



Filter elements for installation in Hydac filter housings

Type 9. and 10. filter elements

- ▶ Installation in return flow filters (R)
- ▶ Installation in inline filters (D)
- ▶ Frame sizes: 30-1500 (model D)
- ▶ Frame sizes: 30-2600 (model R)
- ▶ Collapse pressure rating: 10 to 210 bar
[145 to 3045 psi]
- ▶ Temperature rating: -30 °C to +100 °C
[-22 to +212 °F]
- ▶ Filter rating: 3 µm to 20 µm (DIN 24550 part 2)
- ▶ Filtration ratio: $\beta_{x(c)} > 200$ (ISO 16889)

Features

- ▶ Filter media made of non-woven glass fiber, filter paper, wire mesh, non-woven fabric for numerous applications
- ▶ Cleanable wire mesh filter media
- ▶ Attainable oil cleanliness to ISO 12/8/3 (ISO 4406)
- ▶ High dirt holding capacity and filtration performance due to multi-layer glass fiber technology and a low initial pressure differential (ISO 3968)
- ▶ Extended product range for non-mineral oil based fluids
- ▶ Filter elements with high pressure differential stability

Ordering code

of the type 9. filter element

01	02	03	04	05	06	07	08
9.			-		-	0	-

Filter element

01	Design	9
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Size

02	According to standard	30LA
		60LA
		75LA
		110LA
		140LA
		160LA
		240LA
		280LA
		330LA
		450LA
		500LA
		650LA
		660LA
		990LA
		1320LA
		1500LA

Filter rating ¹⁾ in μm

03	Not cleanable	absolute (ISO 16889)	Non-woven glass fiber	H3XL
				H6XL
				H10XL
				H20XL
		nominal	Filter paper	P10
				P25
	Reusable (cleanable)	nominal	Stainless steel wire mesh, cleanable	G10
				G25
				G40
				G60
				G100

Pressure differential

04	Maximum pressure differential of the filter element 210 bar [3000 psi]	F
	Maximum pressure differential of the filter element 30 bar [435 psi]	A

Element design

05	Standard adhesive	$T_{\text{max}} = 100\text{ }^{\circ}\text{C}$ [212 $^{\circ}\text{F}$]	0...
	Standard material		... 0

Bypass valve

06	For series 9., without	0
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Seal ²⁾

07	NBR seal	M
	FKM seal	V

Ordering code

of the type 9. filter element

01	02	03	04	05	06	07	08
9.			-		-	0	-

Amending information

08	Protective cage ³⁾	SO3000
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- 1) Other filter ratings upon request
- 2) Other seal materials upon request
- 3) Protective cage SO3000 only in connection with filter material H...XL or AS...

Order example:

9.240LA H10XL-A00-0-M SO3000

Ordering code

of the type 10. filter element

01	02	03	04	05	06	07	08
10.			-	A	-	-	

Filter element

01	Design	10
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Size

02	According to standard	30LA
		60LA
		75LA
		90LA
		110LA
		160LA
		165LA
		185LA
		210LA
		240LA
		270LA
		330LA
		450LA
		500LA
		580LA
		600LA
		660LA
		750LA
		850LA
		950LA
		1300LA
		1700LA
		2600LA

Filter rating ¹⁾ in µm

03	Non-Reusable (not cleanable)	absolute (ISO 16889)	Non-woven glass fiber	H3XL
				H6XL
				H10XL
				H20XL
	Reusable (cleanable)	nominal	Filter paper	P10
				P25
		nominal	Stainless steel wire mesh, cleanable	G10
				G25
				G40
				G60
				G100

Pressure differential

04	Maximum pressure differential of the filter element 30 bar [435 psi]	A
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Element design

05	Standard adhesive	T _{max} = 100 °C [212 °F]	0...
	Standard material		... 0

Ordering code

of the type 10. filter element

01	02	03	04	05	06	07	08
10.			-	A	-	-	

Bypass valve

06	Standard opening pressure 3 bar [44 psi] at series 10	6
	Cracking pressure 6 bar [87 psi] at series 10	B6
	Without bypass valve	0

Seal ²⁾

07	NBR seal	M
	FKM seal	V

Amending information

08	Protective cage ³⁾	SO3000
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¹⁾ Other filter ratings upon request

²⁾ Other seal materials upon request

³⁾ Protective cage SO3000 only in connection with filter material H...XL or AS...

Order example:

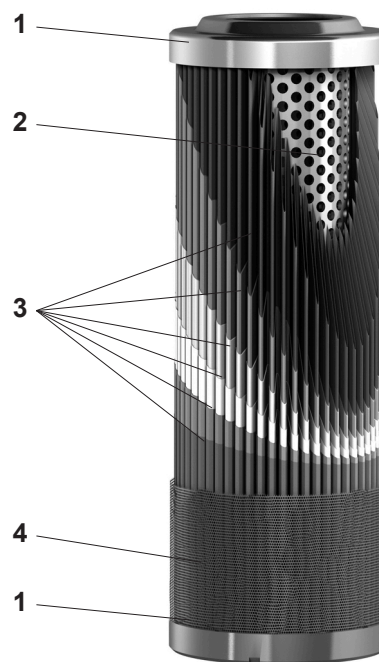
10.1300LA H10XL-A00-6-M SO3000

Function, section

The filter element is the central component of industrial and mobile filters. The actual filtration process takes place in the filter element. The main filter variables, such as size range of particle retention, dirt holding capacity and pressure loss are determined by the filter elements and the filter media used in construction. Filter elements are used for the filtration of hydraulic fluids in the hydraulic system as well as for the filtration of lubricants, industrial fluids and gases.

6-layer filter material construction

Filter elements consist of a combination of star-like pleated filter media (3) which are laid around a perforated supporting tube (2). A perforated protective cage (4) is laid around the filter mat. Supporting tube and filter element mat are glued to both end caps (1). The protective cage allows for a continuous fluid flow around the filter element mat and, at the same time, provides mechanical protection against external damage. Seal rings are provided between the filter element and the filter housing as a seal.



Zinc-free filter element construction

All filter elements of the preferred program are made of zinc-free components thus preventing the formation of zinc-soap, in particular if water-containing fluids (HFA/HFC) and synthetic oils are used. Moreover, many manufacturers of construction and agricultural machinery stipulate the use of zinc-free machine elements for rapidly bio-degradable hydraulic oils.

With regard to the aforementioned fluids, the use of zinc-free filter elements prevents early "blocking" of the filter element, thus considerably increasing the lifetime of the filter elements. Therefore, filter elements can be used universally for hydraulic fluids and lubricants.

Filter variables

Filter rating and attainable oil cleanliness

The main goal when using industrial filters is not only the direct protection of machine components but to attain the target oil cleanliness. Oil cleanliness is defined on the

basis of oil cleanliness classes which classify how the amount of particles of the existing contamination is distributed in the operating liquid.

Filtration performance

Filtration quotient $\beta_{x(c)}$ (β value)

The retention capacity of hydraulic filters in a hydraulic system is defined by the filtration ratio $\beta_{x(c)}$. This variable is therefore the most important performance characteristic of a hydraulic filter. It is measured in the multipass test, and is the average value of the specified initial and final pressure differential according to ISO 16889 using ISOMTD test dust.

The filtration quotient $\beta_{x(c)}$ is defined as the quotient of the particle count of the respective particle size on both sides of the filter.

Dirt holding capacity

It is also measured using the multipass test and determines the amount of test dust ISOMTD which is fed to the filter medium until a certain pressure increase has been reached.

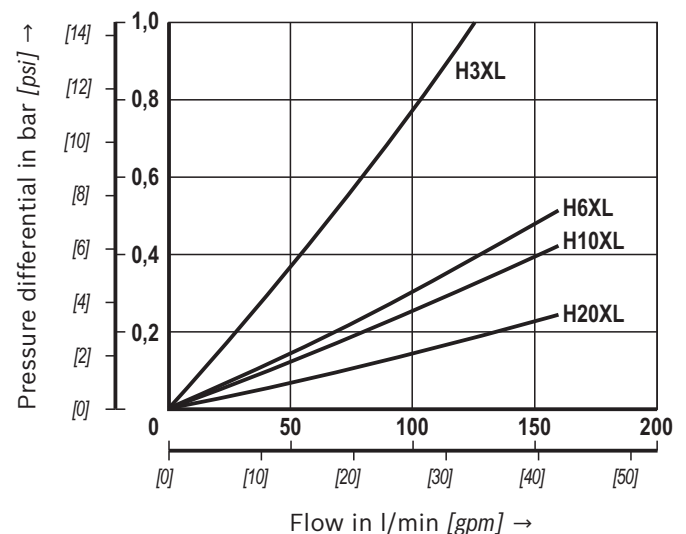
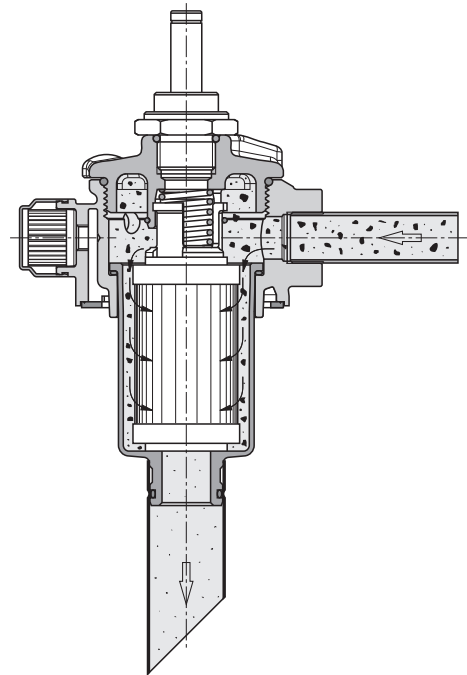
Pressure loss (also pressure differential or delta p)

The pressure loss of the filter element is the relevant variable for the determination of the filter size. The pressure loss with a clean filter element is recommended by the filter manufacturer or defined by the system manufacturer. This variable depends on many factors, mainly: The rating of the filter medium, its geometry and disposition in the filter element, the filter area, the operating viscosity of the fluid and the flow.

The term "delta p" is often also expressed with the symbol " Δp ".

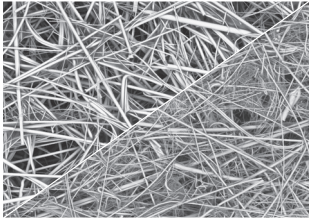
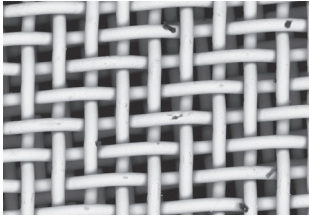
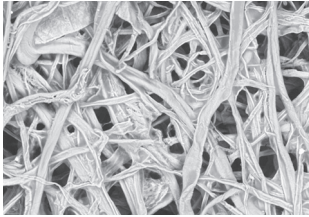
When dimensioning the filter, an initial pressure loss is determined which must not be exceeded by the new filter element state on the basis of the aforementioned conditions.

The following diagram shows the typical pressure loss behavior of filter elements with different filter media at different flows for a viscosity of 30 mm²/s [150 SUS].



Filter media

Overview

Filter medium/set-up	Electron microscope image
H...XL, non-woven glass fiber Depth filter, combination of inorganic micro glass filter medium. High dirt holding capacity due to multi-layer technology.	
G..., stainless steel wire mesh Material 1.4401 or 1.4571 Surface filter made of stainless steel wire mesh with supporting layer.	
P..., filter paper Inexpensive depth filter made of filter paper with supporting layer. Made of specially impregnated cellulose fiber preventing humidity and swelling.	

Filter media

Technical data

Glass fiber media, H...XL

If properly designed and applied, the H...XL filter medium achieves a high degree of cleanliness for hydraulic fluids, lubricants as well as for chemical and industrial fluids. Due to its defined retention capacity (ISO 16889), it offers highly effective protection for machine and system components which are sensitive to contamination.

- ▶ H...XL depth filter made of inorganic glass fiber material

- ▶ Absolute filtration/defined retention capacity according to ISO 16889
- ▶ High dirt holding capacity due to multi-layer set-up
- ▶ Non-reusable filter (not cleanable due to the depth filtration effect)
- ▶ Attainable oil cleanliness classes according to ISO 4406 up to ISO code 12/8/3 and better

Filter rating and attainable oil cleanliness

The following table provides recommendations for the selection of a filter medium in dependency of the applica-

tion and indicates the average oil cleanliness class attainable according to ISO 4406 or SAE-AS 4059.

Application	Recommended oil cleanliness according to ISO 4406 (SAE-AS 4059)	Recommended filter medium
Systems with components which are very sensitive to contamination, and require reliable continuous operation. Servo valve technology	≤ 18/13/10 (5)	H3XL
Systems with proportional valves	≤ 19/14/11 (6)	H6XL
Modern industrial hydraulic systems with directional valves	≤ 20/16/13 (8)	H10XL
Industrial hydraulic systems with major tolerances and minor sensitivity to contamination	≤ 21/17/14 (10)	H20XL

Filtration ratio $\beta_{x(c)}$ (β value)

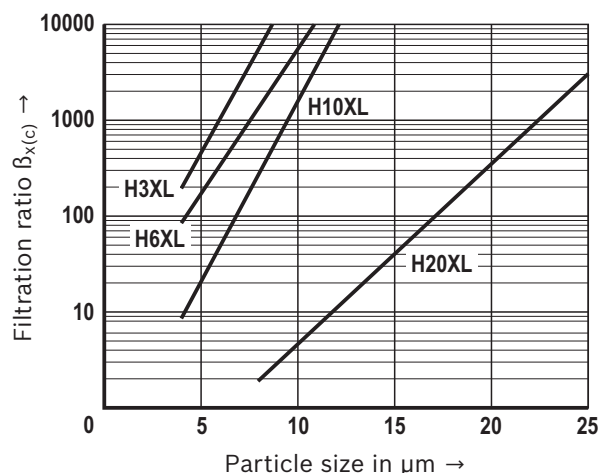
Typical β values of up to 2.2 bar [31.9 psi] Δp pressure increase at the filter element ¹⁾

Filter medium	Particle size "x" for different β values, measurement according to ISO 16889		
	$\beta_{x(c)} \geq 75$	$\beta_{x(c)} \geq 200$	$\beta_{x(c)} \geq 1000$
H3XL	4.0 $\mu\text{m(c)}$	< 4.5 $\mu\text{m(c)}$	5.0 $\mu\text{m(c)}$
H6XL	4.8 $\mu\text{m(c)}$	5.5 $\mu\text{m(c)}$	7.5 $\mu\text{m(c)}$
H10XL	6.5 $\mu\text{m(c)}$	7.5 $\mu\text{m(c)}$	9.5 $\mu\text{m(c)}$
H20XL	18.5 $\mu\text{m(c)}$	20.0 $\mu\text{m(c)}$	22.0 $\mu\text{m(c)}$

¹⁾ Filtration ratio $\beta_{x(c)}$ for other filter media upon request

Filtration ratio $\beta_{x(c)}$

As a function of the particle size $\mu\text{m(c)}$



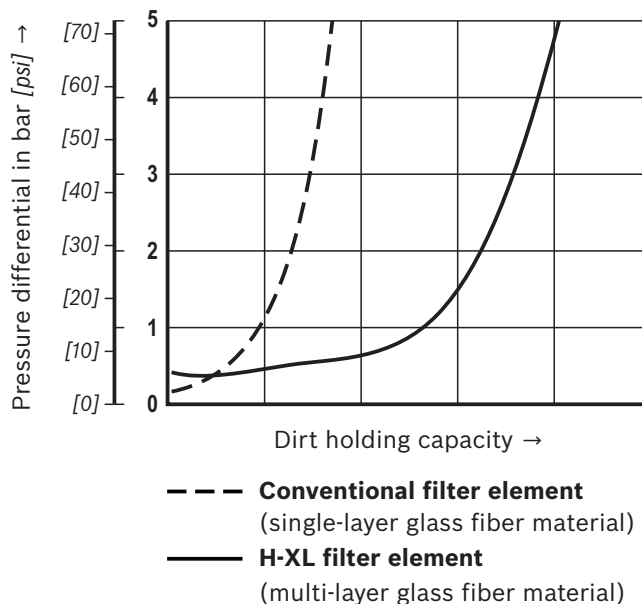
Filter media

For further information regarding filter elements as well as to contamination and oil cleanliness control, see our publications or specific brochures.

Dirt holding capacity

Compared to conventional filter media with single layer technology, the H...XL features a high dirt holding capacity because it is made of two separate filter layers connected in series.

Superior dirt holding capacity of H...XL filter elements



Stainless steel wire mesh, G...

There is a comprehensive field of applications for wire mesh filter media. Not only pre-filtration is possible, but also the filtration of lubricating oils, hydraulic oils, coolants and water-like fluids.

Wire mesh G10 ... G40

As surface filters, these materials are generally cleanable. Due to their fine mesh, however, cleaning is more difficult than with coarser filter mesh. Therefore, we recommend cleaning the filters in an ultrasonic bath.

Wire mesh G60

Due to their coarser mesh size, the cleaning of these filters media is easier.

- ▶ Surface filter made of stainless steel wire mesh
- ▶ Reusable, cleanable
- ▶ Pleated design, single, two or three-layer design
- ▶ Supporting mesh: Epoxy-coated wire mesh or stainless steel wire mesh

Filter medium	Design	Mesh size	Attainable oil cleanliness ¹⁾
G10	Special Dutch weave	10 µm nom.	nom.20/18/13...21/20/15
G25	Woven mesh	25 µm nom.	No details, only suitable for coarse filtration (particle size ≥ 25 µm)
G40	Woven mesh	40 µm nom.	
G60	Plain woven cloth	No details	

¹⁾ According to ISO 4406 for particles ≥ 4 µm(c), ≥ 6 µm(c) and ≥ 14 µm(c)

Filter media

Cleaning of filter elements

Cleaning or replacement

Before cleaning a G element, the filter element has to be dismantled first and then checked whether it makes sense to clean the element. For example, if the cloth contains many fibrous substances and consists of a material finer than G40, effective and complete cleaning is not possible in many cases. Filter mesh which has visible defects due to

frequent cleaning must be replaced. In general, the following applies: The finer the cloth, the thinner the wire. Therefore, especially fine mesh must be cleaned gently to protect the material. Cracks in the folds of the wire mesh and the metal fiber fleece are to be avoided. Otherwise, the filter capacity will be insufficient.

Cleaning frequency

Experience has shown that filter elements made of G10, G25 and G40 can be cleaned up to ten times. Filter mesh > 60 µm can usually be reused more than ten times. Reusability, however, very much depends on the type of contamination as well as on pressure differential during operation (final Δp before dismantling the fil-

ter element).

For maximum reusability, we therefore recommend replacing in particular the fine mesh and the M material at a final Δp of 2.2 bar [31.9 psi] at the latest. Due to the given reasons, the aforementioned values must be regarded as reference values for which we do not assume any liability.

Recommendations for cleaning

Manual and simple cleaning method for G... elements

Procedure	Wire mesh G10, G25, G40	Wire mesh G60 – G100
Chemical pre-cleaning	Let the filter element drain for approx. 1 hour after disassembly. Bathe in solvent afterwards.	
Mechanical pre-cleaning	Remove rough dirt with a brush or scrubber. Do not use hard or pointed objects which could damage the filter medium.	
Mechanical/chemical main cleaning	Put pre-cleaned element in an ultrasonic bath with special solvent. Clean the element in the ultrasonic bath until any visible contamination is removed.	Evaporate with hot washing solution (water with corrosion protection agent)
Test	Visually inspect the material for damage. Replace the filter element if you identify obvious damages.	
Preservation	After drying, you must spray the cleaned element with preservative agents and store it sealed against dust in a plastic foil.	

Automated cleaning for G... elements

Procedure	Wire mesh G10, G25, G40, G60 – G100
Chemical pre-cleaning	Let the filter element drain for approx. 1 hour after disassembly. Bathe in solvent afterwards.
Mechanical/chemical main cleaning	By means of special cleaning systems for filter elements. Most of these systems are provided with a fully automated and combined cleaning mechanism including ultrasound as well as mechanical and chemical cleaning processes. This allows for best possible cleaning results with gentle cleaning processes.

Filter media

Filter paper, P...

Filter paper is used for the filtration of lubricating oil and for pre-filtration. Filter paper has the following features:

- ▶ Depth filter made of cellulose fibers
- ▶ Specially coated to prevent swelling caused by humidity
- ▶ Pleated design: Two-layered design
- ▶ Supporting mesh: Epoxy-coated wire mesh

Filter medium	Filtration ratio β values ¹⁾	Retention rate ¹⁾	Attainable oil cleanliness ²⁾
P10	$\beta_{10(c)} > 2.0$	50 %	20/19/14...22/20/15
P25	$\beta_{10(c)} > 1.25$	20 %	21/20/15...22/21/16

¹⁾ According to ISO 16889

²⁾ According to ISO 4406

Compatibility with hydraulic fluids

Hydraulic fluid	Classification	Suitable sealing materials	Standards
Mineral oil	HLP	NBR	DIN 51524
Bio-degradable	– insoluble in water	HETG	VDMA 24568
		HEES	
	– soluble in water	HEPG	VDMA 24568
Flame-resistant	– water-free	HFDR, HFDR	VDMA 24317
	– containing water	HFAS	DIN 24320
		HFAE	
		HFC	VDMA 24317



Important information on hydraulic fluids.

- ▶ For more information and data on the use of other hydraulic fluids, please refer to data sheet or contact us.
- ▶ **Flame-resistant - containing water:** Due to possible chemical reactions with materials or surface coatings of machine and system components, the service life with these hydraulic fluids may be less than expected. Filter materials made of filter

paper P... (cellulose) may not be used, filter elements with filter materials made of glass fiber (HydroClean H...XL or wire mesh G) have to be used instead.

- ▶ **Bio-degradable:** If filter materials made of filter paper are used, the filter life may be shorter than expected due to incompatibility of materials and swelling.

Installation, commissioning and maintenance

When does the filter element have to be replaced or cleaned?

As soon as the dynamic pressure or the pressure differential set at the maintenance indicator is reached, the red button of the optical, mechanical maintenance indicator pops out. If there is an electronic maintenance indicator, an electric signal output is also provided. In this case, the filter element must be replaced or cleaned.

Filter elements should be replaced or cleaned after a max. 6 months.

Notice!

If the maintenance indicator signal is disregarded, the increasing pressure differential may damage the filter element causing it to collapse.

Filter element exchange

- ▶ For single filters:
Switch off the system and discharge the filter on the pressure side.
- ▶ For installed duplex switch filters:
Refer to the relevant maintenance instructions according to the data sheet.

Warning:

Filters are containers under pressure. Before opening the filter housing, check whether the system pressure in the filter has been decreased to ambient pressure. Only then may the filter housing be opened for maintenance.

Detailed instructions with regard to the exchange of filter elements can be found on the data sheet of the relevant filter series.

Functional and safety warranty only applicable when using genuine spare parts!

Warranty becomes void if the delivered item is changed by the ordering party or third parties or improperly mounted, installed, maintained, repaired, used or exposed to environmental condition that do not comply with the installation conditions.

Directives and standardization

filter elements are tested and quality-monitored according to various ISO test standards:

Filtration performance test (multipass test)	ISO 16889:2008-06
Δp (pressure loss) characteristic curves	ISO 3968:2001-12
Compatibility with hydraulic fluid	ISO 2943:1998-11
Collapse pressure test	ISO 2941:2009-04

The development, manufacture and assembly of industrial filters and filter elements is carried out within the framework of a certified quality management system in accordance with ISO 9001:2000.