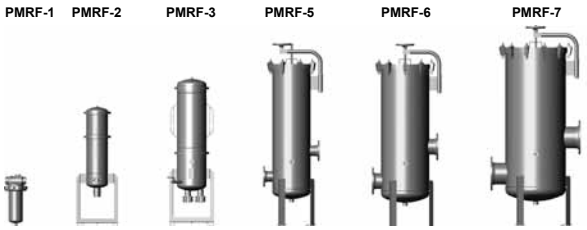
Process Multi-Rheo Filter PMRF



1. TECHNICAL SPECIFICATIONS

1.1 GENERAL

The filter series PMRF (for duplex filters see PMRFD) Process Multi-Rheo Filter completes the HYDAC Process Technology inline filter series. These filters use HYDAC FlexMicron filter elements. The elements feature outstanding contamination retention capacities. The filter housings are available in 7 different sizes and lengths and therefore a suitable filter can be found for every process. By using clogging indicators which monitor the differential pressure, the condition of the filter can be determined at any time.

Typical areas of application for this filter series are:

- Process water treatment
- Filtration of cooling lubricants and washing fluids
- Pure and ultrapure water production
- Boiler feed water
- Extending the service life of circulating fluids
- Protection filtration for UV and membrane systems

1.2 HOUSING

The filter housings in the PMRF series are designed in accordance with international regulations. They are available in carbon steel or stainless steel and in various lengths.

1.3 FILTER ELEMENTS

1.3.1 **FlexMicron E (Economy)**

The filter elements in the FlexMicron E (Economy) product line are depth filter elements produced using melt-blown technology. They are used particularly in applications where an average level of fluid cleanliness and material purity is required and they provide a cost-effective solution. Available lengths 10", 20", 30", 40" with filtration rates of 95 %.

1.3.2 **FlexMicron S (Standard)**

The filter elements in the FlexMicron S (Standard) product line are SpunSpray depth filter elements produced using melt-blown technology. They are used particularly in applications where a high level of fluid cleanliness and material purity is required. Available lengths 10", 20", 30", 40" with filtration rates of up to 99.8 %.

1.3.3 **FlexMicron P (Premium)**

The filter elements in the FlexMicron P (Premium) product line are heavy-duty elements using Pleat Technology, produced in melt-blown or high-quality glass fibre technology. They are used particularly in applications requiring high levels of cleanliness. Available lengths 10", 20", 30", 40" with a filtration rate of up to 99.99 %.

2. FILTER SPECIFICATIONS

2.1 SUMMARY OF TECHNICAL SPECIFICATIONS OF THE FILTER HOUSING (STANDARD CONFIGURATION))

Size	Length [inches]				Connection			Materials			Pressure range					Temperature	Weight	Volume
	10	20	30	40	SAE	Pipe thread G	DIN DN	Stainless steel[1]	Carbon steel with int. corrosion protection	Carbon steel without int. corrosion protection	PN6	PN10	PN16	PN25	PN40	[°C]	[kg]	[l]
1	●	●	●	●		1"		●				●			●		7.4	8.4
2	●	●	●	●	2"	2", 1.5"	50	●			●	●					34	38
3	●	●	●	●	2"	2", 1.5"	50	●			●	●					44	65
4[3]				●			50/ 80/ 100	●	●	●		●	●	●		-10 to 90	140	120
5[3]				●			80/ 100/ 150	●	●	●		●	●	●			200	180
6[3]				●			100/ 150/ 200	●	●	●		●	●	●			280	240
7[3]				●			150/ 200/ 250	●	●	●		●	●	●			370	465

[1] Size 1 in stainless steel 1.4571, sizes 2 to 7 in stainless steel 1.4301

[2] based on length of 40 inches

[3] includes cover lifting device

2.2 FURTHER SPECIFICATIONS OF THE FILTER HOUSING

2.2.1 **Seal materials**
- NBR
- FPM (Viton)
- EPDM

2.2.2 **Corrosion protection, external**
- 2 layer primer (not required for stainless steel filters)

2.2.3 **Corrosion protection, internal**
- 2K epoxy coating (not required for stainless steel filters or for type NU)

2.2.4 **Documentation**
- Operating and maintenance manual

2.3 OPTIONAL VERSIONS OF FILTER HOUSING

There are a range of optional versions available for the PRMF. For technical details and prices, please contact our Technical Sales Department at Head Office.

2.3.1 **Housing manufacture**
- ASME Code Design (with or without U-Stamp)

2.3.2 **Flange connections**
- ANSI
- JIS

2.3.3 **Housing materials**
- Various qualities of stainless steel
- Various qualities of carbon steel

2.3.4 **Seal materials**
- Various seal materials on request, depending on the resistance to the fluid.

2.3.5 **Corrosion protection and external finishes**
- RAL colours acc. customer requirements
- Various multi layer coatings

2.3.6 **Differential pressure monitoring**
- Visual
- Electrical
- Visual electrical
- Differential pressure gauge with 2 microswitches

2.3.7 **Documentation**
- Manufacturer's test certificates
- Material certificates (3.1 according to DIN EN 10204)
- 3rd parties (TÜV, ABS, Lloyds, etc.)
- Welding procedure specifications (WPS) / Procedure Qualification Record (PQR)
- Inspection plan

and many other documents available on request

Further optional models on request.

2.4 SUMMARY OF TECHNICAL SPECIFICATIONS OF FILTER ELEMENTS

2.4.1 **FlexMicron E (Economy)**

Size	No. of filter elements	Filter element type	Filter materials and filtration ratings [µm]
			Polypropylene
1	1	FlexMicron E	Not available
2	3 or 5	FlexMicron E	1, 3, 5, 10, 20, 30, 40, 50, 70, 90
3	7 or 11	FlexMicron E	
4	17	FlexMicron E	
5	22	FlexMicron E	
6	36	FlexMicron E	
7	52	FlexMicron E	

2.4.2 **FlexMicron S (Standard)**

Size	No. of filter elements	Filter element type	Filter materials and filtration ratings [µm]	
			Polypropylene	Polyamide
1	1	FlexMicron S	Not available	
2	3 or 5	FlexMicron S	1, 3, 5, 10, 20, 30, 40, 50, 70, 90	1, 3, 5, 10, 20, 30, 40, 50, 70, 90
3	7 or 11	FlexMicron S		
4	17	FlexMicron S		
5	22	FlexMicron S		
6	36	FlexMicron S		
7	52	FlexMicron S		

2.4.3 **FlexMicron P (Premium)**

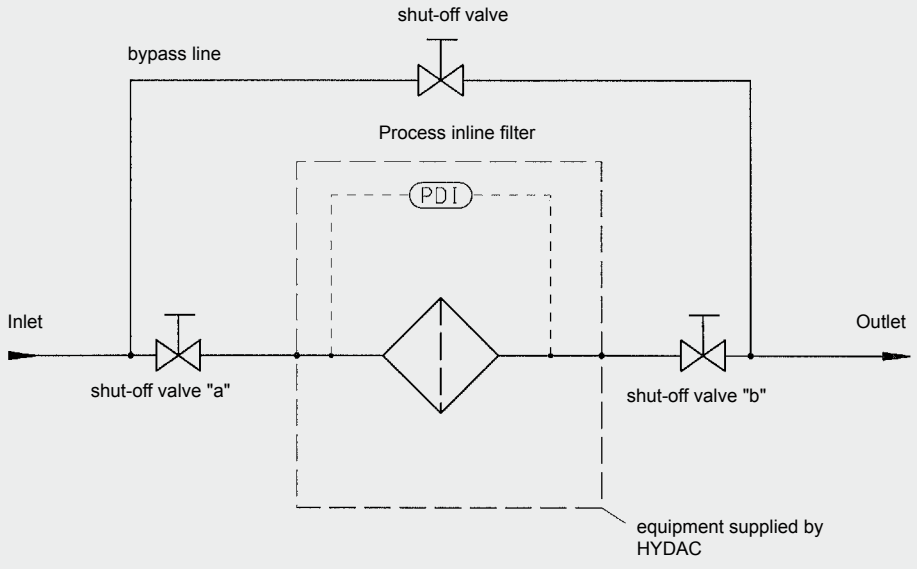
Size	No. of filter elements	Filter element type	Filter materials and filtration ratings [µm]	
			Polyester	Glass fibre
1	1	FlexMicron P	1, 3, 5, 10, 20, 30, 40, 50, 70, 90	1, 3, 5, 10, 20, 30, 40, 50, 70, 90
2	3 or 5	FlexMicron P		
3	7 or 11	FlexMicron P		
4	17	FlexMicron P		
5	22	FlexMicron P		
6	36	FlexMicron P		
7	52	FlexMicron P		

2.4.4 **Permissible differential pressure**

The maximum permissible differential pressure of the elements is dependent on the temperature in the application. Please refer to the table below:

Temperature	Filter material		
	PES / GF	PP	PA
-10 ... + 30 °C	8 bar	4 bar	7 bar
-10 ... + 60 °C	6.5 bar	2 bar	5.5 bar
-10 ... +100 °C	5 bar	–	3.5 bar

2.5 CIRCUIT DIAGRAM



3. MODEL CODE PMRF 1/2/3/4/5/6/7

PMRF - 4 - E / 17 - Q - 40 - 10 - F - 1 - X

Type
PMRF = Process Multi Rheo Filter

Size
1 = approx. 76 mm housing diameter
2 = approx. 223 mm housing diameter
3 = approx. 274 mm housing diameter
4 = approx. 355 mm housing diameter
5 = approx. 406 mm housing diameter
6 = approx. 508 mm housing diameter
7 = approx. 610 mm housing diameter

Housing material

		for size						
		1	**2**	**3**	4	5	6	7
E	= stainless steel*							
NU	= carbon steel uncoated*				4	5	6	7
NM	= carbon steel with internal 2K epoxy coating*				**4**	**5**	**6**	**7**

* For quality, see technical specifications **Bold** = standard

Number of elements

		for size						
1	= 1 filter element	1						
3	= 3 filter elements		2					
5	= 5 filter elements		2					
7	= 7 filter elements			3				
11	= 11 filter elements			3				
17	= 17 filter elements				4			
22	= 22 filter elements					5		
36	= 36 filter elements						6	
52	= 52 filter elements							7

Connection type

		for size						
D	= G 1"	1	2	3				
F	= G1/ 1/2"		2	3				
G	= G 2"		2	3				
L	= SAE DN50		2	3				
J	= DIN DN 50		2	3				
Q	= DIN DN 80				4			
R	= DIN DN 100					5		
V	= DIN DN 150						6	
W	= DIN DN 200							7

Element size

		for size						
10	= 10 "	1	2	3				
20	= 20 "	1	2	3				
30	= 30 "	1	2	3				
40	= 40 "	1	2	3	4	5	6	7

Pressure range

		for size						
6	= 6 bar			3				
10	= 10 bar	**1**	**2**	**3**	**4**	**5**	**6**	**7**
16	= 16 bar				4	5	6	7
25	= 25 bar				4	5	6	7
40	= 40 bar	1			4	5	6	7

Bold = standard

Seal material
N = NBR
F = FPM (Viton)
E = EPDM

Clogging indicator
0 = without
1 = with visual indicator (PVD 2B.1)
2 = with visual-electrical indicator (PVD 2D.0/-L..)
3 = V01
4 = differential pressure gauge AL (measuring range 4 bar)
5 = differential pressure gauge Stainless steel (measuring range 4 bar)
6 = with electrical indicator (PVD 2C.0)
See Brochure no.:D7.706.1../.. Clogging Indicators for Process Filters

Modification number
X = the latest version is always supplied

3.1 MODEL CODE FLEXMICRON E (ECONOMY) FILTER ELEMENTS

N - 40 - FM-E - 005 - PP - 1 - F

Element length

10	=	10"	30	=	30"		
20	=	20"	40	=	40"		

Element type

FM-E = FlexMicron E (Economy)

Filtration rating

001	=	1 µm	010	=	10 µm	040	=	40 µm	090	=	90 µm
003	=	3 µm	020	=	20 µm	050	=	50 µm			
005	=	5 µm	030	=	30 µm	070	=	70 µm			

Material of filter element

PP = polypropylene

End cap type

0 = compression ring (DOE), no cap or seal (Ø 64 mm)
1 = plug-in adapter (1x 222 O-ring), flat end cap (Ø 64 mm)
2 = plug-in adapter (2x 222 O-ring), flat end cap (Ø 64 mm)
10 = gasket (DOE) (Ø 64 mm)
13 = plug-in adapter (2x 222 O-ring), locating spigot (Ø 64 mm)
14 = bayonet (2x 226 O-ring), locating spigot (Ø 64 mm)
others on request

Seal material

N = NBR
F = FPM (Viton)
E = EPDM
Other element models available on request

3.1 MODEL CODE FLEXMICRON S (STANDARD) FILTER ELEMENTS

N - 40 - FM-S - 005 - PP - 1 - F

Element length

10	=	10"	30	=	30"		
20	=	20"	40	=	40"		

Element type

FM-S = FlexMicron S (Standard)

Filtration rating

001	=	1 µm	010	=	10 µm	040	=	40 µm	090	=	90 µm
003	=	3 µm	020	=	20 µm	050	=	50 µm			
005	=	5 µm	030	=	30 µm	070	=	70 µm			

Material of filter element

PP = polypropylene
PA = polyamide

End cap type

0 = compression ring (DOE), no cap or seal (Ø 64 mm)
1 = plug-in adapter (1x 222 O-ring), flat end cap (Ø 64 mm)
2 = plug-in adapter (2x 222 O-ring), flat end cap (Ø 64 mm)
10 = gasket (DOE) (Ø 64 mm)
13 = plug-in adapter (2x 222 O-ring), locating spigot (Ø 64 mm)
14 = bayonet (2x 226 O-ring), locating spigot (Ø 64 mm)
others on request

Seal material

N	=	NBR	E	=	EPDM
F	=	FPM (Viton)	Z	=	No seal (only for end cap form 0)

Other element models available on request

3.1 MODEL CODE FLEXMICRON P (PREMIUM) FILTER ELEMENTS

N - 40 - FM-P - 005 - PES - 1 - F

Element length

10	=	10"	30	=	30"		
20	=	20"	40	=	40"		

Element type

FM-P = FlexMicron P (Premium)

Filtration rating

001	=	1 µm	010	=	10 µm	040	=	40 µm			
003	=	3 µm	020	=	20 µm						
005	=	5 µm	030	=	30 µm						

Filter material

PES = Polyester
GF = Glass fibre

End cap type

1 = plug-in adapter (1x 222 O-ring), flat end cap, (Ø 64 mm)
2 = plug-in adapter (2x 222 O-ring), flat end cap, (Ø 64 mm)
3 = plug-in adapter (2x 222 O-ring), flat end cap, (Ø 70 mm)
5 = plug-in adapter (2x 222 O-ring), locating spigot, (Ø 70 mm)
7 = bayonet (2x 226 O-ring), locating spigot, (Ø 70 mm)
10 = open (gasket DOE), (Ø 64 mm)
12 = Cuno adapter (hanging elements), (Ø 64 mm)
others on request

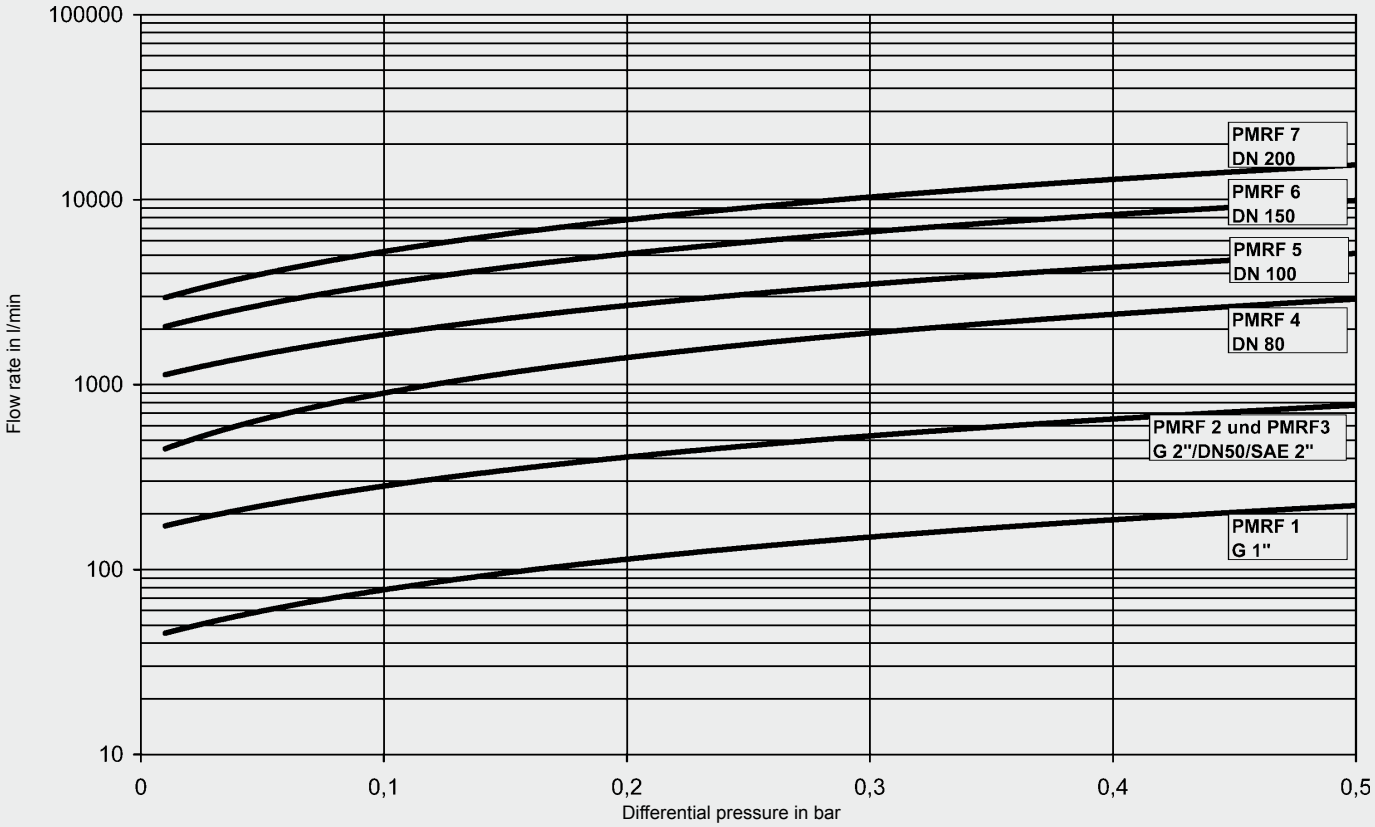
Seal material

N = NBR
F = FPM (Viton)
E = EPDM
Other element models available on request

4. FILTER CALCULATION / SIZING

4.1 PRESSURE DROP CURVES HOUSING

The pressure drop curves apply to water and other fluids up to a viscosity of 15 mm²/s.



The total pressure drop of the filter at a certain flow rate is the sum of the housing Δp and the element Δp.

The housing pressure drop can be determined using the following pressure drop curves. The pressure drop of the elements is calculated using the R factors.

In order to be able to size the filter correctly, the following design data should be available:

- Flow rate
- Type of medium
- Materials/resistance
- Viscosity
- Required filtration rating
- Particulate loading in the fluid
- Type of contamination
- Operating pressure
- Operating temperature
- Integration of the PMRF into the whole system

A further factor in the calculation is the flow velocity through the flange inlet. It should not exceed 4 m/s.

4.2 PRESSURE DROP CALCULATION FOR ELEMENTS

The pressure drop for elements in clean condition is calculated as follows:

$$\Delta p\ [bar] = \frac{R \times V\ [mm^2/s] \times Q\ [l/min]}{n \times l\ [inch] \times 1000}$$

R = R factor
V = viscosity [mm²/s]
Q = flow rate [l/min]
n = no. of elements
L = element length [inch]

FlexMicron E (Economy) R (resistance) factor

Filtration rating [µm]	Water-based fluids PP
1	37
3	29
5	20
10	11
20	8
30	6.8
40	5.4
50	4.2
70	3.1

FlexMicron S (Standard) R (resistance) factor

Filtration rating [µm]	Water-based fluids PA	PP
1	274	321
3	116	186
5	42	132
10	15	99
20	11	54
30	6	16
40	3.8	12
50	1.9	10
70	1.1	8
90	0.6	6

FlexMicron P (Premium) R (resistance) factor

Filtration rating [µm]	Water-based fluids PES*	Oils PES*	GF**
1	32	10.4	5.4
3	24	7.5	-
5	18	4.4	4.3
10	17	1.8	3.2
20	15	1.8	-
30	14	0.9	-
40	14	0.9	-

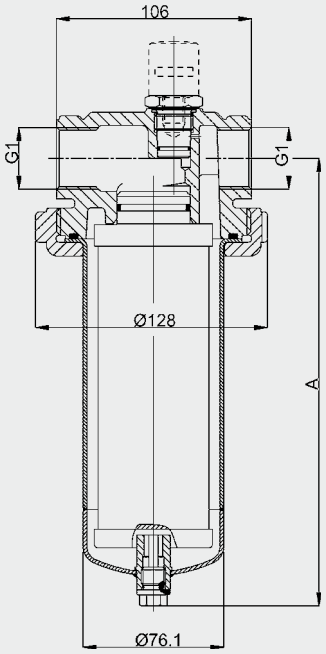
* β > 5000
** β >20000

5. DIMENSIONS

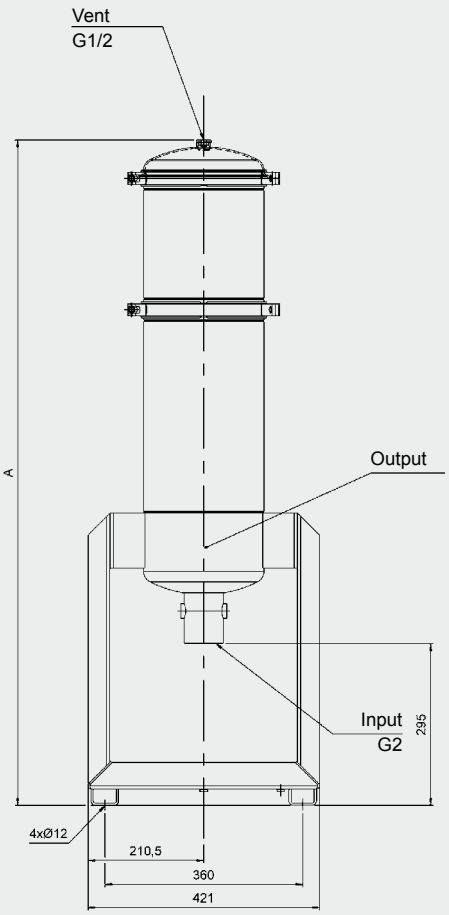
5.1 DIMENSIONS OF FILTER HOUSING

The dimensions given below are based on standard pressure ranges in combination with stainless steel or uncoated carbon steel housings. For carbon steel with internal coating, the filter housing is divided into an upper and lower section. This increases the overall height of the housing.

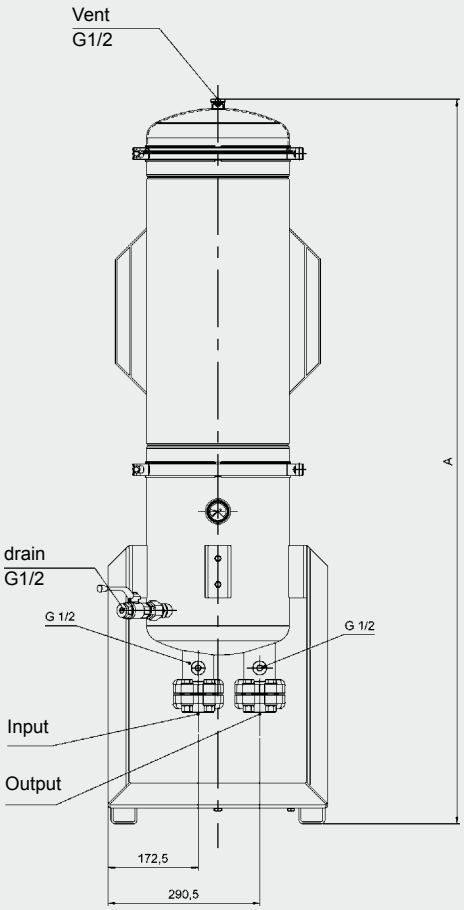
PMRF 1

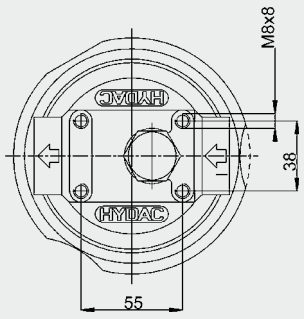


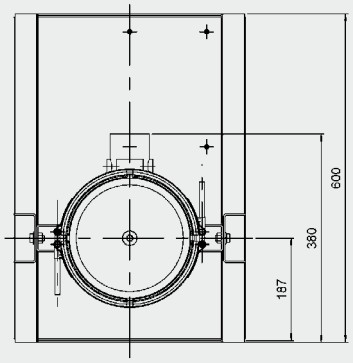
PMRF 2

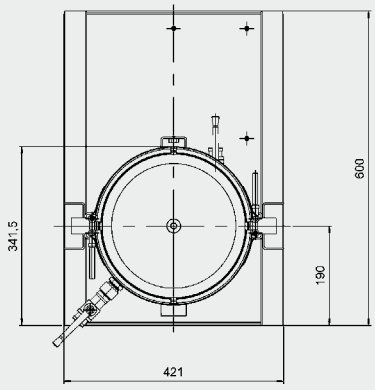


PMRF 3









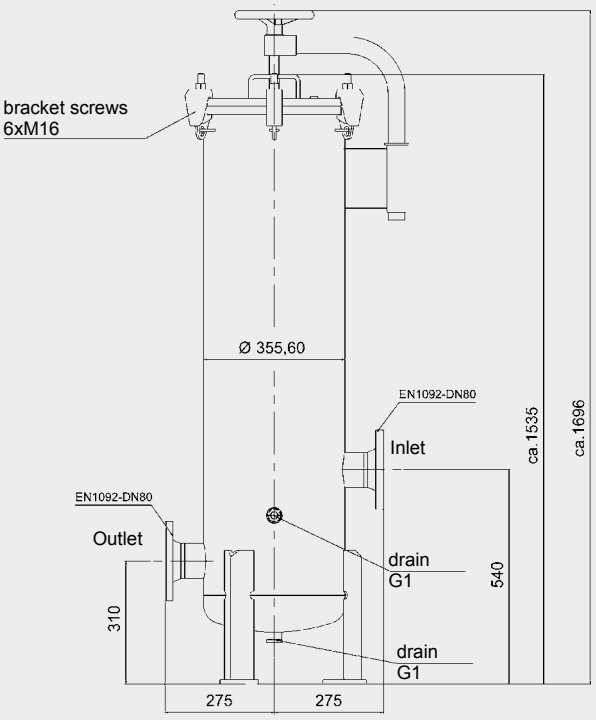
Length	A	Volume [l]
10"	332.5	1.1
20"	586.5	2.1
30"	816	3
40"	1094.5	4

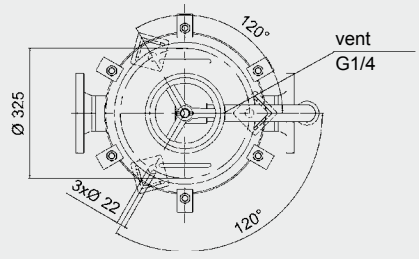
Length	A	Volume [l]
10"	975	17
20"	1215	26
30"	1433	35
40"	1682	45

Length	A	Volume [l]
10"	798	20
20"	1066	40
30"	1323	50
40"	1578	65

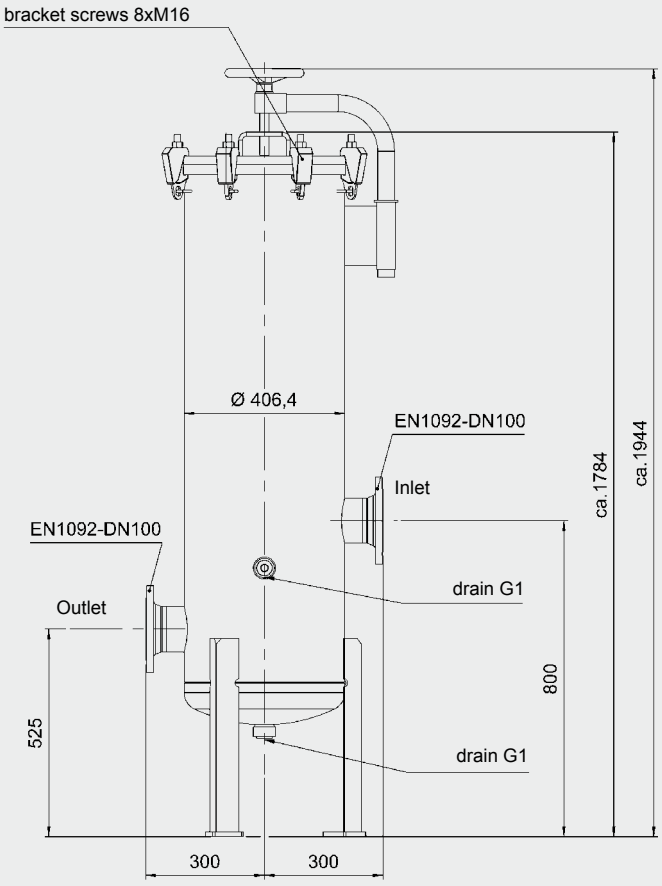
– The filter must not be used as a pipe support.
– The dimensions quoted have ± 5 mm tolerances for sizes up to 3.
– The dimensions quoted have ± 10 mm tolerances for sizes 4 upwards.

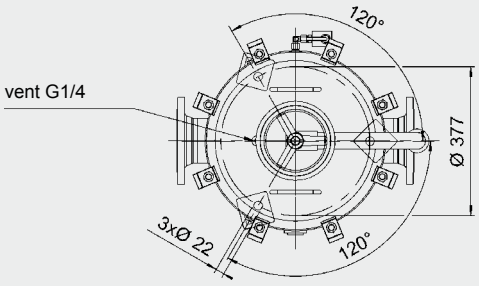
PMRF 4





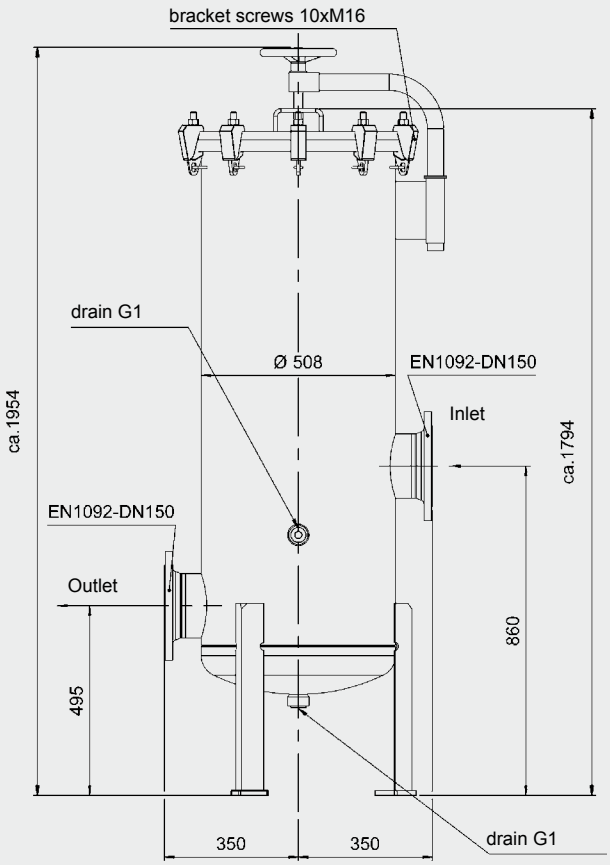
PMRF 5

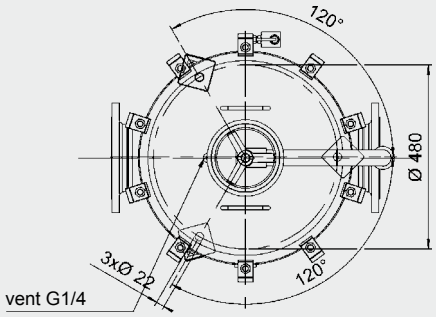




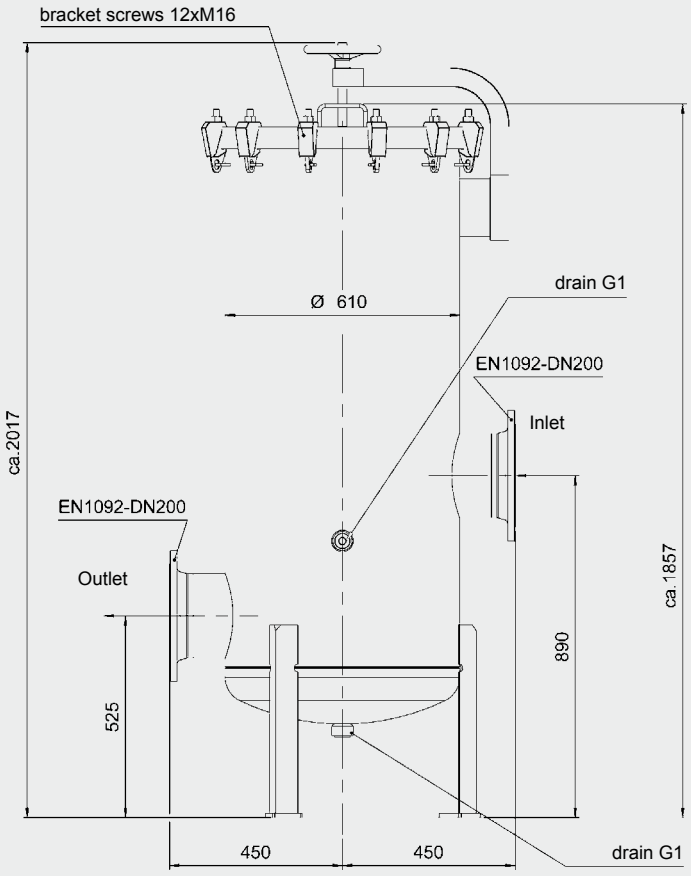
– The filter must not be used as a pipe support.
– The dimensions quoted have ± 5 mm tolerances for sizes up to 3.
– The dimensions quoted have ± 10 mm tolerances for sizes 4 upwards.

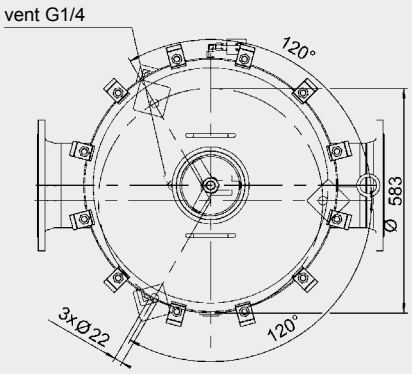
PMRF 6





PMRF 7

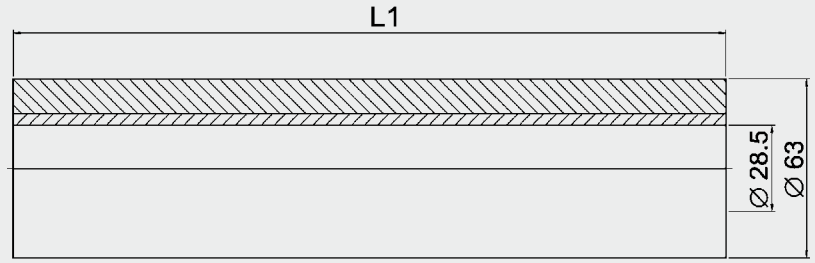




– The filter must not be used as a pipe support.
– The dimensions quoted have ± 5 mm tolerances for sizes up to 3.
– The dimensions quoted have ± 10 mm tolerances for sizes 4 upwards.

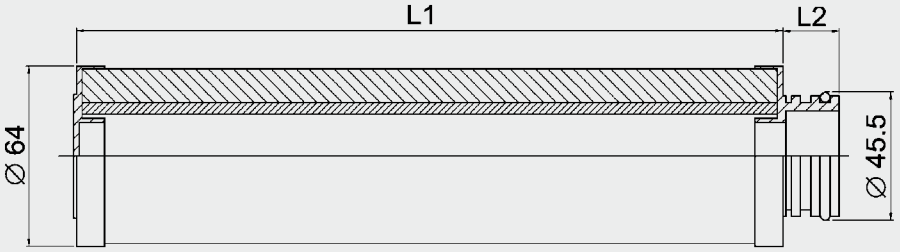
5.2 DIMENSIONS OF FLEXMICRON E ELEMENTS

Type 0: Compression ring (DOE), no cap or seal



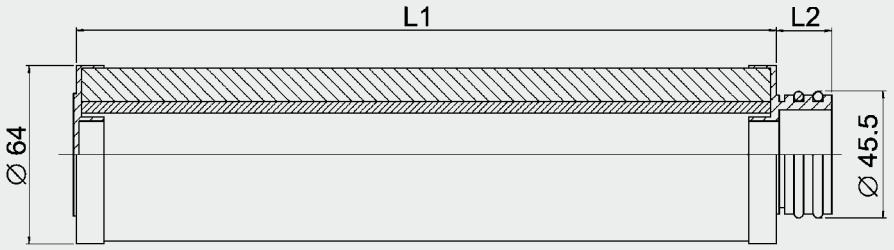
Code	L1 in mm
N10FM-E...	254
N20FM-E...	508
N30FM-E...	762
N40FM-E...	1016

Type 1: Plug-in adapter (1 x 222 O-ring), flat end cap



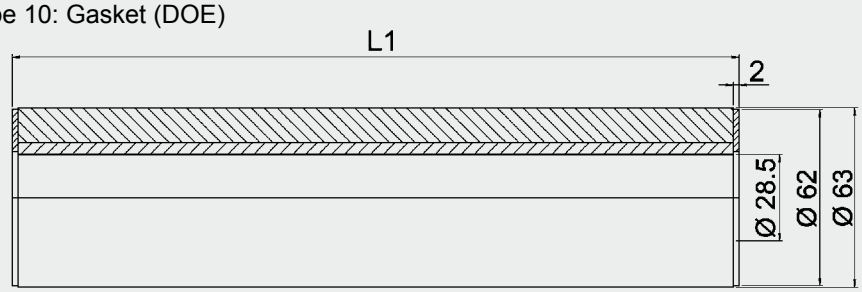
Designation	L1 in mm	L2 in mm
N10FM-E...	254	20
N20FM-E...	508	20
N30FM-E...	762	20
N40FM-E...	1016	20

Type 2: Plug-in adapter (2 x 222 O-ring), flat end cap



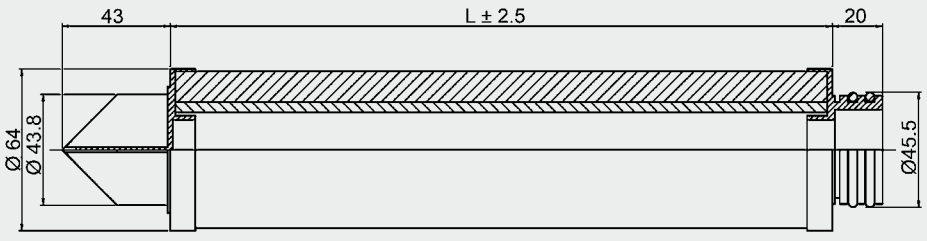
Designation	L1 in mm	L2 in mm
N10FM-E...	254	20
N20FM-E...	508	20
N30FM-E...	762	20
N40FM-E...	1016	20

Type 10: Gasket (DOE)



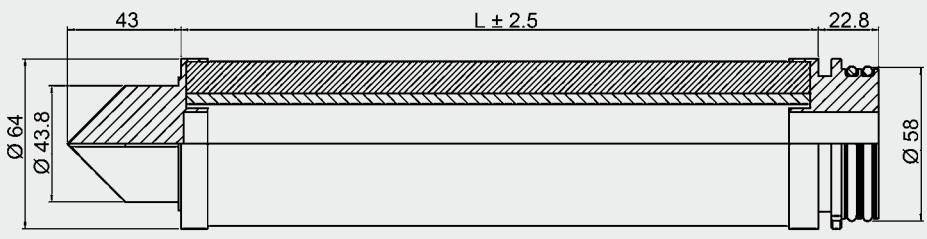
Designation	L1 in mm
N10FM-E...	254
N20FM-E...	508
N30FM-E...	762
N40FM-E...	1016

Type 13: Plug-in adapter (2x 222 O-ring), locating spigot



Designation	L1 in mm	L2 in mm
N10FM-E...	254	43
N20FM-E...	508	43
N30FM-E...	762	43
N40FM-E...	1016	43

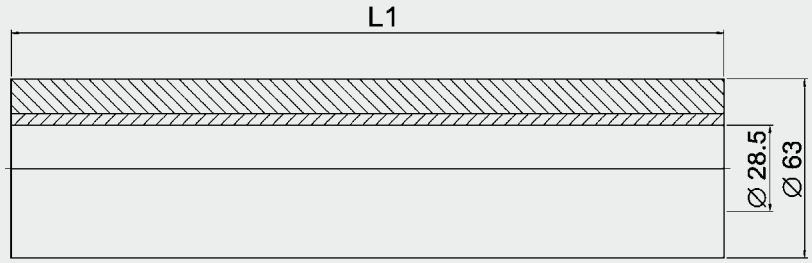
Type 14: Bayonet (2x 226 O-ring), locating spigot



Designation	L1 in mm	L2 in mm
N10FM-E...	235	43
N20FM-E...	489	43
N30FM-E...	743	43
N40FM-E...	997	43

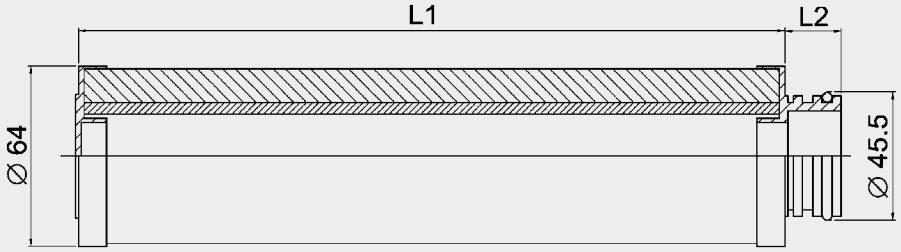
5.3 DIMENSIONS OF FLEXMICRON S ELEMENTS

Type 0: Compression ring (DOE), no cap or seal



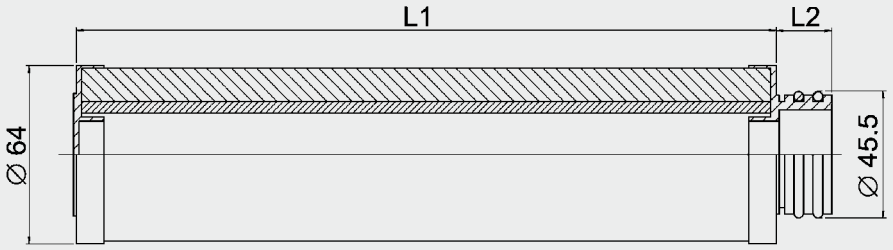
Code	L1 in mm
N10FM-S...	254
N20FM-S...	508
N30FM-S...	762
N40FM-S...	1016

Type 1: Plug-in adapter (1 x 222 O-ring), flat end cap



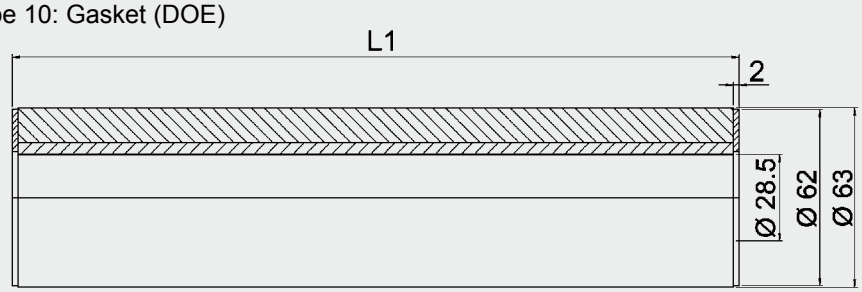
Designation	L1 in mm	L2 in mm
N10FM-S...	254	20
N20FM-S...	508	20
N30FM-S...	762	20
N40FM-S...	1016	20

Type 2: Plug-in adapter (2 x 222 O-ring), flat end cap



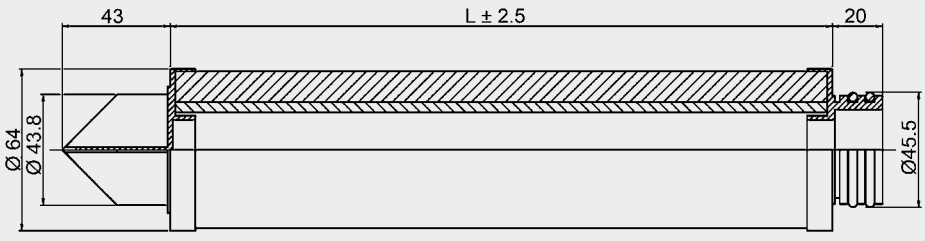
Designation	L1 in mm	L2 in mm
N10FM-S...	254	20
N20FM-S...	508	20
N30FM-S...	762	20
N40FM-S...	1016	20

Type 10: Gasket (DOE)



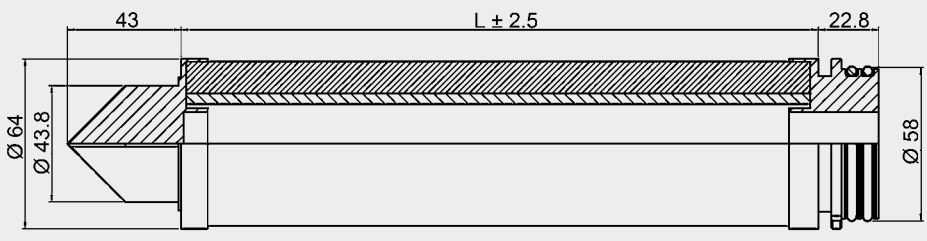
Designation	L1 in mm
N10FM-S...	254
N20FM-S...	508
N30FM-S...	762
N40FM-S...	1016

Type 13: Plug-in adapter (2x 222 O-ring), locating spigot



Designation	L1 in mm	L2 in mm
N10FM-S...	254	43
N20FM-S...	508	43
N30FM-S...	762	43
N40FM-S...	1016	43

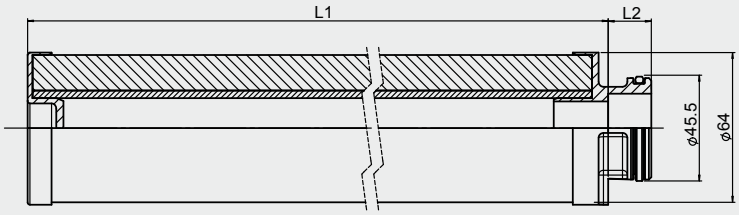
Type 14: Bayonet (2x 226 O-ring), locating spigot



Designation	L1 in mm	L2 in mm
N10FM-S...	235	43
N20FM-S...	489	43
N30FM-S...	743	43
N40FM-S...	997	43

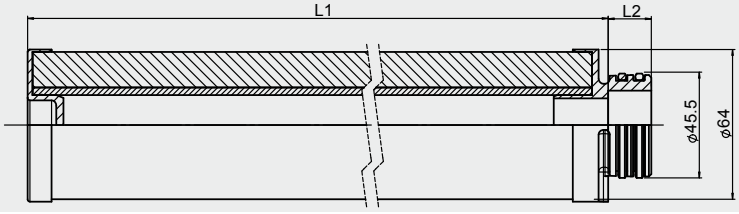
5.4 DIMENSIONS OF FLEXMICRON P (PREMIUM)

Type 1: Plug-in adapter (1 x 222 O-ring), flat end cap



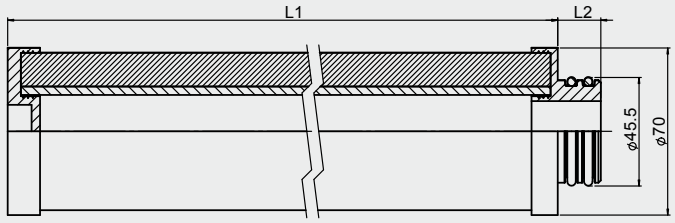
Code	L1 in mm	L2 in mm
N10MR-P...	263	18
N13MR-P...	339	18
N20MR-P...	517	18
N30MR-P...	771	18
N40MR-P...	1025	18

Type 2: Plug-in adapter (2 x 222 O-ring), flat end cap



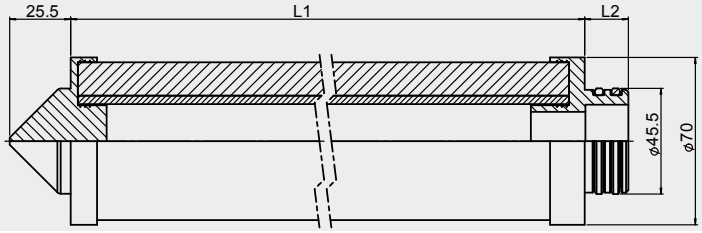
Designation	L1 in mm	L2 in mm
N10MR-P...	263	18
N13MR-P...	339	18
N20MR-P...	517	18
N30MR-P...	771	18
N40MR-P...	1025	18

Type 3: Plug-in adapter (2 x 222 O-ring), flat end cap



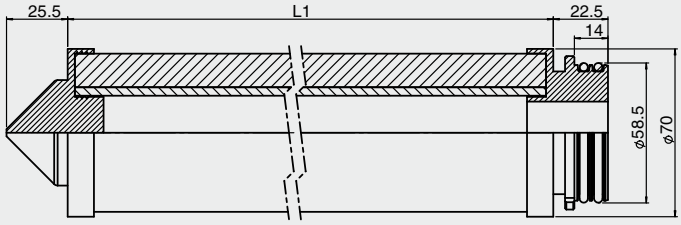
Designation	L1 in mm	L2 in mm
N10FM-P...	263	18
N13FM-P...	339	18
N20FM-P...	517	18
N30FM-P...	771	18
N40FM-P...	1025	18

Type 5: Plug-in adapter (2x 222 O-ring), locating spigot



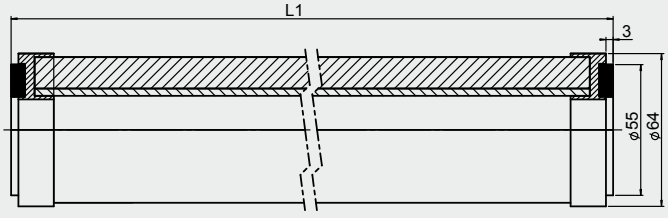
Designation	L1 in mm	L2 in mm
N10FM-P...	263	18
N13FM-P...	339	18
N20FM-P...	517	18
N30FM-P...	771	18
N40FM-P...	1025	18

Type 7: Bayonet (2x 226 O-ring), locating spigot



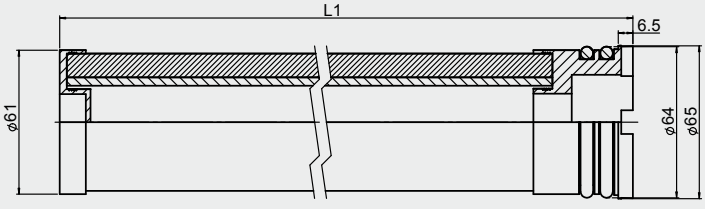
Designation	L1 in mm
N10FM-P...	241
N13FM-P...	317
N20FM-P...	495
N30FM-P...	749
N40FM-P...	1003

Type 10: Gasket (DOE), open



Designation	L1 in mm
N10MR-P...	254
N13MR-P...	330
N20MR-P...	508
N30MR-P...	762
N40MR-P...	1016
N40MR-P...-990	988

Type 12: Cuno adaptor (suspended elements)



Designation	L1 in mm
N37FM-P...	977

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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