

Process Filters for Machine Tools and Industrial Part Washers Product Overview



HYDAC Process Technology:
Your partner for expertise
in sophisticated filtration
solutions

With over 9000 employees worldwide, HYDAC is one of the leading suppliers of fluid technology, hydraulic and electronic equipment.

More than 50 overseas subsidiaries and over 500 sales and service partners guarantee competent on-site service – wherever you need our support.

Our wide range of products, combined with our expertise in development, manufacturing, sales and service, allows HYDAC to provide comprehensive filtration concepts – from individual filter components to the complete system.

The challenges

The filtration of coolants and cleaning media entails special challenges. Contaminated components bring about costs because of faults and complaints and in some cases can cause complete system downtime.

Our solutions

Perfectly harmonised filtration and system solutions are vital if your systems are to operate as effectively as possible.

- Automatic filter
- Inline filter
- Bag filter
- System solutions: filtration and pressure increase, back-flush treatment
- Filter element technology

Areas of application

- Centralised/decentralised production: Filtration of coolants
- Industrial part washers: Filtration of washing media
- Machine tools: Filtration of coolant and high-pressure supply of coolant in machine tools
- General: Filtration of process and cooling water

Centralised coolant system
gearbox manufacturing
→ Filtration of processing
emulsion

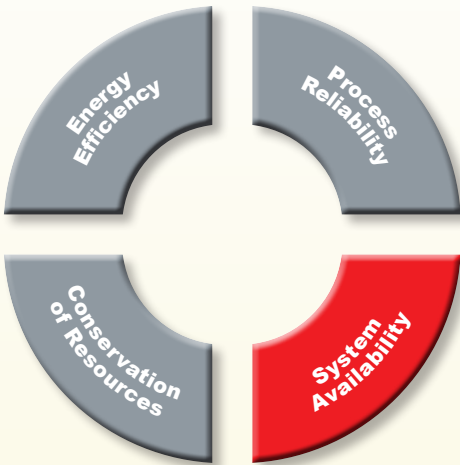
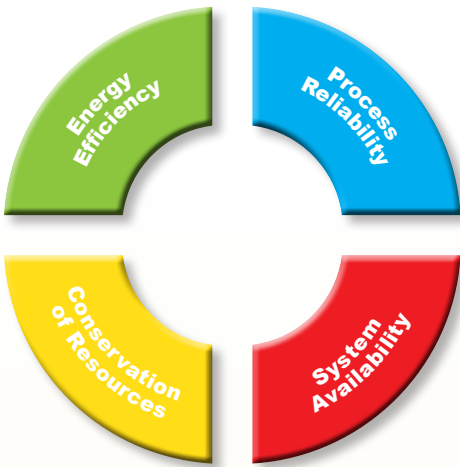
System availability increased by using an AutoFilt® RF3 automatic filter with magnet technology.

Protective filtration with a belt filter, optimisation potential through extending the back-flush intervals and reducing the back-flush volume.

- Improvement of filter performance and efficiency
- Effective retention of contamination, even finer than the set filtration rating
- Stainless steel magnet inserts – ideally suited for usage in parts cleaning

Practical test at a gearbox manufacturing site		
Filter type AutoFilt®	Magnet technology	Time interval between two back-flush cycles
RF3-2	Without	4.3 h
RF3-2	With	8.3 h
→ The time between two back-flush cycles was extended by approx. 93 %		
RF3-2.5	Without	4.3 h
RF3-2.5	With	10.3 h
→ The time between two back-flush cycles was extended by approx. 139 %		

Note
The information in this brochure relates to the operating conditions and fields of application described. For fields of application and operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.



Part cleaning –
HP deburring of crankshafts
→ Filtration of washing
media

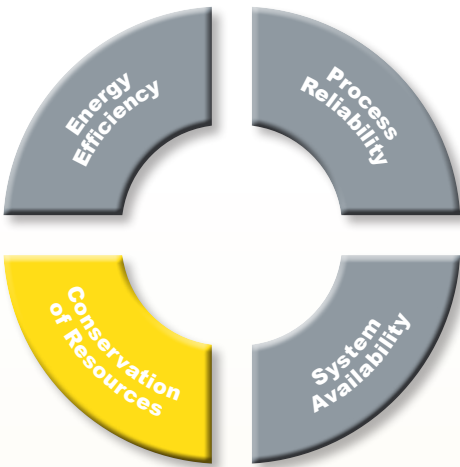
Efficient use of resources –
Service life of washing media
doubled by using HYDAC process
inline filter PLF1.

A plant for HP deburring of crankshafts has been in operation at a large German automotive manufacturer for around four years.

Previously various HP valves had to be replaced on this plant every 1 to 3 weeks. The cause was thought to be inadequate filtration of the process medium.

Using HYDAC PLF1 made it possible to achieve significant success:

- Effective retention of contaminants
- Doubling of process medium life expectancy from the original 2 to 3 weeks to approx. 5 to 6 weeks
- Reduction in high-pressure valve failures: No valve failure during the testing period
- System availability: the life expectancies of other filters present in the system were significantly increased



Features	Initial situation		HYDAC solution	
Filter life	No details		4 months, until 2 bar differential pressure achieved	
Valve failures	Yes		No *	
Life expectancy of washing water	3 weeks		5 weeks	
Costs	Repair of HP valves 75 pc./year x €320	€24,000	Washing water change 10 x €1,800	€18,000
	Washing water change 17 x €1,800	€30,600	Repl. elements (PLF1/PM9) 6 pc. x €350/year	€2,100
	Repl. elements (other filters) 156 pc./year x €26	€4,056		
Total costs	€58,656		€20,100	
Saving			Saving for the customer	€38,556

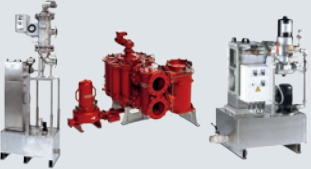
* During the testing period

HYDAC Process Filters for Machine Tools and Industrial Part Washers

Automatic filter AutoFilt®	RF3 / RF5 / RF7	RF4	RF9	RF10	RF12	ATF TwistFlow Strainer
		 New for flow rates up to 385 l/min				
Characteristics and areas of application	All-rounder * ● Coolant ● Wash emulsion ● Process and cooling water	Compact filter ● Coolant	Fine filter ● Emulsion ● Processing oil/honing oil	Low pressure ● Wash emulsion ● Process and cooling water	Not dependent on pressure of filtrate ● Coolant	Hybrid – Centrifugal separation with a defined filtration rating ● Process and cooling water
Nominal size	DN 50 – DN 900	G1"; G1½"; G2"	DN 50 – DN 350	DN 100 – DN 600	G1½"	G1" – DN 200
Q _{max}	7500 m³/h	385 l/min	1200 m³/h	3500 m³/h	80 l/min	400 m³/h
p _{max}	100 bar **	16 bar	16 bar	6 bar	10 bar	16 bar
Filtration rating	30 – 3000 µm	30 – 1000 µm	1 – 500 µm	40 – 3000 µm	25 – 1000 µm	< 200 µm dependent on particle nature

* Magnet technology optional
** Only on request

Inline filter	PLF1	PBF	PMAG
			
Characteristics and areas of application	High contamination retention and protection of clean side * ● Wash emulsion	Bag filter ● Coolant ● Wash emulsion ● Processing oil	Magnet technology/inline or return line filter upstream from tank ● Coolant ● Wash emulsion
Nominal size	DN 50 – DN 150	DN 50	G1" – G2"
Q _{max}	200 m³/h	30 m³/h	400 l/min
p _{max}	16 bar	10 bar	10 bar
Filtration rating	1 – 90 µm (absolute, β = 5000)	1 – 1000 µm	Dependent on flow velocity

System solutions	Back-flush volume treatment BTU/STU	PBB Process Booster Block
		
Characteristics and areas of application	Back-flush treatment ● Coolant	Coolant HP supply ● Coolant
Nominal size	G1" – DN 150	G1"
Q _{max}	100 m³/h	80 l/min
p _{max}	16 bar	70 bar
Filtration rating	25 – 150 µm	30 – 1000 µm

Notice:
Technical data may vary depending on size.
Subject to technical modifications.

Innovative Filter Element Technology

Automatic filter AutoFilt®

Filter type	AutoFilt® RF3 / RF4 / RF5 / RF7	AutoFilt® RF9	AutoFilt® RF10	AutoFilt® RF12	AutoFilt® ATF
Filter element					
Type Filtration rating in µm	Wedge wire 50–3000	Chemicon® metal fibre fleece 1–25	Wedge wire 50–3000	Wedge wire 30– 1000	Wedge wire 200–3000 Depending on the specific weight, even particles <100 µm are separated effectively.
	SuperMesh wire mesh, sintered* 25–500	Wire mesh 10–500	SuperMesh wire mesh, sintered* 25–100	SuperMesh wire mesh, sintered* 25–100	SuperMesh wire mesh, sintered* 500–1000 Depending on the specific weight, even particles <100 µm are separated effectively.

* With or without support structure

Inline and bag filter

Filter type	PLF1				PBF
Filter element					
Type Filtration rating in µm	Processmicron® HighFlow (HF) 9" → protective filtration 1–90 (absolute)	Processmicron® HighLoadCas- cade (HLC) 9" → working filtration 1–90 (absolute)	Processmicron® HighFlow (HF) 6" → working filtration 1–90 (absolute)	Processmicron® Spun Spray 9" → initial start-up, for low requirements 5/20 µm	Bag filter 1–1000

Special Features of Types and Materials

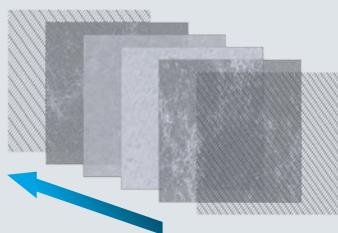
Processmicron® filter elements



The high-quality filter elements made of polyester or polypropylene are used in the inline filter series PLFx. They are suitable for the separation of solid particles from low-viscosity fluids, such as:

- Coolants
- Washing media
- Processing oils

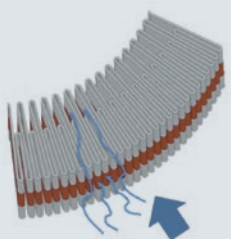
The special filter element geometry prevents contamination from being discharged to the clean side and is much easier to handle than conventional cartridge filter elements.



Graduated depth filtration and multi-layer filter mat construction

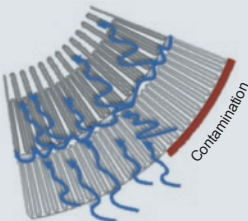
- High cleanliness in single passage
- High layer thickness of the filter medium
→ high storage volume for contamination
- Robust and high-quality layer structure
→ no skewing of the filter layers
- High contamination retention
- Low pressure drops due to large cross sections and filter areas

Filter element types



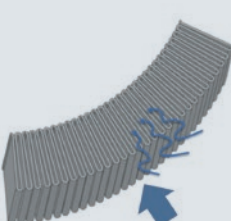
1) Working filtration:

Larger flow surface for higher contamination loads
→ HighFlow 6"



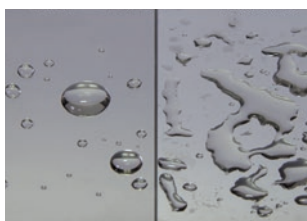
2) Comprehensive work filtration:

Double the safety, even for contamination peaks, thanks to cascading effect
→ HighLoadCascade 9"

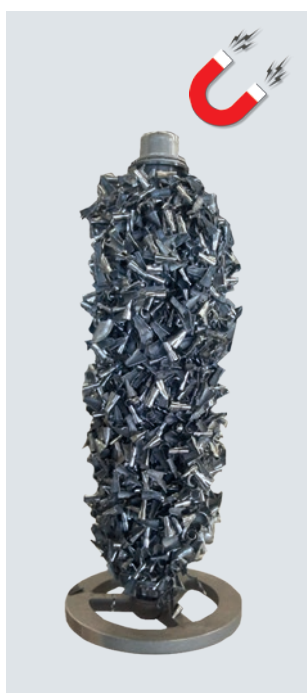


3) Protective filtration:

High flow rates
→ HighFlow 9"



with and without
SuperFlush non-stick coating



SuperMesh

**Fine filter material for automatic filters
from the AutoFilt® series**

- Wire mesh, sintered –
with or without support structure
- Outstanding stability due to sintered filter element
technology
- Highly effective cleaning
- Particles do not get stuck or caught between
the filter element layers
- Reliable filtration rating is guaranteed thanks to sintered
filter layers and the uniform pore structure
- With its self-supporting structure, the available filtration
area for the HYDAC filter element is up to 40 % larger
in comparison to conventional wire mesh filter elements
with a support layer

SuperFlush

Optimum filter performance thanks to non-stick coating

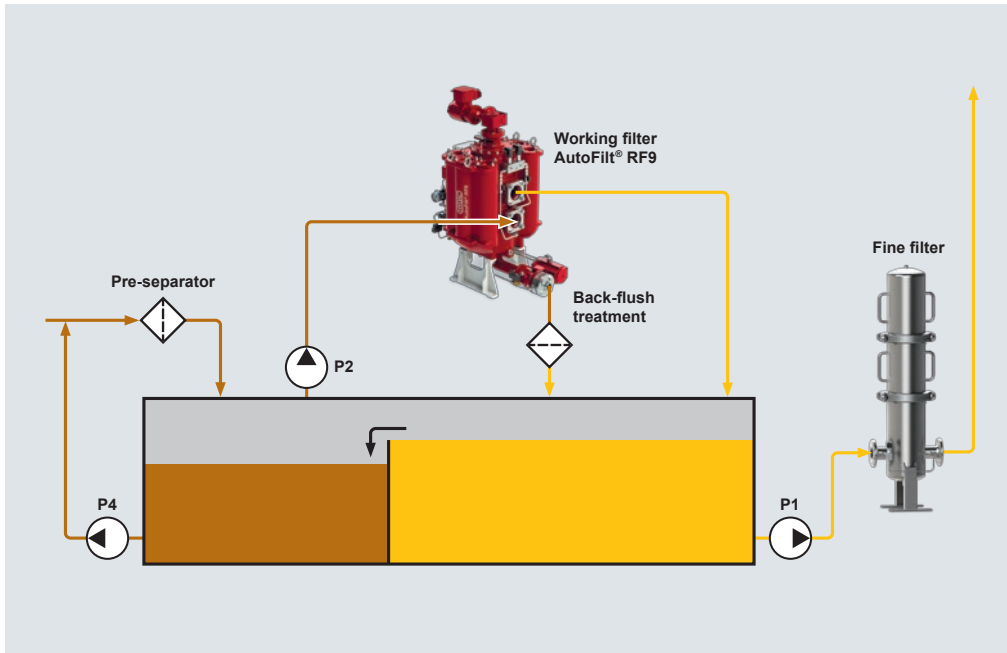
- Minimises adhesive particles adhering
to the filter element surface
- Reduces biofouling
- Increases the interval
between two back-flushing cycles
- Improves filter performance
- Available as an option for almost all filter element types
from the AutoFilt® series
- HYDAC exclusive coating technology
- Recommended for filtration ratings $\leq 200 \mu\text{m}$

Magnet technology

Increased efficiency thanks to magnetic force

- Specially developed for applications
with ferritic contamination, e.g. filtration
of coolants and wash emulsions
- Effective retention of contamination,
even finer than the set filtration rating
- Stainless steel magnet inserts – ideally suited
for usage in parts cleaning
- High resilience thanks to usage of magnets
with a very high magnetic field strength
- In a practical test, automatic filters with magnet
inserts were able to double their filtration time
between two back-flush cycles
- Available for filter types:
 - AutoFilt® RF3 automatic filter – also as retrofit set
 - PLF1 process inline filter
 - PMAG process magnet filter

Filter Calculation – the Important Factors

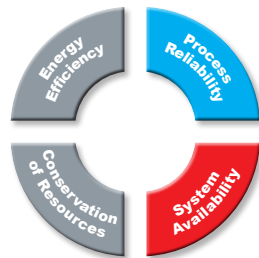


Parameters needed for correct dimensioning

- 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
- Integration of the filter/piping/operation of the filter
- Treatment of the back-flush volume
- Desired filtration rating

Automatic Filter

AutoFilt® RF3 / RF5 / RF7



Areas of application

- Automotive Industry:
 - Secondary and protective filtration of coolants in centralised and decentralised treatment systems
 - Filtration of process and cooling water
- Part cleaning: filtration of wash emulsions

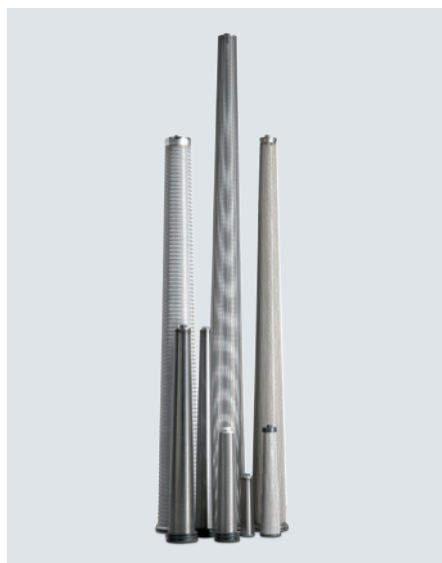
Features

Self-cleaning automatic filter with variable flange positions:

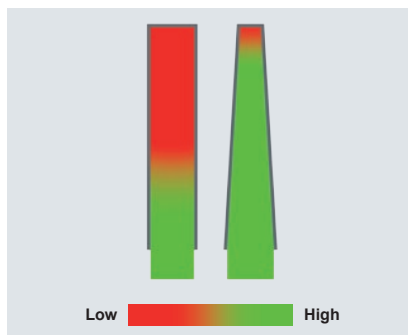
- Vertical version – all-rounder, tried-and-tested in over 1000 applications
AutoFilt® RF3
- Horizontal version – space-saving design
AutoFilt® RF7
- Economy version up to 200 µm
AutoFilt® RF5

Product advantages

- Automatic back-flushing reduces operating costs
- No interruption of the filtrate flow during back-flushing
- AutoFilt® Control Unit ACU (optional)
 - Open connectivity to all commonly used customer interfaces (1x Ethernet, 1x serial RS-232 C / RS 485)
 - Remote monitoring possible with smartphone or tablet
 - Self-diagnosis, system diagnosis, process monitoring



Conical filter elements



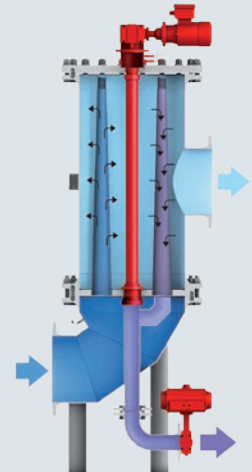
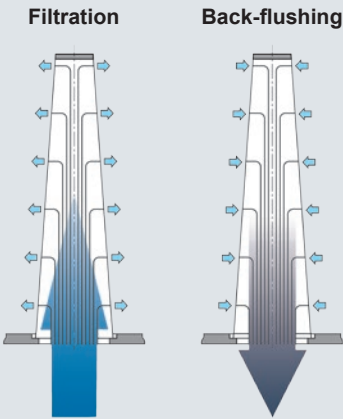
Back-flushing efficiency of conical filter elements compared to conventional cylinder filter elements

Technical data	AutoFilt® RF3 / RF5 / RF7
Nominal size	● DN 50 to DN 900
$Q_{\max}$	● up to 7500 m³/h
$p_{\min} / p_{\max}$	● 2.5 bar / 100 bar *
$T_{\max}$	● 90 °C
Filtration ratings	● Wedge wire: 50 to 3000 µm ● SuperMesh wire mesh: 25 to 60 µm ● Optional SuperFlush non-stick coating <i>Availability dependent on filter type</i>
Filter housing materials	● Carbon steel ● Stainless steel

Mode of operation

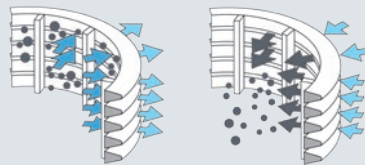
Filtration

- The fluid flows through the filter elements from the inside to the outside
- In the process, the particles are deposited on the smooth inside surface of the filter elements
- As the level of contamination increases, the differential pressure between the dirty and the clean side of the filter rises
- When the differential pressure reaches the pre-set trigger point, back-flushing starts automatically



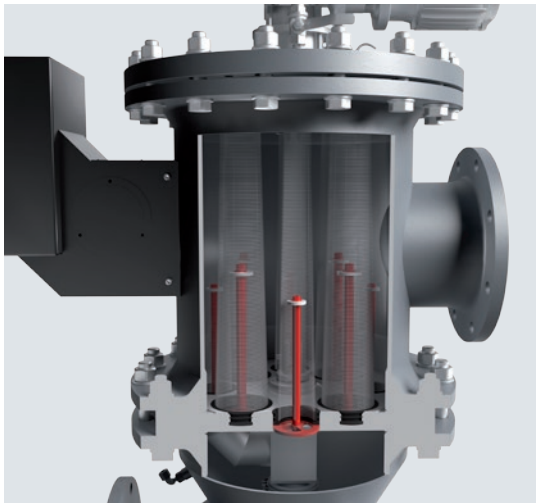
Automatic back-flushing is triggered:

- When the triggering differential pressure is exceeded
- By means of an adjustable timer
- By pressing the "test" key



As soon as back-flushing has been triggered, the back-flushing filter starts to clean the filter elements.

The back-flushing function depends on the selected control type.



Magnet technology

- For retrofitting to existing AutoFilt® RF3
- Optimisation of filter performance for applications with ferrite contaminations
- Retention of contamination finer than the filtration performance using filter elements
- Automatic cleaning of the bar magnet with scraper by means of flow reversal during back-flushing
- Material: stainless steel, suitable for use in industrial part washers



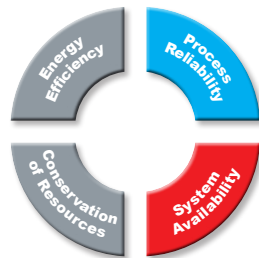
Notice:

For description of success story, see page 2

RF3-2 / average filtration time		
Without magnet technology	4.3 h	Between two back-flushing cycles
With magnet technology	8.3 h	Between two back-flushing cycles
→ Filtration time extended by 93 %		

RF3-2.5 / average filtration time		
Without magnet technology	4.3 h	Between two back-flushing cycles
With magnet technology	10.3 h	Between two back-flushing cycles
→ Filtration time extended by 139 %		

Automatic Filter AutoFilt® RF4



New for
flow rates up to
385 l/min

Areas of application

- Special design for use with machine tools

Features

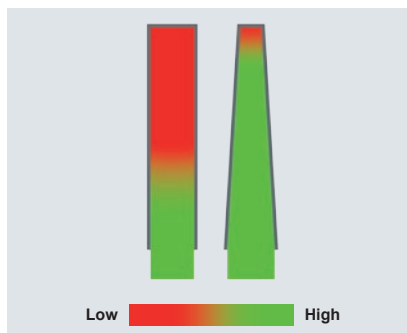
- Self-cleaning automatic filter
- Separation of solid particles from low viscosity fluids
- Available as a fully automatic or manual filter variant
- Also available as all-in-one solution for high-pressure coolant supply for machine tools (page 29)
- AutoFilt® Control Unit ACU (optional)
 - Open connectivity to all commonly used customer interfaces (1x Ethernet, 1x serial RS-232 C / RS 485)
 - Remote monitoring possible with smartphone or tablet
 - Self-diagnosis, system diagnosis, process monitoring

Product advantages

- Fully automatic operation
- Compact design
- Continuous flow of filtrate even during back-flushing
- Maximum utilisation of the filter area
- Full filtration performance following back-flushing



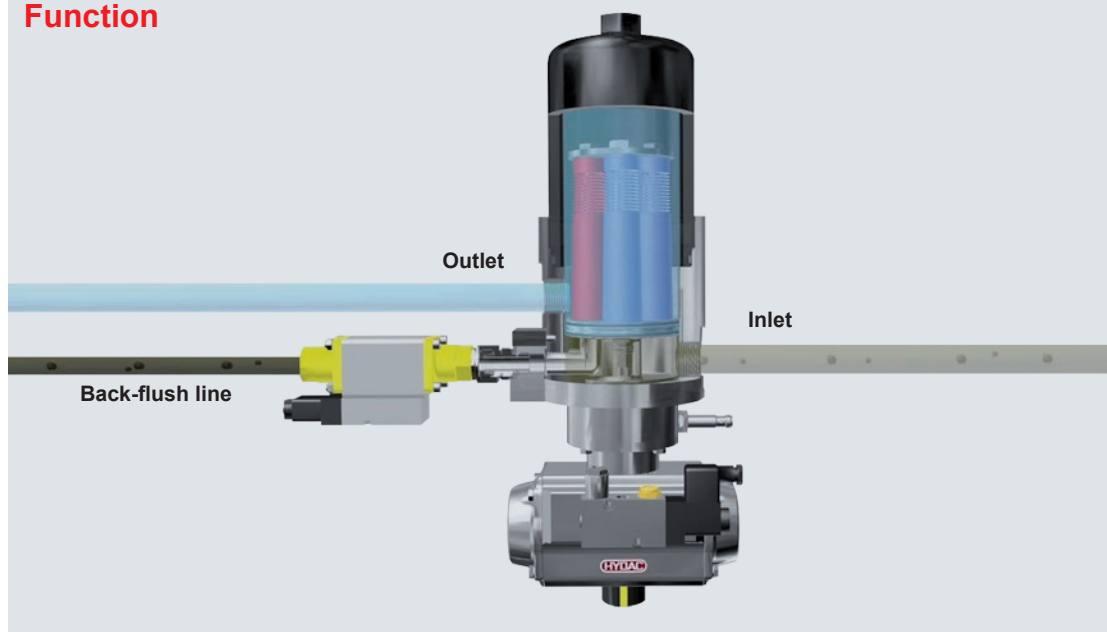
Conical filter elements



Back-flushing efficiency of conical filter elements compared to conventional cylinder filter elements

Technical data	AutoFilt® RF4
Nominal size	● Inlet and outlet: G 1"; G 1½"; G 2"
$Q_{\max}$	● 385 l/min
$p_{\min} / p_{\max}$	● 2.5 bar / 16 bar
$T_{\max}$	● 80 °C
Filtration ratings	● Wedge wire: 30 to 1000 µm ● Wire mesh SuperMesh, sintered: 30 to 60 µm ● Optional SuperFlush non-stick coating
Filter housing materials (combinations)	● Aluminium ● Stainless steel ● Carbon steel, nickel-plated

Function



Mode of operation

Filtration

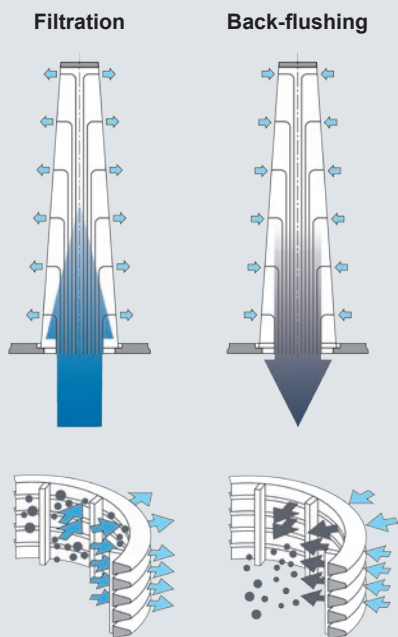
- The fluid to be filtered flows through the filter elements of the back-flushing filter, passing from the inside to the outside
- During this process, the particles deposit on the smooth inside of the filter element surface
- As the level of contamination increases, the differential pressure between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

Triggering back-flushing

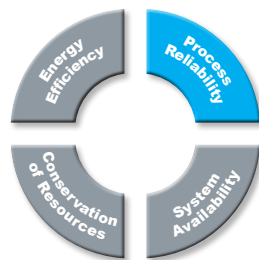
- Automatic:
Back-flushing is triggered automatically when the set triggering differential pressure is exceeded
- Manual:
When the visual clogging indicator responds
- Timer function:
Makes it possible to set a maximum filtration time, independent of differential pressure, between the two back-flushing cycles
- By pressing the "TEST" button

Back-flushing

- 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 filtrate side and back-flush line flushes a small amount of the filtrate back through the contaminated filter element
- The contaminant particles deposited on the inside of the filter elements are loosened and flushed into the back-flush line via the flush opening
- 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
- On the AutoFilt® RF4 with manual back-flushing, the filter element mounting plate, including the filter elements, is rotated and the back-flush valve is opened by hand
- The flow of filtrate is not interrupted during back-flushing



Hydropneumatic Filter AutoFilt® RF9



Areas of application

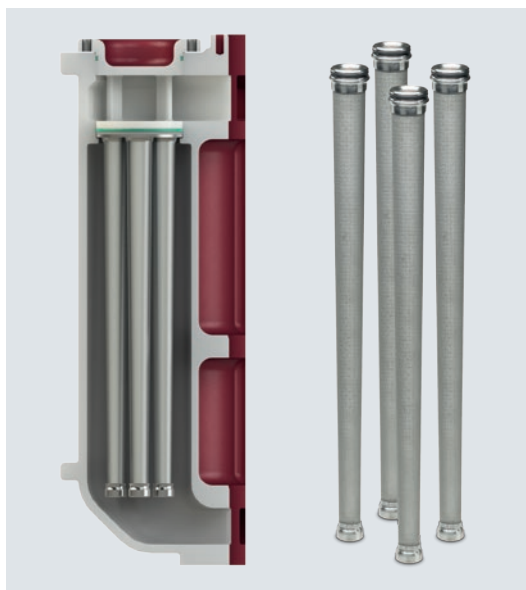
- Fine filtration

Features

- Self-cleaning automatic filter
- Back-flushing driven by external fluid
- Large filter surface for its compact size
- Low-maintenance, service-friendly design
- Suitable for fuels, coolants, lubricants
- Optional: Sludge Treatment Unit STU for back-flush treatment

Product advantages

- No mixing with the compressed air
- Adjustable back-flushing intensity
- Efficient hydraulic cleaning
- High cleaning efficiency
- No reduction in pressure during back-flushing
- Defined back-flush volume
- Low compressed air consumption
- Low flow losses
- Intelligent control system



Conical filter elements with installation situation



AutoFilt® RF9 with back-flush treatment and bypass filter

Technical data

Nominal size

$Q_{\max}$

$p_{\min} / p_{\max}$

$T_{\max}$

Filtration ratings

Filter housing materials

AutoFilt® RF9

• DN 32 to DN 350

• 1000 l/min

• 1.5 bar / 16 bar

• 160 °C

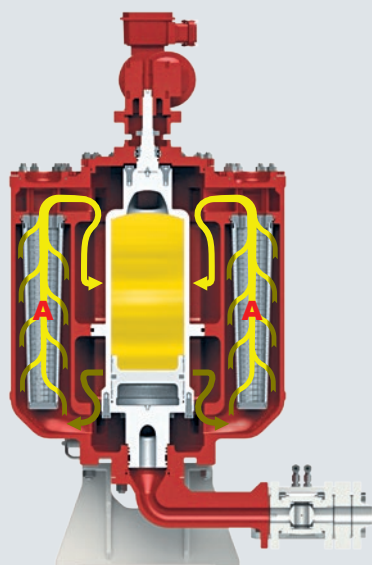
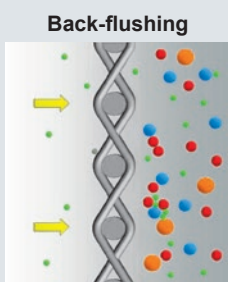
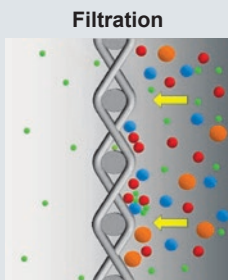
• Chemicon® metal fibre fleece: 5 µm to 20 µm
• Dutch weave: 5 µm to 30 µm
• Square mesh: 20 µm to 100 µm

• Steel and cast iron

Mode of operation

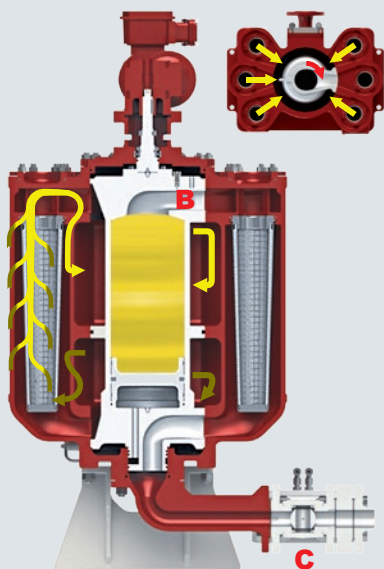
Filtration – consistent filtration performance

- The fluid 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 contaminants are separated from the fluid at the outer surface of the filter element and stopped there.
- The cleaned medium 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.



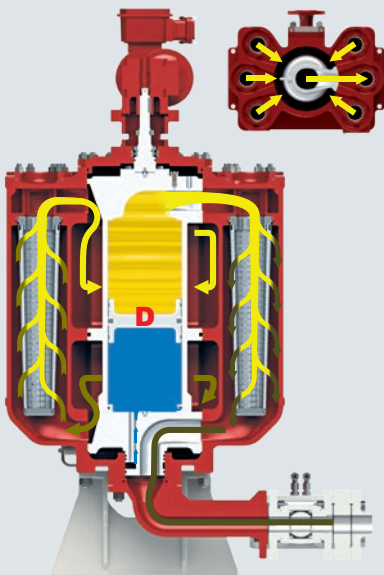
Preparing to back-flush – without interrupting filtration

- 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 gear motor from turning as soon as the new filter chamber is reached.
- The back-flushing valve **C** and the piston accumulator diaphragm valve open simultaneously.

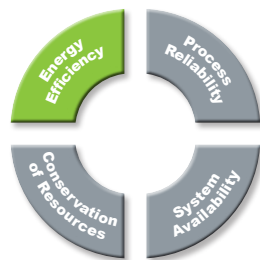


Back-flushing – with excellent efficiency

- The energy stored in the compressed air moves the back-flushing piston **D**, forcing the filtrate to flow in the reverse direction through the filter elements. The contaminants are 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 a second 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.



Automatic Filter AutoFilt® RF10



Areas of application

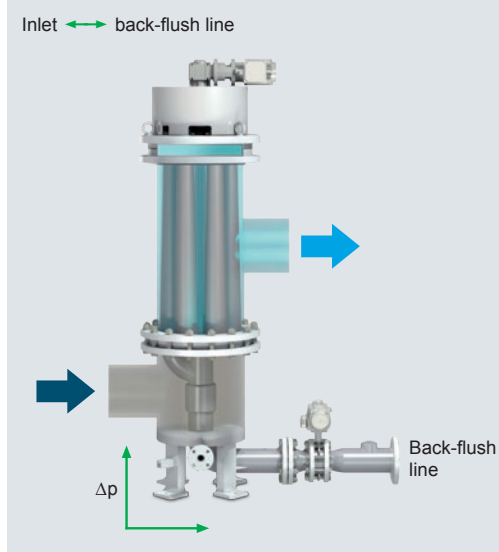
- For applications with low pressure conditions

Features

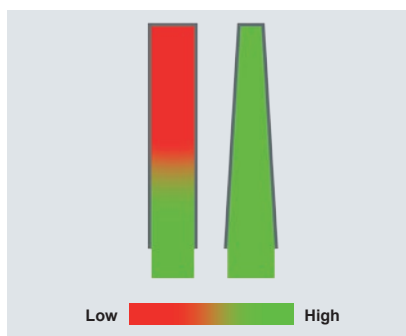
- Variable filter isometry
- Individual control parameters
- Filtration ratings from 40 µm to 3000 µm
- Electro-pneumatic supply voltage
- Stainless steel filter elements
- Corrosion protection for carbon steel filter housing: polyurethane coating

Product advantages

- Back-flushing independent of pressure on clean side of filter
- Dependent only on the inlet pressure
- Highly efficient back-flushing under low pressure conditions and with long back-flush line
- With its highly efficient back-flushing, the filter is suitable for high dirt loads and also surges in contamination
- Low maintenance requirements reduce operating costs



Back-flushing independent of pressure on clean side of filter



Back-flushing efficiency of conical filter elements compared to conventional cylinder filter elements

Technical data

Nominal size

$Q_{\max}$

$p_{\min} / p_{\max}$

$T_{\max}$

Filtration ratings

Filter housing materials

AutoFilt® RF10

● DN 100 to DN 600

● 3500 m³/h

● 1 bar / 10 bar
(standard 6 bar)

● 55 °C

● Wedge wire: 50 to 3000 µm

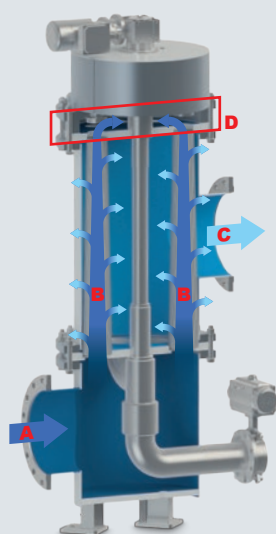
● SuperMesh wire mesh, sintered: 40 to 60 µm

● Carbon steel

● Stainless steel

Mode of operation

Filtration



Filtration without interrupting production: Consistent performance and cleanliness

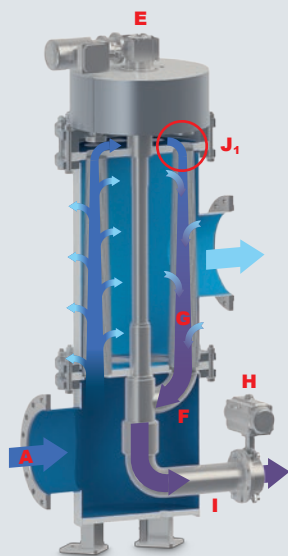
- The fluid to be filtered enters the filter housing via the filter inlet **A** and flows through the filter elements of the back-flushing filter from the inside to the outside **B** and leaves the filter via the filter outlet **C**
- During the filtration process, the JetFlush reservoir **D** located above the filter elements is filled with fluid from the dirty 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 dirty and the clean side of the filter rises
- When the differential pressure reaches the pre-set trigger point, back-flushing starts automatically

Triggering back-flushing

Automatic back-flushing is triggered:

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

Back-flushing – phase 1



Simultaneously during filtration

Phase 1 of back-flushing – removing the contaminant particles

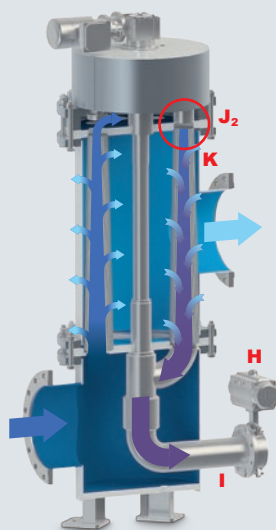
Back-flushing in general:

- 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 element, triggers the special JetFlush effect of the AutoFilt® RF10
- The remaining filter elements continue filtering to ensure uninterrupted filtration

Phase 1 of back-flushing – 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
- The development of the core flow is supported by the open jet effect which also sucks water from the filtrate side into the inside of the filter element

Back-flushing – phase 2

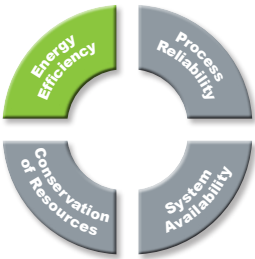


Effective back-flushing without interrupting filtration

Phase 2 of back-flushing – discharging the contamination

- Once the core flow has developed, the JetFlush reservoir located above the filter element is closed **J2**
- Closing the filter element initiates the second phase, namely discharging the contamination: The fluid column which is already moving sucks water from the filtrate side to **K** because no fluid is entering the filter element as it is now closed at the top
- Due to the conical filter element geometry, 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 under the next filter element to be cleaned; the process is repeated
- When the back-flush cycle is finished, the back-flushing valve **H** is closed

Automatic Filter AutoFilt® RF12



**Inexpensive alternative
to cyclone separators**

Areas of application

- Machine tools with internal supply
- Filtration of coolants in low pressure applications

Features

- Self-cleaning automatic filter
- Separation of solid particles from low viscosity fluids
- Particularly suitable for filtering coolants in individually supplied machine tools
- Discontinuous filtration

Product advantages

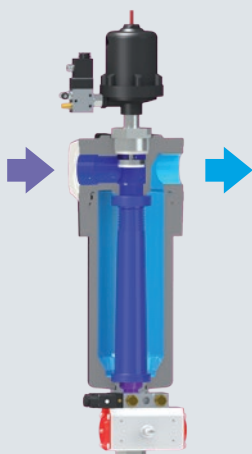
- Energy-optimised filtration and back-flushing principle
- Not dependent on pressure of filtrate
- Efficient alternative to a cyclone separator
- Compact design
- Simple structure
- Simple integration and flexible adjustment to suit machine tool
- Maintenance-friendly design



Conical JetFlush filter elements

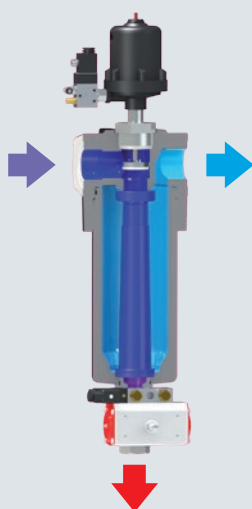
Technical data	AutoFilt® RF12
Nominal size	● G 1½"
Flow rates	● 80 l/min
p _{min} / p _{max}	● 0.7 bar / 10 bar
T _{max}	● 90 °C
Filtration ratings	● Wedge wire: 30 to 1000 µm ● SuperMesh wire mesh, sintered: 25 to 60 µm
Filter housing materials	● Aluminium

Mode of operation



Filtration

- The fluid being filtered enters the filter housing via the filter inlet and flows through the filter element from the inside to the outside
- The filtrate leaves the filter via the filter outlet
- As fluid passes through the filter element, particles are deposited on the inner side of the filter element and the differential pressure between dirt and clean side increases

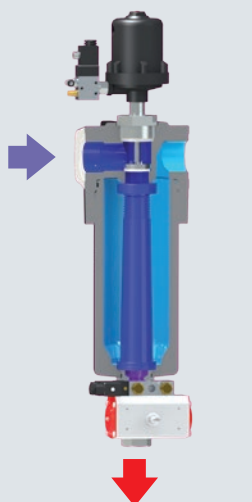


Triggering back-flushing

- After the time pre-set on the timer has elapsed, or by means of an optional differential pressure gauge, back-flushing starts automatically

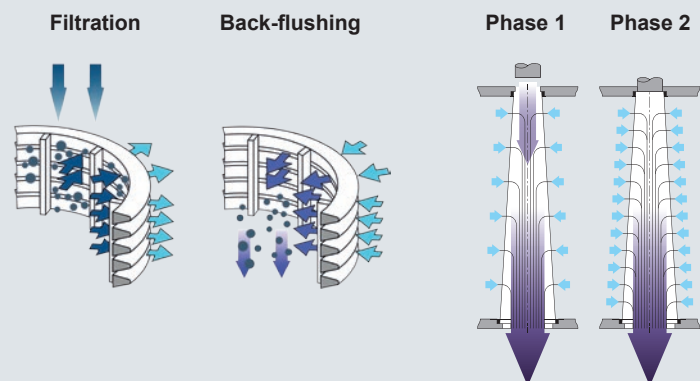
Phase 1 of back-flushing: stripping away the contamination

- The back-flushing valve is opened
- A pressure drop occurs between the filter inlet and the back-flush line
- Unfiltered fluid from the filter inlet flows into the filter element from above
- The conical filter element geometry generates a core flow that is mainly fed by the filter inlet
- The core flow is supported by the open jet effect which also sucks water from the filtrate side into the inside of the filter element

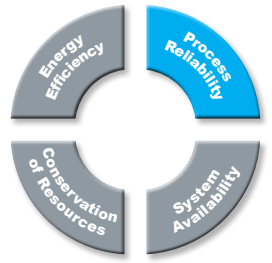


Phase 2 of back-flushing: discharging the contamination

- The JetFlush valve is closed via the filter element
- The moving column of fluid draws water from the filtrate side as soon as the water supply stops as a result of the JetFlush valve closing
- The flow of filtrate is interrupted during this phase
- After the JetFlush valve is opened, the contamination is discharged by means of a flow of unfiltered fluid via the back-flush line
- After the back-flush valve is closed, the filter begins filtering again



Hybrid Filter AutoFilt® ATF



Centrifugal separator and inline filter hybrid

Areas of application

- Cooling water and process water filtration
- Suitable for wide variability in the quality of untreated water

Features

- Coarse separation by centrifugal force with guaranteed filtration ratings
- Separation of solids from water and water-based media
- 2-stage separation principle:
 - **Stage 1:**
Centrifugal separation deals with high contamination loads
 - **Stage 2:**
Conical filter element guarantees the filtration rating

Product advantages

- Suitable for wide variability in the quality of untreated water
- Copes easily with high contamination loads
- Degree of separation associated with a centrifugal separator combined with defined filtration rating
- No transfer of contamination to the clean side
- Consistent quality of filtrate
- No rotating parts
- Easy to service and low-maintenance
- For higher flow rates, also available as a system solution



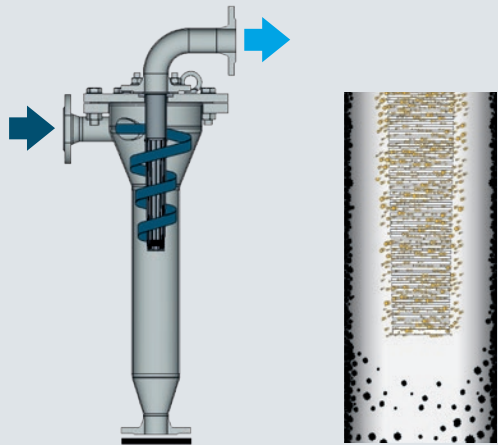
Safety filter element:
Even particles <100 µm are separated effectively, depending on their specific weight (see separation performance table)

Technical data	AutoFilt® ATF
Nominal size	● G 1" to DN 200
Flow rates	● 400 m³/h Skid solution for high flow rates
p _{min} / p _{max}	● 1 bar / 16 bar
T _{max}	● 90 °C
Filter elements	< 200 µm dependent on particle nature and operating conditions ● Wedge wire: 200 to 3000 µm ● SuperMesh wire mesh, sintered: 200 to 3000 µm ● Perforated plate: 500 to 3000 µm ● Optional: SuperFlush non-stick coating
Filter housing materials	● Carbon steel ● Stainless steel

Mode of operation

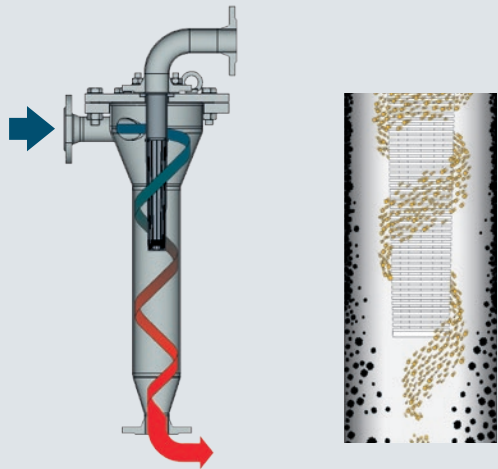
Filtration

- Fluid enters the housing tangentially
- The tangential inflow and the conical housing cross section help the fluid flow down in a spiral shape
- Particles with a high density are pressed against the tank wall by the centrifugal forces and are deposited in the lower section
- Particles with a low density, which are not deposited below, are separated out by the conical wedge wire filter element with a defined filtration rating



Cleaning

- Particles that are deposited and separated at the conical wedge wire filter element collect in the lower section and are removed periodically
- Cleaning is performed by flushing with unfiltered fluid
- Continuous filtration operation as only partial flow is used for flushing



The AutoFilt® TwistFlow Strainer ATF can achieve ratings finer than 200 µm

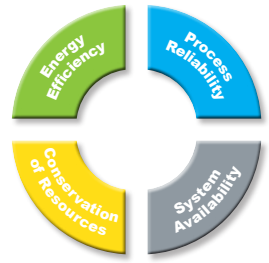
Depending on the specific weight, even particles < 100 µm are separated effectively. While in conventional hydrocyclones there is some risk of dirt being carried over to the clean side when operating conditions change, in the ATF the conical wedge wire with defined filtration rating performs a protective function (as a safety filter) and thus keeps dirt away from the clean side.

Efficiency / particle size	Specific weight 7.5 g/cm³	Specific weight 2.6 g/cm³	Specific weight 1.7 g/cm³
> 100 µm	99 %	98 %	77 %
100 – 75 µm	92 %	84 %	35 %
75 – 50 µm	87 %	78 %	21 %



AutoFilt® ATF skid for handling high flow rates

Process Inline Filter PLF1



Fine filtration optimally adjusted to suit the needs of modern industrial part washers

Areas of application

- Industrial part washers
- Test benches

Features

- Continuous separation of solids from low-viscosity fluids, such as:
 - Coolants
 - Washing media
 - Processing oils
 - Water
- PLF1-2: Compact and cost-optimised design for flow rates up to 25 m³/h, inexpensive alternative to conventional bag or cartridge filters

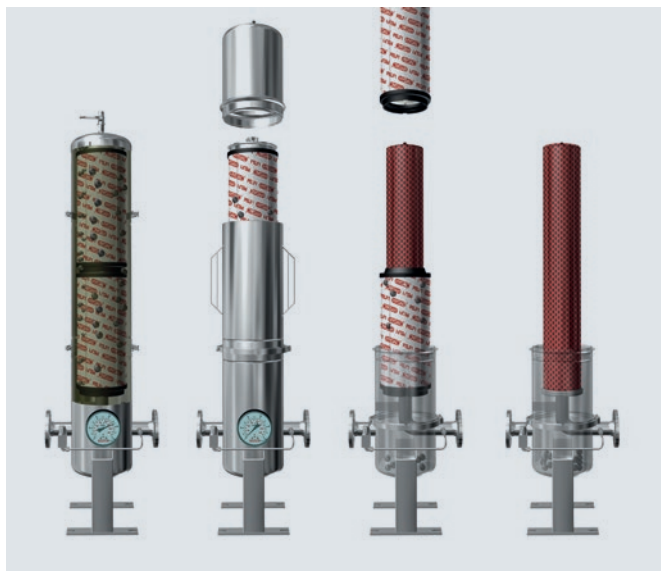
Product advantages

- Very large filter area per filter element
- Compact design with high flow rates
- Superior handling compared to commonly available disposable filter elements
- Protection of the clean side during filter element replacement thanks to fixed support tube
- Modular design for a perfect fit in every application
- Low pressure drops due to large cross sections and filtration areas
- Short maintenance times
- High contamination retention capacity, separation performance and media compatibility
- High flow rates can be handled thanks to parallel control of multiple PLF1
 - Continuous filtration:
 - Optionally the filters can be blocked individually with parallel control
- Fully incinerable



Processmicron® filter elements (see page 7)

Technical data	PLF1
Nominal size	● DN 50 (G2") to DN 150
Flow rates	● 100 m ³ /h
p _{min} / p _{max}	● 16 bar
T _{max}	● PES filter element 90 °C ● PP filter element 60 °C
Filter elements	● Processmicron® HighFlow 6": 1 to 90 µm ● Processmicron® HighFlow 9": 1 to 90 µm ● Processmicron® HighFlow 9" HLC: 1 to 90 µm
Filter housing materials	● Stainless steel



Function

- Flow through the filter element is from the outside to the inside
- The particles are deposited on the outside of the filter element
- The filter elements should be replaced once the maximum permitted differential pressure is reached



PLF1 with clamp connection and replaceable support tube

Replaceable support tube

- More flexibility – its modular design allows the filter to be extended to meet individual customer requirements
- Optimal adaptation to the particular application
- Particularly suited to meet the requirements of industrial part washers
- Retroactive optimisation when upgrading the system – doubling of maximum life expectancy



Economy version PLF1-2

- Compact and cost-optimised design specially adapted to the requirements of industrial part washers
- Flow rates up to 25 m³/h with compact dimensions and highest filtration performance
- Simplified handling – more convenient and safer than with bag filters and conventional cartridge filters

Locking technology



V-clamp

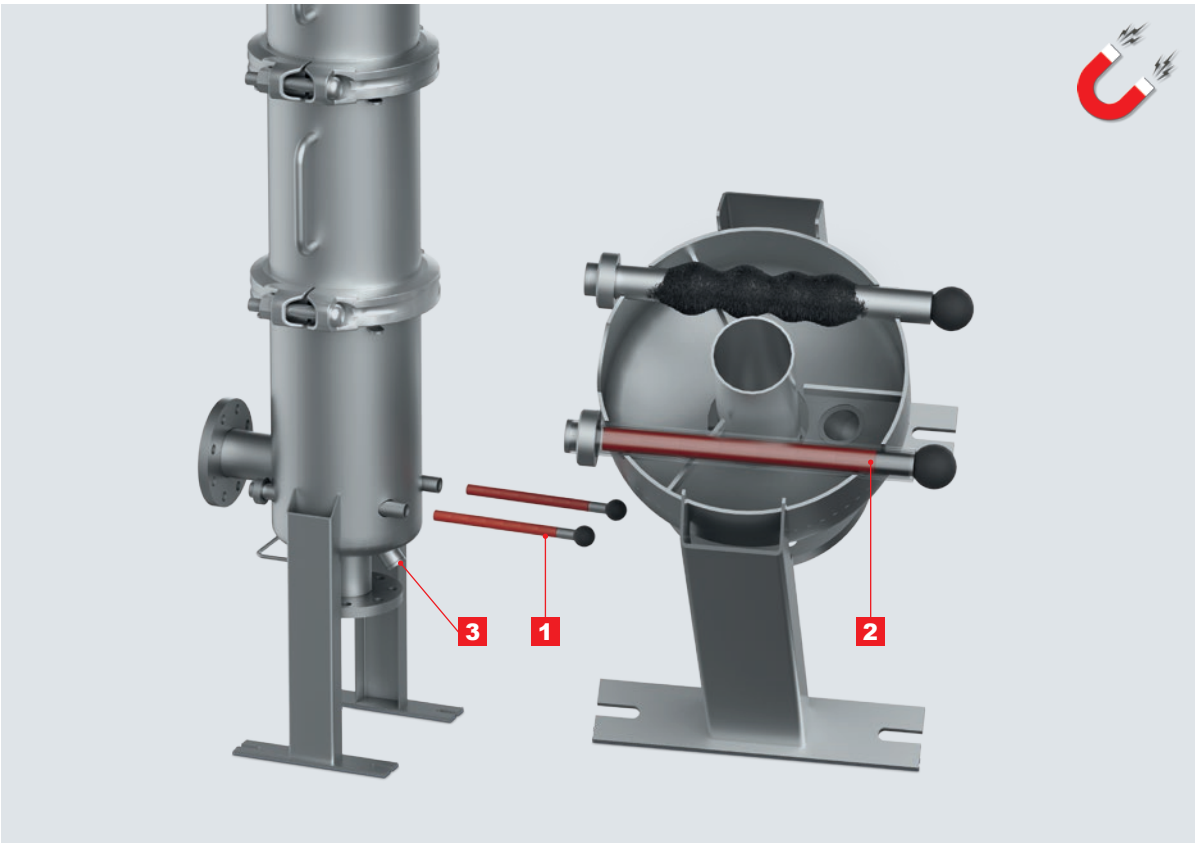


Clamp connection



Flange connection

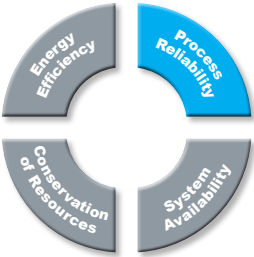
- V-clamp for 10 bar filter housing
- Clamp connection for 10 bar filter housing or 16 bar filter housing
 - Reduction in installation time when changing the filter element, compared with a flange port
 - Convenient alignment to user side
 - Sealing materials preferably EPDM or NBR (FKM also available)
 - Particularly suitable for use in industrial part washers
- Flange connection for 10 bar or 16 bar filter housing
 - Used for special design requirements (e.g. ASME Design)



Magnet technology to increase service life of the filter elements in fields of application with ferritic contamination

- 1** Bar magnets integrated into the filter housing – filter housing does not need to be opened to clean the bar magnets
- 2** No contact with the magnet surface thanks to special tube-in-tube design – no contact with contamination/medium and magnet during handling
- 3** Reliable discharge of dirt through drain line

Process Bag Filter PBF



Areas of application

- Coolants
- Parts cleaning
- Processing oils

Features

- Continuous separation of solid particles from low-viscosity fluids
- Flow from inside to outside
- Sealing lip for bypass-free sealing
- Sealing collar made of polypropylene
- Optional: stainless steel backup ring

Product advantages

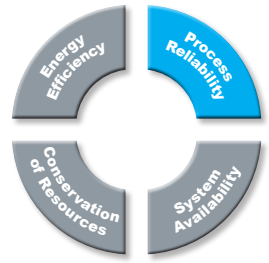
- Separated contamination can be disposed of with the filter bag
- The bag filters can be connected in parallel to tackle large flow rates
- The bag filters can optionally be blocked individually to operate continuous filtration
- Standard adjustable foot stand



Filter bag

Technical data	PBF
Nominal size	● DN 50
$Q_{\max}$	● 30 m³/h
$p_{\max}$	● 10 bar
$T_{\max}$	● 90 °C
Filter bag	● Polypropylene (PP) needle felt: 1 to 1000 µm ● Polyester (PE) needle felt: 1 to 1000 µm ● Nylon monofilament (NY): 1 to 1000 µm
Filter housing materials	● Stainless steel

Process Magnet Filter PMAG



Areas of application

- Coolants
- Parts cleaning

Features

- Particle filter
- Applications with ferrite contaminations
- Available as single or double filter
- Return line filter upstream from tank
- Pre-separator for unloading other filters
- Bypass filter

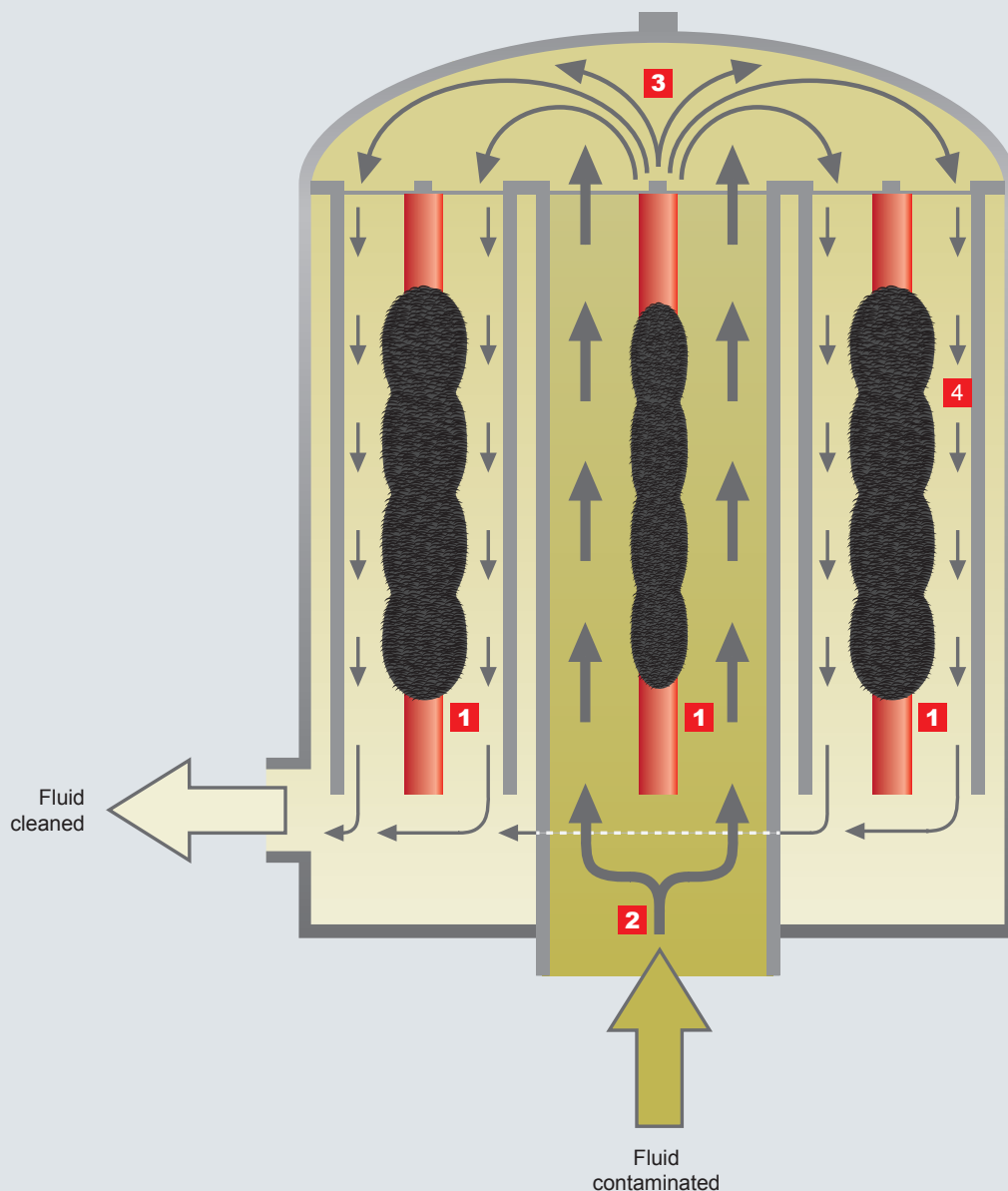
Product advantages

- Optimised for filter performance of downstream filters, such as automatic filters or inline filters
- Stainless steel materials are ideally suited for use in industrial part washers
- Bar magnet can be removed easily without having to detach the filter from the pipe
- High magnetic field strength for effective retention of ferritic contamination
- Economical and environmentally friendly as not a consumable



Filter element with magnet insert to retain ferritic contamination

Technical data	PMAG
Nominal size	● G 1" to G 2"
$Q_{\max}$	● 400 l/min
$p_{\max}$	● 6 bar / 10 bar
$T_{\max}$	● 80 °C
Magnet technology	● Bar magnet with magnetic field strength of 13200 Gs, retention rate in accordance with flow rate
Filter housing materials	● Plastic ● Aluminium ● Stainless steel



1 Effective retention of ferritic contamination

Several bar magnets with a high magnetic field strength (13200 Gs) are integrated into the filter housing.

2 Efficient pre-filtration

The pre-separation is performed by a bar magnet with flow directed at its centre. The flow-optimised design ensures 100 % of the flow is guided over the bar magnet.

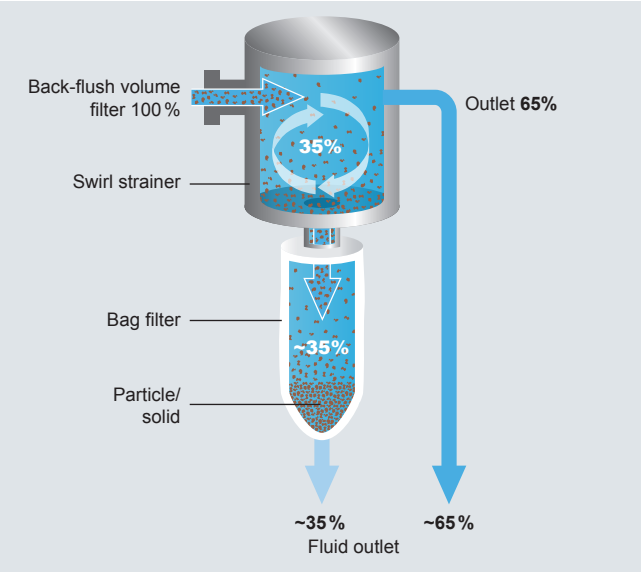
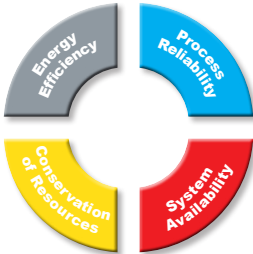
3 Increased filtration performance

Before the pre-separation, the entire flow is split across the remaining bar magnets. This reduces the flow velocity and increase the separation performance.

4 Optimum flow control

The optimum flow control ensures that flow passes around the bar magnets uniformly. This results in efficient separation performance.

Back-flush Treatment BTU / STU



Functional principle of turbo swirl strainer process PTS for AutoFilt® RF3 / RF4

Areas of application

- Machine tools
- Parts cleaning

Features

- Available for automatic filters of series AutoFilt® RF3 / RF4 and for filters of series AutoFilt® RF9
- Continuous separation of solids, such as ultrafine magnetic and non-magnetic metal particles (corundum, grains of sand etc.)
- Long-term filtration to produce reduced-particle filtrate
- Components of the BTU AutoFilt® RF3 / RF4
 - Back-flushing filter for main filtration
 - Process swirl strainer for treating the back-flush volume
 - Buffer tank with components (only BTU1)
 - Control
- Components of the STU AutoFilt® RF9 *
 - Back-flush treatment by means of specially developed filter element technology

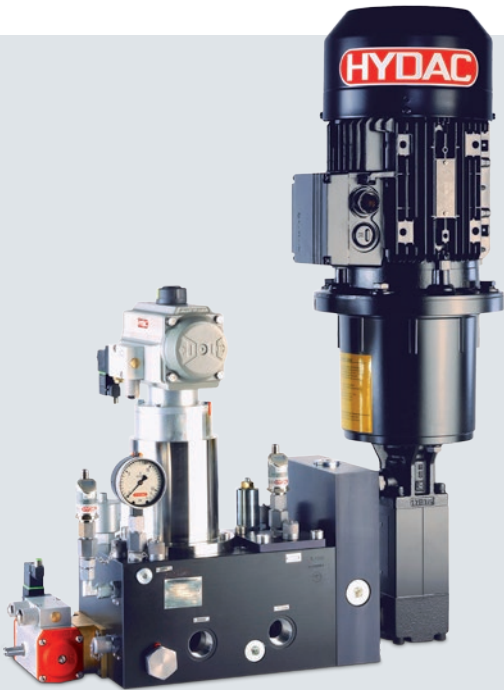
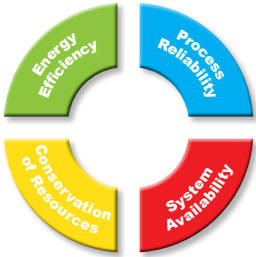
Product advantages

- Automatic filtration unit
- For universal application
- Long-term filtration
- Reliable retention of ultrafine magnetic and non-magnetic metal particles
- Bag filter easy to dispose of
- Self-cleaning and low-maintenance turbo swirl strainer

* Technical data on request

Technical data	BTU AutoFilt® RF3 / RF4
Nominal size	● G1" to DN 150
Q _{max}	● 1900 l/min
p _{min} / p _{max}	● 2 bar / 16 bar
T _{max}	● 80 °C
Filter elements	● Turbo swirl strainer (SuperMesh): 25 to 150 µm ● Bag filter: 25 to 150 µm ● Back-flushing filter: 25 to 150 µm
Filter housing materials	● Carbon steel ● Stainless steel ● Aluminium

Process Booster Block PBB



Areas of application

- Internal coolant supply to machine tools
- High-pressure coolant supply to machine tools

Features

Process Booster Block PBB combines full functionality in a compact system:

- Automatic protective filtration: AutoFilt® RF4
- Pressure monitoring: HYDAC electronic pressure and differential pressure switch
- High-pressure distribution: HYDAC CX coaxial valve
- Pressure control: HYDAC CX CBB valve
- Pressure increase: high-pressure pump – optionally with HYDAC Kinesys frequency converter
- Pressure limiting: HYDAC pressure relief valve
- Optional: available with tank
- Optional: available with bayonet fitting

Product advantages

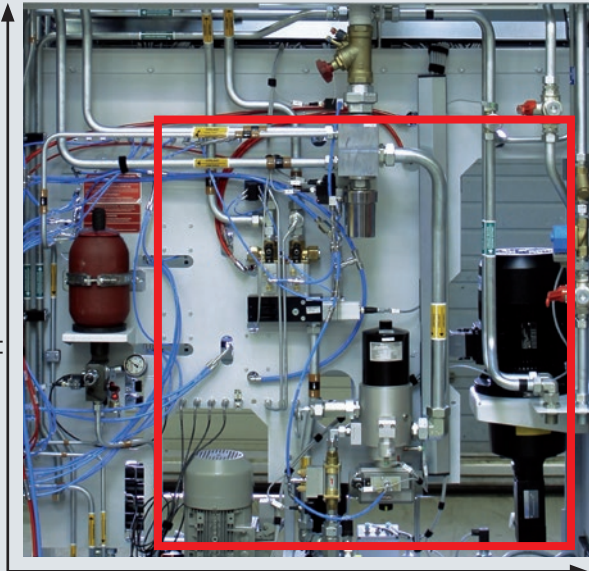
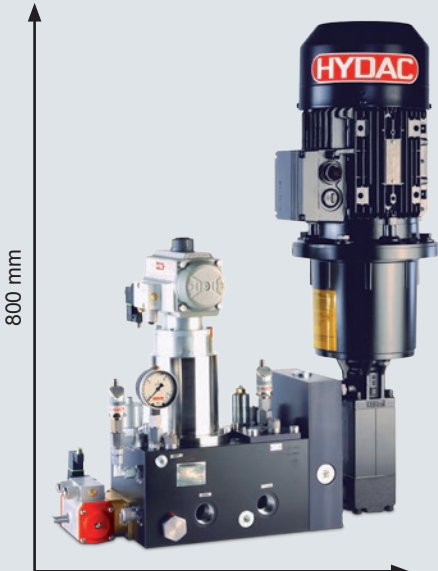
- Compact design
- Modular system – standard components
- Simple design and integration into the machine
- Ready-to-install unit
- Low space requirements
- Reliable HYDAC valve technology
- Quick and easy error analysis
- Reduced maintenance costs

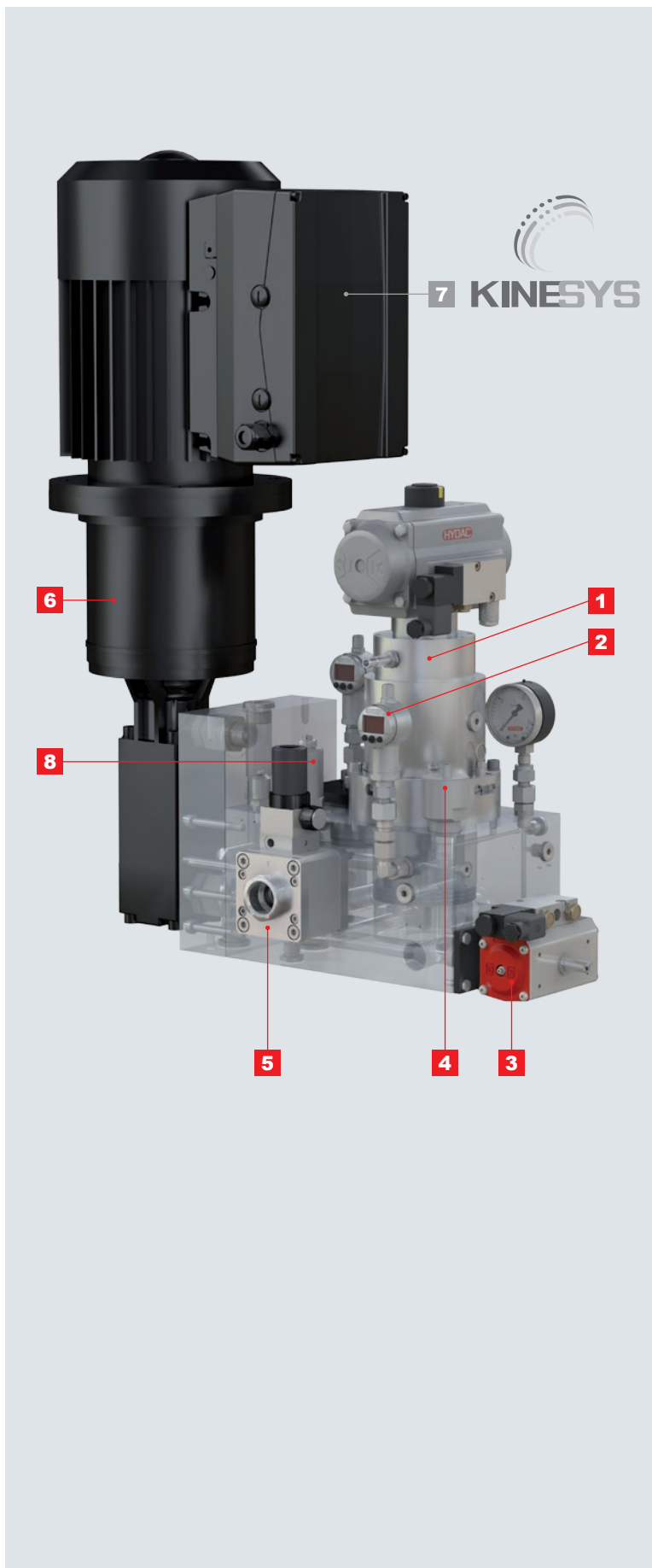


Conical filter elements

Technical data	PBB
Nominal size	● Inlet: G 1 " ● Outlet, low pressure: up to G 1" ● Outlet, high pressure: up to G 1" ● Tank line/back-flush line: up to G ¾"
Q _{max}	● 80 l/min
p _{min} / p _{max}	● 2 bar / 70 bar
T _{max}	● 80 °C
Filter elements	● Wedge wire: 30 to 1000 µm ● Wire mesh SuperMesh, sintered: 30 to 60 µm ● Optional SuperFlush non-stick coating
Filter housing materials	● High-pressure block: aluminium ● Pump case: cast iron

Comparison of conventional solution and HYDAC Process Booster Block PBB

Conventional solution	HYDAC PBB
 Approx. 1600 mm Approx. 1500 mm	 800 mm 567 mm
Integration into the machine	
High space requirements ● Difficult to integrate into compact machines Complex design ● Reduced degrees of freedom when integrating	Compact model ● More space in the machine Simple design ● Straightforward integration Modular system with standardised components ● More degrees of freedom, e.g. design on a slide ● Simple and flexible adaptation to the machine series
Machine output and operating costs	
Leaking pipes ● Increased cycle time ● Loss of production time	Elimination of pipes ● No loss in production time resulting from leaks Automatic filter ● Minimum personnel and maintenance costs
Installation	
Complex design ● Difficult handling Leaking screwed fittings ● Time wasted on monitoring and rectification	Simple design ● Easy handling ● Simplified logistics
Initial start-up	
Leaking screwed fittings ● Time wasted on monitoring and rectification	Unit instantly ready for use ● No time wasted on monitoring and rectification
Maintenance and servicing	
Complex, confusing design ● Difficult error analysis ● Changing components is time-consuming and costly ● High level of training required for maintenance personnel Leaking pipes ● Recurring inspection necessary ● Contamination of the machine ● High labour costs	Straightforward design ● Quick and easy error analysis Components arranged in block design ● Components easy to change Elimination of pipes ● Reduced inspection work Automatic back-flushing filter ● Maintenance work minimised



1 Automatic protective filtration

HYDAC AutoFilt® RF4

- Highly reliable
- Minimal maintenance costs
- Excellent filtrate quality

2 Process monitoring

Electronic pressure switch HYDAC EDS

- Monitoring of inlet pressure
- Monitoring of pump starting pressure
- Monitoring in high-pressure circuit
- Process reliability ensured
- Robust sensor cell
- Functional monitoring

3 Automatic back-flushing

Pneumatically actuated ball valve

- Safety
- Long life expectancy

4 Differential pressure monitoring

HYDAC VL x GW

- 2 switching contacts warning/alert

5 Pressure control

HYDAC CX CBB valve

- Bypass circuit
and/or closed-loop pressure control

6 Pressure increase

Adapted high-pressure pump

- Flexible solution
- Adaptation to customer-specific pump types

7 Optional:

HYDAC Kinesys frequency converter

8 Pressure limiting

HYDAC pressure relief valve DB12

- Short reaction time
- First-class reliability

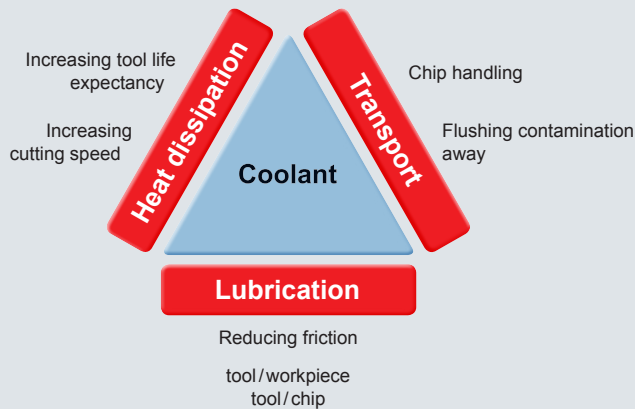
High-pressure distribution (optional)

HYDAC CX valve, 2/2-way,
pilot-operated

Filtration of Coolant

Functions of coolants

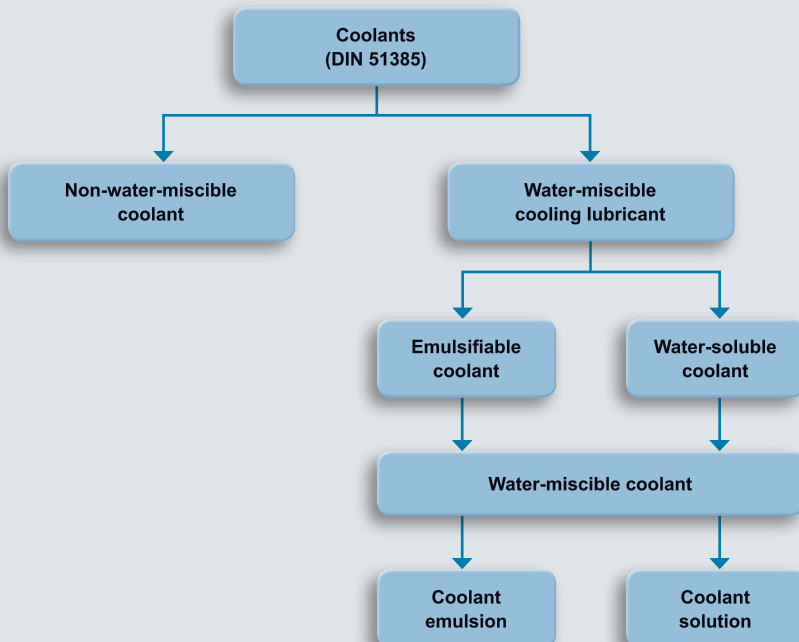
Coolants are used in modern manufacturing for cutting and forming with machine tools and primarily for the following tasks:



The relative importance and emphasis of the individual criteria are dependent on the particular machining process. In addition, all coolants for metal machining are optimally tailored to numerous secondary requirements which also have positive implications for the user:

- Consistent stability for long term use due to perfect filtration
- Excellent corrosion protection
- Neutrality towards compatible elastomers, machine coatings
- Reduced outlay for machine failures and maintenance due to continuous conditioning
- Easy disposal

Range of coolants



Non-water-miscible coolant



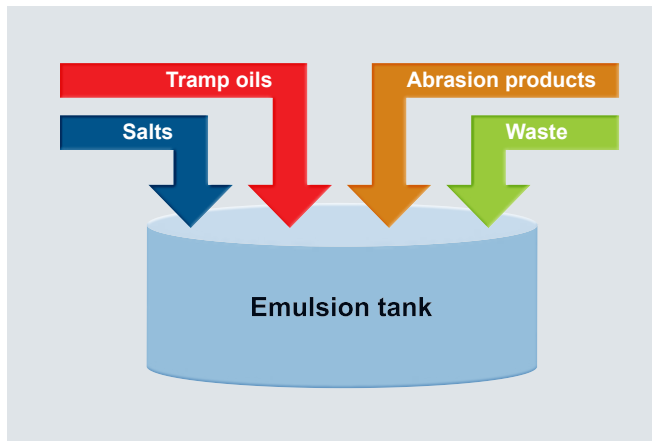
Water-miscible coolant



Coolant solution

Even the best coolant will not function without conditioning

To obtain maximum usage from the coolant over a long time period, effective filtration is essential. All contamination which enters the system must also be removed from the system by filtration.



HYDAC recommendation for high-pressure coolant circuits: Automatic filter AutoFilt® with filtration ratings between 30 µm and 50 µm.

Possible consequences of inadequate filtration

Wear on moving parts



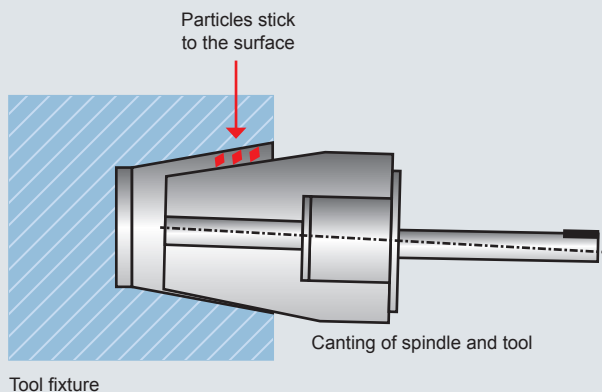
Figure:
Damage pump case

Valve malfunctions



Figure:
Damaged valve
sealing seat

Tool fixture malfunctions

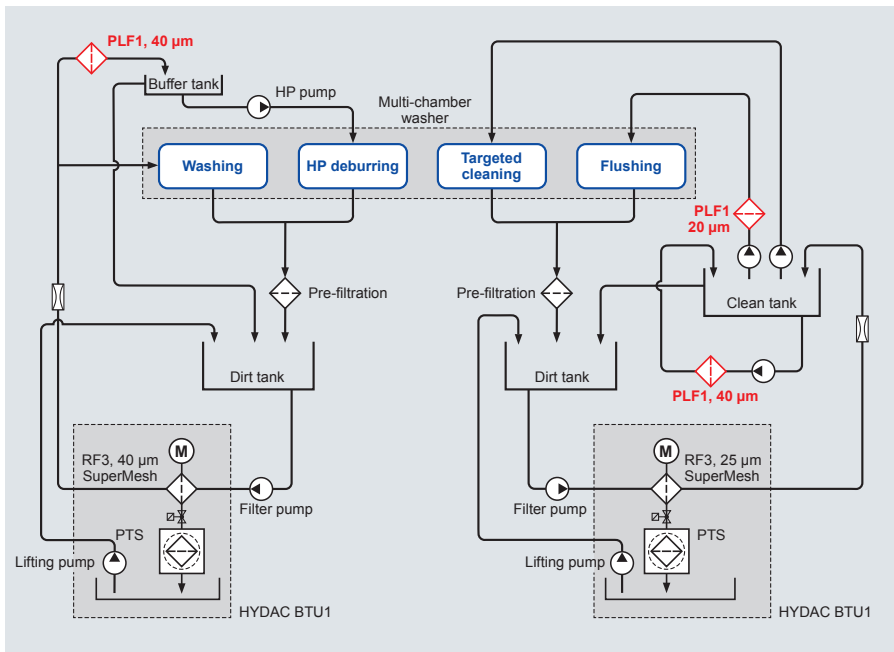


Clogging of orifices



Figure:
Correctly functioning
internal coolant supply

Typical Application Examples

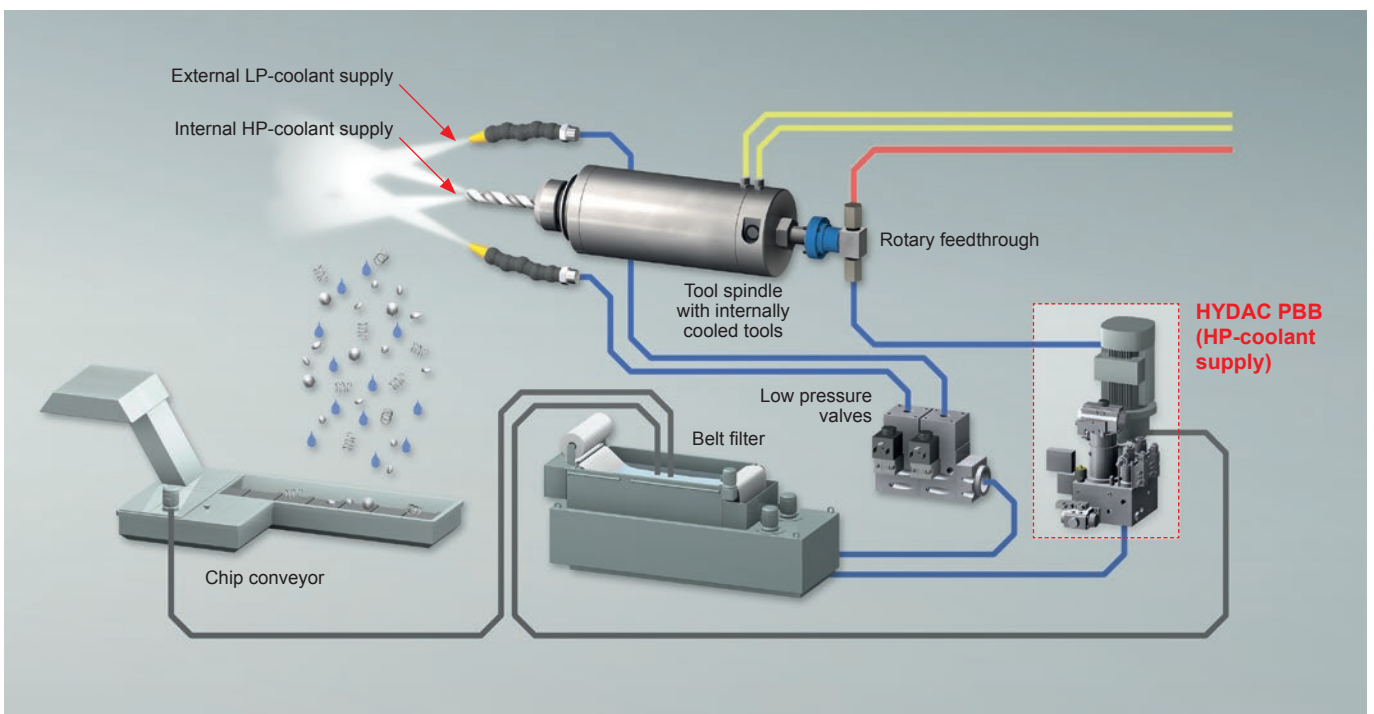


Industrial part washers

- Fresh water treatment
- Washing fluid treatment

HYDAC solutions:

- AutoFilt® RF3 / RF4 / RF5 / RF7 / RF10
- AutoFilt® TwistFlow Strainer ATF
- Process Inline Filter PLF1
- Back-flush treatment BTU

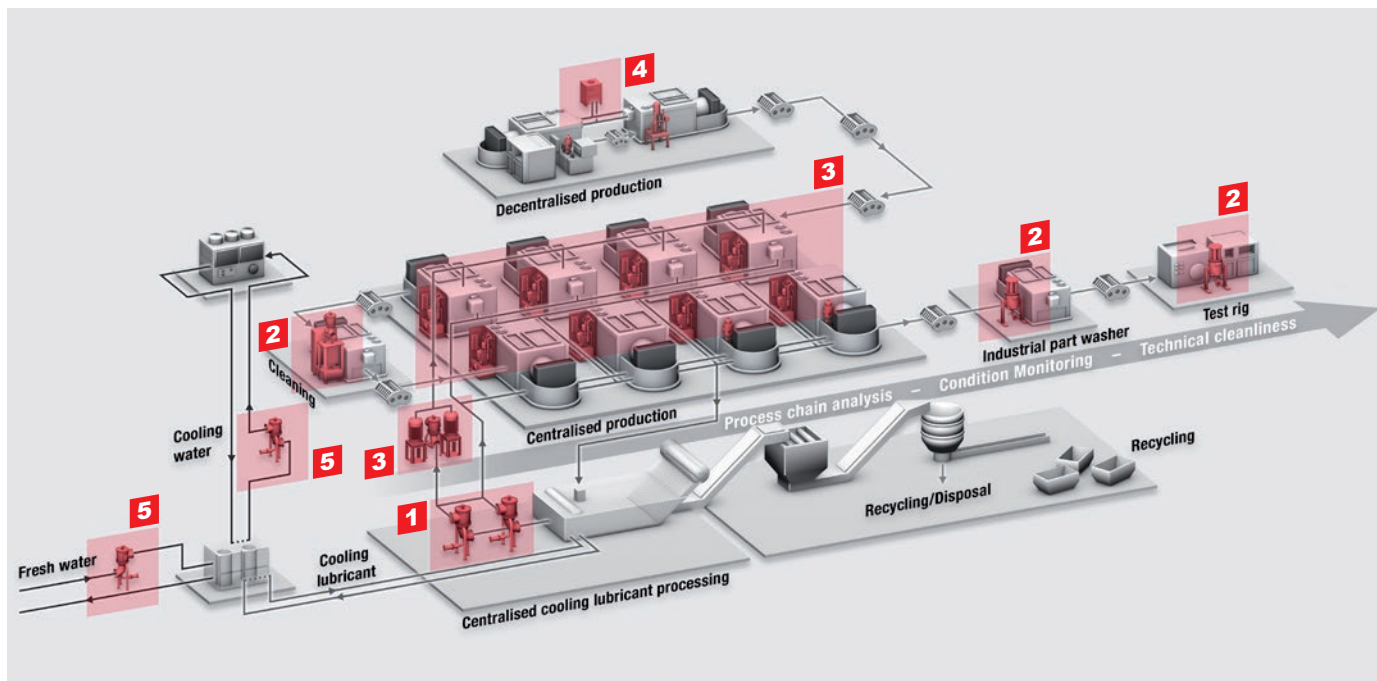


Machine tools

- High-pressure coolant supply

HYDAC solutions:

- AutoFilter® RF4
- Process Booster Block PBB
Compact unit comprising:
 - Protective filter
 - High-pressure supply
 - Control valve
 - High-pressure valve
 - Pressure monitoring



Automotive industry

- 1** Secondary filtration of centralised coolant systems
- 2** Filtration of industrial part washers and test benches
- 3** Protective filtration of high pressure coolant circuits
- 4** Secondary filtration of decentralised coolant systems
- 5** Filtration of process and cooling water

HYDAC solutions:

- AutoFilt® RF3 / RF4 / RF7 / RF9 / RF10 / RF12
- Process Booster Block PBB
- Back-flush treatment BTU
- Process Inline Filter PLF1

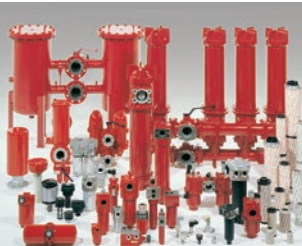
For the latest information
on process filters
for machine tools and
industrial part washers,
visit:

<https://coolantfiltration.hydac.com/>





Accumulator Technology 30.000



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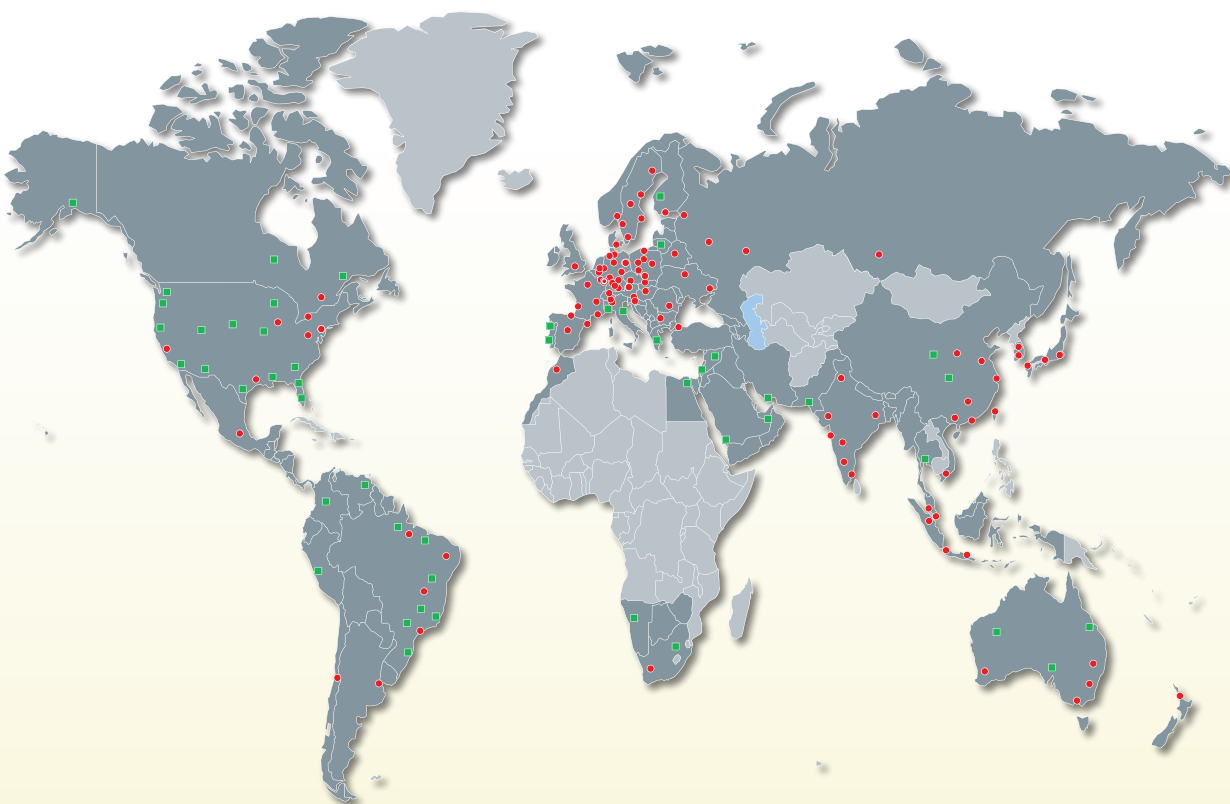


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