method for cartridges but values are given for use as an indicator of product integrity.

4.11. Chemical Compatibility

The following data is indicative of TETPOR LIQUID cartridge & capsule compatibility with a range of chemicals at ambient temperature and 72 hour exposure. However it is recommended that specific process conditions are reviewed with your local Parker domnick hunter representative.

	ASYPOR	BIO-X II	HIGH FLOW BIO-X	HIGH FLOW BIO-X VENT AUTOCLAVE	HIGH FLOW PREPOR GFA	HIGH FLOW TETPOR	HIGH FLOW TETPOR H.T.	HIGH FLOW TETPOR VENTAUTOCLAVE	PROCLEAR PP	PROCLEAR GF	PREPOR SG	PROPOR HC	TETPOR AIR	TETPOR LIQUID	TETPOR PLUS	EPDM o-ring	VITON o-ring	SILICONE o-ring
Acetic acid 8.75N	LC	C	C	-	C	C	C	C	C	C	-	-	C	C	C	LC	LC	NC
Acetic acid conc.17.5N	NC	C	C	-	C	C	C	C	C	C	-	-	C	C	C	LC	NC	NC
Acetone	NC	C	C	-	C	C	C	C	C	C	NC	NC	C	C	C	NC	NC	NC
Acetonitrile	NC	C	C	-	LC	C	C	C	C	LC	-	-	C	C	C	NC	NC	NC
Acidbrite 4 (Diversey) 3.0%$_{v/v}$	NC	-	-	-	C	-	-	-	C	C	-	-	-	-	-	C	C	C
Ammonium Hydroxide 8N	NC	C	C	C	C	C	C	C	C	C	C	LC	C	C	C	C	C	C
Ammonium Oxalate 0.07N	-	C	C	C	C	C	C	C	C	C	-	-	C	C	C	C	C	C
Amyl Acetate	NC	C	C	C	LC	C	C	C	C	LC	LC	LC	C	C	C	NC	NC	LC
Aqueous Ammonia 15.5N	NC	C	C	C	LC	C	LC	C	C	LC	C	LC	C	C	C	C	C	C
Benzyl Alcohol	NC	C	C	C	NC	C	C	C	NC	NC	-	-	C	C	C	C	C	C
Benzyalkonium Chloride 0.1%	LC	C	C	C	C	C	C	C	C	C	-	-	C	C	C	C	C	C
Boric acid,saturated	C	C	C	C	C	C	C	C	C	C	-	-	C	C	C	C	C	C
Butan-1-ol	NC	C	C	C	C	LC	LC	LC	C	C	C	C	NC	NC	NC	C	C	C
Butan-2-ol	NC	C	C	C	C	C	C	C	C	C	C	C	C	C	C	LC	C	C
Carbon Tetrachloride	NC	C	C	C	NC	C	C	C	NC	NC	-	-	NC	NC	NC	NC	C	NC
Chloroform	NC	C	C	C	NC	C	C	C	NC	NC	NC	NC	NC	NC	NC	NC	LC	NC
Cyclohexane	NC	C	C	C	NC	-	-	-	NC	NC	-	-	LC	LC	LC	NC	NC	NC
1,4 – Dioxane	NC	C	C	C	LC	C	C	C	C	LC	-	-	C	C	C	NC	NC	NC
Diverflow (Diversey) 3%v/v	NC	-	-	-	NC	-	-	-	C	NC	C	C	-	-	-	C	C	LC
Diversey 212G 0.6%v/v	NC	-	-	-	C	-	-	-	C	C	-	-	-	-	-	C	C	C
Divosan Forte 0.5%v/v	LC	-	-	-	C	-	-	-	C	C	C	C	-	-	-	C	C	C
Divosan XT 1%v/v	C	-	-	-	C	-	-	-	C	C	-	-	-	-	-	C	C	C
Ethanol	NC	C	C	C	C	C	-	C	C	C	C	C	C	C	C	C	C	LC
Ethanol 45%	LC	-	-	-	C	-	-	-	C	C	C	C	C	C	C	C	C	C
Ethyl Acetate	NC	LC	LC	LC	LC	LC	LC	LC	LC	LC	NC	NC	LC	LC	LC	C	NC	LC
Formaldehyde 0.3%	LC	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Formaldehyde 37%	NC	C	C	C	C	C	C	C	C	C	-	-	C	C	C	C	C	C
Formic acid conc.	NC	C	C	C	NC	C	C	C	C	NC	-	-	C	C	C	C	NC	NC
Glycerol	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Hexane	LC	C	C	C	-	C	C	C	NC	-	-	-	-	-	-	NC	NC	NC
Hydrochloric acid 1N	C	-	-	-	C	-	-	-	C	C	C	C	C	C	C	C	C	C
Hydrochloric acid conc.	NC	-	-	-	NC	-	-	-	C	NC	-	-	C	C	C	NC	NC	NC

	ASYPOR	BIO-X II	HIGH FLOW BIO-X	HIGH FLOW BIO-X VENT AUTOCLAVE	HIGH FLOW PREPOR GFA	HIGH FLOW TETPOR	HIGH FLOW TETPOR H.T.	HIGH FLOW TETPOR VENTAUTOCLAVE	PROCLEAR PP	PROCLEAR GF	PREPOR SG	PROPOR HC	TETPOR AIR	TETPOR LIQUID	TETPOR PLUS	EPDM o-ring	VITON o-ring	SILICONE o-ring
Hydrochloric acid conc.13%	-	C	C	C	-	C	C	C	-	-	-	-	-	-	-	NC	NC	NC
Hydrogen Peroxide	-	C	C	C	-	-	-	-	C	-	-	-	-	-	-	C	C	C
Hydrogen Peroxide 10% Volume	C	-	-	-	C	-	-	-	C	C	C	C	C	C	C	C	C	C
Hydrogen Peroxide 100% Volume	LC	-	-	-	C	C	C	C	C	C	-	-	C	C	C	C	C	C
Methanol	NC	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	NC	C
Methyl-Iso-Butylketone	NC	C	C	C	C	C	C	C	C	C	NC	NC	C	C	C	NC	NC	LC
Methylene Chloride @ 40°C	-	-	-	-	LC	-	-	-	LC	LC	-	-	-	-	-	-	-	-
Nitric acid 2N 14.4%	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	LC	C	C
Nitric acid 15.8N	NC	C	C	C	NC	C	NC	C	C	NC	-	-	C	C	C	NC	NC	NC
Ozone	-	-	-	-	-	-	-	-	-	-	NC	NC	-	-	-	-	-	-
Paraffin yellow	LC	LC	LC	LC	LC	C	C	C	C	LC	-	-	C	C	C	NC	C	NC
Pentane	LC	C	C	C	LC	-	-	-	LC	LC	-	-	LC	LC	LC	NC	C	NC
Peracetic acid 0.5% (10 wk test)	C	-	-	-	-	C	C	C	-	-	-	-	-	-	-	C	C	C
Peracetic acid 4%	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Perchloroethylene	-	-	-	-	-	-	-	-	-	-	NC	NC	-	-	-	-	-	-
Petroleum spirits	NC	-	-	-	NC	C	C	C	NC	NC	-	-	LC	LC	LC	NC	C	NC
Phenol (aq) 0.5N	-	C	C	C	-	NC	-	NC	-	-	-	-	-	-	-	-	-	-
Phenol 5%	NC	-	-	-	C	-	-	-	C	C	-	-	C	C	C	C	C	C
Phenol 0.25%	C	-	-	-	C	-	-	-	C	C	-	-	C	C	C	C	C	C
Polyethylene Glycol 600	NC	LC	LC	LC	NC	C	C	C	LC	NC	NC	NC	-	-	-	-	-	-
Polyglycol 2000-E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	C	C
Potassium Dichromate 0.1N	LC	C	C	C	C	C	C	C	C	C	-	-	C	C	C	C	C	C
Potassium Iodine 0.6N	C	C	C	C	C	C	C	C	C	C	-	-	C	C	C	C	C	C
Potassium Hydroxide 10N	NC	C	C	C	NC	C	C	C	C	NC	C	LC	C	C	C	C	C	C
Potassium Permanganate 0.1N	NC	C	C	C	NC	C	LC	C	C	NC	C	C	C	C	C	C	C	C
Propan-1-ol	NC	C	C	C	NC	C	C	C	C	NC	C	C	C	C	C	C	C	LC
Propan-2-ol	C	C	C	C	NC	C	C	C	C	NC	C	C	C	C	C	C	C	LC
Propan-2-ol, 60:40 H_2O	C	C	C	C	NC	C	C	C	C	NC	C	C	C	C	C	C	C	C
Pyridine	NC	C	C	C	NC	C	C	C	C	NC	NC	NC	C	C	C	C	NC	C
Sodium Chloride 0.5N	LC	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Saline Lactose Broth	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Sodium Hydroxide 2N 8%	NC	NC	NC	NC	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Sodium Hydroxide 7N 28%	NC	NC	NC	NC	NC	C	C	C	C	NC	NC	NC	C	C	C	C	C	LC
Sodium Hypochlorite (14% Free Cl_2)	NC	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Sodium thiosulphate 0.1N	LC	C	C	C	C	C	C	C	C	C	-	-	C	C	C	C	C	C
Sulphuric acid 1N	NC	C	C	C	LC	C	C	C	C	LC	C	C	-	-	-	C	C	C

	ASYPOR	BIO-X II	HIGH FLOW BIO-X	HIGH FLOW BIO-X VENT AUTOCLAVE	HIGH FLOW PREPOR GFA	HIGH FLOW TETPOR	HIGH FLOW TETPOR H.T.	HIGH FLOW TETPOR VENTAUTOCLAVE	PROCLEAR PP	PROCLEAR GF	PREPOR SG	PROPOR HC	TETPOR AIR	TETPOR LIQUID	TETPOR PLUS	EPDM o-ring	VITON o-ring	SILICONE o-ring
Sulphuric acid conc.	NC	NC	NC	NC	LC	LC	NC	LC	LC	LC	NC	NC	LC	LC	LC	-	-	-
Sulphurous acid	-	-	-	-	-	-	-	-	-	-	NC	NC	-	-	-	-	-	-
Toluene	-	NC	NC	NC	-	NC	NC	NC	NC	-	NC	NC	-	-	-	NC	LC	NC
1,1,1 Trichloroethane	LC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2 Trichloroethane	-	C	C	C	LC	C	LC	C	LC	LC	NC	NC	LC	LC	LC	NC	LC	LC
Trichloroacetic Acid 80%	LC	-	-	-	LC	-	-	-	C	LC	-	-	C	C	C	NC	LC	NC
Trichloroacetic Acid 5N	-	C	C	C	-	C	C	C	-	-	-	-	-	-	-	---		
Toluene	NC	-	-	-	NC	-	-	-	-	NC	-	-	-	-	-	NC	LC	NC
Xylene	NC	LC	LC	LC	NC	LC	LC	LC	NC	NC	LC	LC	NC	NC	NC	C	LC	NC

Chemical Compatibility User Instructions and Notes

- The chemicals are arranged in alphabetical order using their most common or trade names. If the chemical in question does not appear to be listed, it may be found elsewhere in the table under a pseudonym, in particular its IUPAC[10] name.
- Please note:
  - Any product that has limited compatibility (LC) at ambient temperatures should not be used at a higher temperature.
  - The list of compatibilities does not take into account any synergistic effects of more than one chemical present in the solution to be filtered.

[10] International Union of Pure and Applied Chemistry

5. Cartridge Cleanliness and Biocompatability

TETPOR LIQUID filters must meet stringent standards to be certified pharmaceutical (P) grade product by Parker domnick hunter.

- Conformance to the requirements for non-fibre releasing filters as laid down in the United States Food and Drug Administration Regulations 21CFR11.72 and 210.3(b), (6).
- Effluent quality following a purified water flush must also be met as determined by the following tests:
  - Test for oxidisable material per USP 23 Purified Water
  - Test for bacterial endotoxins using a gel clot LAL (Limulus Amoebocyte Lysate).
  - Test for particulates
  - Test for TOC (total organic carbon)
  - Test for conductivity
- All components conform to the Biological Safety Standards identified in USP<88> to Class VI-121ºC levels.
- All filters must meet minimum defined integrity test values prior to despatch, defined from a correlation against an appropriate bacterial challenge.
- All filters are flushed with a high flux of purified water prior to despatch as a guarantee of product cleanliness.

One aspect of this is to confirm levels of potential contaminants that may be added to a process stream by the addition of the filter cartridge.

Quality of Purified Water used in the preparation of Pharmaceutical Grade Filters

The current USP and EP standards for Purified Water and Highly Purified Water specify a maximum conductivity of 1.1µS/cm at 20ºC (68ºF) and a maximum TOC content of 0.5 mg (500 ppb) of carbon per litre. The water used in the flushing stages of pharmaceutical grade filters exceeds these Pharmacopoeial requirements.

In addition, two other tests are carried out on samples taken from point of use and from a number of points in the supply pipework:

- A Membrane filtration Method Standard Plate Count Technique to establish the microbial content.
- A gel clot LAL test for detection of bacterial endotoxins at 0.125 EU/mL sensitivity.

5.1. Extractables

All pharmaceutical grade filters are designed and manufactured to yield a minimum of extractables. Testing of a purified water filtrate with TETPOR LIQUID is documented below.

Test Method (1)

Non-volatile extractables from purified water samples after flowing through an autoclaved 250 mm (10") TETPOR LIQUID cartridge are listed below. The levels shown are the quantities present in 100 ml samples of filtrate, which were taken at stages throughout a 10-litre flush.

Cartridge Serial No. S000136

Flush Quantity (litres)	Non-volatile Extract (mg per 100 ml)	Oxidisables (per USP 23 Test Method)
1	0.5	PASS
2	0.1	PASS
4	<0.1	PASS
6	0.1	PASS
8	<0.1	PASS
10	<0.1	PASS

Test Method (2)

Non-volatile extractables from an autoclaved 250 mm (10") TETPOR LIQUID cartridge and a B-size TETPOR LIQUID capsule were measured following a 4-hour dynamic immersion in a variety of commonly used solvents. The solvent volume used was 1500 mL.

Solvent	Serial No. Cartridge	Weight of extract (mg)	Serial No. Capsule	Weight of extract (mg)
Water	M41711	2.2	A022783	<0.01
Iso Propyl Alcohol (IPA)	M41719	17.6	A022782	0.38
Ethanol	M41729	9.8	A022777	0.11
Methanol	M41717	12.0	A022773	3.00
Ammonium Hydroxide (pH 12)	M41708	0.8	A022776	<0.01
Hydrochloric acid (pH3)	M41714	8.3	A02274	<0.01

6. Certificate of Conformance

To certify that Parker domnick hunter's TETPOR LIQUID filter products meet the highest pharmaceutical quality and performance requirements, a Certificate of Conformance is issued.

Documentation Approval Section

Q.A. Approval

Approved By: Martin Newman

Title: Senior Quality Engineer

Date: February 2016

Technical Approval

Approved By: Andrew Kelly

Title: Product Manager (Life Science)

Date: February 2016

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