

Automatic back-flushing filter AutoFilt® RF9



Specifications	
Nominal size:	DN 50 - DN 350
Q _{max} :	1,360 m ³ /h (LO)
p _{max} :	10 / 16 bar
Filtration ratings:	1–150 μm *

1. GENERAL

Product description

- Self-cleaning automatic filter supported by external fluid (AutoFilt® RF9)
- Separation of solid particles from low- and high-viscosity fluids
- Can be used with operating temperatures of up to max. 180 °C (depending on choice of sealing material)
- Thanks to various optionally available automation technologies, also suitable for "Industrie 4.0".

Filter element technology

- Pleated filter elements
- Conical filter elements
- Metal fleece 1–10 μm * (Chemicon®)
- Wire mesh: 10 to 150 μm



Product advantages

- Back-flushing driven by external fluid
- Fluid does not mix with the compressed air
- Adjustable back-flushing intensity
- Efficient hydraulic cleaning
- High cleaning effect
- No reduction in pressure during back-flushing
- Low compressed air consumption
- Low pressure drops
- Large filter surface for its compact size
- Low-maintenance, service-friendly design
- External heater possible
- Intelligent control system
- Modular structure for simple expansion with manual bypass and flushing oil treatment
- Long maintenance intervals
- Low operating costs

* Dependent on application

1. GENERAL

Product parameters

Technical specifications of standard models										
AutoFilt® RF9	RF9-0	RF9-0.5	RF9-2	RF9-3	RF9-4	RF9-5	RF9-6	RF9-7	RF9-8	RF9-9
Connection (DN) ¹⁾	25 / 32 / 40 /		40 / 50 /	50 / 65 /	65 /	100	150	200	250	350
	50		65	80						
Back-flush line connection ²⁾ (DN)	25		32			50			80	
Design	AD 2000 / 2014/68/EU									
Housing material	EN-GJS 400-15 / DIN EN 1563 / AD 2000 W3/2									
Max. perm. operating pressure	16 bar / 232 psi								10 bar / 145 psi	
Max. perm. test pressure	25 bar / 363 psi								16 bar / 232 psi	
Max. perm. operating temperature range	-10 °C to 180 °C / 14 °F to 356 °F								-10 °C to 120 °C / 14 °F to 248 °F	
No. of filter chambers	2	3	3	4	6	4	6	8	6	8
Pilot air supply	4–8 bar / 58–116 psi									
Back-flushing process	Hydropneumatic back-flushing with secure media separation									
Back-flushing medium	Filtrate									
Volume per flushing ³⁾	1.1 L		5.0 l			9.0 l			17.2 l	
Air consumption per flushing	0.01 Nm³								0.03 Nm ³	
Flushing duration	< 2 seconds					< 3 seconds			< 4 seconds	
Trace heating (optional)	1	2	4	2	4	-				
Max. perm. operating pressure, trace heating	10 bar / 145 psi								-	
Max. perm. test pressure, trace heating	16 bar / 232 psi								-	
Max. perm. operating temperature, trace heating	200 °C / 392 °F								-	
Heating medium	Hot water / steam / thermal oil								-	

1. The value in bold is the standard connection at the housing. Alternatively, counter flanges can be mounted for smaller pipe diameters!
2. The stated nominal connection width for the back-flush line must be observed as a minimum value.
3. The stated back-flush volume refers to the flushing of one single filter chamber. Under normal operating conditions, the filter flushes no more than once per hour.

2. FUNCTION

OPERATION

The fully-automatic back-flushing filter AutoFilt® RF9 is a self-cleaning filter for removing solid particles from low- to high-viscosity fluids. This system automatically regenerates itself during the filtration process without interrupting the flow of filtrate. Due to its specific construction, the cleaning and discharge of the filtered solid particles are done without influencing the output of the operating pressure. The back-flushing filter is low-maintenance; no replacement of elements is necessary under normal operating conditions.

The bypass filter is a redundant unit to the back-flushing filter and is optionally available. This allows maintenance work to be carried out on the back-flushing filter without interrupting the flow of filtrate.

The back-flushing filters AutoFilt® RF9-0 and RF9-0.5 are available optionally with an integrated bypass and switchover.

For the back-flushing filters AutoFilt® RF9-2 to RF9-9, a Sludge Treatment Unit (STU) is available optionally. The STU is a filter for separating solids out of the back-flushing fluid.

FILTRATION

Consistent filtration performance

The medium enters the filter housing via the inlet and is distributed evenly to the different filter chambers. One cleaned filter chamber is always on stand-by.

The flow direction through the filter elements (**A**) in the chambers is from the outside to the inside. The contamination is separated from the fluid on the outer surface of the filter element and is retained there.

The cleaned fluid leaves the various filter chambers, collects in the upper part of the filter housing and exits the filter through the outlet.

As the level of contamination in the filter elements increases, the differential pressure in the filter rises.

PREPARATION FOR FLUSHING

Without interruption

If the differential pressure in the filter reaches the pre-set value, back-flushing is initiated. Back-flushing can also be carried out manually or at set intervals.

When back-flushing is initiated, the gear motor turns the back-flushing unit (**B**) to the next filter chamber. Whilst the unit is being turned, the cleaned filter element is released from stand-by and the differential pressure is re-set.

A sensor stops the rotary movement of the gear motor when the next filter chamber is reached.

The back-flushing valve (**C**) and the piston accumulator diaphragm valve open simultaneously.

BACK-FLUSHING

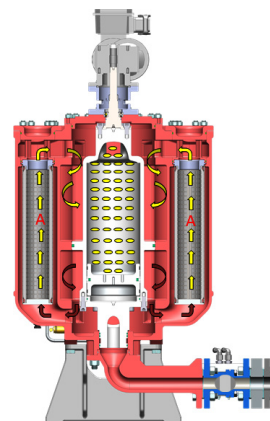
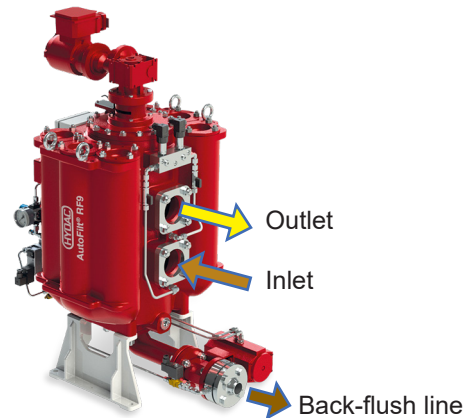
With excellent efficiency

The energy stored in the compressed air abruptly moves the back-flushing piston (**D**), forcing the filtrate to flow in the reverse direction through the filter elements. The contaminants are abruptly loosened from the filter material and are carried out through the open back-flushing port.

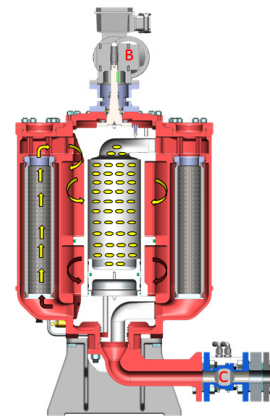
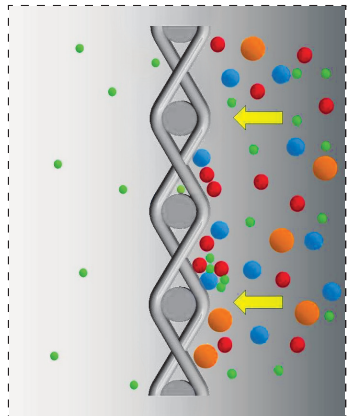
When the back-flushing piston (**D**) has reached its end position both the back-flushing port and piston accumulator diaphragm valve close.

It takes less than four seconds to clean the filter element.

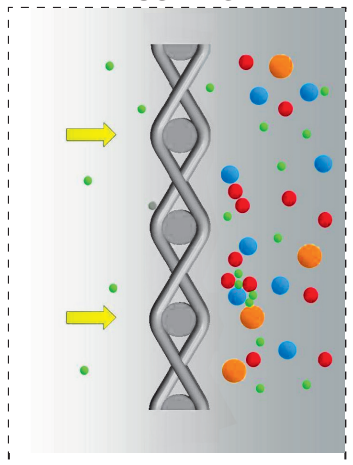
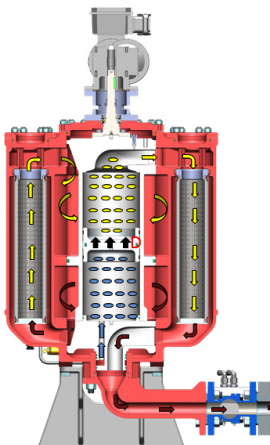
The back-flushing chamber is refilled via the filling bore and the piston returns to its starting position; in other words the accumulator is charged with the filter's own cleaned medium, ready to clean another filter element.



FILTRATION

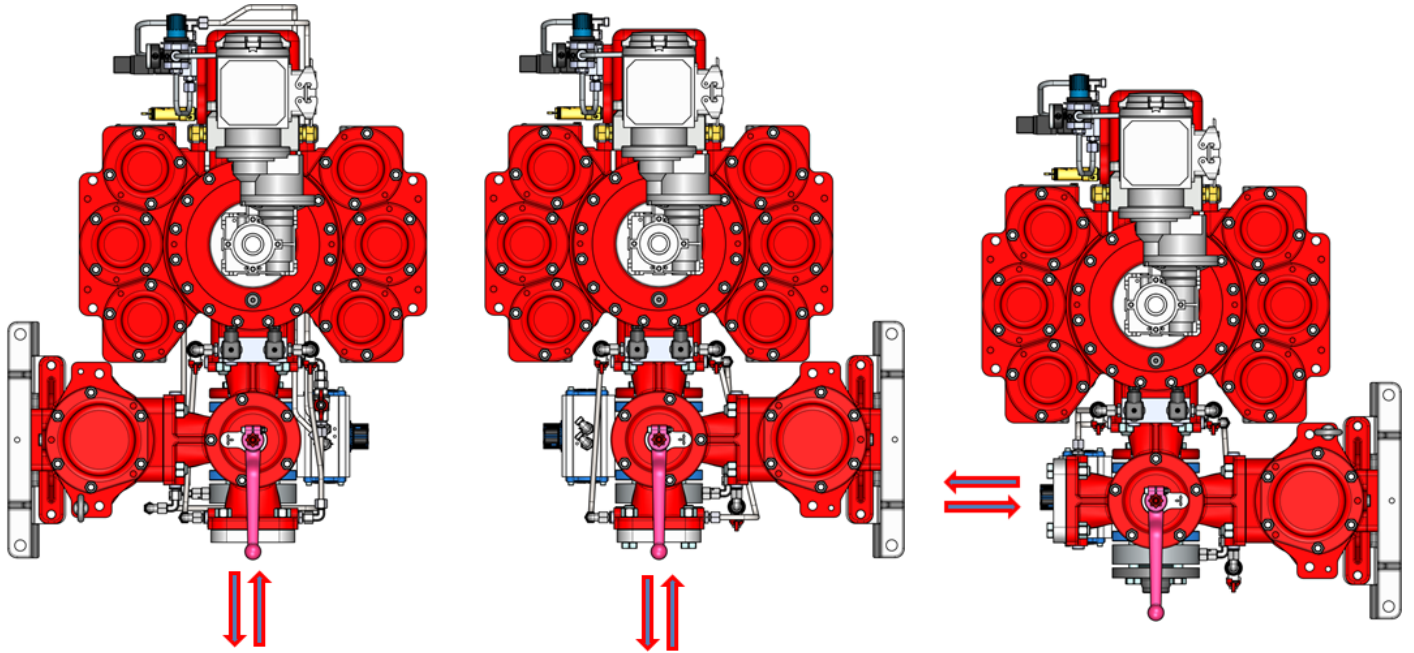


BACK-FLUSHING



2. FUNCTION

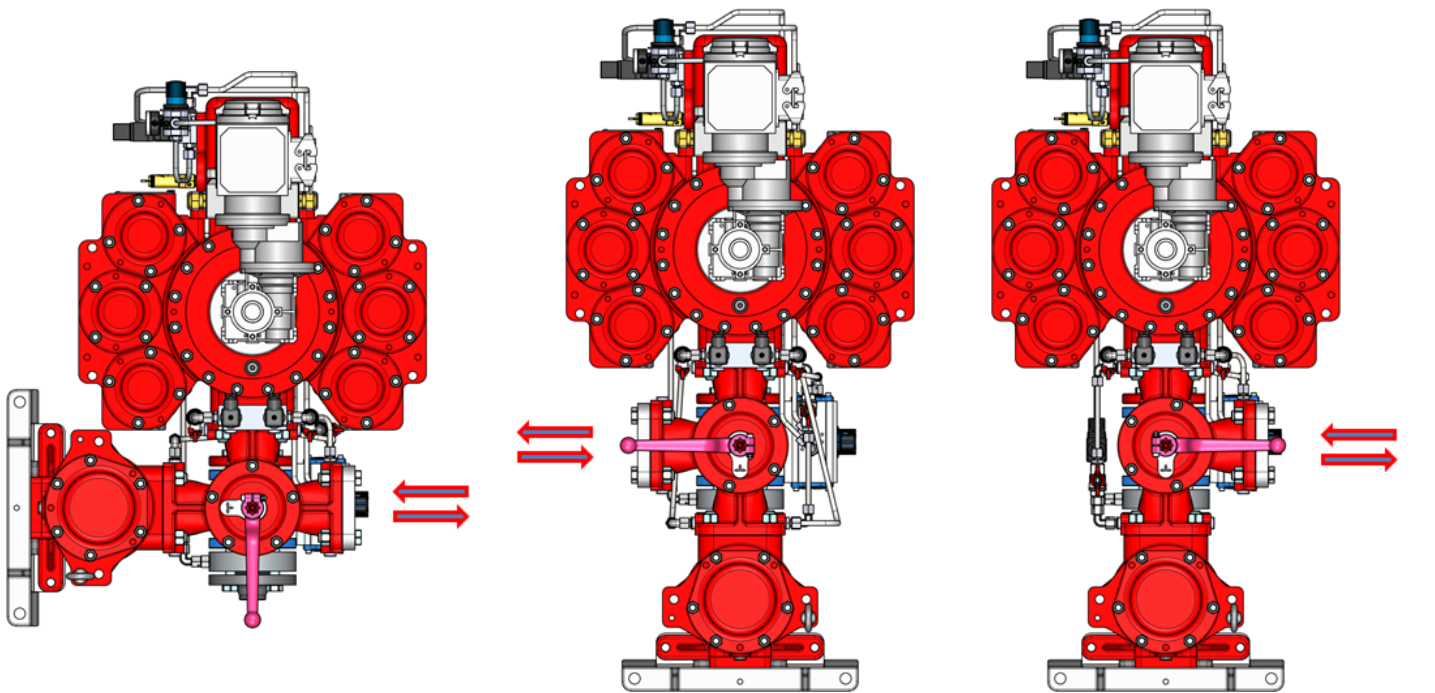
Modular concept, bypass switchover



Position 1

Position 2

Position 3

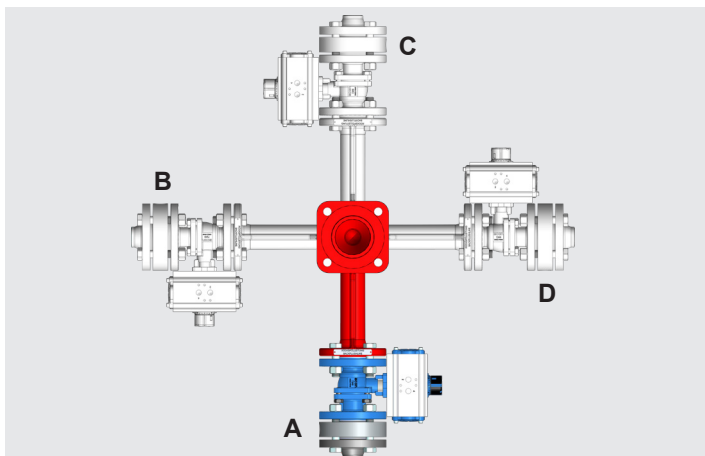


Position 4

Position 5

Position 6

Four different positions can be selected for the sludge drain:



RF9-0 to RF9-7:

Any position can be selected for the sludge drain, in 90° increments. The version marked in red in the left-hand picture shows the standard connection "A". This connection is accordingly located directly beneath the inlet and outlet flange of the standard Autofilt RF9.







The other positions are marked with letters in alphabetical order in a clockwise direction.

(If an STU is used, position "A" is not possible)

RF9-8 and RF9-9:

Only position "C" possible.

3. CLOGGING INDICATORS

Type	Figure	Description	Fluid
Clogging indicator/ differential pressure monitoring			
Electrical HDA 4 7 x x		<ul style="list-style-type: none"> • Pressure as a proportional analogue signal of 4–20 mA 	<ul style="list-style-type: none"> • LO and MDO; HFO only for use with glycerol receiver • Coolants
Analogue HPT 1 7 4 6		<ul style="list-style-type: none"> • Analogue HDA 	<ul style="list-style-type: none"> • Analogue HDA
Electrical VD x C.x		<ul style="list-style-type: none"> • Electrical signal when trigger point is reached • Automatic reset • Switch type: normally closed or normally open 	<ul style="list-style-type: none"> • LO and MDO • Coolants
Visual-electrical VD x D.x /-L...		<ul style="list-style-type: none"> • Lamp for visual display • Electrical signal (normally closed or normally open) • Automatic reset 	<ul style="list-style-type: none"> • LO and MDO • Coolants
Differential pressure indicator/ switch V02 x VE.x		<ul style="list-style-type: none"> • 1 change-over contact (N/C or N/O) • Contact at 100% of the switching pressure • Switching contacts 0.8, 2.0 and 4.3 bar 	<ul style="list-style-type: none"> • LO, MDO and HFO • Coolants
Differential pressure indicator/ switch V02 x VZ.x		<ul style="list-style-type: none"> • 2 change-over contacts (N/C or N/O (change-over contacts)) • Contact 1 at 75% and contact 2 at 100% of the switching pressure • Switching contacts 0.8, 2 and 4.3 bar 	<ul style="list-style-type: none"> • LO, MDO and HFO • Coolants

4. FILTER CALCULATION

CHECKLIST FOR FILTER CALCULATION

STEP 1: CHECKING THE PREREQUISITES

The essential criterion for operating the AutoFilt® RF9 is the presence of a minimum pressure at the filter outlet (back-flush line laid with no counter-pressure!).

For operating pressures below 2.5 bar, please contact our Head Office.

- The flow velocity at the flange inlet should not exceed the maximum permitted values
- Depending on the choice of sealing material, the permitted temperature is maximum 180 °C for RF9-0 to RF9-7, and maximum 120 °C for RF9-8 and RF9-9
- The permitted operating pressure for RF9-0 to RF9-7 is maximum 16 bar, and for RF9-8 and RF9-9 maximum 10 bar

STEP 2: FILTER DIMENSIONING

- The filter dimensioning is determined on the basis of calculation tables
- The values in the tables shown apply only for the conditions named. For variations to these conditions, please consult with the Head Office.

STEP 3: DETERMINING THE FILTRATION RATING

- The filtration rating that is currently required should be determined either in accordance with customer specifications or in consultation with our Head Office

4.1 MARINE DIESEL POWER (MDP)

CALCULATION TABLES

Size	DN	Maximum flow rate at 34 µm		
		Medium LO* [m³/h]	Medium LFO** ¹⁾ [m³/h]	Medium HFO** ²⁾ (feeder) [m³/h]
RF9-0	50	22	8.1	5.7
RF9-0.5	50	27	16.2	11.4
RF9-2	65	47	28.5	22.9
RF9-3	80	71	46	34
RF9-4	80	71	46	44
RF9-5	100	111	68	66
RF9-6	150	250	155	109
RF9-7	200	445	218	153
RF9-8	250	695	324	228
RF9-9	350	1200	454	320

¹⁾ This refers to all low-viscosity fluids such as LSFO / MDO / DMA / DMB

²⁾ This refers to all high-viscosity fluids such as HSFO / HFO

* Lube oil

** Light fuel oil

*** Heavy fuel oil

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

4. FILTER CALCULATION

4.2 COOLANTS

PARAMETERS NEEDED FOR CORRECT DIMENSIONING

- Flow rate
- Type of fluid and viscosity
- Operating pressures (upstream/downstream from filter)
- Operating temperature
- Type of dirt (type of processing, material)
- Pre-filtration
- Expected dirt volume
- Chemicals/resistance/materials
- Treatment of the back-flush volume
- Desired filtration rating

CALCULATION TABLES

Size	DN	Maximum flow rate at 50 µm filtration rating	
		Pleated elements ZP (polishing filter) (m³/h)	Smooth elements KG (protective filter) (m³/h)
RF9-2	65	77	32
RF9-3	80	116	48
RF9-4	80	193	79
RF9-5	100	222	107
RF9-6	150	370	178
RF9-7	200	518	249
RF9-8	250	771	436
RF9-9	350	1079	610

Remarks:

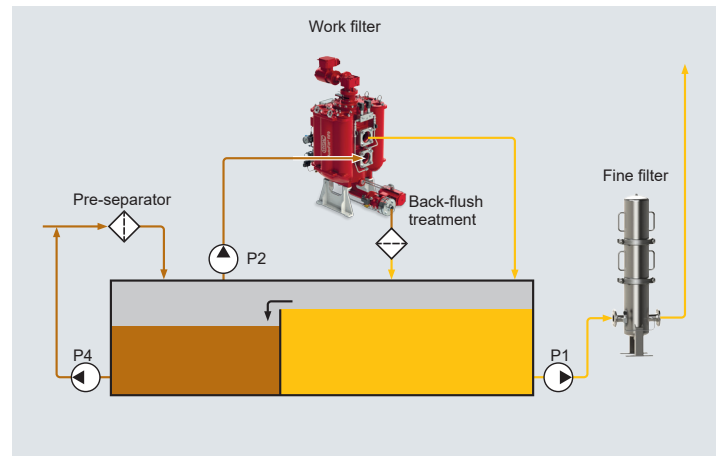
1. Configuration is valid for coolant emulsions and processing oils with a viscosity <15 cSt at operating temperature. For higher viscosities, please contact our Head Office.
2. Dirt arising from cutting machining methods (turning, drilling, milling). For grinding and honing applications, contact our Head Office.
3. Dirt load < 200 mg/l
4. Operating pressure > 2.5 bar at filter outlet
5. Coolant conditioned to the latest standards with prefiltration by means of paper belt filter (filtration rating ≤ 120 µm)

4. FILTER CALCULATION

4.2 COOLANTS

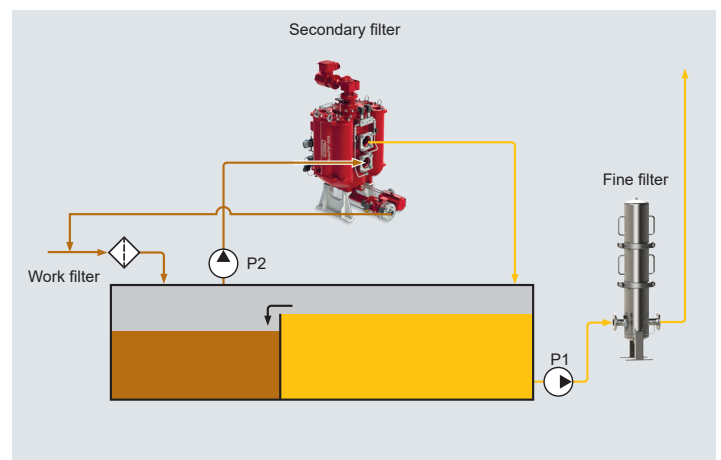
Main filter / working filter

- High concentrations of dirt
- Installed downstream from coarse filter stage
- **Objective:** to achieve the filtration rating



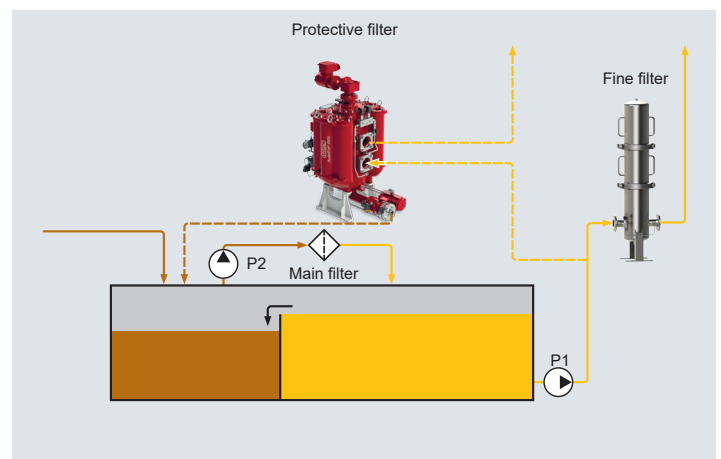
Secondary filter / polishing filter

- Low concentrations of dirt
- Installed downstream from main filter
- **Objective:** to improve the filtration quality of the main filter



Protective filter / safety filter

- Very low concentrations of dirt
- Filtration rating generally more coarse compared with the main filter system
- Installed downstream from secondary filter / polishing filter
- **Objective:** protective function in case of a problem with the main filter system



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

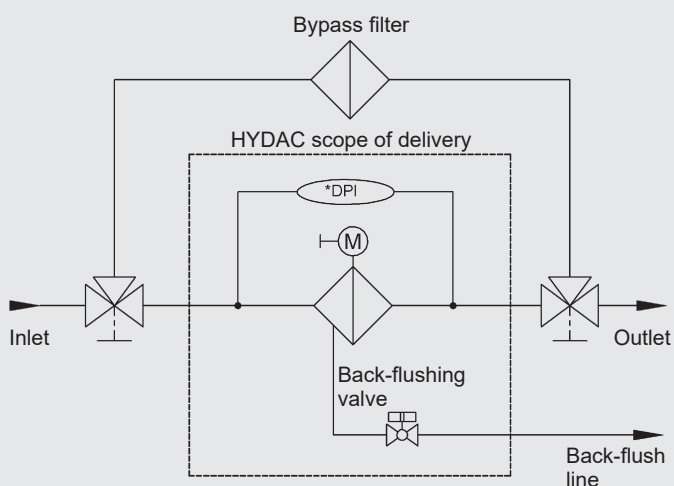
5. FILTER CONFIGURATION *

	Standard	Optional
Control variants	With controller	Control function can be programmed in module-specific controller
Connection voltages	All current international connection voltages and frequencies can be implemented	
Electrical protection classes	IP55	Other IP protection classes on request
Explosion protection	No	
Housing calculation / housing manufacture	AD 2000 / 2014/68/EU Pressure Equipment Directive	Classification society acceptance in acc. with: DNV, BV, ABS, etc.
Flange connections	DIN EN flanges or square flanges in acc. with HYDAC factory standard	
Flange connection, back-flush line	Inlet/outlet fixed, flushing-oil line can be rotated in 90° increments, for RF9-8 and RF9-9 only in 180° increments	
Housing materials	EN GJS 400-15	
Materials of internal parts	Stainless steel / EN GJS 400-15	
Material of filter elements	Stainless steel / steel	
Corrosion protection, external	Primer	<ul style="list-style-type: none"> • Multiple-layer coatings (on request) • Special paints and coatings according to customer specifications (on request)
Internal corrosion protection	Hydraulic oil HLP46	
Sealing materials	<ul style="list-style-type: none"> • NBR (temperatures ≤ 90 °C) • FKM (temperatures ≤ 120 °C) • FKM special (temperatures > 120 °C up to 180 °C) 	
Measurement of pressure difference	<ul style="list-style-type: none"> • HYDAC HDA pressure transmitter 	Customised
Documentation	<ul style="list-style-type: none"> • Operation instructions – filter • Operating instructions – controller • Installation drawing • Certificate of conformity acc. to 2014/68/EU DG24 	Customised

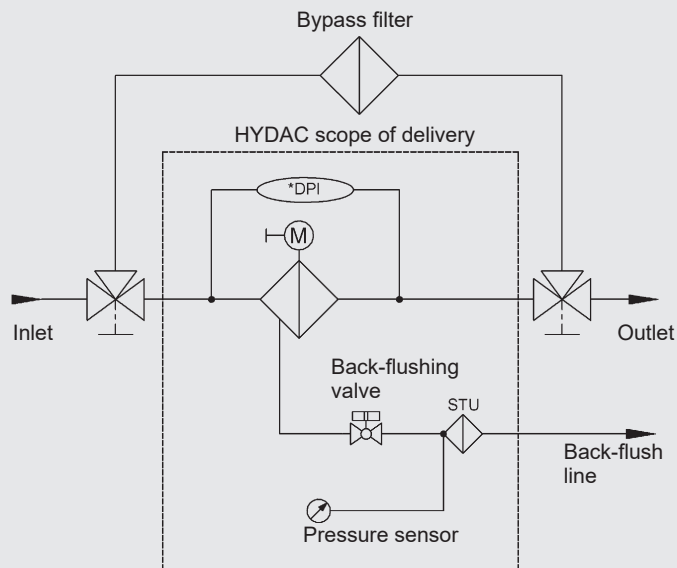
* Other versions and customer-specific special solutions after consultation with our Head Office.

6. HYDRAULIC CIRCUIT

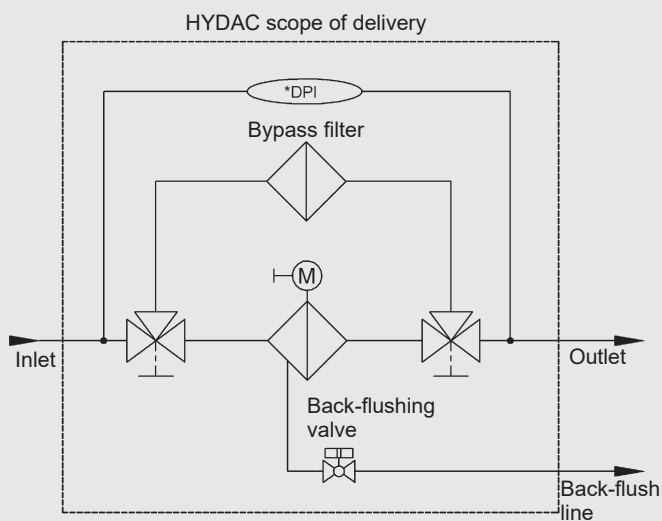
AutoFilt® RF9



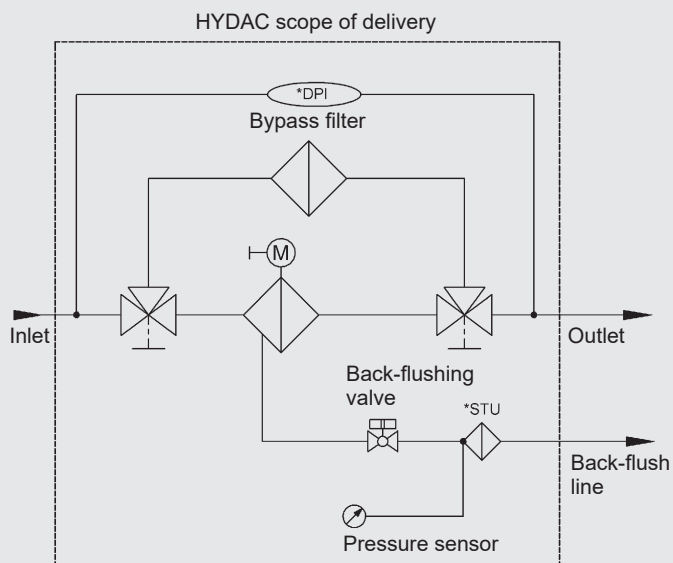
AutoFilt® RF9 with STU



AutoFilt® RF9 with bypass



AutoFilt® RF9 with bypass and STU



*** Legend:**

DPI – Differential pressure indicator (pressure transmitter)
 STU – Flushing oil treatment

7. MODEL CODE

MODEL CODE AUTOFILT® RF9

AutoFilt® RF9 - 4 - F - 1 - B - 1 - G 1 - X / ZP025 - 1234567

Type

AutoFilt®

Filter size

- 0 = Max. DN 50 – filter chambers: 2
- 0.5 = Max. DN 50 – filter chambers: 3
- 1 = Max. DN 65 – filter chambers: 2 (replaced by RF9-0.5)
- 2 = Max. DN 65 – filter chambers: 3
- 3 = Max. DN 80 – filter chambers: 4
- 4 = Max. DN 80 – filter chambers: 6
- 5 = DN 100 – filter chambers: 4
- 6 = DN 150 – filter chambers: 6
- 7 = DN 200 – filter chambers: 8
- 8 = DN 250 – filter chambers: 6
- 9 = DN 350 – filter chambers: 8

Connection flange

- A = DN 25 – counter flange with welding end
- B = DN 32 – counter flange with welding end
- C = DN 40 – counter flange with welding end
- D = DN 50 – counter flange with welding end
- E = DN 65 – counter flange with welding end
- F = DN 80 – counter flange with welding end
- G = DN 100 - EN 1092-1/11/B1/DN100/PN16
- H = DN 125 - EN 1092-1/11/B1/DN125/PN16
- I = DN 150 - EN 1092-1/11/B1/DN150/PN16
- J = DN 200 - EN 1092-1/11/B1/DN200/PN16
- K = DN 250 - EN 1092-1/11/B1/DN250/PN10
- L = DN 350 - EN 1092-1/11/B1/DN350/PN10
- Y = special model in acc. with data sheet

Variants/versions

- 0 = only AutoFilt® RF9
- 1 = with bypass filter “BF”
- 2 = with Sludge Treatment Unit “STU”
- 3 = with “BF” and “STU”
- 4 = only AutoFilt® RF9 in coolant version
- 5 = with Sludge Treatment Unit “STU” in coolant version
- 6 = only AutoFilt® RF9 in WAM version
- 7 = with Sludge Treatment Unit “STU” in WAM version
- 8 = 2 x AutoFilt® RF9 with switchover
- 11 = with coarse bypass filter “BF”
- 13 = with coarse bypass filter “BF” and standard Sludge Treatment Unit “STU”
(precise version in acc. with data sheet)

Position of back-flush line

- A = under inlet/outlet (standard) (not for “STU”)
- B = filter outlet 90° clockwise to default
- C = filter outlet 180° clockwise to default (fixed position for sizes 8 and 9)
- D = filter outlet 270° clockwise to default

Trace heating

- 0 = no heating
- 1 = with heating

Sealing material

- N = NBR
- V = FKM standard (MDO/MGO/HFO <120 °C)
- G = FKM special (HFO >120 °C to 180 °C)
- K = FFKM perfluoro

Filter control

- 0 = without controller / without terminal box
- 1 = without controller / with terminal box
- 2 = with controller / with terminal box
- 3 = special design
- 4 = with controller / without terminal box

Modification number

- X = the latest version is always supplied

Filter element set / filtration rating in µm

- KG = conical smooth filter elements
- ZG = cylindrical smooth filter elements
- ZP = cylindrical pleated filter elements
- ZPM = cylindrical pleated metal fibre fleece filter elements

Data sheet number

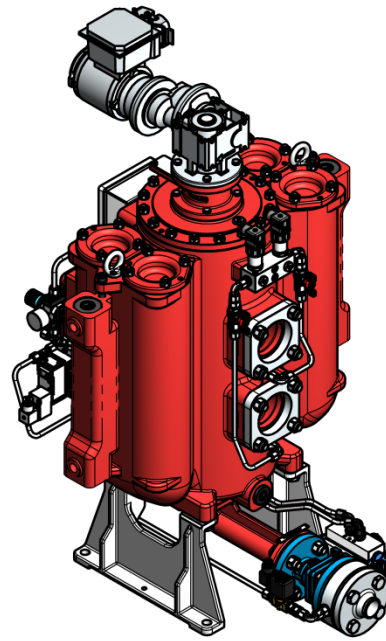
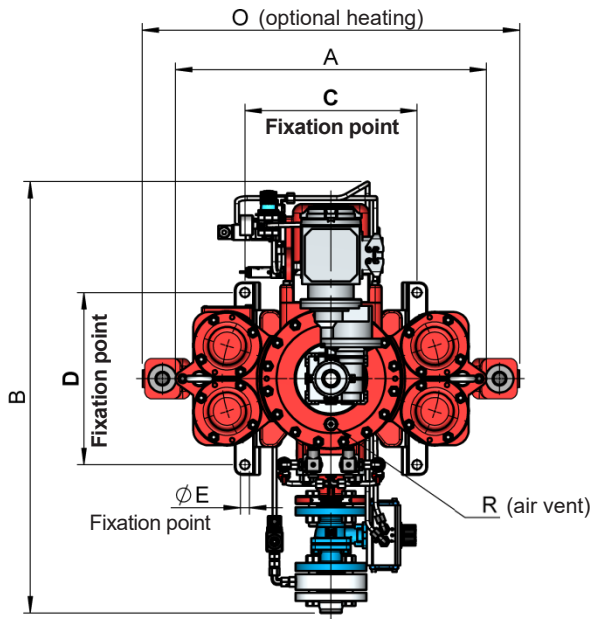
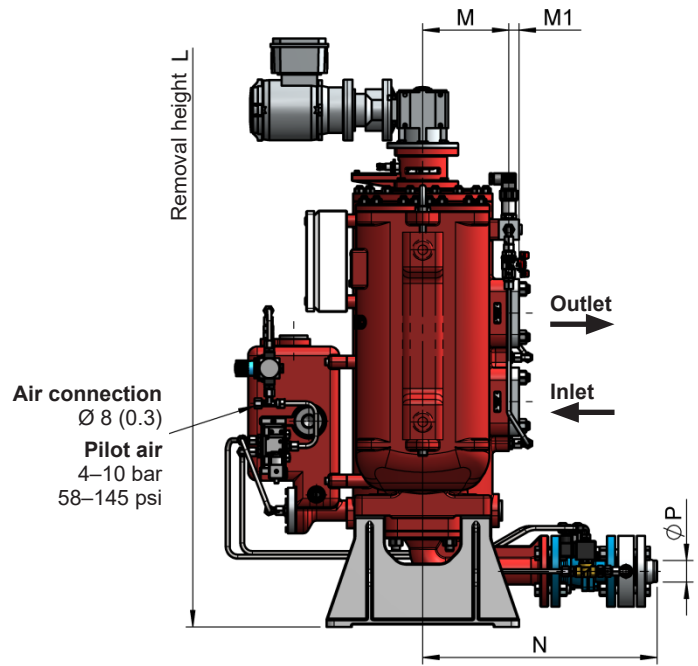
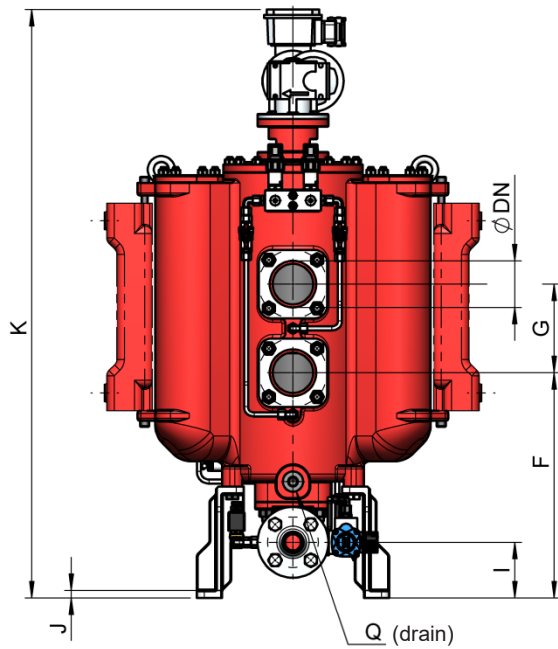
(Number issued after technical clarification in Head Office)

7. MODEL CODE

RF9	Pressure range	No. of filter elements		Connection flange											
				DN 25	DN 32	DN 40	DN 50	DN 65	DN 80	DN 100	DN 125	DN 150	DN 200	DN 250	DN 350
	PN	ZP/ ZPM	ZG/ KG	A	W	C	D	E	F	G	H	I	J	K	L
0	16	2	–	X	X	X	S								
0.5		3	–	X	X	X	S								
1		2	8		X	X	X	S							
2		3	12			X	X	S							
3		4	16			X	X	X	S						
4		6	24			X	X	X	S						
5		4	36							S	X				
6		6	54								X	S			
7		8	72										S		
8	10	24	132											S	
9		32	176												S

S = standard design

8. DIMENSIONS



All dimensions in the drawing are given in mm
Subject to technical modifications

Filter type	Filter size [DN]	No. chambers	A	W	C	D	ØE	F	G	I	J	K	L	M	M1	N	O	ØP [DN]	ØQ	ØR	Weight [kg]	Contents [l]
RF9-0	25-50	2	410	635	150	150	14	322	110	60	10	780	1250	130	15	305	—	25	G1/2"	G1/4"	135	10
RF9-0.5	25-50	3	500	645	150	150	14	322	110	60	10	850	1250	130	15	305	—	25	G1/2"	G1/4"	170	12
RF9-2	40-80	3	625	805	340	340	18	445	175	110	15	1165	1750	170	20	465	730	32	G1"	G1/4"	275	45
RF9-3	40-80	4	610	835	340	340	18	445	175	110	15	1165	1750	170	20	465	740	32	G1"	G1/4"	295	50
RF9-4	40-80	6	560	835	340	340	18	445	175	110	15	1165	1750	170	20	465	680	32	G1"	G1/4"	365	60
RF9-5	100	4	765	915	425	425	18	480	240	110	15	1275	1950	275	—	515	905	50	G1"	G1/4"	450	100
RF9-6	150	6	720	915	425	425	18	450	300	110	15	1275	1950	285	—	515	830	50	G1"	G1/4"	520	120
RF9-7	200	8	690	1030	425	425	18	420	360	110	15	1275	1950	380	—	515	720	50	G1"	G1/4"	570	150
RF9-8	250	6	1135	1120	450	686	18	255	515	110	20	1620	2200	520	—	615	—	80	G1"	G1/4"	1145	340
RF9-9	350	8	1085	1170	450	670	18	295	600	110	20	1700	2300	545	—	625	—	80	G1"	G1/4"	1315	420

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

66538 Neunkirchen

Tel.: +49 6897 - 509-1241

Fax: +49 6897 - 509-1278

Internet: www.hydac.com

E-mail: prozess-technik@hydac.com