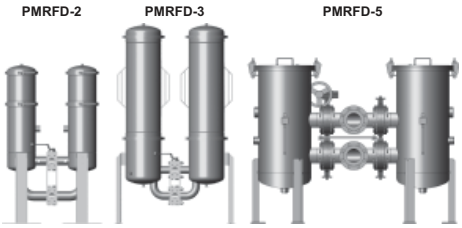
Process Multi-Rheo Filter, Duplex Change-Over PMRFD



1. TECHNICAL SPECIFICATIONS

1.1 GENERAL

The filter series PMRFD (for single filters see PMRF) Process Multi-Rheo Change-over Filter, completes the HYDAC Process Technology inline filter series. These filters use HYDAC DekaRheo or MegaRheo 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 of the PMRFD 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 **DekaRheo elements**

DekaRheo filter elements (meltblown fibre) are elements for filtering fluids with a broad distribution of particles. Due to optimised depth filtration with high contamination retention capacity, very high levels of filtrate cleanliness can be achieved.

1.3.2 **MegaRheo elements**

MegaRheo filter elements are suitable for filtering particles of defined particle distribution. They feature low pressure drops at high flow rates. The pleated construction of the elements results in a large filter area with optimum contamination retention capacities.

2. FILTER SPECIFICATIONS

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

Size	Length [inches]				Connection size			Materials			Pressure range					Temp-erature	Weight[2]	Vol-ume[2]
	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"		●				●			●	-10 to 90	14	2x8.4
2	●	●	●	●	2"	2", 1.5"	50	●			●	●					85	2x38
3	●	●	●	●	2"	2", 1.5"	50	●			●	●					100	2x65
4[3]				●			50/ 80/ 100	●	●	●		●	●	●			290	2x 120
5[3]				●			80/ 100/ 150	●	●	●		●	●	●			470	2x 180
6[3]				●			100/ 150/ 200	●	●	●		●	●	●			730	2x 240
7[3]				●			150/ 200/ 250	●	●	●		●	●	●			890	2x 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 plate 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-coat 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 instructions

2.3 OPTIONAL VERSIONS OF FILTER HOUSING

There is a range of optional versions available for the PRMFD. 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 according to customer requirement (on carbon steel qualities)
- 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 others on request

Further optional models on request.

2.4 SUMMARY OF TECHNICAL SPECIFICATIONS OF FILTER ELEMENTS

2.4.1 **DekaRheo (DR)**

Size	No. of filter elements	Filter element type	Filter materials and filtration ratings [µm]	
			Polypropylene	Polyester
1	1	DekaRheo (DR)	1, 3, 5, 10, 20, 30, 40, 50, 70, 90	1, 3, 5, 10, 20, 30, 40, 50, 70, 90
2	3 or 5	DekaRheo (DR)		
3	7 or 11	DekaRheo (DR)		
4	17	DekaRheo (DR)		
5	22	DehaRheo (DR)		
6	36	DekaRheo (DR)		
7	52	DekaRheo (DR)		

2.4.2 **MegaRheo (MR)**

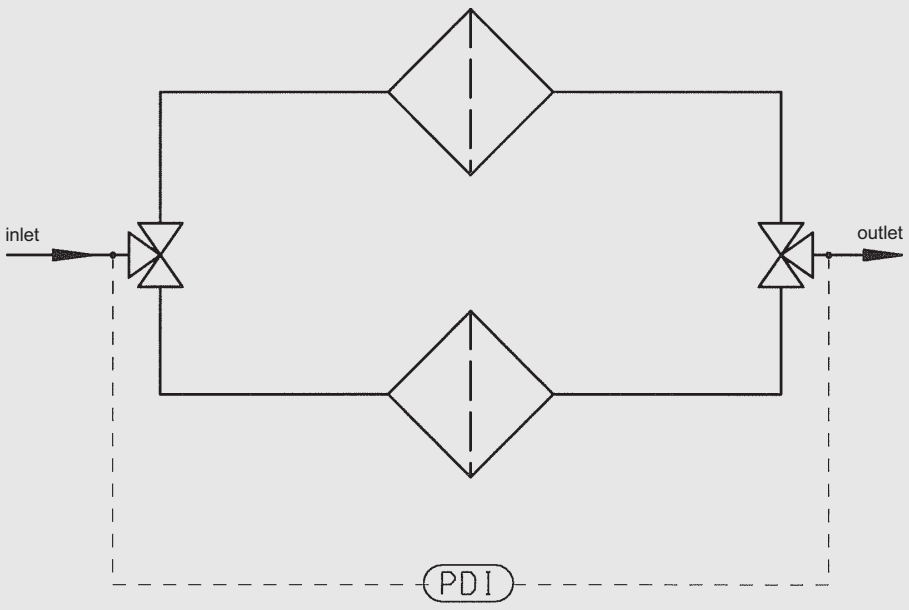
Size	No. of filter elements	Filter element type	Filter materials and filtration ratings [µm]	
			Polypropylene	Polyester
1	1	MegaRheo (MR)	Not available	1, 3, 5, 10, 20, 30, 40, 50, 70, 90
2	3 or 5	MegaRheo (MR)		
3	7 or 11	MegaRheo (MR)		
4	17	MegaRheo (MR)		
5	22	MegaRheo (MR)		
6	36	MegaRheo (MR)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

2.4.3 **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	PP
-10 ... + 30 °C	8 bar	5 bar
-10 ... + 60 °C	6.5 bar	2 bar
-10 ... +100 °C	5 bar	–

2.5 CIRCUIT DIAGRAM



3. MODEL CODE PMRFD

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

Type
PMRFD = Process Multi Rheo Change-Over 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 (Point 2.1) **Bold** = standard

No. 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

Type of connection

		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		2	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 clogging indicator
1 = visual indicator PVD 2 B.1
2 = visual-electrical indicator PVD 2 D.0/-L
3 = visual-electrical-analogue indicator V01
4 = differential pressure gauge AL (measuring range 4 bar)
5 = differential pressure gauge Stainless steel (measuring range 4 bar)
6 = electrical pressure switch PVD 2 C.0
See Brochure no.: E 7.706…./.. Clogging Indicators for Process Filters

Modification number
X = the latest version is always supplied

3.1 MODEL CODE RHEO FILTER ELEMENTS

N - 40 - MR - 005 - PES - 1 - F

Element length
10 = 10"
20 = 20"
30 = 30"
40 = 40"

Element type
MR = Mega Rheo
DR = Deka Rheo

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

Material of filter element
PP = polypropylene for element type: DR
PES = polyester for element type: MR, DR

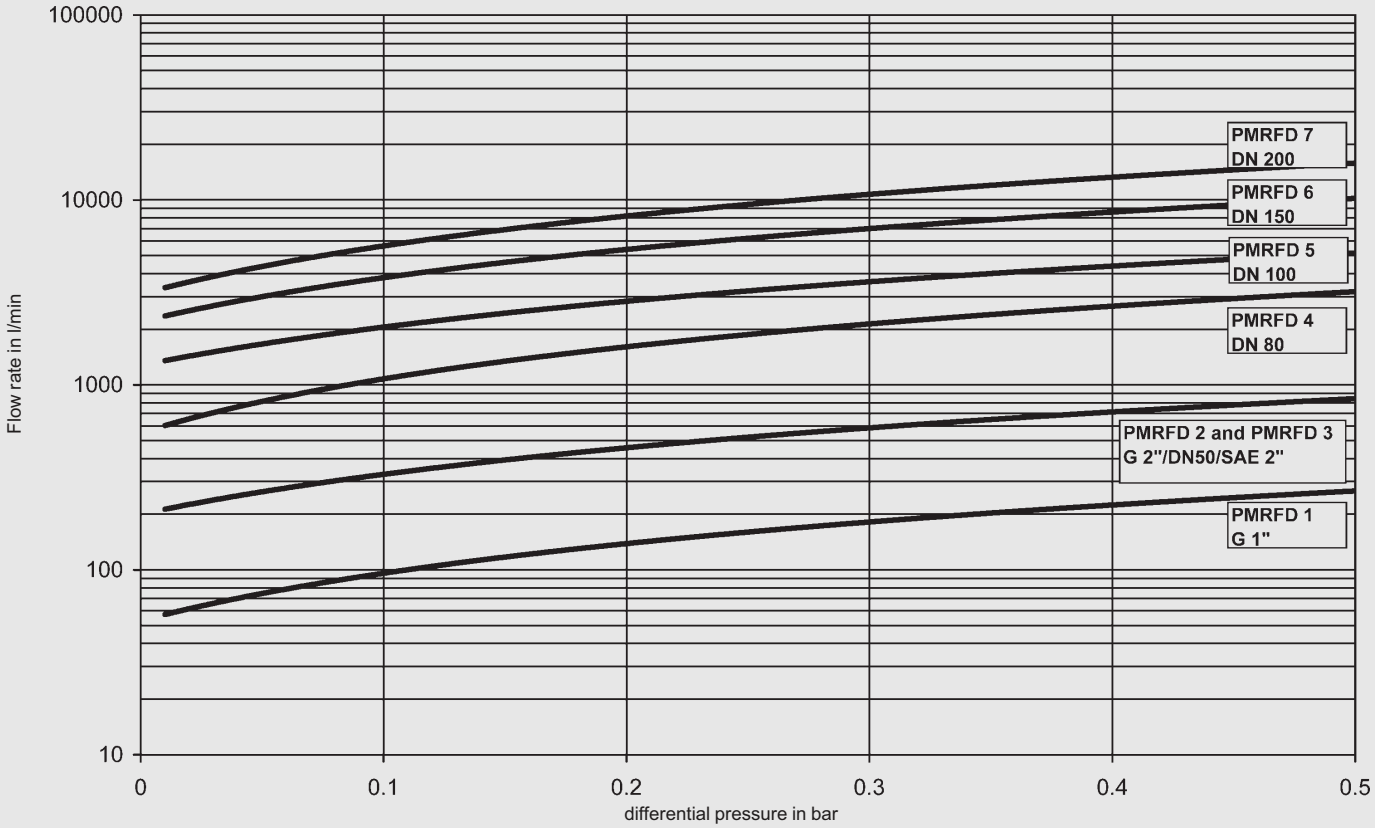
End cap form
1 = 'plug in' end cap (1 x 222 O-ring), flat end cap

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

4. FILTER CALCULATION / SIZING

4.1 PRESSURE DROP CURVES HOUSING

The curves apply to water at 20 °C or fluids up to 15 mm²/s viscosity!



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

Use the pressure drop curves above to determine the pressure drop of the housing. 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 PMRFD in 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 the 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]

MegaRheo R-Factor PES (polyester)

Filtration rating [µm]	Water-based fluids	Oils
1	32.0	10.4
3	24.0	7.5
5	18.0	4.4
10	17.0	1.8
20	15.0	1.8
30	14.0	0.9
40	14.0	0.9
50	13.0	0.6
70	12.0	0.5
90	12.0	0.5

DekaRheo R-Factor PES (polyester)

Filtration rating [µm]	Water-based fluids	Oils
1	196.0	267.0
3	154.0	201.0
5	98.0	121.0
10	74.0	94.0
20	42.0	21.0
30	35.0	13.0
40	30.0	7.3
50	25.0	2.9
70	25.0	2.6
90	20.0	2.3

DekaRheo R-Factor PP (polypropylene)

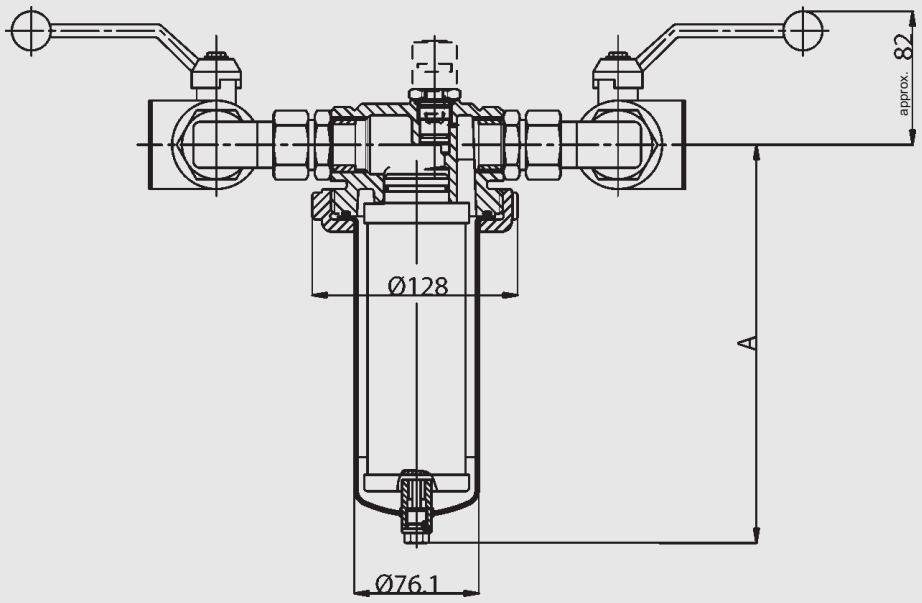
Filtration rating [µm]	Water-based fluids
1	300.0
3	223.0
5	138.0
10	97.0
20	55.0
30	47.0
40	41.0
50	34.0
70	34.0
90	34.0

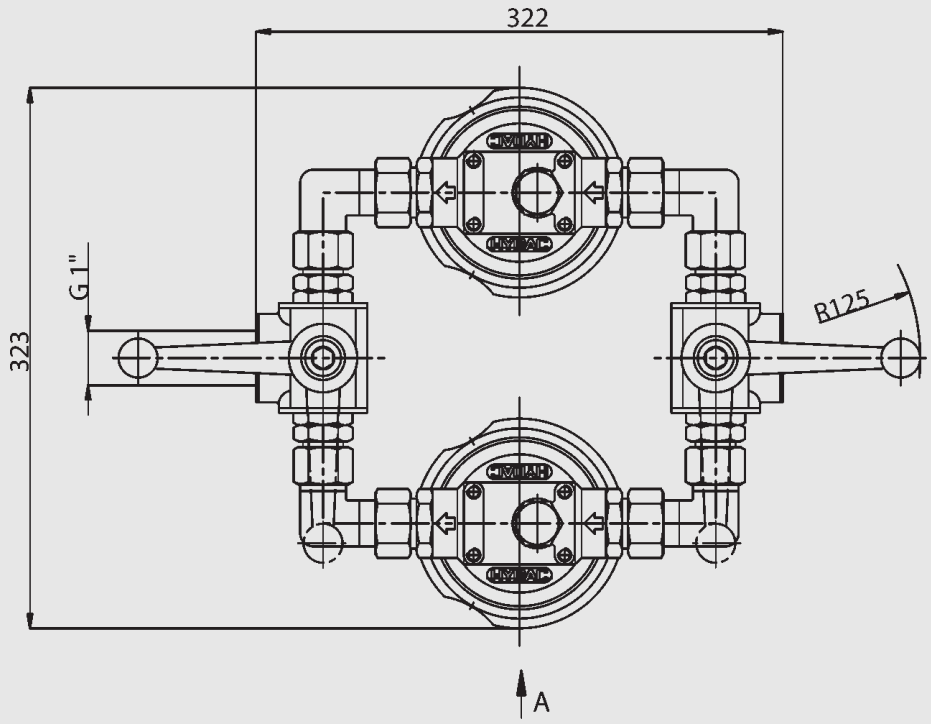
5. DIMENSIONS

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.

PMRFD 1

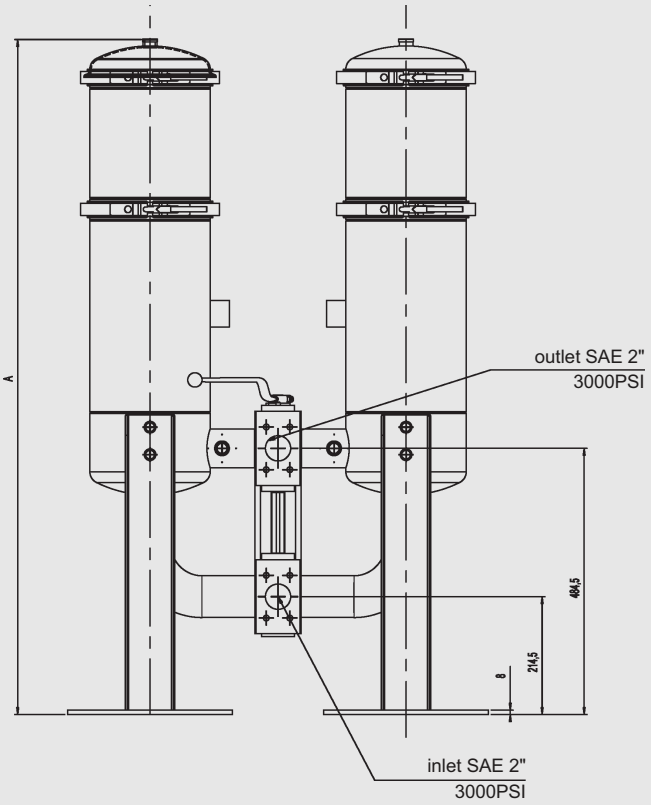


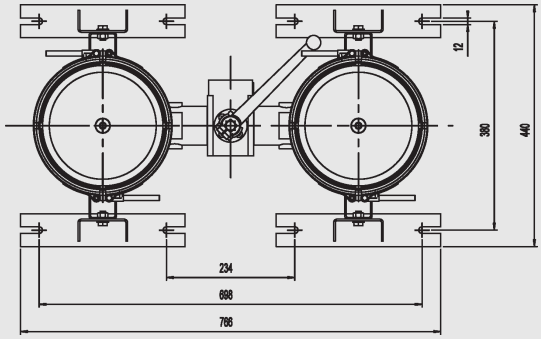


Length	A	Volume [l]
10"	332.5	2 x 1.1
20"	586.5	2 x 2.1
30"	816	2 x 3
40"	1094.5	2 x 4

– 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

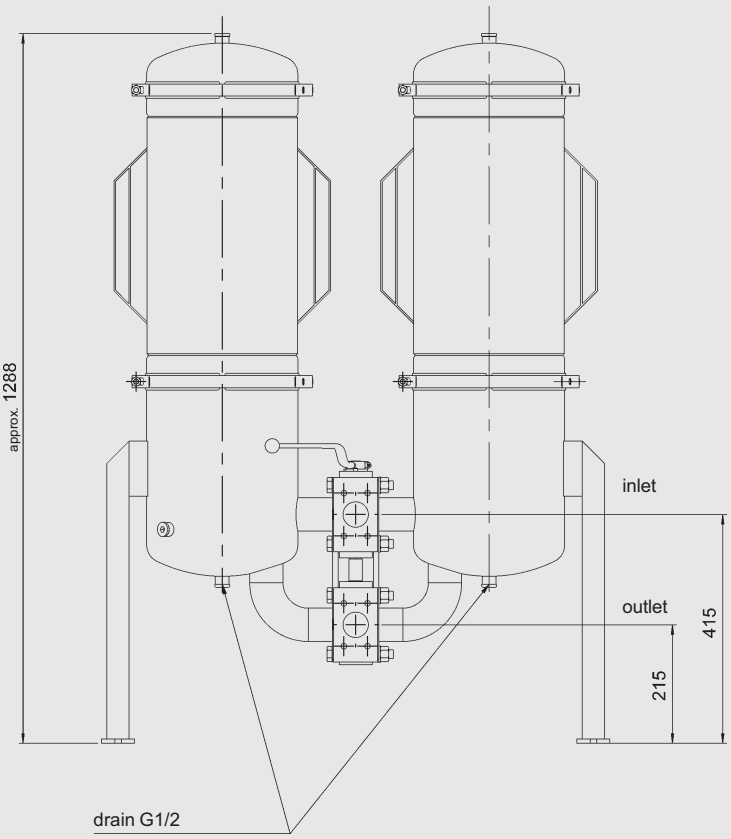
PMRFD 2

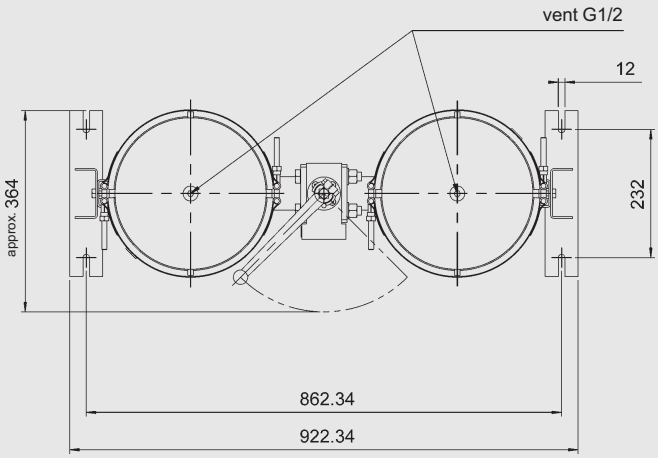




Length	A	Volume [l]
10"	975	2 x 17
20"	1215	2 x 26
30"	1433	2 x 35
40"	1682	2 x 45

PMRFD 3

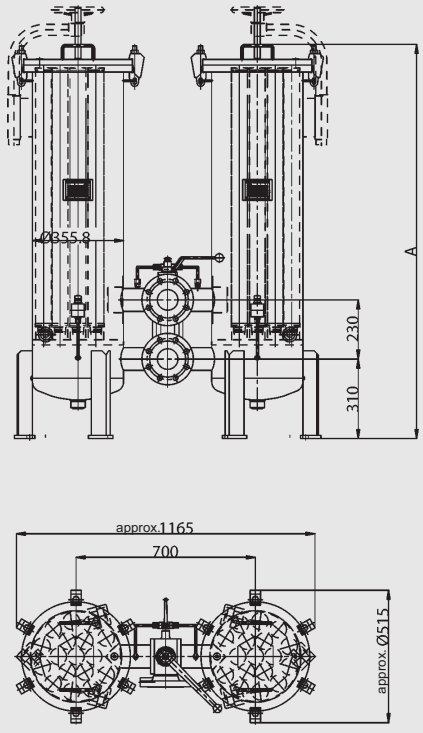




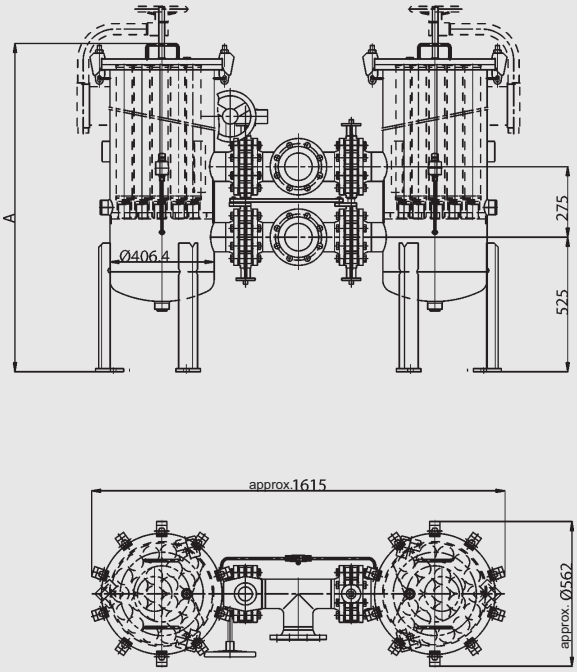
Length	A	Volume [l]
10"	798	2 x 20
20"	1066	2 x 40
30"	1323	2 x 50
40"	1578	2 x 65

– 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

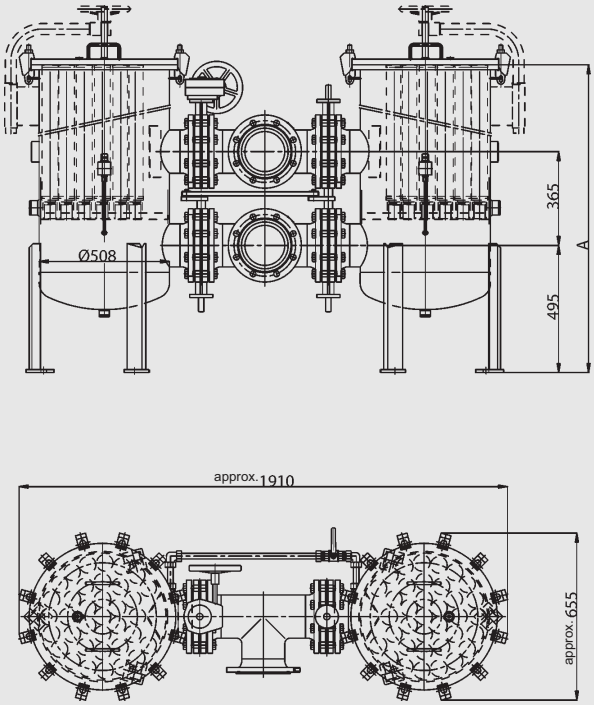
PMRFD 4



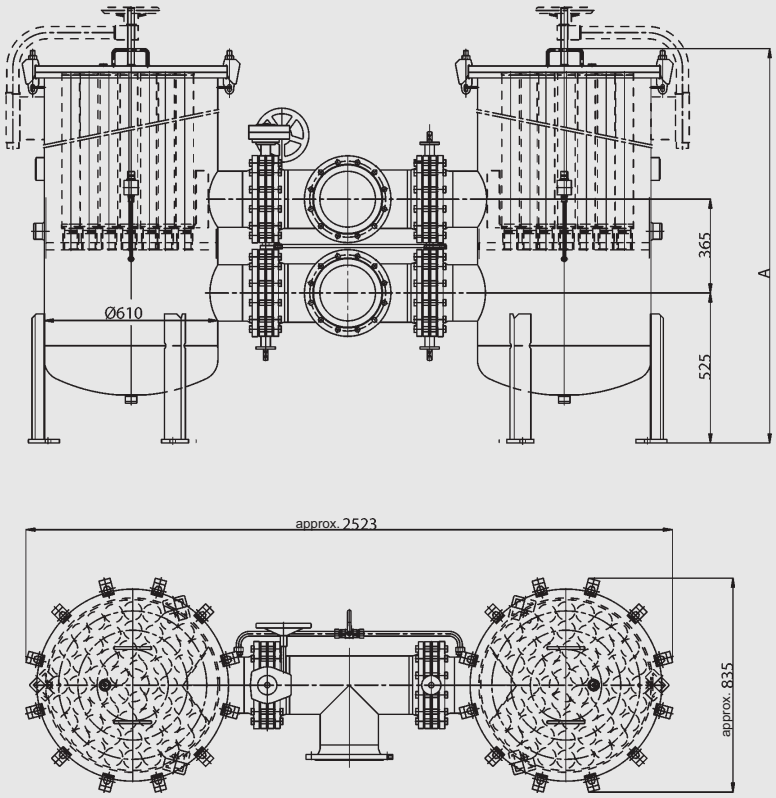
PMRFD 5



PMRFD 6



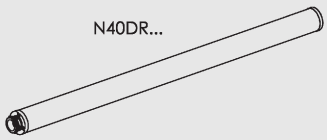
PMRFD 7

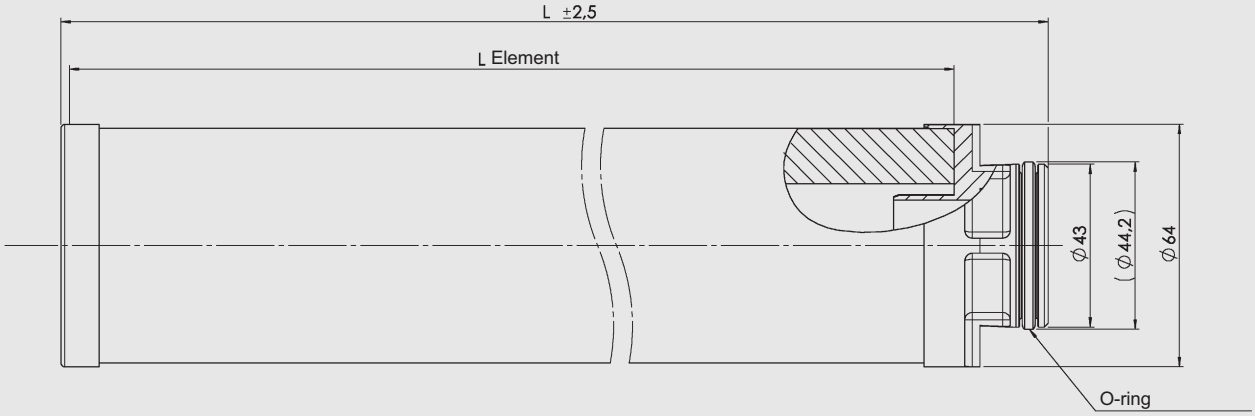


– The filter must not be used as a pipe support
– The dimensions quoted have ± 5 mm tolerances for sizes up to 3
– The dimensions quoted have ± 10 mm tolerances for sizes 4 upwards

5.2 DIMENSIONS OF FILTER ELEMENTS

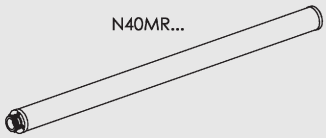
DR elements

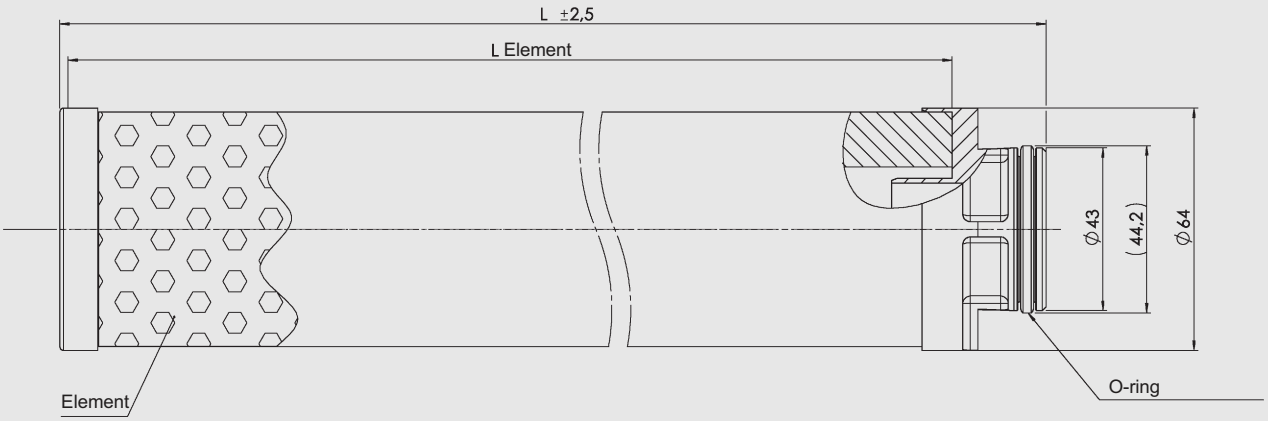




Designation	Length
(nominal length in inches = L Element)	L in mm
N10DR...	281
N20DR...	535
N30DR...	789
N40DR...	1043

MR elements





Designation	Length
(nominal length in inches = L Element)	L in mm
N10MR...	281
N20MR...	535
N30MR...	789
N40MR...	1043

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.

HYDAC Process Technology GmbH
Am Wrangelflöz 1
D-66538 Neunkirchen
Tel.: 0 68 21 / 86 90 - 0
Fax: 0 68 21 / 86 90 - 200
Internet: www.hydac.com
E-Mail: prozess-technik@hydac.com