HYDAC INTERNATIONAL

Automatic back-flushing filter
AutoFilt® RF4

RF4-1

RF4-2

Specifications	
Nominal size:	G1” – G 1½”
Q_{max}:	220 l/min
p_{max}:	16 bar
Filtration ratings:	30 – 1000 µm

1. GENERAL

Product description
- Self-cleaning automatic filter
- Separation of solid particles from low viscosity fluids
- Available as a fully automatic or manual filter variant

Filter element technology
- Conical filter elements
- Wedge wire: 30 to 1000 µm
- SuperMesh wire mesh, sintered: 25 to 60 µm

Product advantages
- Fully automatic function
- Compact design
- Continuous flow of filtrate even during back-flushing
- Maximum utilisation of the filter area
- Full filtration performance after back-flushing
- Ready-to-operate unit
- Low maintenance costs
- Low operating costs

Technical data – standard models

Size [1]	Pressure range [bar]	Connection Inlet / outlet	Connection, back-flush line	Weight [2] [kg]	Volume [l]	No. of filter elements	Filter area [cm²]	Back-flush volume [l] [3]
RF4-1	6	G1”	G ½”	13	2.5	4 x KM	548	4
RF4-1	16	G1”	G ½”	15	2.5	4 x KM	548	4
RF4-2	6	G1 ½”	G ¾”	32	3.7	4 x KN	1420	13
RF4-2	16	G1 ½”	G ¾”	63	3.7	4 x KN	1420	13

Legend

[1] $T_{s\,max}$ for all AutoFilt® RF4: 80°C

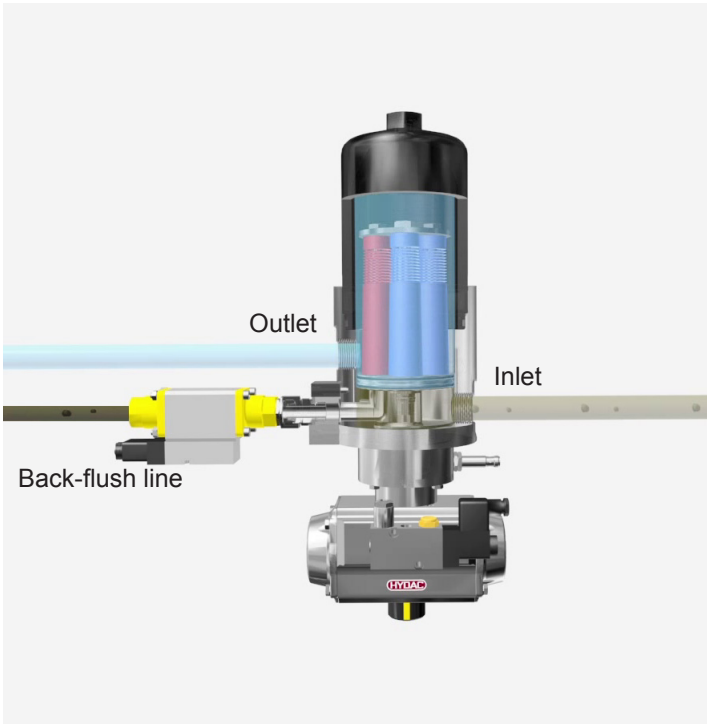
[2] Refers to EPT version

[3] Back-flush volume with a valve opening time of 1.5 seconds with a pressure difference of 1.5 bar between the filtrate line and the back-flush line

2. FUNCTION

FILTRATION

- The fluid to be filtered flows through the filter elements of the back-flushing filter, passing from the inside to the outside
- During this process, the particles deposit on the smooth inside of the filter element surface
- As the level of contamination increases, the differential pressure between the dirty and the clean side of the filter increases
- When the pressure drop reaches the pre-set differential pressure trigger point, back-flushing starts automatically

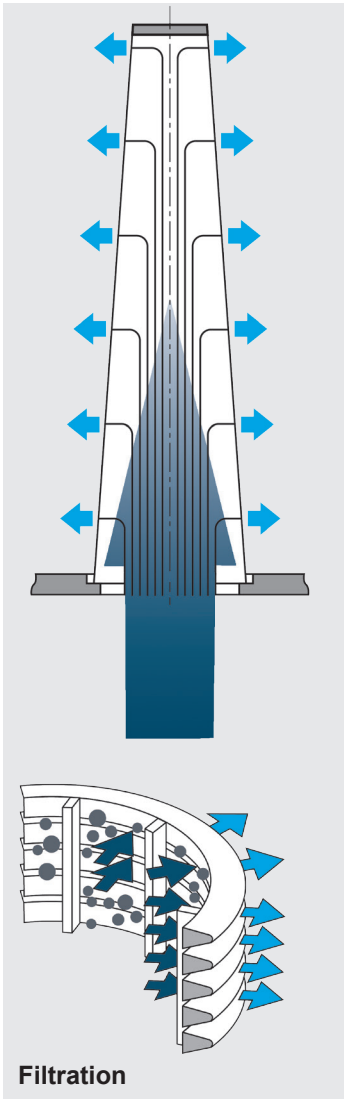


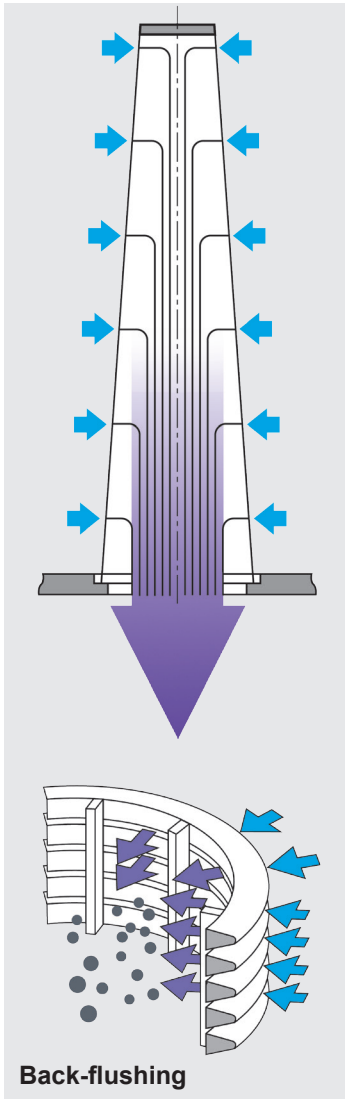
TRIGGERING BACK-FLUSHING

- Automatic: automatic back-flushing is triggered when the pre-set differential pressure trigger point is exceeded
- Manual: when the visual clogging indicator is triggered

BACK-FLUSHING OF THE FILTER ELEMENTS – BACK-FLUSHING CYCLE

- The rotary drive rotates the filter element mounting plate, along with the filter elements, into position so that a clogged filter element is located above a flush opening
- The back-flushing valve is opened
- The pressure drop between the filtrate side and the back-flush line flushes a small amount of the filtrate back through the filter element to be cleaned
- The contaminant particles deposited on the inside of the filter elements are loosened and flushed into the back-flush line via the flushing arm
- Once the “back-flush time per filter element” has elapsed, the back-flushing valve is closed
- In this way, all the filter elements are back-flushed, one after the other
- A back-flushing cycle is complete once all the filter elements have been cleaned
- In the AutoFilt® RF4 with manual back-flushing, the filter element mounting plate is turned along with the filter elements, and the back-flushing valve is opened manually
- The flow of filtrate is not interrupted during back-flushing





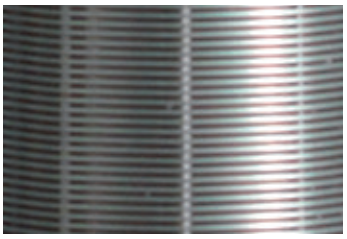
3. SPECIAL FEATURES

FILTER ELEMENT TECHNOLOGY

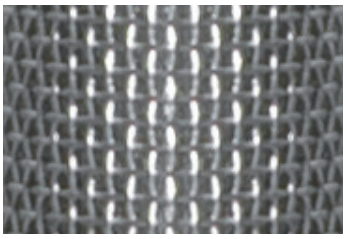
Conical filter elements
Robust wedge wire or SuperMesh filter elements made from stainless steel are used in the HYDAC AutoFilt® RF4 automatic back-flushing filter. The conical shape of the filter elements provides maximum efficiency during filtration and optimum effectiveness during back-flushing.

SuperFlush non-stick coating
For waste-water treatment applications, the filter elements can also be given a special non-stick coating (SuperFlush).

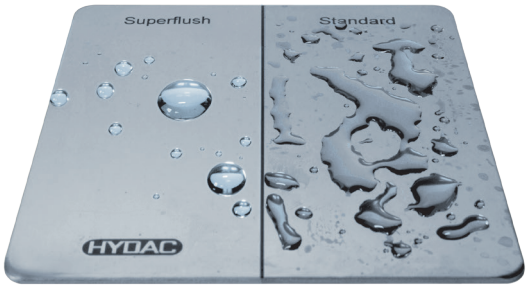
Advantages of the SuperFlush coating:
- Unique coating technology
- Available for conical filter elements
- Prevents particle build-up on the filter element surface
- Gel-like particles do not adhere to the filter element surface
- Reduces biofouling
- Increases the service life
- Increases effectiveness



Wedge wire



SuperMesh –
Wire mesh, sintered, with or without support structure



With | Without
SuperFlush
Non-stick coating for filter elements

ISOKINETIC FILTRATION AND BACK-FLUSHING

The conical shape and alignment of the filter elements allow uniform flow, resulting in a low pressure drop and effective cleaning of the filter elements.

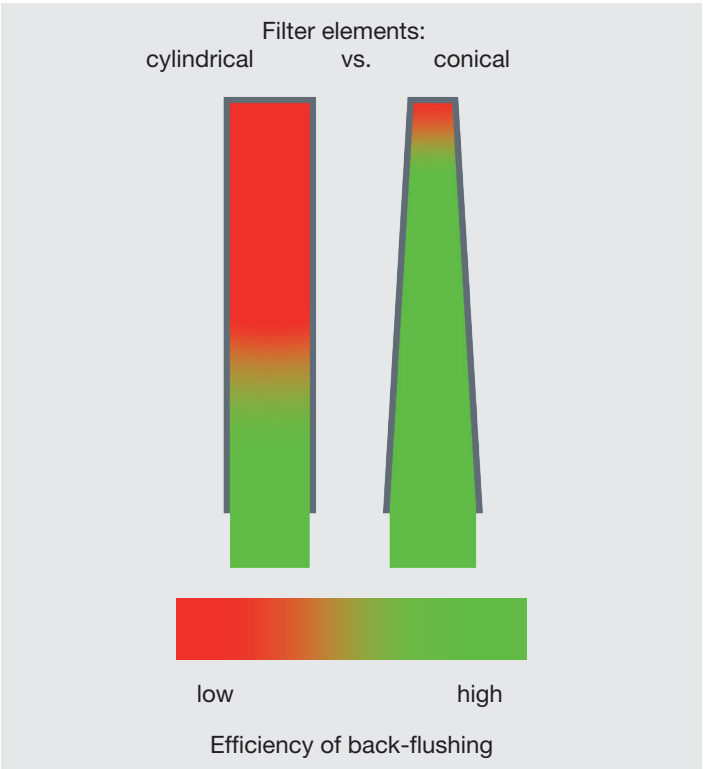
Advantages:
- Fewer back-flushing cycles
- Lower back-flushing losses

PULSE-AIDED BACK-FLUSHING

In the EPT control types, the filter element to be back-flushed remains in the flushing position for only a few seconds. Rapid opening of the back-flushing valve generates a pressure surge in the filter element openings, providing an additional cleaning effect to the back-flushing process.

SMALL BACK-FLUSH VOLUMES DUE TO CYCLIC CONTROL

In the EPT control types, the back-flushing valve opens and closes during back-flushing of each filter element.



4. FILTER CALCULATION*

CHECKLIST, FILTER CALCULATION

Step 1: Checking the prerequisites

- The determining factor for operating the AutoFilt® RF4 is the presence of a pressure difference of at least 1.5 bar** between the filter outlet and the back-flush line
- This minimum pressure difference is vital for the filter operation
- Application data is determined using filter questionnaires
- The flow velocity of 4 m/s at the filter inlet should not be exceeded
- The maximum permitted operating temperature for every AutoFilt® RF4 is 80°C
- The flow must not drop below the minimum flow rate of 40 l/min

Step 2: Filter sizing

- Determined on the basis of the pressure drop curves and, specially for cooling lubricant emulsion applications, on the basis of the calculation table
- The initial pressure difference (Δp) when the filter is in a clean condition must not exceed 0.2 bar
- The pressure drop curve applies to filtration ratings of 100 to 1000 µm wedge wire and to 25 µm / 40 µm and 60 µm SuperMesh filter elements
- The flow velocity of 4 m/s at the filter inlet should not be exceeded

Step 3: Calculation tables

The calculation tables form an important decision-making basis for selection of the AutoFilt® RF4.

➔ In particular, the higher contamination load in the cooling lubricant emulsion applications requires that the filter be calculated more generously

➔ Validity of the tables for emulsions and oils up to a viscosity of 15 mm²/s

** For diverse cooling lubricant applications, the filtrate pressure must be adjusted to suit the particular application.

CALCULATION TABLES

WATER APPLICATIONS

Fluid	Filter size / max. flow rate [l/min]	
	RF4-1	RF4-2
Water	120	220

The flow rate ranges indicated apply to filtration ratings ≥ 100 µm

COOLING LUBRICANT EMULSIONS

Applications only following consultation with our Head Office

Conditions for correct performance in standard areas of application	
Filtration rating	≥ 100 µm
Pre-filtration	< 1000 µm
Contamination content	< 120 mg/l
Viscosity	< 15 cSt

Fluid	Type of contamination	Machining	Max. flow rate [l/min]	
			RF4-1	RF4-2
Emulsion	Aluminium	• Milling • Boring • Turning	100	220
	Cast iron		70	180
	Carbon steel		80	200
	Stainless steel		80	200

➔ The flow rate ranges indicated apply to filtration ratings ≥ 100 µm and a maximum contamination content of 120 mg/l

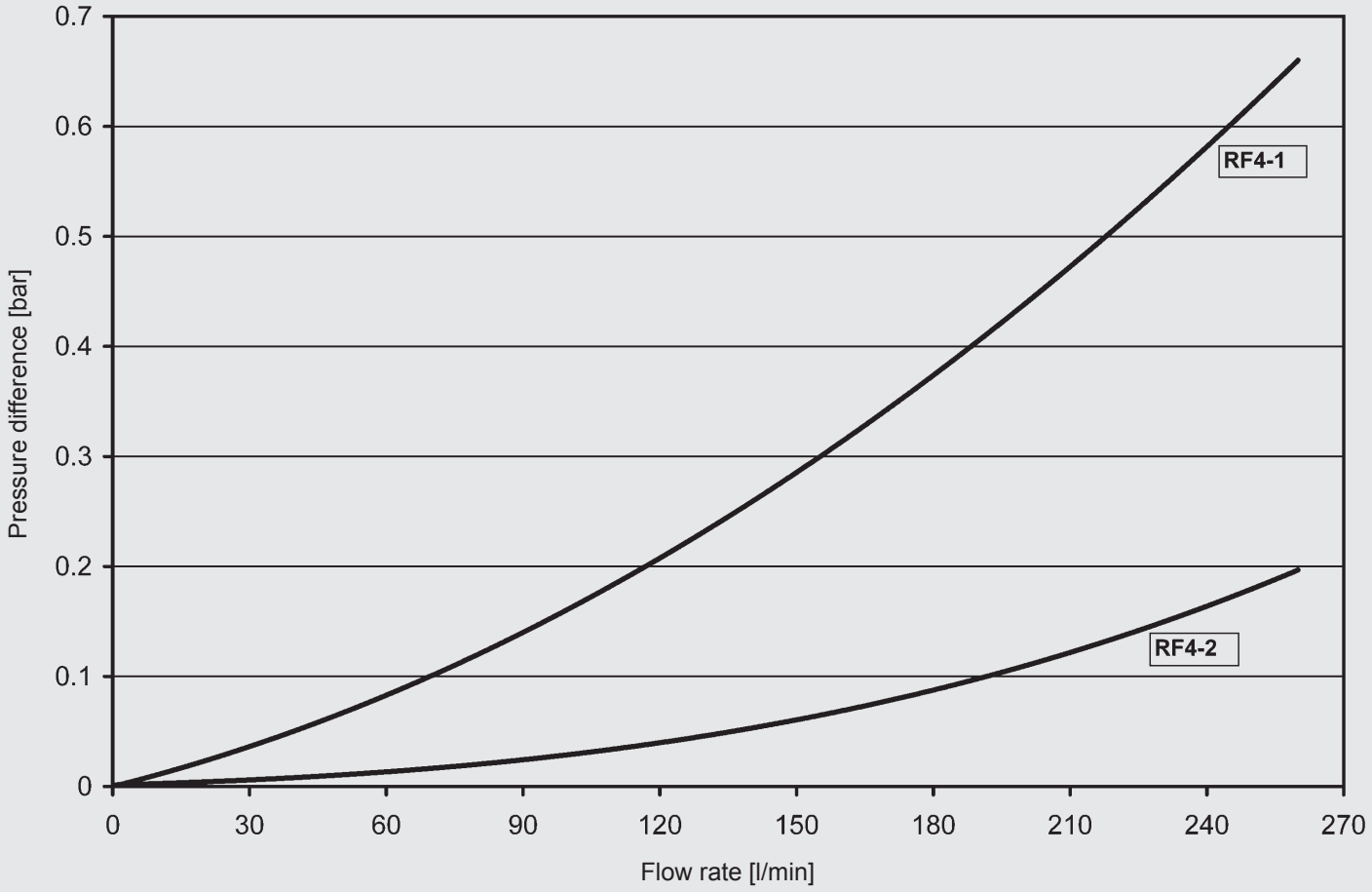
➔ Validity of the tables for emulsions and oils up to a viscosity of 15 mm²/s

➔ Our Head Office must be consulted for applications involving compacted graphite iron, grinding, honing and fluids with a viscosity greater than 15 mm²/s

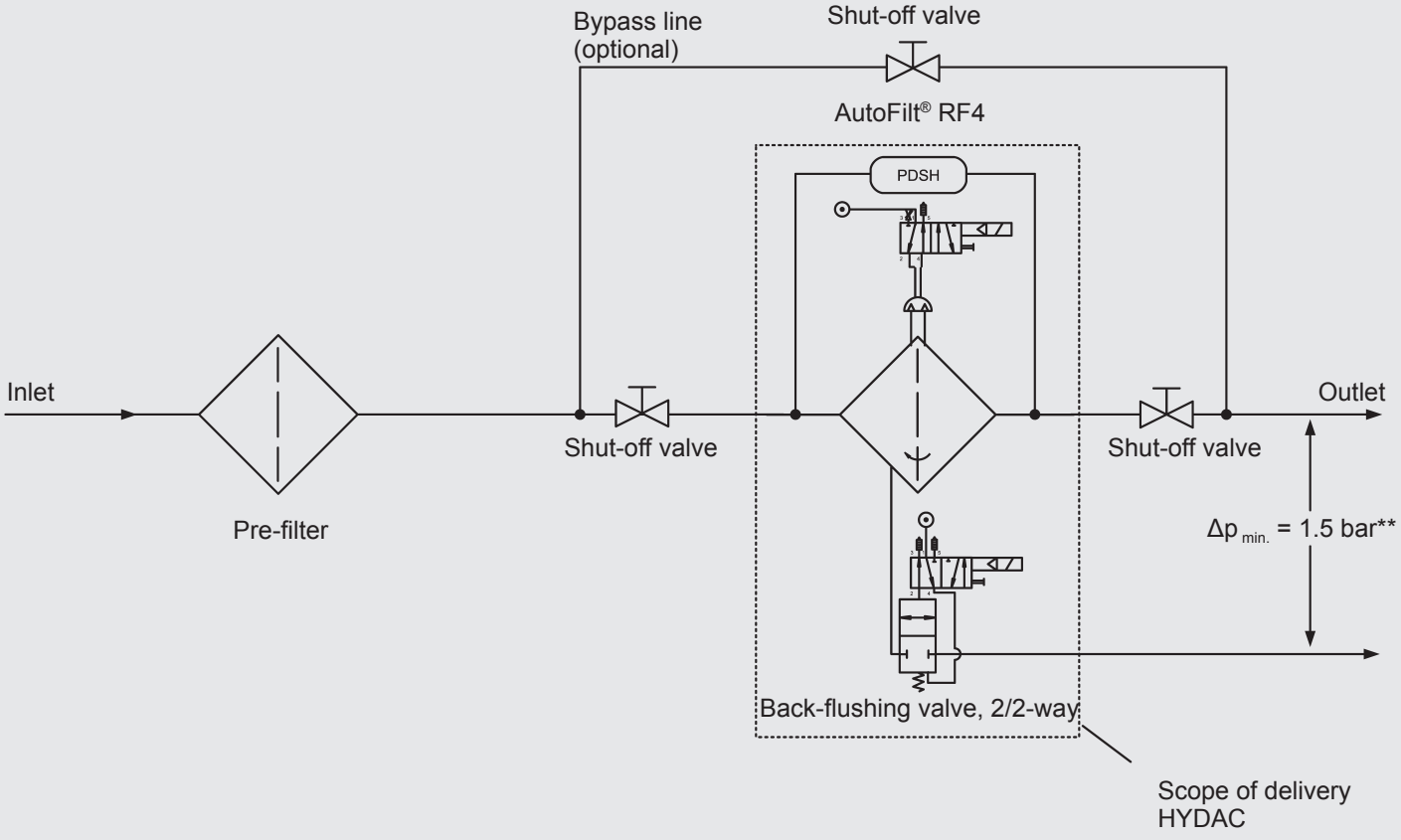
* Please contact our Head Office if you have any queries regarding the filter calculation

PRESSURE DROP CURVES

The pressure drop curves apply to water and fluids with a similar viscosity



CIRCUIT DIAGRAM



** For diverse cooling lubricant applications, the filtrate pressure must be adjusted to suit the particular application.

5. FILTER CONFIGURATION*

	Standard	Optional
Types of control	• EPT: electro-pneumatic cyclic control • ET: electrical cyclic control (electrical only) • M: manual	Customised special solutions
Connection voltages	• 230 V AC main voltage • 230 V AC or 24 V DC control voltage • For ET control variants only: control voltage 24 V DC, drive 3 x 400 V / N / PE, 50 Hz	Special voltages
Electrical protection classes	IP65	
Housing materials (combinations)	• Aluminium, anodised • Stainless steel: 1.4571 or similar (Group 316) • Carbon steel, nickel-plated	
Material of internal parts	• Stainless steel: 1.4301 or similar (Group 304)	
Back-flushing valve	• Coaxial valve • Stainless steel ball valve • Ball valve, brass, nickel-plated	
Filter elements	**SuperMesh filter elements:** • SuperMesh wire mesh, sintered, with or without support structure: 1.4401 or similar (Group 316) • Nominal filtration rating: 30 – 60 µm **Wedge wire:** • Robust wedge wire • Stainless steel: 1.4435 or similar (Group 316) • Nominal filtration rating: 30 – 1000 µm	• SuperFlush non-stick coating for filter elements • Filter elements with solenoid technology
Differential pressure monitoring	• Differential pressure switch with or without setting options	
Pressure ranges	• 6 bar (stainless steel version only) • 16 bar	25 bar
Documentation	• Operating and maintenance instructions	• Material certificates according to EN 10204, 3.1 for the pressurised components in contact with media (stainless steel version only) • Manufacturer inspection certificate according to DIN 55350, Part 18 “M” for final inspection and pressure testing

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

6. MODEL CODE

MODEL CODE AutoFilt® RF4

RF4-2 – EPT 2 – NN E – CO – 3 – 16 – 1 / SKNS100 – 1234567

Filter type
RF4-1 = AutoFilt® RF4, size 1
RF4-2 = AutoFilt® RF4, size 2

Control
M = manual
EPT = electro-pneumatic control (incl. pneumatic drive)
ET = electrical control

Control type / connection voltage
For EPT control only:
0 = without control, without solenoid valve
1 = with S7 control, 1 x 230 V / N / PE 50 Hz, solenoid valve 230 V AC
2 = with S7 control, 1 x 230 V / N / PE 50 Hz, solenoid valve 24 V DC
2M = with S7 control, 1 x 230 V / N / PE 50 Hz, solenoid valve 24 V DC / M12x1 male connector
3 = without control, with solenoid valve 230 V AC
4 = without control, with solenoid valve 24 V DC
4M = without control, with solenoid valve 24 V DC / M12x1 male connector
5A = with AutoFilt® Control Unit ACU control, 1 x 230 V/N/PE 50 Hz
5C = with AutoFilt® Control Unit ACU control, 3 x 380–420 V / N / PE 50/60 Hz
5D = with AutoFilt® Control Unit ACU control, 3 x 380–420 V / x / PE 50/60 Hz
For ET control only:
0A = without control, drive 1 x 230 V / N / PE, 50 Hz
Back-flushing valve 1 x 230 V / N / PE, 40–60 Hz
Sensor system 24 V DC
0C = without control, drive 3 x 380–420 V / x / PE, 50/60 Hz
Back-flushing valve 1 x 230 V / N / PE, 40–60 Hz
Sensor system 24 V DC
1A = with S7 control, 1 x 230 V / N / PE, 50 Hz
1C = with S7 control, 3 x 380–420 V / N / PE, 50/60 Hz
1D = with S7 control, 3 x 380–420 V / x / PE, 50/60 Hz
2A = with AutoFilt® Control Unit ACU control, 1 x 230 V / N / PE, 50 Hz
2C = with AutoFilt® Control Unit ACU control, 3 x 380–420 V / N / PE, 50/60 Hz
2D = with AutoFilt® Control Unit ACU control, 3 x 380–420 V / x / PE, 50/60 Hz
Other voltages on request!

Materials

Bottom filter section	*Top filter section*	*Note*
AA = aluminium ALMG3	aluminium ALMG3	Only RF4-1, 16 bar
NN = carbon steel, nickel-plated	carbon steel, nickel-plated	Only RF4-2, 16 bar
EE = stainless steel	stainless steel: 1.4571 or similar (Group 316)	RF4-1/2, 16 bar

Internal parts
E = stainless steel: 1.4301 or similar (Group 304)

Back-flushing valve
0 = without back-flushing valve
CO = coaxial valve, brass
CON = coaxial valve, zinc-plated steel (only on request!)
COE = coaxial valve, stainless steel (only on request!)
KN = ball valve, nickel-plated brass (only on M or EPT control variants)
KE = ball valve, stainless steel (only on M or EPT control variants) (only on request!)

Differential pressure monitoring
0 = without differential pressure monitoring
1 = fixed value: 0.5 bar, type DS 32, normally open contact (n. o.)
2 = adjustable: 0.1–1 bar, type DS 31, normally open contact (n. o.)
3 = fixed value: 0.5 bar, type DS 32, normally closed contact (n. c.)
4 = adjustable: 0.1–1 bar, type DS 31, normally closed contact (n. c.)
5 = Visual clogging indicator (for manual version only)
7 = fixed value 0.5 bar, type VL 1 GW (aluminium), normally closed contact (n. c.)
8 = fixed value 0.5 bar, type PVL 1 GW (1.4301), normally closed contact (n. c.)
9 = 2 x HDA 4700 stainless steel (4–20 mA), standard in combination with AutoFilt® Control Unit ACU control

Pressure range
06 = 6 bar (housing fastened with clamp), only for housings in stainless steel design
16 = 16 bar (top filter section threaded)
25 = 25 bar, only for RF4-1 (only on request!)

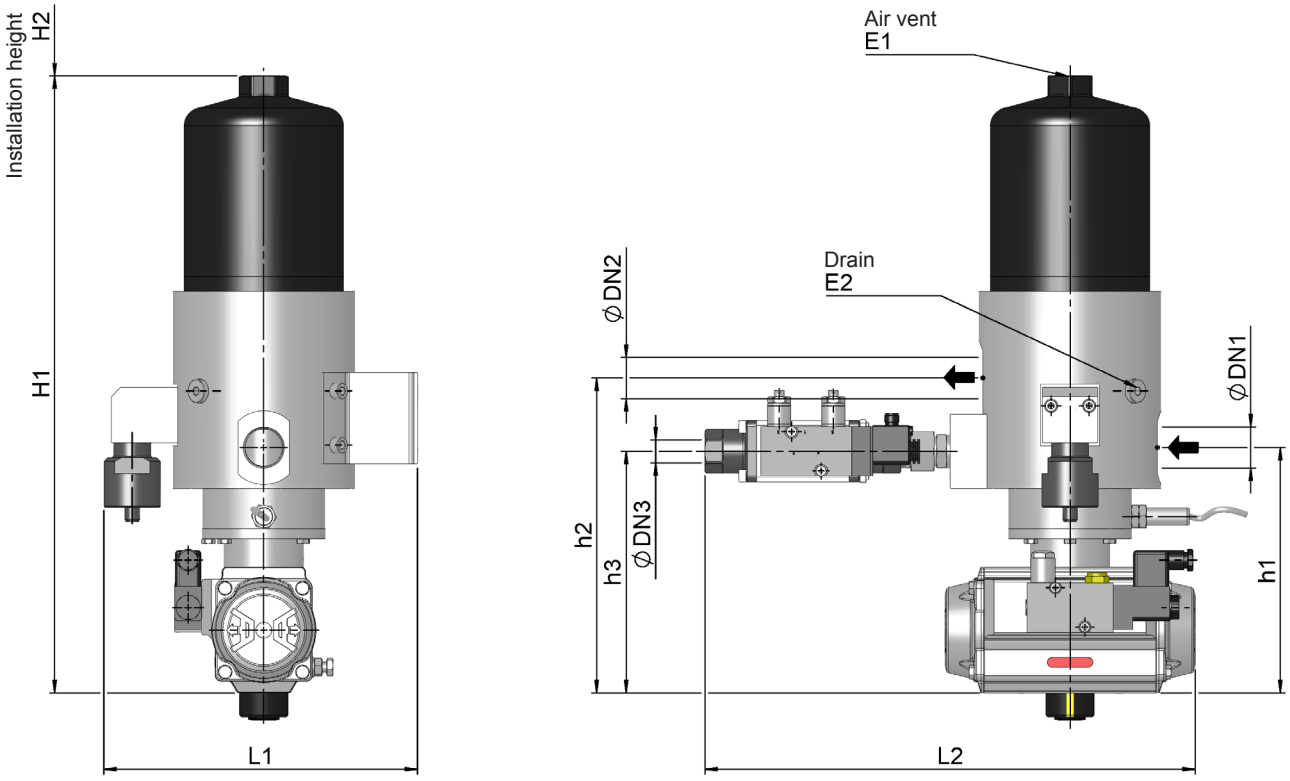
Modification number
1 = the latest version is always supplied

Filter elements / filtration rating
M = “M” added in front for solenoid technology
S = “S” added in front for SuperFlush
For RF4-1:
KMS = wedge wire 30 µm to 1000 µm
KMD = SuperMesh 25 µm / 40 µm / 60 µm; other filtration ratings on request
For RF4-2:
KNS = wedge wire 30 µm to 1000 µm
KND = SuperMesh 25 µm / 40 µm / 60 µm; other filtration ratings on request

Drawing number
For special designs

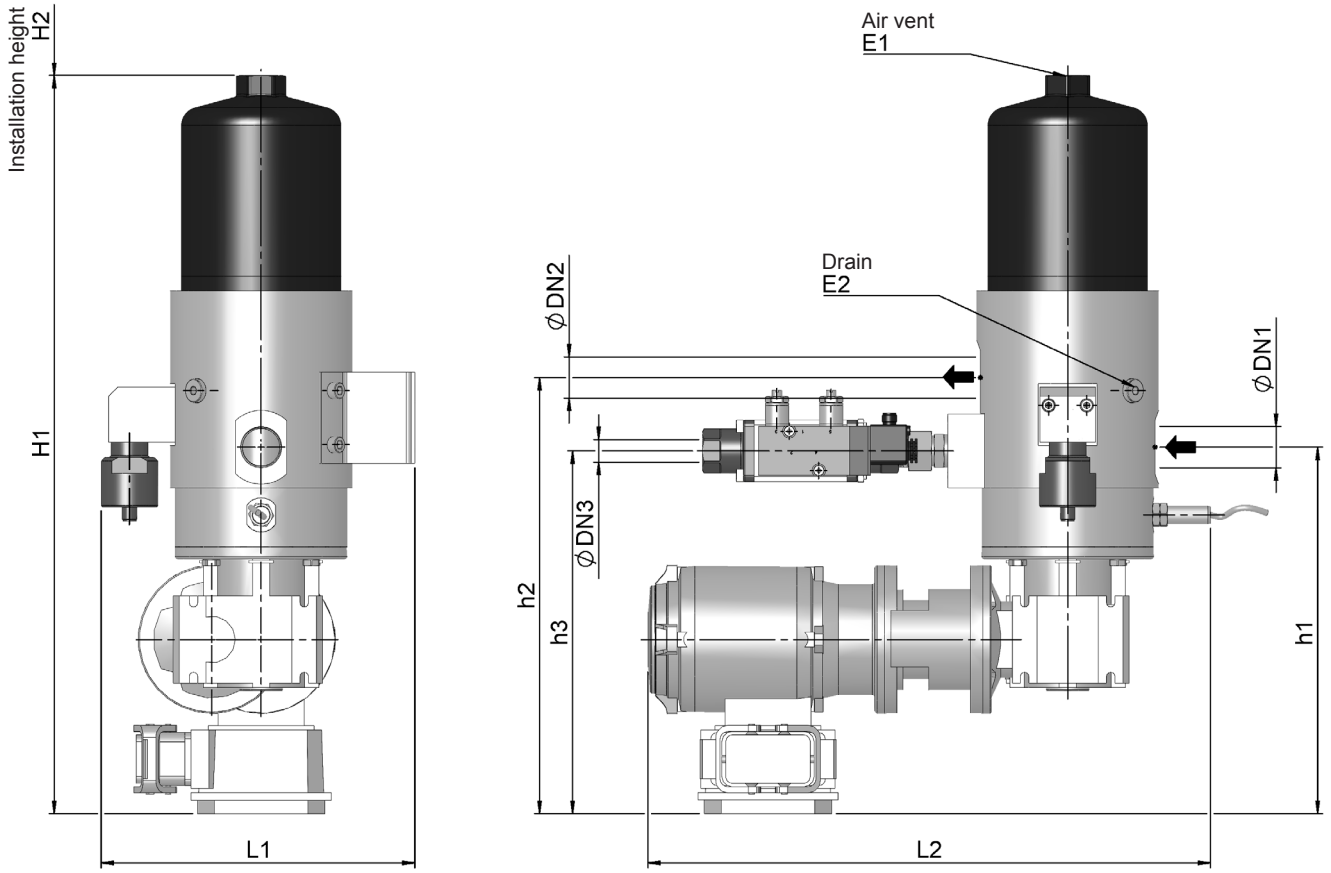
7. DIMENSIONS

RF4-1/2 Coax



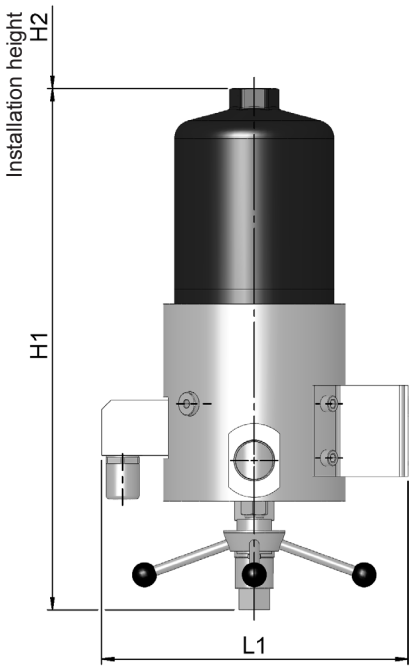
Size	DN1	DN2	DN3	h1	h2	h3	H1	H2	L1	L2	E1	E2
RF4-1	G1	G1	G1/2	199	256	196	501	110	255	399	G1/2	G1/4
RF4-2	G1 1/2	G1 1/2	G3/4	206	282	210	572	106	342	452	G1/2	G1/4

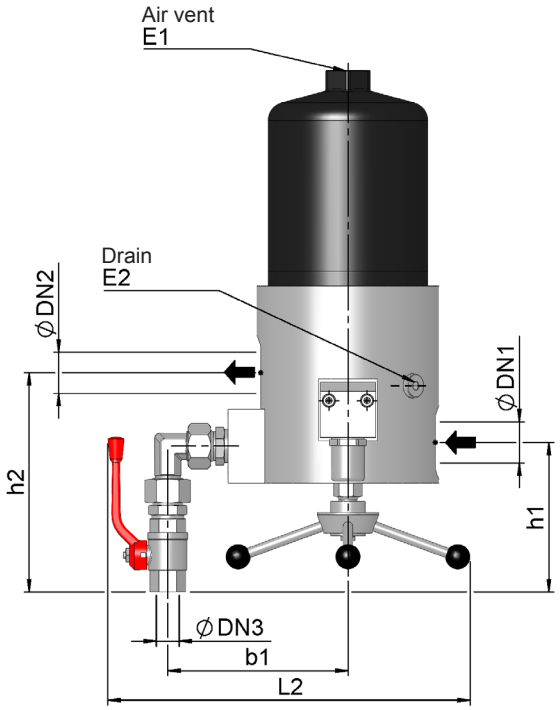
RF4-1/2 electrical



Size	DN1	DN2	DN3	h1	h2	h3	H1	H2	L1	L2	E1	E2
RF4-1	G1	G1	G1/2	298	355	295	600	110	255	437	G1/2	G1/4
RF4-2	G1 1/2	G1 1/2	G3/4	304	379	307	672	206	342	458	G1/2	G1/4

RF4-1/2 manual





Size	DN1	DN2	DN3	h1	h2	h3	H1	H2	L1	L2	E1	E2
RF4-1	G1	G1	G1/2	121	178	147	423	110	249	294	G1/2	G1/4
RF4-2	G1 1/2	G1 1/2	G3/4	115	190	178	480	206	336	337	G1/2	G1/4

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

NOTE

The information in this brochure relates to the operating conditions and applications described.
For applications and/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.: +49 (0)6897 - 509-1241
Fax: +49 (0)6897 - 509-1278
Internet: www.hydac.com
E-mail: prozess-technik@hydac.com