Hengst filter materials

RE 51548
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Filter material configurations:

- PWR...: Glass fiber material with three filter-effective layers
- H...XL: Glass fiber material with two filter-effective layers
- H...PZ: Glass fiber material with two filter-effective layers
- P...: Filter paper for lubricating oil and pre-filtration
- VS...: Non-woven material for cooling lubricant applications
- AS...: Aquasorb material (water-adsorbing)
- M...: Non-woven metal fiber for special fluids and high temperatures
- G...: Stainless steel fabric (cleanable filter elements)

Features

- Filter media made of glass fiber material (optionally water adsorbing), filter paper, wire mesh, non-woven material and non-woven metal fiber for various fields of application
- Cleanable wire mesh filter media
- Attainable oil cleanliness up to ISO 10/6/4 (ISO 4406)
- High dirt holding capacity and filtration performance due to multi-layer glass fiber technology and simultaneously a low initial pressure differential
- Extended product range for non-mineral oil based fluids
- Filter elements with high pressure differential stability

Contents

Features	1
Filter design	2
Filter variables	3, 4
PWR... filter media	5
H...XL filter media	6
H...PZ filter media	7
P... filter media	8
VS filter media	9
AS filter media	10, 11
M... filter media	12
G filter media	13, 14
Directives and standardization	15

Filter design

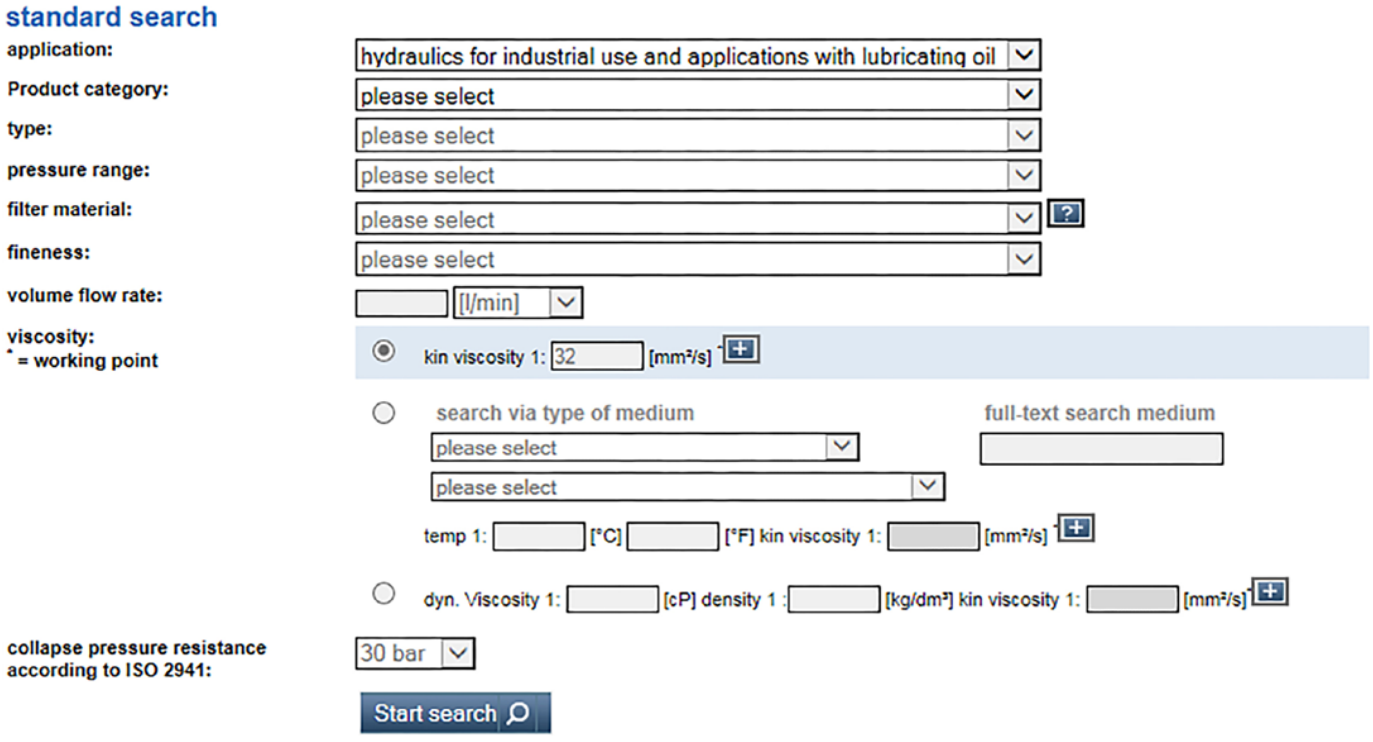
Easy selection of the filter size is made possible by the FilterSelect online tool. The filter can be designed using the operating pressure, flow and fluid system parameters. The required filter rating is based on the application, the sensitivity to contamination of the components and the environmental conditions.

The program leads you through the menu on a step-by-step basis.

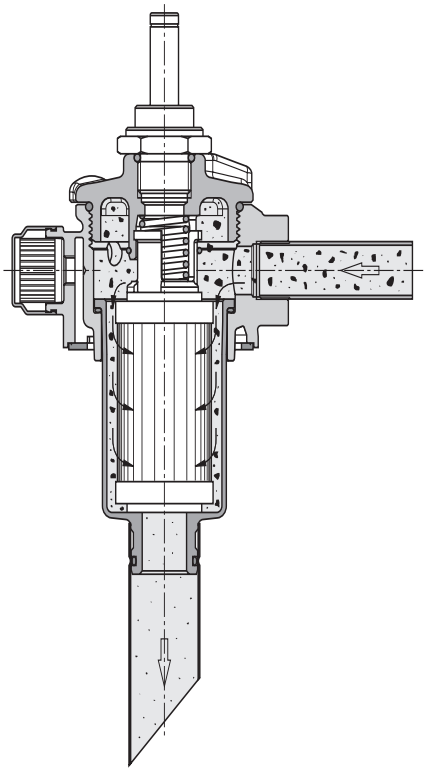
A documentation of the filter selection can finally be created in the form of a PDF file. This file contains the entered parameters, the designed filter with material number including spare parts, and the pressure loss curves.

Link FilterSelect:
http://www.filterselect.de

Other languages can be selected using the page navigation.



Filter variables



Filter rating and attainable fluid cleanliness
The main goal when using industrial filters is not only the direct protection of machine components but to attain the required fluid cleanliness. Fluid cleanliness is defined on the basis of fluid cleanliness classes which classify the particle distribution of existing contamination in the operating liquid.

Filtration performance

Filtration ratio $\beta_{x(c)}$ (β value)
The retention capacity of hydraulic filters is characterized by the filtration ratio $\beta_{x(c)}$. This variable without dimension is therefore the most important performance characteristic of a hydraulic filter. It is measured in the multipass test according to ISO 16889 using test dust according to ISO 12103-1. The filtration ratio $\beta_{x(c)}$ specifies the ratio of the number of particles with the same particle size upstream and downstream of the filter.

Filter rating

It is defined according to DIN 24550 - part 2 by the particle size in which the filtration ratio is $\beta_{x(c)} \geq 200$.

☞ **Notice:**
- The specification of a filtration ratio $\beta_{x(c)}$ exclusively refers to the underlying test procedure according to ISO 16889.
- Measurements in real operating conditions - e.g. by means of online particle counting or analysis of bottle samples - cannot be used as basis for the determination of the filtration ratio $\beta_{x(c)}$ due to numerous possible influences.

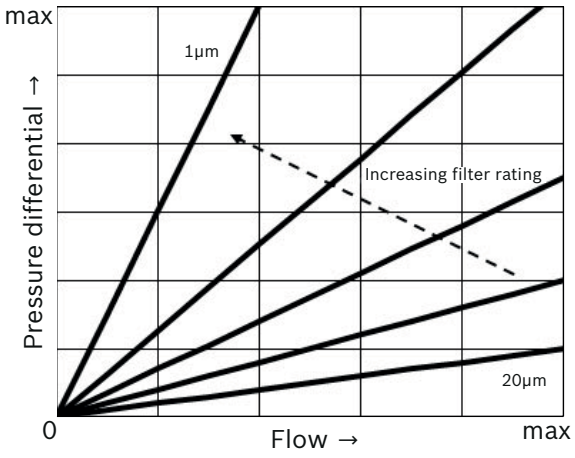
Dirt holding capacity
It is also measured using the multipass test and determines the amount of test dust which is fed to the filter medium until a specified pressure differential increase has been reached.

☞ **Notice:**
- The specified dirt holding capacity exclusively refers to the underlying test procedure according to ISO 16889. Due to numerous possible influences, particularly the different density of different types of contamination, it cannot be transferred to measurements in real operating conditions.

Pressure loss (also pressure differential or delta p)
The pressure loss of the filter element is the relevant characteristic value for the determination of the filter frame size. These are recommended values of the filter manufacturer, specifications by the system manufacturer or the filter user.

This characteristic value is essentially dependent on the filter rating of the filter medium, its geometry and arrangement in the filter element, the filter area, the operating viscosity, the liquid and the flow.

The term "delta p" is often also expressed with the symbol: "Δp". When dimensioning the complete filter, an initial pressure loss is determined which must not be exceeded by the new filter state dependent on the aforementioned conditions. The size design of a Hengst filter on the basis of an initial Δp or pressure loss can be easily done using our online design tool Hengst "FilterSelect" on our homepage.
The adjacent diagram shows the typical pressure loss behavior of filter elements with different filter media at different flows. The lower the filter rating, the higher is the pressure loss.



Filter media

Technical data	**PWR...**
Glass fiber material - filter medium generation 5, PWR... The PWR... material configuration achieves the best cleanliness possible compared to other filter media. It is intended for use with hydraulic fluids, lubricants and industrial liquids and, due to its defined filtration ratio $ß_{x(c)}$, it offers highly effective protection for machines and system components which are sensitive to contamination. An optimized dirt holding capacity in connection with an excellent cleanliness class is achieved by three filter-effective glass fiber filter layers. The stainless steel mesh used on the clean side is also responsible for a high degree of stability of the filter element in case of pulsations. The electrostatic effects common with non-conductive fluids are reduced by a conductive non-woven medium integrated by default. ▶ Electrically conductive non-woven material, by default ▶ Glass fiber material made of inorganic glass fiber material ▶ Defined filtration ratio $ß_{x(c)}$ 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)	
Filter rating and attainable fluid cleanliness The following table provides recommendations for the selection of a filter medium dependent on the application and indicates the average oil cleanliness class attainable according to ISO 4406.	

Fluid cleanliness class ISO 4406	**Recommended filter medium**		**Possible arrangement**	**Hydraulic system**	
10/6/4 - 14/8/6	PWR1	Glass fiber filter medium PWR...	Return flow or pressure filter	--------	Special applications
13/10/8 - 17/13/10	PWR3			--------	Servo valves
15/12/10 - 19/14/11	PWR6			------	High-response valves
17/14/10 - 21/16/13	PWR10			---	Proportional valves
19/16/12 - 22/17/14	PWR20			-	Pumps and valves in general

Filtration ratio $ß_{x(c)}$ of the material configuration measured according to ISO 16889 (multipass test)

Filter medium	**Filtration ratio $ß_{x(c)}$**
PWR1	$ß_{4(c)} \geq 200$ / $ß_{5(c)} \geq 1000$
PWR3	$ß_{5(c)} \geq 200$ / $ß_{6(c)} \geq 1000$
PWR6	$ß_{7(c)} \geq 200$ / $ß_{8(c)} \geq 1000$
PWR10	$ß_{10(c)} \geq 200$ / $ß_{11(c)} \geq 1000$
PWR20	$ß_{20(c)} \geq 200$ / $ß_{21(c)} \geq 1000$

Dirt holding capacity according to ISO 16889

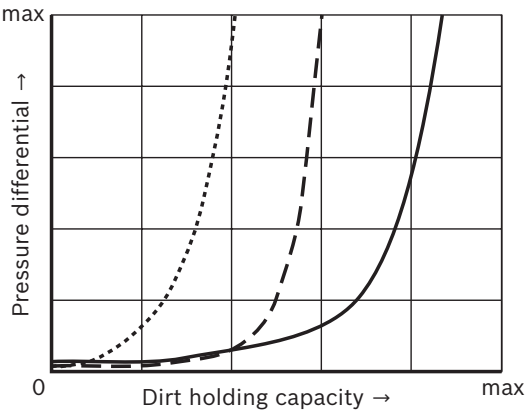
Compared to conventional filter media with single filter-effective glass fiber layer, the PWR... filter medium distinguishes itself by its high dirt holding capacity. PWR... consists of three separate glass fiber filter layers connected in series.

Typical dirt holding capacity characteristic curves for glass fiber filter media

Conventional filter element ------
(Single-layer glass fiber filter medium)

Two-layer filter element – – –
(Hengst combination H...XL)

Hengst PWR... filter element ——
(three-layer glass fiber filter medium with electrically conductive non-woven material)

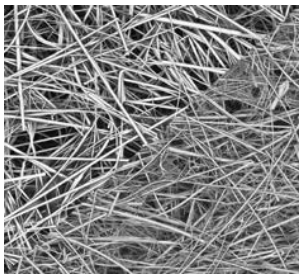


Filter media

Technical data	H...XL

Glass fiber filter medium, H...XL
Unlike the PWR configuration, H...XL has two filter-effective glass fiber filter layers and is intended for use with hydraulic fluids, lubricants and industrial liquids. It offers highly effective protection for machines and system components which are sensitive to contamination.

- H...XL depth filter made of inorganic glass fiber material
- Defined filtration ratio 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)



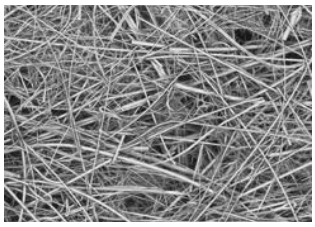
Filter rating and attainable fluid cleanliness
The following table provides recommendations for the selection of a filter medium dependent on the application and indicates the average fluid cleanliness class attainable according to ISO 4406.

Fluid cleanliness class ISO 4406	Recommended filter medium		Possible arrangement	Hydraulic system	
10/6/4 - 14/8/6	H1XL	Glass fiber filter medium H...XL	Return flow or pressure filter	--------	Special applications
13/10/8 - 17/13/10	H3XL			--------	Servo valves
15/12/10 - 19/14/11	H6XL			------	High-response valves
17/14/10 - 21/16/13	H10XL			---	Proportional valves
19/16/12 - 22/17/14	H20XL			-	Pumps and valves in general

Filtration ratio $ß_{x(c)}$ of the material configuration measured according to ISO 16889 (multipass test)

Filter medium	Filtration ratio $ß_{x(c)}$
H1XL	$ß_{4.5(c)} \geq 200$
H3XL	$ß_{5(c)} \geq 200$
H6XL	$ß_{7(c)} \geq 200$
H10XL	$ß_{10(c)} \geq 200$
H20XL	$ß_{20(c)} \geq 200$

Filter media

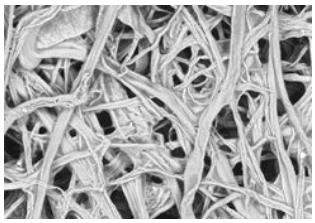
Technical data	**H...PZ**
Glass fiber - filter medium, H...PZ H...PZ contains a single filter-effective glass fiber filter layer and is intended for use in sandwich plate filters for the filtration of hydraulic fluids. Due to its defined filtration ratio (ISO 16889), it offers effective protection for machines and system components which are sensitive to contamination. ▶ Depth filter made of inorganic glass fiber material ▶ Defined filtration ratio according to ISO 16889 ▶ Non-reusable filter (not cleanable due to the depth filtration effect)	
Filter rating and attainable fluid cleanliness The following table provides recommendations for the selection of a filter medium dependent on the application and indicates the average fluid cleanliness class attainable according to ISO 4406.	

Fluid cleanliness class ISO 4406	**Recommended filter medium**		**Use**	**Hydraulic system**		
13/10/8 - 17/13/10	H3PZ	Glass fiber filter medium H...PZ	Sandwich plate filters 320PZ...		----------	Vertical stacking (sandwich plate assembly)
15/12/10 - 19/14/11	H6PZ					
17/14/10 - 21/16/13	H10PZ					
19/16/12 - 22/17/14	H20PZ					

Filtration ratio $ß_{x(c)}$ of the material configuration measured according to ISO 16889 (multipass test)

Filter medium	**Filtration ratio $ß_{x(c)}$**
H3PZ	$ß_{5(c)} \geq 200$
H6PZ	$ß_{7(c)} \geq 200$
H10PZ	$ß_{10(c)} \geq 200$
H20PZ	$ß_{20(c)} \geq 200$

Filter media

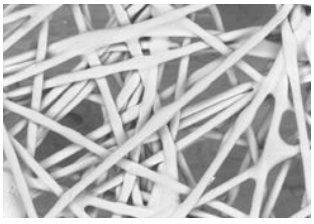
Technical data	P...
Filter paper, P... Filter paper P... is intended for the use with lubricating oil and for pre-filtration. It has a so-called nominal, manufacturer-specific defined filtration ratio (ISO 16889) with the following features. ▶ Depth filter made of cellulose fibers ▶ Special impregnation to reduce the risk of swelling caused by humidity ▶ Design: single-, two- or three-layer filter media set-up ▶ Non-reusable filter (not cleanable due to the depth filtration effect)	
Filter rating and attainable fluid cleanliness The following table provides recommendations for the selection of a filter medium dependent on the application and indicates the average fluid cleanliness class attainable according to ISO 4406.	

Fluid cleanliness class ISO 4406	Recommended filter medium		Possible arrangement	Hydraulic system		
20/19/14 - 22/20/15	P10	Paper P...	Return flow or pressure filter		--------	For existing systems
21/20/15 - 22/21/16	P25					

Filter medium	Nominal filter rating	Filtration ratio β values [1]	Retention rate with 10 µm [1]
P10	10 µm	$\beta_{10(c)} > 2.0$	50%
P25	25 µm	$\beta_{10(c)} > 1.25$	20%

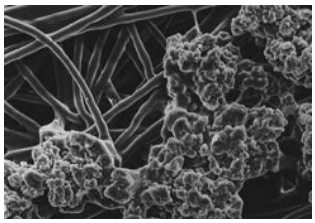
[1] according to ISO 16889

Filter media

Technical data	VS...
Non-woven material, VS... The non-woven material VS... filter medium is intended for use with cooling lubricants, water and water-based media. It can moreover be used for the filtration of emulsions or for general pre-filtration. ▶ Depth filter material made of bi-component fibers (plastic fibers with different melting temperatures) ▶ Free of binding agents and heat-set (the fiber shell is connected to other fibers at the knots due to the low melting temperature) ▶ High resistance and tensile strength ▶ Pleated design: single or two-layer design ▶ Supporting mesh: epoxy-coated or stainless steel wire mesh ▶ Non-reusable filter (not cleanable due to the depth filtration effect)	

Filter medium	Nominal filter rating
VS 25	25 µm

Filter media

Technical data	AS...
Water-adsorbing filter media, AS... AS ... **Aquasorb** filter elements adsorb free water from hydraulic fluids and lubricating oils as well as in air for breathing filters. Even low water concentrations over the saturation point of the oil may accelerate oil aging due to oxidation. This leads to increased corrosion and wear. Additionally, specific oil additives may lead to change or settling in form of solid, slimy substances causing early clogging of the pores of the used filters. Its combination with glass fiber filter media additionally ensures highly efficient separation of contamination. ▶ Absolute filtration ISO 16889 ▶ Surface filter made of water-adsorbing non-woven filter medium ▶ Combined with glass fiber material ▶ Non-reusable filter (not cleanable due to the depth filtration effect) ▶ Pleated design: multi-layer design	
Filter rating and attainable fluid cleanliness The following table provides recommendations for the selection of a filter medium dependent on the application and indicates the average fluid cleanliness class attainable according to ISO 4406.	

Fluid cleanliness class ISO 4406	Recommended filter medium		Possible arrangement	Hydraulic system	
13/10/8 - 17/13/10	AS3	Aquasorb AS...	Return flow, bypass or breathing filter	--------	Servo valves
15/12/10 - 19/14/11	AS6			------	High-response valves
17/14/10 - 21/16/13	AS10			---	Proportional valves
19/16/12 - 22/17/14	AS20			-	Pumps and valves in general

Filtration ratio $ß_{x(c)}$ of the material configuration measured according to ISO 16889 (multipass test)

Filter medium	Filtration ratio $ß_{x(c)}$
AS3	$ß_{5(c)} \geq 200$
AS6	$ß_{7(c)} \geq 200$
AS10	$ß_{10(c)} \geq 200$
AS20	$ß_{20(c)} \geq 200$

Functional principle

Like Hengst industrial filter elements, Hengst Aquasorb filter elements are pleated, however, they include a layer of non-woven material with a water-binding material in the form of a fine granulate. Behind this non-woven material, the respective glass fiber filter medium is installed in the filter element mat depending on the filter rating.

Effectiveness

The water content (free water) can be reduced to the saturation point of the hydraulic fluid. The efficiency and water adsorption depend on the filter area load, oil viscosity and oil temperature. The following values refer to the water adsorption and change at higher viscosity.

Design and area of application

Hengst Aquasorb filter elements are to be dimensioned in such a way that an initial pressure loss of 0.2 bar *[2.9 psi]* is not exceeded. They are to be preferably used as bypass filters in a low-pressure range < 5 bar *[72.5 psi]*.
The filter element needs to be changed at a maximum pressure differential of 2.2 bar *[31.9 psi]*.
Hengst Aquasorb can only be used in HLP and HEES.

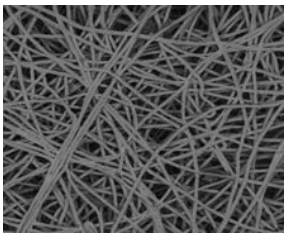
Filter media

Technical data	**AS...**

Type	Rated flow in l/min *[US gpm]*	Calculative water adsorption for selected filter elements			
		at 15 cst in ml	at 30 cst in ml	at 46 cst in ml	at 120 cst in ml
1.0040	5 *[1.33]*	60	40	35	20
1.0063	8 *[2.21]*	100	70	55	35
1.0100	14 *[3.57]*	160	110	90	60
1.0130	19 *[5.01]*	225	155	130	85
1.0150	30 *[8.03]*	360	250	210	135
1.0160	20 *[5.25]*	265	185	155	100
1.0250	32 *[8.57]*	435	305	255	165
1.0400	40 *[10.57]*	785	550	455	300
1.0630	66 *[17.32]*	1290	900	750	490
1.1000	97 *[25.67]*	1435	1005	830	545
1.2000	189 *[49.85]*	2785	1950	1615	1055
1.2500	197 *[51.94]*	3650	2555	2115	1385

Type	Rated flow in l/min *[US gpm]*	Calculative water adsorption for selected filter elements			
		at 15 cst in ml	at 30 cst in ml	at 46 cst in ml	at 120 cst in ml
2.0040	3 *[0.74]*	35	25	20	15
2.0063	5 *[1.25]*	55	40	30	20
2.0100	8 *[2.01]*	90	65	50	35
2.0130	9 *[2.48]*	110	75	65	40
2.0150	12 *[3.24]*	145	105	85	55
2.0160	17 *[4.50]*	200	140	115	75
2.0250	28 *[7.27]*	325	225	190	125
2.0400	45 *[11.90]*	525	370	305	200
2.0630	46 *[12.17]*	715	500	415	270
2.1000	73 *[19.40]*	835	585	485	315
2.0058	105 *[27.7]*	1545	1080	895	585
2.0059	121 *[32.05]*	1790	1250	1035	680

Filter media

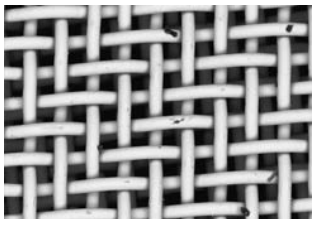
Technical data	M...
Non-woven metal fiber filter media, M... Non-woven metal fibers are intended for use with special fluids at high operating temperatures up to 160°C and to attain high fluid cleanliness classes. They offer effective protection for machine parts which are sensitive to contamination, thanks to their defined filtration ratio (ISO 16889). As this material consists of stable, and meshed and bound stainless steel fibers, it is classified as depth filter medium and as not cleanable. ▶ Defined filtration ratio (measurement according to ISO 16889) ▶ Depth filter made of stainless steel fibers ▶ Non-reusable filter ▶ Pleated design: two or three-layer design ▶ Supporting mesh: Epoxy or stainless steel wire mesh	
Filter rating and attainable fluid cleanliness The following table provides recommendations for the selection of a filter medium dependent on the application and indicates the average fluid cleanliness class attainable according to ISO 4406.	

Fluid cleanliness class ISO 4406	Recommended filter medium		Possible arrangement	Hydraulic system		
16/13/10 - 20/15/11	M5	Non-woven metal fiber M...	Return flow or pressure filter		--------	Filter material for special applications
18/14/10 - 21/17/13	M10					

Filter medium	Particle size for filtration ratio > 75 [1]
M5	5 µm
M10	10 µm

[1] according to ISO 16889

Filter media

Technical data	**G...**
Stainless steel wire mesh, G... There is a comprehensive field of applications for wire mesh filter media. Apart from the filtration of lubricating oils, hydraulic fluids, cooling liquids and liquids similar to water, filter elements made of wire mesh are also suitable for use as coarse and pre-filters. The filter rating of wire mesh is specified by its mesh size. The specification of a filtration ratio according to ISO 16889 is not possible due to the test dust used. When selecting wire mesh, it must be observed that they are surface filters with a 2-dimensional structure. That means that downstream of the filter, there may be particles the length of which is larger than the specified mesh size. For this reason, the mesh size of the filter media made of stainless steel wire mesh is referred to as nominal. **Wire mesh G10 ... G40** As surface filters, these filter media 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 ... G800** Due to their coarser mesh size, cleaning of these filter media is easier. ▶ Surface filters made of corrosion-resistant stainless steel-wire mesh ▶ Reusable, cleanable ▶ Pleated design: single, two or three-layer design	
Filter rating and attainable fluid cleanliness The following table provides recommendations for the selection of a filter medium dependent on the application and indicates the average fluid cleanliness class attainable according to ISO 4406.	

Fluid cleanliness class ISO 4406	**Recommended filter medium**		**Possible arrangement**	**Fluid system**		
20/18/13 - 21/20/15	G10	Stainless steel wire mesh, G...	Return flow, pressure filters or suction filters		--------	For existing systems (hydraulics) and as protective filter (G10, G25) For fluids such as: ▶ Lubricants ▶ Water filter ▶ Machine oils
Cannot be used for wire mesh > 10 µm	G25...G800					

Filter medium	**Design**	**Mesh size**
G10	Special Dutch weave	10 µm nominal
G25	Woven roving	25 µm nominal
G40		40 µm nominal
G60 ... G800	Plain cloth	60 ... 800 µm nominal

Filter media

Technical data	G...

Cleaning of filter elements made of stainless steel wire mesh

Cleaning or replacement
Before cleaning a filter element with the stainless steel wire mesh filter medium, it must be checked after dismantling of the filter element whether it makes sense to clean the element. For example, if the stainless steel wire mesh contains many fibrous substances and consists of a material with a nominal mesh size 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 filter mesh, the thinner the wire. Therefore, especially fine mesh must be cleaned gently to protect the material. Cracks in the folds of the stainless steel wire mesh are to be avoided. Otherwise, the filtering 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 cleaned more than ten times. Reusability, however, very much depends on the type of contamination as well as on pressurisation (final Δp before dismantling the filter element). For maximum reusability, we therefore recommend exchanging especially the fine mesh 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... filter elements

Procedure	Wire mesh G10, G25, G40	Wire mesh G60 ... G800
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 damage.	
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... filter elements

Procedure	Wire mesh G10, G25, G40, G60 ... G800
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.

Directives and standardization

Product validation

Hengst filter elements are tested and quality-monitored according to different 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
Fluid Technology; Hydraulic Filter – Part 2; Assessment Criteria and Requirements	DIN 24550-2:2006-09
Hydraulic fluid power - Fluids - Method for coding the level of contamination by solid particles	ISO 4406:2021-01

The development, manufacture and assembly of Hengst industrial filters and Hengst filter elements is carried out within the framework of a certified quality management system in accordance with ISO 9001:2015.

Notes

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