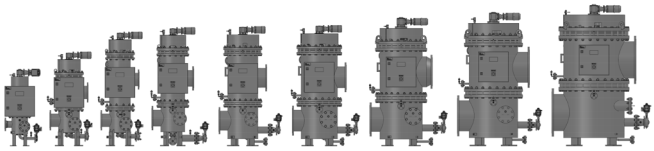
HYDAC INTERNATIONAL

Automatic Back-Flushing Filter
AutoFilt® RF10



Specifications	
Nominal size:	DN 100 - DN 600
Q_{max}:	3,500 m³/h
p_{max}:	6 bar
Filtration ratings:	25 - 3000 µm

1. GENERAL

Product description
- Self-cleaning automatic filter
- Hydrodynamic suction effect
- Conical JetFlush technology
- Separation of solid particles from low viscosity fluids

Filter element technology
- Conical filter elements
- Slotted tube: 50 to 3000 µm
- SuperMesh wire mesh: 25 to 60 µm

Product advantages
- Back-flushing independent of pressure on clean side of filter
- Dependent only on the inlet pressure
- Highly efficient back-flushing with low pressure conditions and long back-flush lines
- With its highly efficient back-flushing, the filter is suitable for high dirt loads and surges in contamination
- Optional davit
- Variable filter isometry
- Optional sacrificial anode

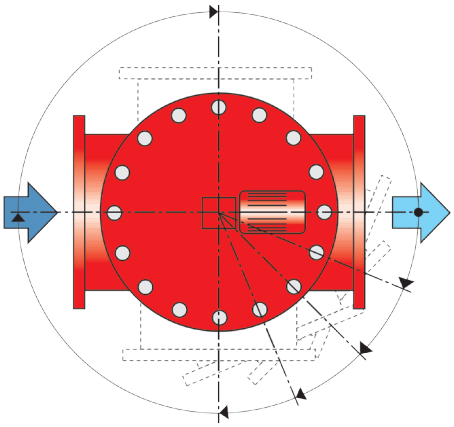
Technical specifications of standard models

Filter size	Pressure range [1] (bar)	Connection Inlet/outlet	Connection back-flush line (PN 16)	Weight empty (kg)	Volume (l)	No. of filter elements	Filtration area (cm²)	Back-flush volume[2] (m³/h)
10	6	DN 100	40	283	36	6 x C2	3600	35
20	6	DN 200	65	445	95	6 x C3	7128	75
23	6	DN 200	65	465	131	5 x C4	12050	85
25	6	DN 250	65	550	160	6 x C4	14460	85
30	6	DN 300	65	725	304	9 x C4	21690	85
35	6	DN 350	65	877	452	11 x C4	26510	85
40	6	DN 400	80	1188	616	18 x C4	43380	145
50	6	DN 500	80	1354	891	24 x C4	57840	145
60	6	DN 600	100	2560	1489	40 x C4	96400	205

Legend

[1] 10 bar on request

[2] Back-flush volumes with an inlet pressure of 1.5 bar and depressurized conditions in the outlet of the back-flush valve. The stated backflush volumes do not correspond to the actual differential flow rate between the filter inlet and the filter outlet. The actual differential flow rate is generally lower - dependent on the pump curve and the pressure conditions during back-flushing.



2. FUNCTION

FILTRATION

The medium being filtered enters the filter housing via the filter inlet (A) and flows through the filter elements of the back-flushing filter from the inside to the outside (B) and leaves the filter via the filter outlet (C). During the filtration process, the JetFlush reservoir (D) located above the filter elements fills with and stores medium from the contaminated side. As fluid is filtered, particles collect on the inside of the filter elements. As the level of contamination increases, the differential pressure between the contaminated and clean side of the filter increases. When the differential pressure reaches the pre-set trigger point, back-flushing starts automatically.

BACK-FLUSHING IN GENERAL

Automatic back-flushing is triggered:

- When the differential pressure trigger point is exceeded
- By means of a timer
- By pressing the test button

The gear motor (E) rotates the back-flushing arm (F) to the filter element to be cleaned (G). The back-flush valve (H) opens. The pressure drop between the filter inlet (A) and the back-flush line (I), combined with the conical geometry of the filter element, triggers the special JetFlush effect of the AutoFilt® RF10.

The remaining filter elements continue filtering to ensure uninterrupted filtration.

BACK-FLUSHING PHASE I

Phase 1 - Stripping away the contamination
In the first phase, unfiltered fluid from the JetFlush reservoir (J1) above flows into the filter element. The conical filter element geometry produces a core flow here, supplied mainly by the JetFlush reservoir. This core flow is supported by the open JetFlush effect which also draws water from the filtrate side into the inside of the filter element.

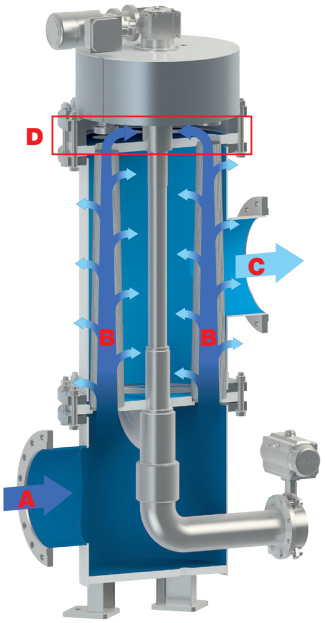
BACK-FLUSHING PHASE II

Phase 2 - Discharging the contamination
Once the core flow has developed, the JetFlush reservoir located above the filter element is closed (J2).

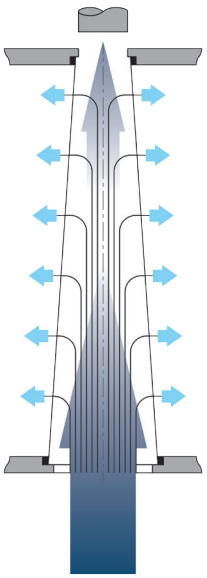
When the opening at the top of the filter element closes, the second phase is initiated, namely discharging the contamination:

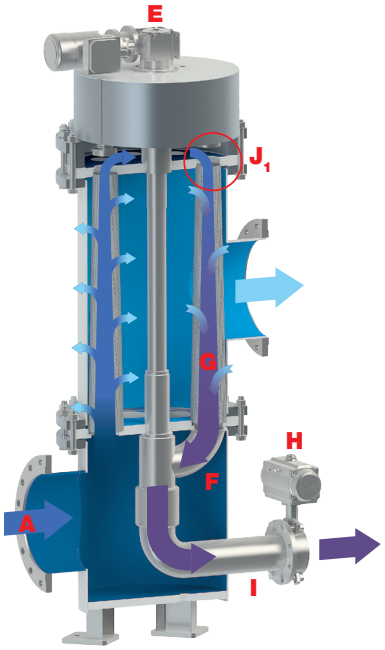
The moving column of fluid draws water from the filtrate side (K) as soon as the fluid supply stops as a result of the filter element closing at the top.

The conical filter element geometry ensures the whole surface of the filter element is now clean and residue-free. The contamination is discharged via the back-flush line (I). After cleaning the filter element, the back-flushing arm rotates to the next filter element to be cleaned; the process is repeated. When the back-flush cycle is finished, the back-flush valve is closed (H).

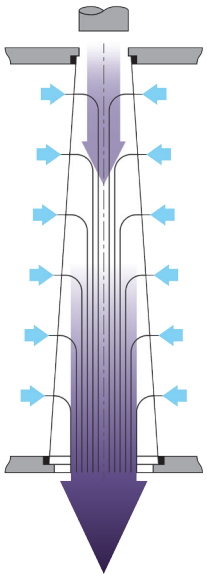


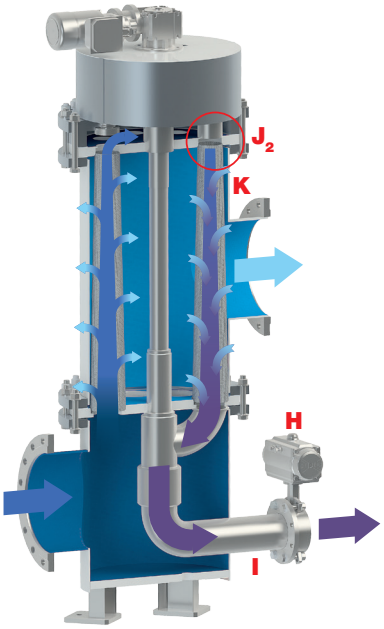
Filtration



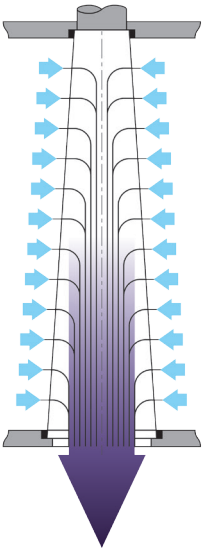


Back-flushing
(phase 1)





Back-flushing
(phase 2)



3. FILTER CALCULATION / SIZING*

CHECKLIST FOR FILTER CALCULATION / SIZING

STEP 1: CHECKING THE PREREQUISITES

- It is crucial when operating the AutoFilt® RF10 that there is a pressure differential between the back-flush line and the filter inlet of at least 1 bar (P1 - P3) ≥ 1 bar
- Application data is determined using filter questionnaires
- The flow velocity of 4 m/s at the flange inlet should not be exceeded
- The maximum temperature for every AutoFilt® RF10 is 90°C (55 °C for ballast water applications)

STEP 2: FILTER SIZING

- The filter is sized based on the calculation table
- The flow rate curves apply to filtration ratings ≥ 50 µm
- The initial differential pressure when the filter is in a clean condition should not exceed 0.2 bar

STEP 3: DETERMINING THE FILTRATION RATING

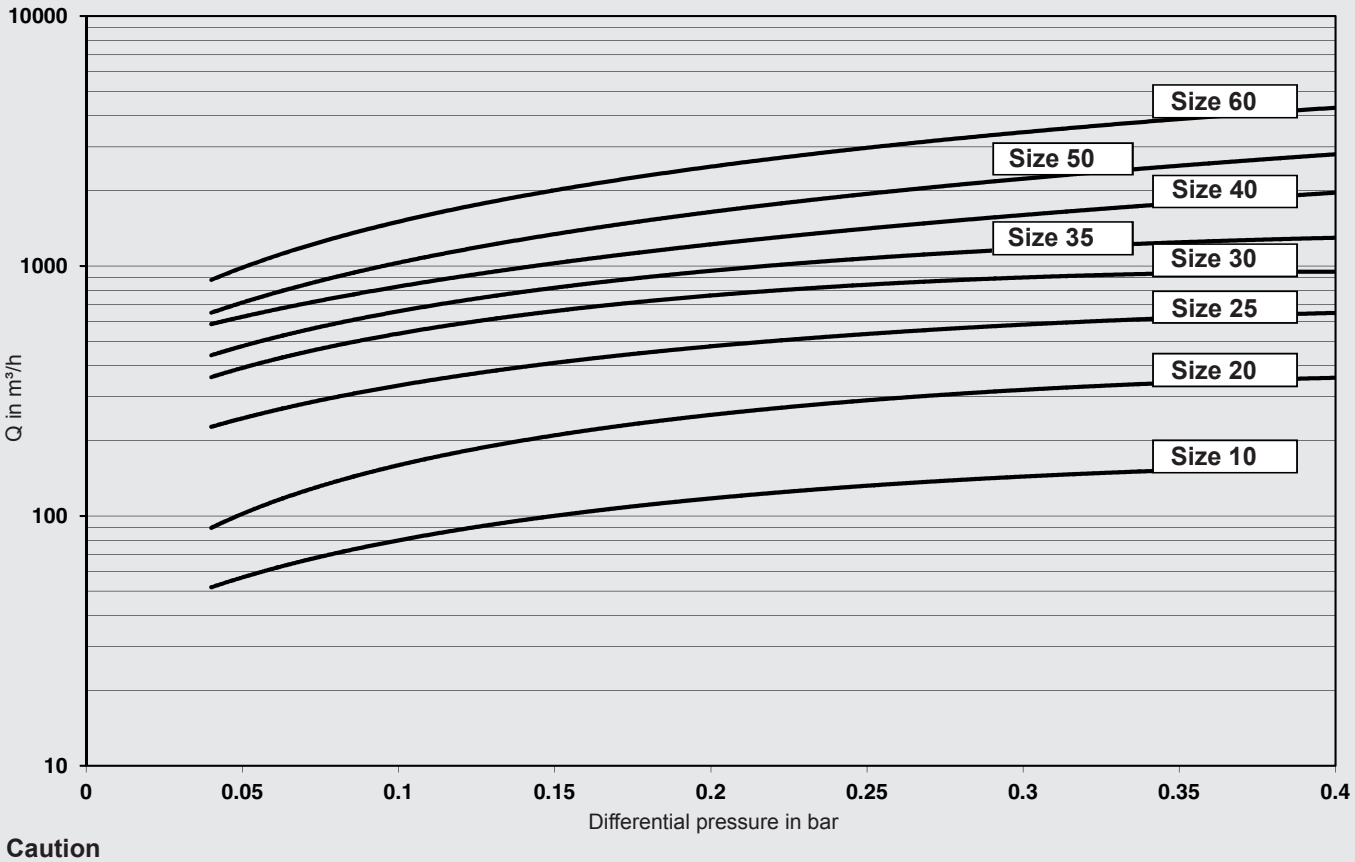
- As a basic rule: As coarse as possible - as fine as necessary
- For filtration ratings below 50 µm, the flow rate should be reduced depending on the application and the expected particulate loading in the fluid - consultation with our Head Office is essential!

CALCULATION TABLE FOR BALLAST WATER APPLICATIONS

Filter size	Maximum flow rate (m^3/h)
RF10-10	120
RF10-20	250
RF10-23	410
RF10-25	500
RF10-30	750
RF10-35	1000
RF10-40	1500
RF10-50	2200
RF10-60	3500

* Please contact our Head Office if you have any queries regarding filter sizing

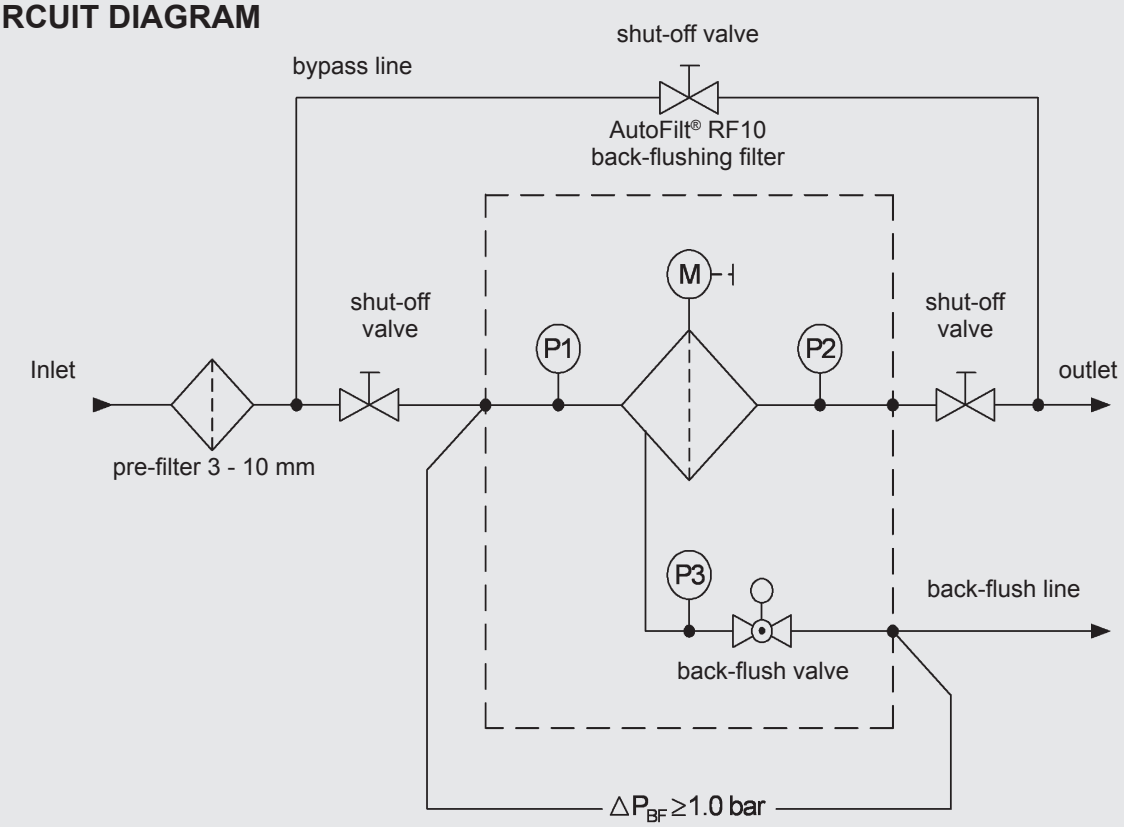
PRESSURE DROP CURVES



Caution

The pressure drop curves apply to SuperMesh wire mesh filter elements with a filtration rating of 50 µm. The test points were at the filter inlet and outlet.

CIRCUIT DIAGRAM



Caution

For cleaning, there must be a minimum pressure difference of 1.0 bar between P1 and P3. (P1 - P3) ≥ 1

Legend

P1 = Inlet pressure
P2 = Outlet pressure
P3 = Back-flush line pressure

4. FILTER CONFIGURATION*

	Standard	Optional
Control parameters	EPP = electric motor, pneumatic JetFlush valve (JFV), pneumatic butterfly valve	PPP = pneumatic motor, pneumatic JetFlush valve (JFV), pneumatic butterfly valve
Connection voltages	All current international connection voltages and frequencies can be implemented	
Electrical protection classes	IP55	Other IP protection classes on request
Explosion protection		• ATEX according to Directive 94/9/EC • IECEX
Housing calculation **Housing manufacture**	AD 2000 / Pressure Equipment Directive PED 97/23/EC	Classification according to: DNV-GL, BV, ABS, ...
Flange connections	DIN EN flanges	• ANSI • JIS
Flange geometry	Variable flange geometry - filter inlet and filter outlet, as well as back-flush line (depending on the size), rotatable	
Housing materials	• Carbon steel • Stainless steel	Special materials on request
Material of internal parts and filter elements	Stainless steel	• Duplex • Superduplex • Various qualities of stainless steel
Material of filter elements	• Stainless steel • SuperFlush coating for ballast water applications	Filter elements with SuperFlush coating
External corrosion protection	2-coat primer (not required for stainless steel housing)	• Multiple-layer coatings • Special paints for offshore applications • Special paints and coatings according to customer specifications
Internal corrosion protection	2K polyurethane coating highly cross-linked	Sacrificial anode
Differential pressure measurement	• HYDAC HDA pressure transmitter • HYDAC EDS electronic pressure switch	
Cover plate lifting device		• Carbon steel (moving parts stainless steel) • Cover plate lifting device for retrofitting
Documentation	• Operating manual • Electric schematic • Installation drawing • Declaration of incorporation in compliance with the machinery directive 2006/42/EG	Customized

* Other versions and customer-specific special solutions after consultation with our Head Office.

5. MODEL CODE

MODEL CODE AutoFilt® RF10

RF10 – 20 A – 1 7 X – P J K N B 2 1 – H 1 1 0 / S H D - 100 – 1234567

Type
AutoFilt®

Filter size

10 = DN 100	25 = DN 250	40 = DN 400
20 = DN 200	30 = DN 300	50 = DN 500
23 = DN 200	35 = DN 350	60 = DN 600

Pressure range
A = PN6
B = PN10

Type of control
1 = EPP electro-pneumatic control
2 = EPP functional control (triggered by the customer)
3 = customer-specific version

Voltage supply

1 = 3 x 400V / N / PE 50Hz	7 = 3 x 440V / x / PE 60Hz
2 = 3 x 400V / x / PE 50Hz	8 = 3 x 525V / x / PE 50Hz
3 = 3 x 500V / x / PE 50Hz	9 = 3 x 575V / x / PE 60Hz
4 = 3 x 415V / x / PE 50Hz	0 = 3 x 690V / x / PE 50Hz
5 = 3 x 415V / N / PE 60Hz	
6 = 3 x 460V / x / PE 60Hz	Y = customer-specific version

EX protection
X = EX protection according to ATEX
C = EX protection according to IECEX

Housing material
N = carbon steel, external primer (RAL 9006), no corrosion protection, internal
M = carbon steel, external primer (RAL 9006), 2K epoxy paint, internal
P = carbon steel, external primer (RAL 9006), 2K polyurethane paint, internal
E = stainless steel AISI 304
H = stainless steel AISI 316

Flange standard
A = ANSI
F = DIN / EN
J = JIS

Nominal size

C = DIN/EN **50** / ANSI 2“	N = DIN/EN **300** / ANSI 12“ (standard size 30)
D = DIN/EN **65** / ANSI 2 1/2“	P = DIN/EN **350** / ANSI 14“ (standard size 35)
E = DIN/EN **80** / ANSI 3“	Q = DIN/EN **400** / ANSI 16“ (standard size 40)
F = DIN/EN **100** / ANSI 4“ (standard size 10)	J = DIN/EN **450** / ANSI 18“
H = DIN/EN **125** / ANSI 5“	R = DIN/EN **500** / ANSI 20“ (standard size 50)
K = DIN/EN **150** / ANSI 6“	W = DIN/EN **550** / ANSI 22“
L = DIN/EN **200** / ANSI 8“ (standard size 20, 23)	S = DIN/EN **600** / ANSI 24“ (standard size 60)
M = DIN/EN **250** / ANSI 10“ (standard size 25)	

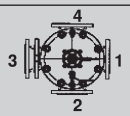
Material of back-flush valve: collar
N = NBR (standard)
E = EPDM
V = FKM (Viton)

Material of back-flush disc
N = stainless steel
B = bronze
D = duplex

Pressure transmitter
0 = No pressure transmitter (flange connection on the filter remains)
1 = pressure transmitter (P-in; P-out and P-rsl) with digital display (type EDS)
2 = pressure transmitter (P-in; P-out and P-rsl) without display on the sensor (type HDA)

min. pressure: -1 bar
max. pressure: +9, +15, +23 bar
(depending on design pressure)

Flange position
1 = filter outlet opposite filter inlet (standard)
2 = filter outlet offset by 90° clockwise to standard
3 = filter outlet offset by 180° clockwise to standard
4 = filter outlet offset by 270° clockwise to standard



Material of internal parts
H = stainless steel (e.g. 1.4404 / analogue AISI 316)
D = duplex
S = superduplex

Sacrificial anode
0 = no anode (O-ring material from same element as butterfly valve, item 16)
1 = with sacrificial anode (O-ring material from element silicone, electrically conductive)
2 = with flange connection, no sacrificial anode (O-ring material from element silicone, electrically conductive)

Cover plate lifting device
0 = no cover plate lifting device
1 = with cover plate lifting device

Modification number
X = determined by manufacturer

FILTERELEMENT:

Coating
S = SuperFlush (optional)

Material
H = stainless steel (e.g. 1.4404 / analogue AISI 316)
D = duplex*
S = superduplex*

Version
D = conical wire mesh elements only available in stainless steel AISI 316
S = conical slotted tube elements

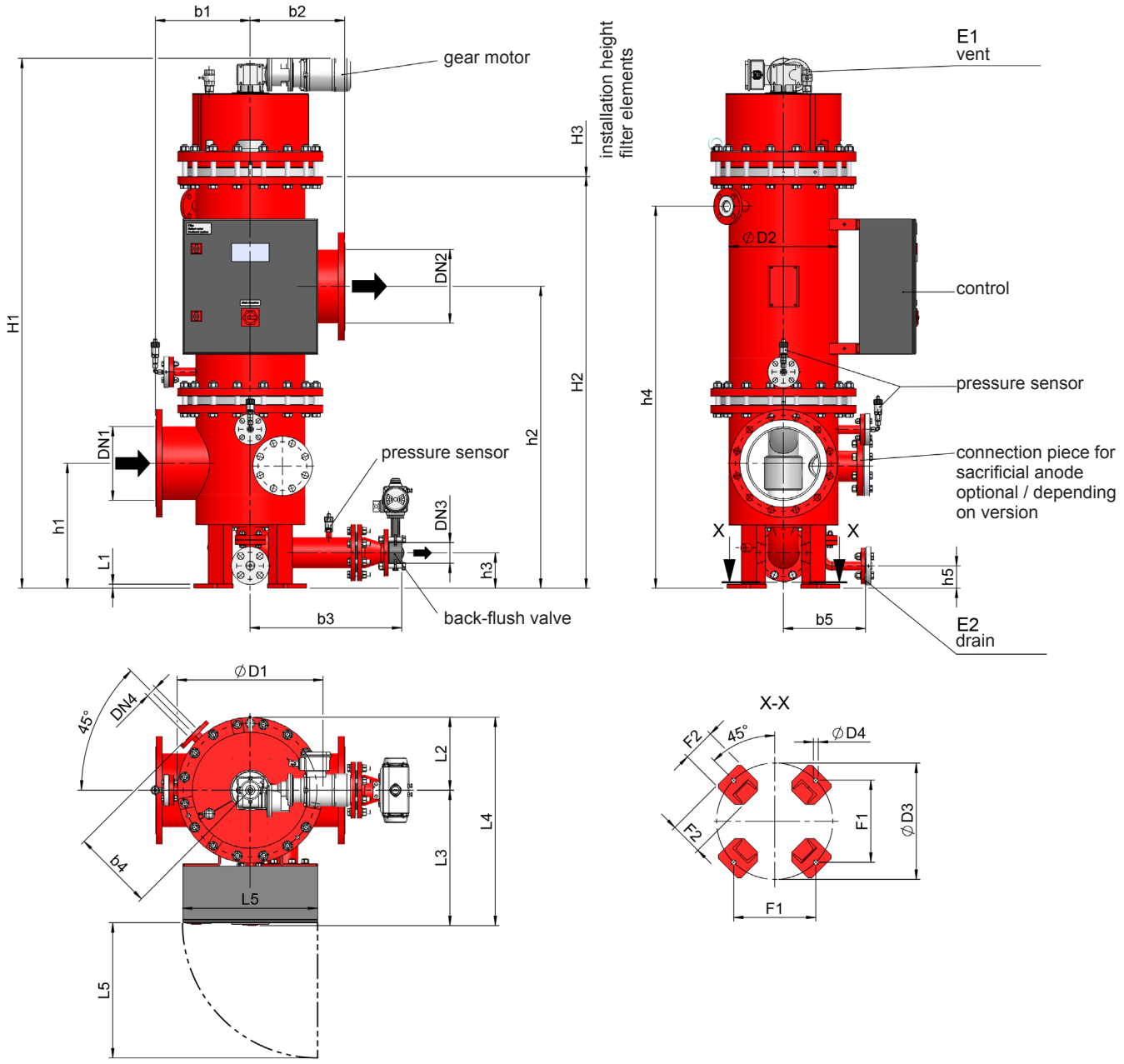
Filtration rating [µm]
No anode, seal material of filter element is identical to seal material of the butterfly valve
With anode, seal material of filter element is always silicone

Drawing number

*only available for slotted tubes

6. DIMENSIONS

Sizes RF10-10 to RF10-25

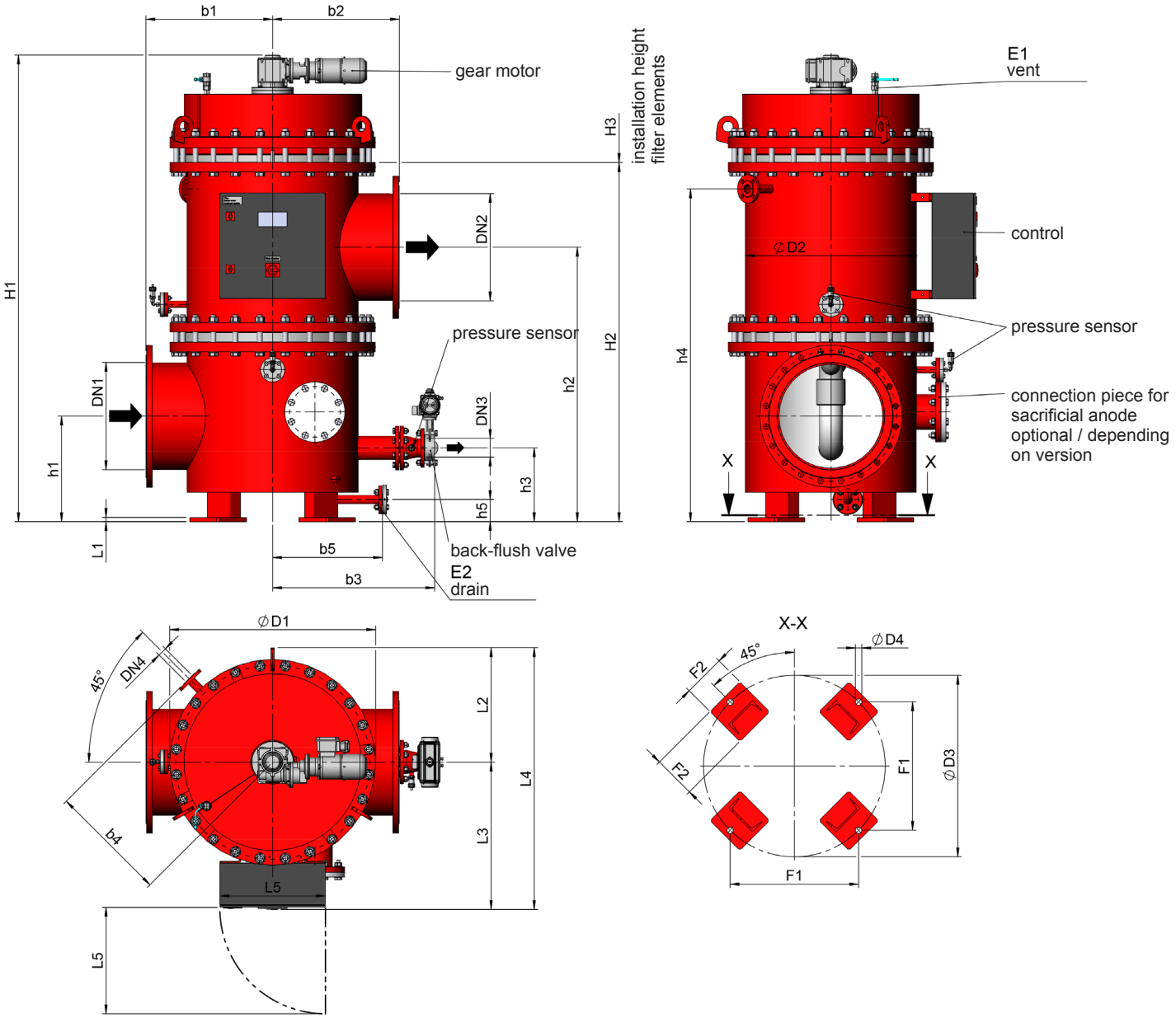


Filter size	DN1	DN2	DN3	DN4	b1	b2	b3	b4	b5	h1	h2	h3	h4	h5	H1
RF10-10	100	100	40	G3/4	250	250	298	–	–	360	687	160	717	-	1274
RF10-20	200	200	65	25	320	320	305	280	295	425	885	161	1005	79	1559
RF10-23	200	200	65	25	320	320	305	280	295	425	1100	161	1341	79	1895
RF10-25	250	250	65	25	350	350	305	300	295	462	1117	131	1414	83	1297

Filter size	H2	H3	L1	L2	L3	L4	L5	D1	D2	D3	D4	E1	E2	F1	F2
RF10-10	837	350	10	188	460	648	500	375	273	340	18	G1/2	G1/2	240	90
RF10-20	1122	550	15	245	517	762	500	490	355.6	370	18	DN25	G1/2	269	120
RF10-23	1458	700	15	245	460	705	500	490	355.6	496	18	DN25	G1/2	351	120
RF10-25	1523	550	15	270	477	747	500	540	406.4	430	18	DN25	G1/2	304	120

6. DIMENSIONS

Sizes RF10-30 to RF10-60



Filter size	DN1	DN2	DN3	DN4	b1	b2	b3	b4	b5	h1	h2	h3	h4	h5	H1
RF10-30	300	300	65	25	400	400	621	350	330	420	1126	266	82	1409	1978
RF10-35	350	350	65	25	450	450	637	410	420	420	1136	266	82	1424	1992
RF10-40	400	400	80	25	520	520	735	460	470	440	1225	300	82	1492	2125
RF10-50	500	500	80	40	600	600	770	560	490	500	1300	350	105	1576	2210
RF10-60	600	600	100	40	700	700	900	650	610	525	1360	330	195	1590	2270

Filter size	H2	H3	L1	L2	L3	L4	L5	D1	D2	D3	D4	E1	E2	F1	F2
RF10-30	1531	700	15	323	497	820	500	645	508	540	18	G1/2	G1/2	382	150
RF10-35	1548	700	15	378	576	954	500	755	610	640	18	G1/2	G1/2	453	150
RF10-40	1617	700	15	485	632	1117	500	860	711	727	27	G1/2	G1/2	514	150
RF10-50	1701	700	20	543	698	1240	500	975	813	860	30	G1/2	G1/2	608	200
RF10-60	1759	700	20	643	795	1438	500	1175	1016	1040	32	G1/2	G1/2	735	200

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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