

Automatic Back-Flushing Filter AutoFilt® RF3



Specifications	
Nominal size:	DN 50 - DN 900
Q _{max} :	7500 m ³ /h
p _{max} :	100 bar
Filtration ratings:	25 - 3000 µm

1. GENERAL

Product description

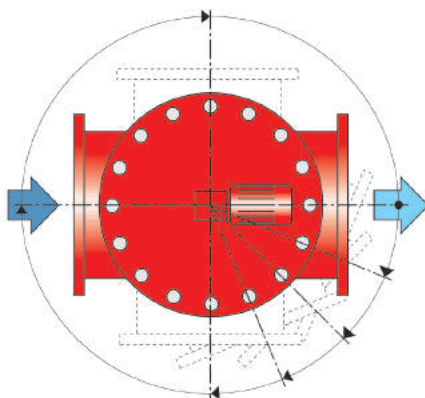
- Self-cleaning automatic filter
- Separation of solid particles from low viscosity fluids

Filter element technology

- Conical filter elements
- Wedge wire: 50 to 3000 µm
- SuperMesh wire mesh: 25 to 60 µm

Product advantages

- Automatic back-flushing reduces operating costs
- Isokinetic filtration and back-flushing provides greater efficiency
- Flow-optimised housing design
- Filtrate flow is not interrupted during back-flushing
- Pulse-aided back-flushing
- Various control variants with individually adjustable control parameters
- Numerous material and equipment options available
- Ready-to-operate unit
- Variable flange positions (inlet and outlet flanges, as well as back-flush line)



Technical specifications of standard models

Filter size	Pressure range ¹⁾ (bar)	Connection Inlet / outlet	Connection back-flush line (PN 16)	Weight ²⁾ (kg)	Volume (l)	No. of filter elements	Filtration area ³⁾ (cm ²)	Back-flush volume ⁴⁾ (l)
C	16	DN 50	DN 25	121	15	6 x KC	2140	25
0	10 ¹⁾	DN 100	DN 25	145	25	6 x K0	3810	25
1	10	DN 150	DN 40	240	60	3 x K1 3 x K2	6190	35
2	10	DN 200	DN 50	365	105	4 x K1 4 x K2	8250	50
2.5	10	DN 250	DN 50	450	190	6 x K3	12500	65
3	10	DN 300	DN 65	570	280	9 x K3	18750	95
4	6	DN 400	DN 80	750	425	18 x K3	37500	210
5	6	DN 500	DN 80	1020	635	16 x K3 8 x K4	55760	310
6	6	DN 600	DN 100	1610	998	32 x K3 8 x K4	89100	485
7	6	DN 700	DN 100	1950	1355	24 x K3 20 x K4	106100	555
8	6	DN 900	DN 150	3550	2710	54 x K5	180700	720

Legend

¹⁾ Pressure range for size 0, stainless steel, is 16 bar.

Housing calculation and housing manufacture according to AD 2000 and, if required, to Pressure Equipment Directive 97/23/EC.

²⁾ Approx. empty weight based on standard pressure range.

³⁾ When using SuperMesh filter elements (KD / SKD), only size K3 filter elements are installed. The number of filter elements remains the same. This results in the following filtration areas:

- RF3-5: 50000 cm²
- RF3-6: 83333 cm²
- RF3-7: 91667 cm²
- RF3-8: 112500 cm²

⁴⁾ Per cycle, based on EPT / PT control mode with opening time of back-flush valve of 1.5 seconds and 1.5 bar differential pressure between outlet and back-flush line, with EU control the back-flush volume increases by a factor of 5.

2. FUNCTION

FILTRATION

- The medium being filtered flows through the filter elements of the back-flushing filter from the inside to the outside
- Contamination particles then collect on the smooth 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

TRIGGERING AUTOMATIC BACK-FLUSHING

- When the differential pressure trigger point is exceeded
- By means of set timer function
- By pressing the TEST button

PROCEDURE FOR AUTOMATIC BACK-FLUSHING – BACK-FLUSH CYCLE

EPT Electro-pneumatic cyclic control

The electrically powered gear motor rotates the flushing arm to the filter element or filter elements to be cleaned and stops. The back-flush valve is opened by a pneumatically operated rotary drive and the filter element or filter elements are cleaned. The pressure drop between filtrate side and back-flush line flushes a small amount of the filtrate back through the contaminated filter elements. The contamination particles collected on the inside of the filter elements are loosened and flushed into the back-flush line via the flushing arm. After the “back-flushing time per filter element” has elapsed, the back-flush valve is closed. The gear motor then rotates the flushing arm further to the next filter element(s) to be cleaned. The back-flush valve is opened again and the filter element or elements are back-flushed. A full back-flush cycle is complete once all filter elements have been cleaned.

PT Pneumatic cyclic control

Like EPT but with purely pneumatic components.

PTZ Pneumatic cyclic control with timer function

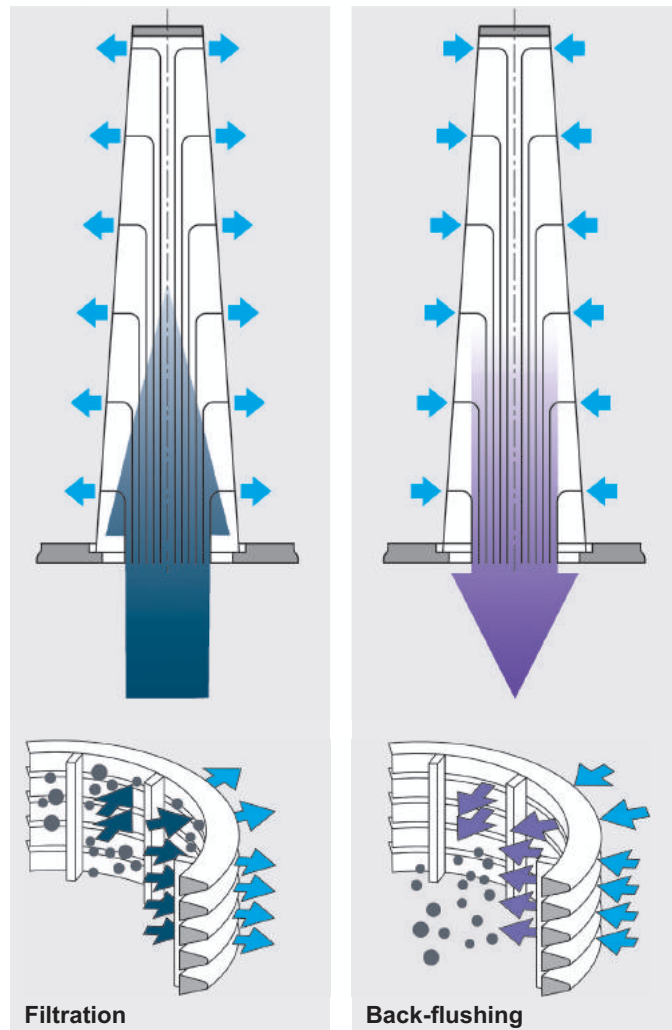
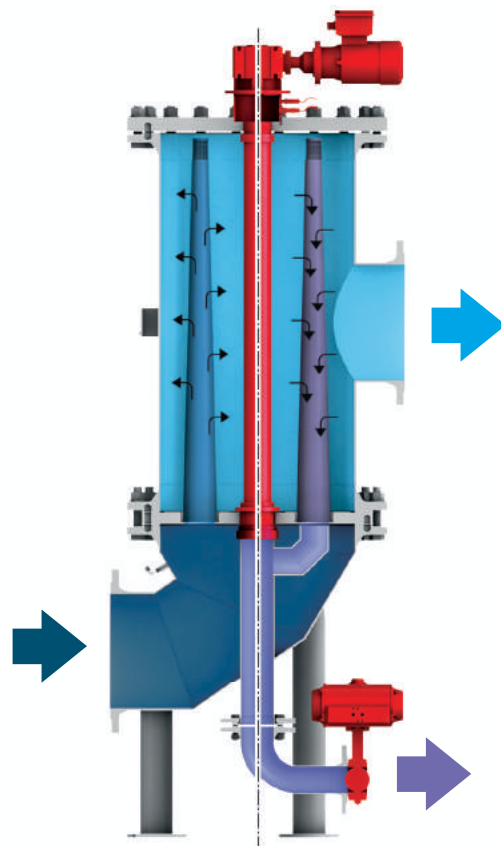
Like PT but with the option of setting a maximum filtration time between two back-flush cycles, independently of the differential pressure. The control of the back-flushing filter automatically triggers back-flushing when the maximum filtration time without back-flush has been exceeded – timer function.

EU Electrical circulation control

The electrically operated back-flush valve opens. The gear motor continuously rotates the flushing arm underneath the filter elements to be cleaned. The pressure drop between filtrate side and back-flush line flushes a small amount of the filtrate back through the contaminated filter elements. The contamination particles collected on the inside of the filter elements are loosened and flushed into the back-flush line via the flushing arm. When the flushing arm reaches its starting position, the gear motor stops and the electric back-flush valve closes automatically. The number of cycles can be preset via the control.

EPU Electro-pneumatic circulation control

Like EU but with the back-flush unit operated pneumatically.



3. SPECIAL FEATURES

FILTER ELEMENT TECHNOLOGY

Conical filter elements

Robust wedge wire and wire mesh filter elements made from stainless steel are used in the automatic back-flushing filter AutoFilt® RF3. The conical shape of the filter elements ensures maximum efficiency during filtration and optimum effectiveness during back-flushing.

SuperFlush technology

The filter elements can also be given a special non-stick coating (SuperFlush) for applications like for e.g. wastewater treatment.

Advantages of a SuperFlush coating:

- Unique coating technology
- Available for conical filter elements
- Minimises the adhesion of sticky particles on the filter element surface
- Reduces biofouling
- Increases the interval between two back-flush cycles
- Increases efficiency

FLOW-OPTIMISED DESIGN

The particularly good flow characteristics allow the filter to be compact whilst achieving high filtration performance and low pressure drops.

ISOKINETIC FILTRATION AND BACK-FLUSHING

The conical shape and configuration of the filter elements allow consistent flow, resulting in a low pressure drop and complete cleaning of the filter elements.

Advantages:

- Fewer back-flush cycles
- Smaller back-flush volumes
- Lower pressure differential (Δp)

PULSE-AIDED BACK-FLUSHING

For the control types EPT and PT, rapid opening of the pneumatic back-flush valve generates a pressure surge (clock pulse) in the filter element openings, and supplements the cleaning effect of the back-flushing process.

SMALL BACK-FLUSH VOLUMES DUE TO CYCLIC CONTROL

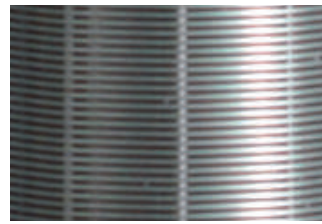
For the control types EPT and PT, the back-flush valve opens and closes for each filter element.

READY-TO-OPERATE UNIT

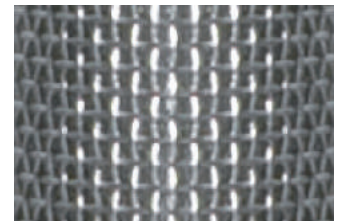
All components (controller, back-flush valve, gear motor) are already installed on the filter, ready to use. Once the pipework has been connected, all that is required is for the auxiliary power supply to be applied.

VARIABLE HOUSING CONFIGURATION

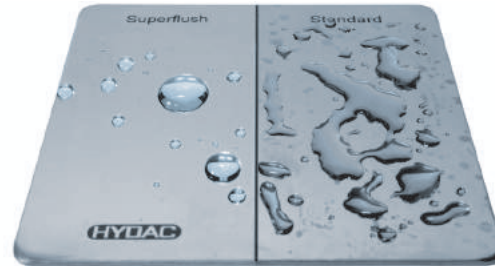
The inlet and outlet flanges and the back-flush line can be arranged in various positions in relation to one another. This makes it possible to integrate the filter easily into any system geometry (see point 1. General).



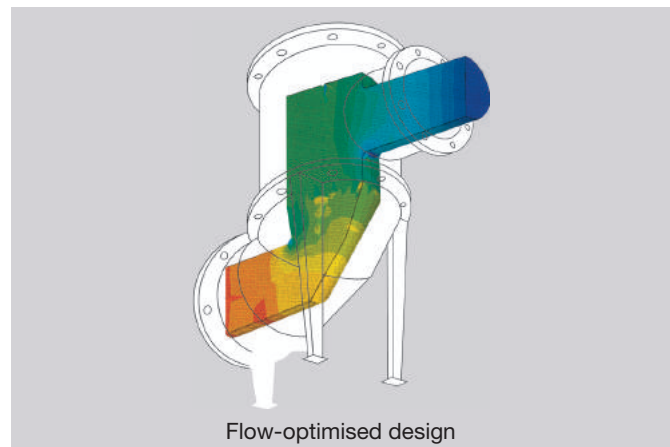
Wedge wire



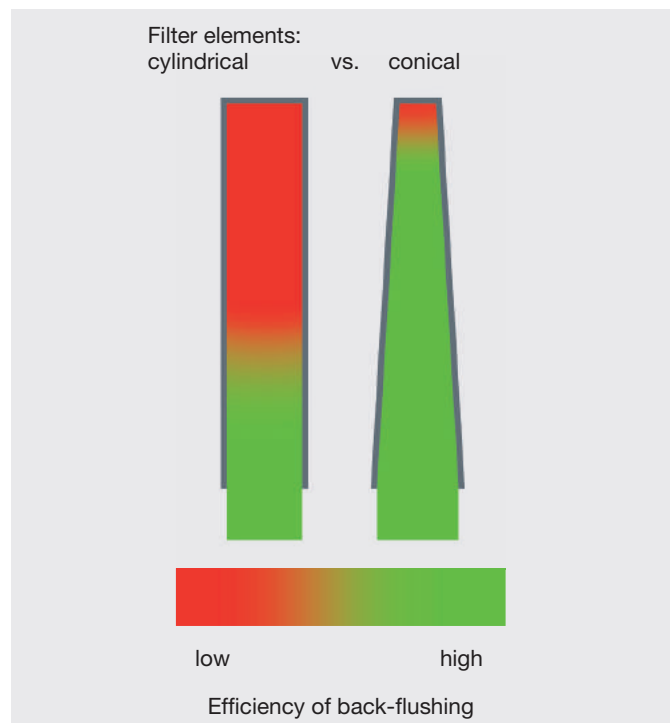
SuperMesh –
3-layer, sintered wire mesh



With SuperFlush / without SuperFlush
coating technology for filter elements



Flow-optimised design



3. SPECIAL FEATURES

FILTER CONTROL

AUTOFILT® CONTROL UNIT ACU

The clear design of the touch screen allows the user to keep an eye on the filter's current operating condition of the filter at all times. The symbols used in the display are self-explanatory and are based on current international standards and colour codes. The control is designed to ensure open connectivity to all customer interfaces.

Advantages of the AutoFilt® Control Unit:

- Intuitive menu navigation via touch screen
- Open connectivity to all commonly used customer interfaces (Ethernet, USB, ...)
- High-precision pressure measurement using HYDAC pressure transmitter HDA
- Several menu languages to choose from
- Always up to date with simple software updates
- Additional differential pressure gauge available as an option

Customer connections on terminal strip:

- Input (not potential-free, 24 VDC)
 - Filter remote control
- Outputs (potential-free)
 - Back-flushing active
 - General errors (power interruption, power failure, broken cable, etc.)
 - Differential pressure (4-20 mA signal)



4. FILTER CALCULATION / SIZING*

CHECKLIST FOR FILTER CALCULATION / SIZING

STEP 1: CHECKING THE PREREQUISITES

- It is crucial when operating the AutoFilt® RF3 that there is a pressure differential between the back-flush line and the filter outlet of at least 1.5 bar
(see circuit diagram on the following page)
- Application data is determined using filter questionnaires
- The flow velocity of 4 m/s at the flange inlet should not be exceeded
- The maximum operating temperature for every AutoFilt® RF3 is 90 °C
- The filter must be installed in a frost-free environment
- For ambient temperatures below 0 °C, our Head Office must be consulted

STEP 2: FILTER SIZING

- The filter is sized based on the calculation table
- The flow rate curves apply to filtration ratings $\geq 100 \mu\text{m}$
- The initial differential pressure (Δp) when the filter is in a clean condition should not exceed 0.2 bar
- AutoFilt® RF3 with low particulate loading
→ calculation of Δp 0.1 to 0.2 bar
- AutoFilt® RF3 with high particulate loading
→ calculation of $\Delta p < 0.1$ bar

STEP 3: DETERMINING THE FILTRATION RATING

- **As a basic rule: as coarse as possible – as fine as necessary!**
- For filtration ratings $\leq 50 \mu\text{m}$, the filter pressure drop increases by approx. 30 % for all sizes

STEP 4: CHECKING THE PARTICLE LOAD

- Rule of thumb: maximum solid particle content up to 300 mg/l depending on the particle distribution - for values outside these ranges, please contact our Head Office
- Note any fluctuations in the dirt load (e.g. seasonal fluctuations in river water)

CALCULATION TABLES

The values given below are the minimum and maximum possible flow rates for the various sizes. For values outside these ranges, please contact our Head Office.

OPERATING FLUID – WATER

Filter size	Flow rate range [m³/h]
The flow rate ranges given apply to filtration ratings $\geq 100 \mu\text{m}$	
C	5 - 28
0	25 - 113
1	90 - 254
2	200 - 450
2.5	400 - 600
3	550 - 860
4	810 - 1700
5	1500 - 2450
6	2000 - 3600
7	3000 - 5000
8	4500 - 7500

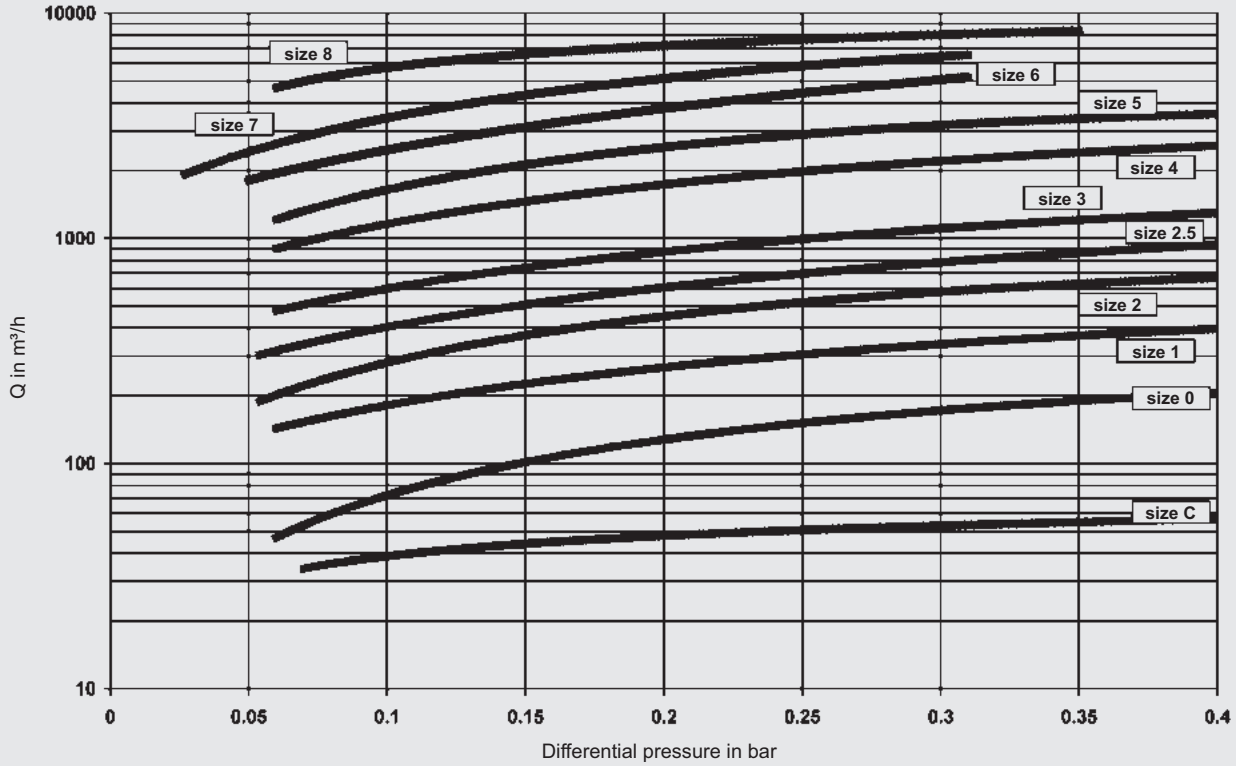
OPERATING FLUID – EMULSION (COOLANTS, WASHING FLUIDS)

Filter size	Flow rate range [m³/h]
The flow rate ranges given apply to filtration ratings $\geq 100 \mu\text{m}$	
C	5 - 15
0	10 - 60
1	40 - 100
2	90 - 200
2.5	100 - 350
3	150 - 450
4	200 - 650
5	350 - 950
6	700 - 1500
7	1000 - 1700
8	1300 - 3000

- Valid for emulsions and oils up to a viscosity of 15 mm²/s
- For applications in the field of grey cast iron processing, grinding, honing and for fluids with a viscosity over 15 mm²/s, consultation with our Head Office

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

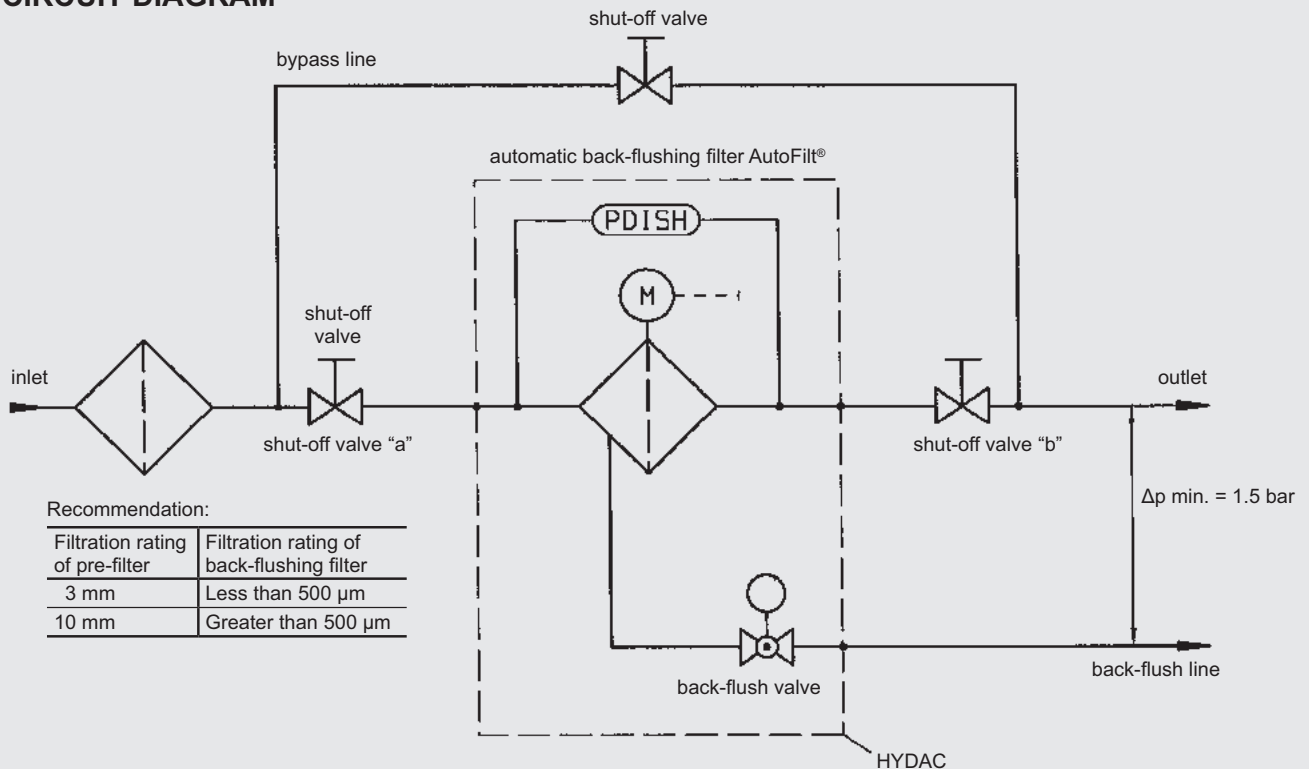
PRESSURE DROP CURVES



Caution

The pressure drop curves apply to filtration ratings from 100 to 3000 μm .
For wedge wire and SuperMesh filter elements $\leq 50 \mu m$, the pressure drop increases by roughly 30 %.

CIRCUIT DIAGRAM



Recommendation:

Filtration rating of pre-filter	Filtration rating of back-flushing filter
3 mm	Less than 500 μm
10 mm	Greater than 500 μm

Caution

For cleaning, the pressure in the back-flush line must be at least 1.5 bar lower than the pressure in the filter outlet line.

5. FILTER CONFIGURATION*

	Standard	Optional
Control parameters	<ul style="list-style-type: none"> • EPT • EU • EPU • PT • PTZ • Manual • Without control 	<ul style="list-style-type: none"> • PLC • Filter interlocking for parallel operation • UL/CSA-approved components • Safe in tropical conditions • Customised special solutions
Connection voltages	All current international connection voltages and frequencies can be implemented	
Electrical protection classes	IP55	Other IP protection classes
Explosion protection		ATEX according to Directive 94/9/EC
Housing	Housing calculation and housing manufacture according to AD 2000 and, if required, to Pressure Equipment Directive 97/23/EC	ASME Code design with or without ASME-stamp
Flange connections	DIN EN flanges	<ul style="list-style-type: none"> • ASME (ANSI) • JIS
Flange positions	Variable connection positions - filter inlet and filter outlet, as well as back-flush line rotatable	
Housing materials	<ul style="list-style-type: none"> • Carbon steel • Stainless steel 	<ul style="list-style-type: none"> • Duplex • Superduplex • Various qualities of stainless steel • Various qualities of carbon steel
Material of internal parts	Stainless steel	<ul style="list-style-type: none"> • Duplex • Superduplex • Various qualities of stainless steel
Material of filter elements	Stainless steel	<ul style="list-style-type: none"> • Duplex • Superduplex • Filter elements with SuperFlush coating • Filter elements with magnetic separator technology
External corrosion protection	<ul style="list-style-type: none"> • 2-coat primer (not required for stainless steel housing) • Colour RAL 7040 (window grey) 	<ul style="list-style-type: none"> • Multiple-layer coatings • Special coating for offshore applications • Special paints/coatings according to customer specifications
Internal corrosion protection	<ul style="list-style-type: none"> • 2K epoxy paint • 2K highly cross-linked polyurethane paint • Rubber lined 	<ul style="list-style-type: none"> • Glass flake lining • Special paints/coatings according to customer specifications
Differential pressure measurement	<ul style="list-style-type: none"> • Differential pressure gauge – pressure chamber aluminium • Differential pressure gauge – pressure chamber stainless steel, V2A group • Differential pressure gauge – with diaphragm seal, stainless steel, V4A group • Differential pressure gauge – pressure chamber brass • Pressure transmitter HYDAC HDA 4700 stainless steel, V2A group • Pressure transmitter HYDAC HDA 4300 duplex 	
Cover plate lifting device		<ul style="list-style-type: none"> • With cover plate lifting device • Cover plate lifting device for retrofitting
Documentation	<ul style="list-style-type: none"> • Operating manual • Declaration of incorporation according to Machinery Directive 2006/42/EC • Brief start-up guide • Circuit diagram 	<ul style="list-style-type: none"> • Manufacturer's test certificates • Material certificates 3.1 according to DIN EN 10204 • TR CU certificates • 3rd parties (TÜV, ABS, Lloyds, etc.) • Welding documentation e.g. WPS, PQR • Inspection plan

* Other versions and customised special solutions after consultation with our Head Office.

6. MODEL CODE

MODEL CODE AutoFilt® RF3

RF3 - 5 - EPT1 - NG - N - 1 - 3 - X / KS1000 - 5 - 12345678

Type

AutoFilt®

Filter size

- C = DN 50 PN16
- 0 = DN 100 PN10¹⁾
- 1 = DN 150 PN10
- 2 = DN 200 PN10
- 2.5 = DN 250 PN10
- 3 = DN 300 PN10
- 4 = DN 400 PN6
- 5 = DN 500 PN6
- 6 = DN 600 PN6
- 7 = DN 700 PN6
- 8 = DN 800 PN6

Type of control / Input supply voltage

- EPT = electro-pneumatic cyclic control
- EPU = electro-pneumatic circulation control
- EU = electrical circulation control
- PT = pneumatic cyclic control
- PTZ = pneumatic cyclic control with time override

M = manual

0 = without control, all consumers on terminal strip / block

- | | | |
|----------------------------|----------------------------|----------------------------|
| 1 = 3 x 400V / N / PE 50Hz | 9 = 3 x 440V / X / PE 60Hz | } Only for EPT, EPU and EU |
| 2 = 3 x 400V / X / PE 50Hz | A = 3 x 525V / X / PE 50Hz | |
| 3 = 3 x 500V / X / PE 50Hz | B = 3 x 575V / X / PE 60Hz | |
| 4 = 3 x 230V / N / PE 50Hz | C = 3 x 690V / X / PE 50Hz | |
| 5 = 3 x 230V / X / PE 50Hz | D = 1 x 230V / N / PE 50Hz | |
| 6 = 3 x 415V / X / PE 50Hz | E = 1 x 230V / N / PE 60Hz | |
| 7 = 3 x 415V / N / PE 60Hz | F = 1 x 115V / N / PE 60Hz | |
| 8 = 3 x 460V / X / PE 60Hz | G = 3 x 415V / N / PE 50Hz | |

Housing material / Corrosion protection

- N = carbon steel, external primer (RAL 7040)
- NM = carbon steel, external primer (RAL 7040), internal 2K epoxy paint
- NP = carbon steel, external primer (RAL 7040), internal 2K highly cross-linked polyurethane paint
- NG = carbon steel, external primer (RAL 7040), internal rubber lining
- E = stainless steel, V4A group
- A = for ANSI flanges, add A
- J = for JIS flanges, add J

Material, back-flush valve

- N = butterfly valve: housing cast iron-coated, disc stainless steel (only up to $p_{max} \leq 16$ bar!)
- B = butterfly valve: housing cast iron-coated, disc bronze (only up to $p_{max} \leq 16$ bar!)
- S = ball valve: ball stainless steel, housing up to nom. size 50 mm carbon steel from nominal bore 50 mm cast iron-coated (from $p_{max} > 16$ bar!)
- E = ball valve: ball stainless steel, housing stainless steel (from $p_{max} > 16$ bar!)

Differential pressure measurement

- 1 = differential pressure gauge – pressure chamber aluminium (only up to $p_{max} = 25$ bar!)
- 2 = differential pressure gauge – pressure chamber stainless steel, V2A group
- 3 = differential pressure gauge – with diaphragm seal, stainless steel, V4A group
- 4 = differential pressure gauge – pressure chamber brass
- 5 = HDA 4700 stainless steel, V2A group (standard for AutoFilt® Control Unit)
- 6 = HDA 4300 duplex (standard for AutoFilt® Control Unit)

Flange position, inlet and outlet

- 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

Modification number

X = the latest version is always supplied

Filter element set

- KS = conical wedge wire filter elements (50 – 3000 μ m)
- KD = conical SuperMesh filter elements (25 / 40 / 60 μ m)
- SKS = conical wedge wire filter elements with SuperFlush coating
- SKD = conical SuperMesh filter elements with SuperFlush coating

Size of filter element set

Identical to size of filter

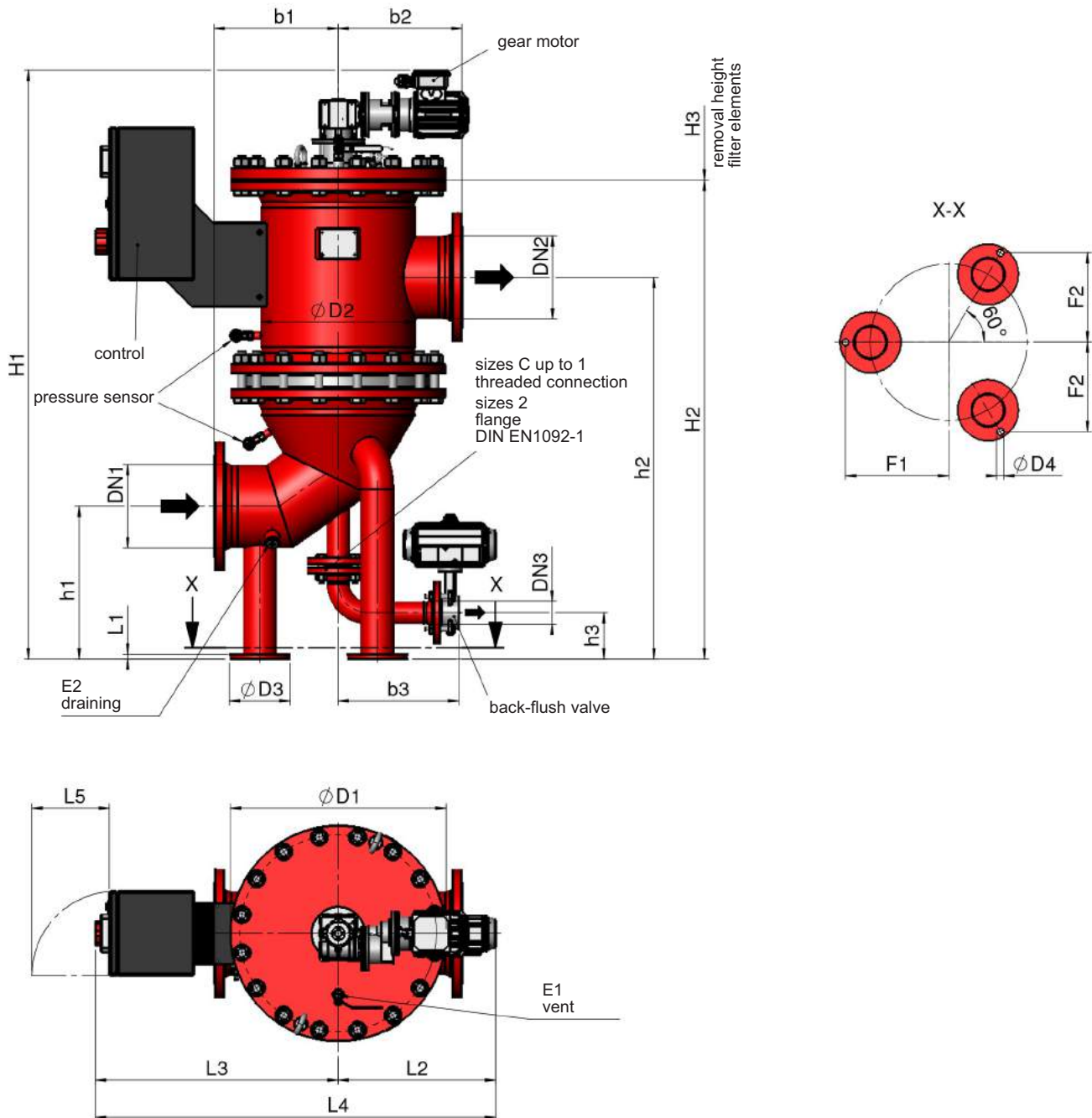
Special number

For special models
(number is allocated after technical clarification in Head Office)

¹⁾ Stainless steel housing PN16

7. DIMENSIONS

Sizes RF3-C to RF3-2



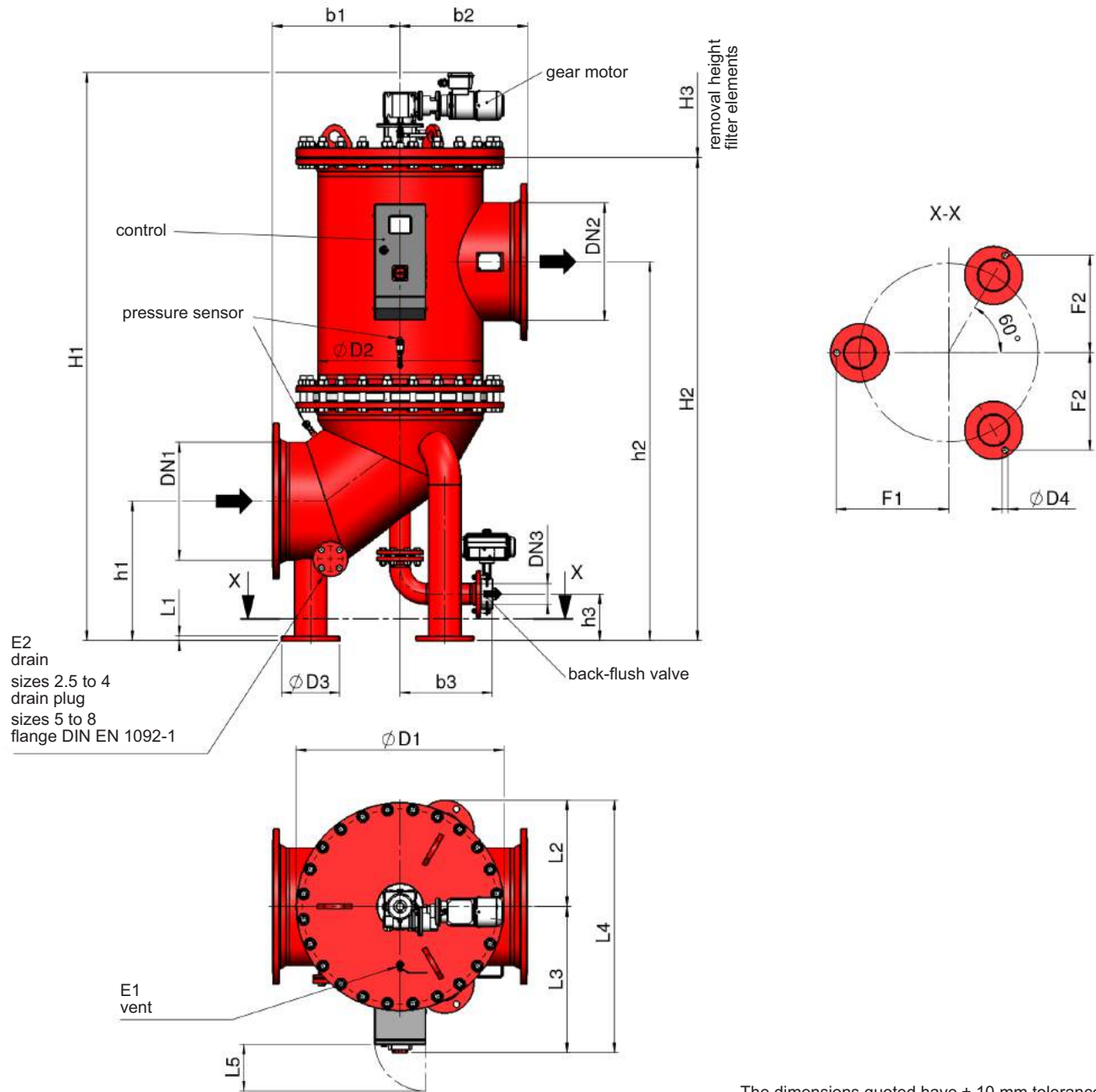
The dimensions quoted have ± 10 mm tolerances.
Subject to technical modifications.

Filter size	DN1	DN2	DN3	b1	b2	b3	h1	h2	h3	H1	H2	H3
RF3-C	50	50	25	200	200	255	220	579	101	967	709	550
RF3-0	100	100	25	200	200	258	250	740	100	1297	994	550
RF3-1	150	150	40	270	270	268	300	860	115	1425	1113	550
RF3-2	200	200	50	325	325	293	400	1000	122	1543	1255	550

Filter size	L1	L2	L3	L4	L5	D1	D2	D3	D4	E1	E2	F1	F2
RF3-C	8	342	646	988	200	340	219.1	100	12	G1/4	G1/2	155	135
RF3-0	8	342	676	1018	200	340	219.1	100	12	G1/4	G1/2	155	134
RF3-1	10	342	738	1080	200	445	323.9	120	15	G1/4	G3/4	210	186
RF3-2	12	342	783	1125	200	565	406.4	160	18	G1/4	G3/4	270	235

7. DIMENSIONS

Sizes RF3-2.5 to RF3-8



The dimensions quoted have ± 10 mm tolerances.
Subject to technical modifications.

Filter size	DN1	DN2	DN3	b1	b2	b3	h1	h2	h3	H1	H2	H3
RF3-2.5	250	250	50	325	325	317	400	1300	120	2048	1760	700
RF3-3	300	300	65	380	380	281	500	1380	155	2198	1888	700
RF3-4	400	400	80	450	450	297	600	1526	220	2338	2033	700
RF3-5	500	500	80	550	550	300	600	1630	200	2421	2080	700
RF3-6	600	600	100	625	625	315	675	1744	200	2618	2275	700
RF3-7	700	700	100	750	750	315	700	1806	201	2654	2311	700
RF3-8	900	900	150	950	950	560	1000	2545	229	3501	3183	700

Filter size	L1	L2	L3	L4	L5	D1	D2	D3	D4	E1	E2	F1	F2
RF3-2.5	12	283	630	913	200	565	406.4	160	18	G1/4	G3/4	270	235
RF3-3	12	335	685	1020	200	670	508	160	18	G1/4	G3/4	322	279
RF3-4	20	389	741	1130	200	780	610	200	22	G1/4	G3/4	375	358
RF3-5	20	459	794	1253	200	895	711	250	27	G1/4	DN40	485	420
RF3-6	20	563	901	1464	200	1115	914	300	30	G1/4	DN40	565	516
RF3-7	20	611	968	1579	200	1230	1016	300	30	G1/4	DN40	652	565
RF3-8	20	712	1000	1712	200	1405	1220	300	30	G1/4	DN40	719	623

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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