# Filter Elements

## Filter Media

H...XL (Non-cleanable)
Multi-layered glass-fibre with protective nonwovens and epoxy support mesh.
Filtration: 1,3,6,10,16,20 µm, Absolute, acc to ISO 16889.
Use: For highest cleanliness requirements of hydraulic fluids and lubricants for stationary & mobile hydraulics.

H...XP (Non-cleanable)
Improved glass-fibre with protective nonwovens, plastic support mesh and outer sleeve.
Enhanced dirt holding, long life.
Filtration: 3,5,10,15,20 µm, Absolute acc to ISO 16889.
Use: For highest cleanliness requirements of hydraulic fluids and lubricants for stationary & mobile hydraulics.

H...XE (Non-cleanable)
Improved glass-fibre with protective nonwovens and epoxy support mesh.
Enhanced dirt holding, long life.
Filtration: 3,5,10,15,20 µm. Absolute acc to ISO 16889.
Use: For highest cleanliness requirements of hydraulic fluids and lubricants for stationary & mobile hydraulics.

H...XC (Non-cleanable)
Multi-layered glass-fibre with electrically conductive nonwoven and epoxy support mesh.
Enhanced dirt holding, long life.
Filtration: 3,5,10,15,20 µm. Absolute acc to ISO 16889.
Use: For static-free and highest cleanliness requirements of systems with non-conductive hydraulic fluids.

G... (Cleanable)
Stainless steel wire mesh underlaid with SS support mesh.
Filtration: 10 to 1500 µm, Nominal, surface filtration.
Use: For protective, and pre-filtration.

P... (Non-cleanable)
Paper, cellulose fibre, cost-effective with epoxy mesh.
Filtration: 5,10,25 µm, Nominal, depth filtration.
Use: For coarse and preliminary filtration.

VS... (Non-cleanable)
Surface filter of extremely solid reinforced non-woven media made of polyethylene-wrapped polypropylene fibre with epoxy support mesh.
Filtration: 10,25,40,60 µm, Nominal, depth filtration.
Use: Pre-filtration, cooling lubricants, hydraulic fluids, water & water-based fluids.

AS... (Non-cleanable)
Nonwoven media with water-absorbent material combined with glass fibre media and epoxy support mesh.
Filtration: 1,3,6,10,20 µm. Absolute acc to ISO 16889.
Use: Dehydration of hydraulics, lubricants & air breathers.

M... (Cleanable)
Stainless steel fibre underlaid with SS support mesh.
Low dirt retention, depth filtration.
Filtration: 5,10,15 µm, Absolute acc to ISO 16889.
Use: For highest cleanliness requirements with aggressive industrial and chemical liquids, hydraulic fluids.

## Application

Filtration of hydraulic fluids, lubricants, industrial liquids and gases.
Filter media for all applications.
Elements for installation in EPE filter housings.
... others on request.

## Specifications

Filtration grade : 1-1500 µm
Filtration area : 10cm$^2$ to 6.2m$^2$ and higher.
[1.55 sq.in to 66.75 sq.ft and higher].

## Construction

Special star pleated filter media that is mounted on a perforated support tube. Coreless design also available.
Glued with a 2-component adhesive in a longitudinal direction and with metal / plastic end-caps.
Sealed with O-ring or profile seal.

## Features

Glass Fibre, Paper, Wire Mesh & Non-Woven Media.
Water-absorbing media.
Achievable oil cleanliness: upto ISO 12/8/3 (ISO 4406).
Superior dirt holding capacity.
Filtration ratio βx = 1000.
Cleanable & non-cleanable filter media.

Technical specifications subject to change.

# Filter Elements Types

Figure 1
**1.** Series

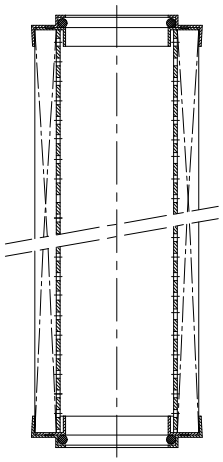


Figure 2
**1.** Series

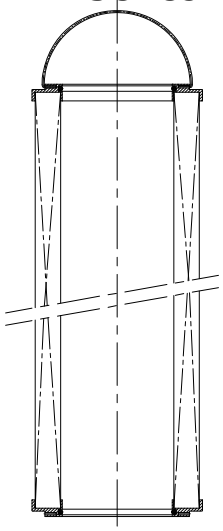


Figure 3
**1.** Series

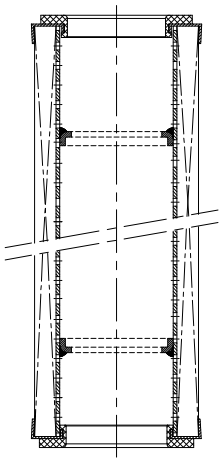


Figure 4
**1.** Series

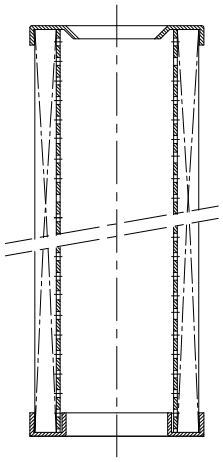


Figure 5
**1.** Series

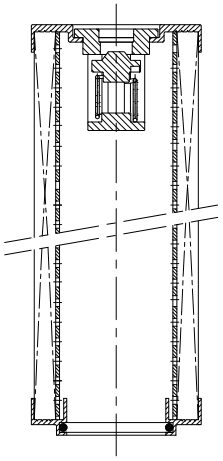


Figure 6
**1.** Series

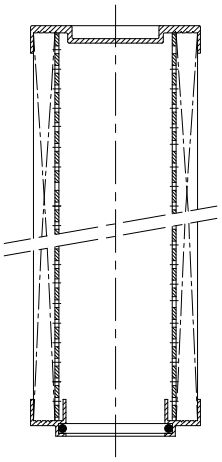


Figure 7
**2.** Series

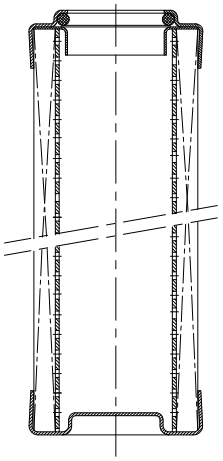


Figure 8
**2.** Series

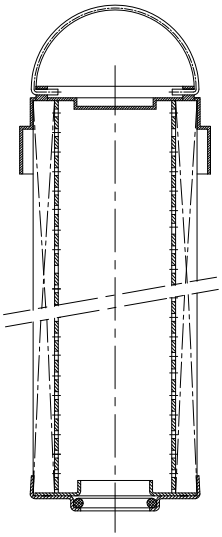


Figure 9
**3.** Series

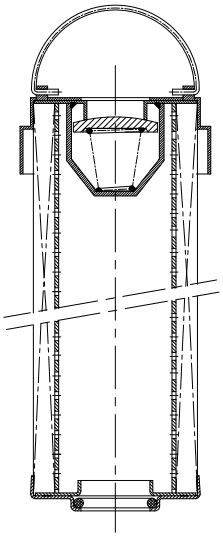
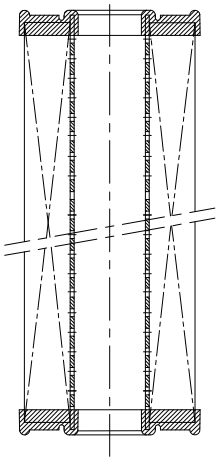


Figure 10
**7.** Series



# Ordering Code

| 1 | 2 | 3 | 4 | 5a | 5b | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| **1** | **.** | **0013** | **-** | **H10XL** | **-** | **A** | **-** | **0 P** | **-** | **0** | **-** | **P** | **-** | **-** | **/** | |

| | | | | | |
|---|---|---|---|---|---|
| 1 | **Element Series** | **Figure** | Both sides open<br>One side open<br>One side open - with Bypass<br>Both sides open - PU End caps | **= 1**<br>**= 2**<br>**= 3**<br>**= 7** | |
| 2 | **Nominal Size**<br>For designs refer Figures on page 2 | **1** | Both sides open - O-Ring sealing | **1.** Series | **0005 0008 0013 0015 0018 0020 0030 0045 0060 0095 0120 0145 0200 0270 0297** |
| | | **2** | Both open - Coreless + O-Ring sealing | **1.** Series | **0020C 0030C 0045C 0060C 0095C 0120C 0145C 0200C 0270C** |
| | | **1** | Both sides open - O-Ring sealing (DIN-24550 series) | **1.** Series | **0040 0063 0100 0160 0250 0400 0630 1000** |
| | | **5** | One open + O-Ring sealing + Bypass (Design : Bypass in Element) | **1.** Series | **0005B 0008B 0013B 0015B 0018B** |
| | | **6** | One open + O-Ring sealing + W/o Bypass (Design : Bypass in Element) | **1.** Series | **0005N 0008N 0013N 0015N 0018N** |
| | | **4** | Both sides open without seal | **1.** Series | **10 18 32 56 90 140 225 225/360 225/450** |
| | | **3** | Both sides open - flat washer sealing | **1.** Series | **360 560 900 1400 1800** |
| | | **1** | Both sides open - O-Ring sealing | **1.** Series | **361 451 561 901 1401 1801** |
| | | **7** | One side open - O-Ring sealing | **2.** Series | **0004 0005 0008 0013 0015 0018 0020 0030 0045 0095 0145** |
| | | **7** | One side open - O-Ring sealing (DIN-24550 series) | **2.** Series | **0040 0063 0100 0160 0250 0400 0630 1000** |
| | | **7** | One side open - O-Ring sealing | **2.** Series | **10 18 32 56 90 140 225 360 460 560 900** |
| | | **8** | One open - Without Bypass (FRE-0003) | **2.** Series | **0003** |
| | | **9** | One open - With Bypass (FRE-0003) | **3.** | **0003** |
| | | **10** | Both sides open - PU sealing (Breather elements) | **7.** | **001 002 004 006 007** |

* Before ordering, check for availability.

# Ordering Code

| 1 | 2 | 3 | 4 | 5a | 5b | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| **1** | **.** | **0013** | **-** | **H10XL** | **-** | **A** | **-** | **0 P** | **-** | **0** | **-** | **P** | **-** | **-** | **/** | |

| | | | |
|---|---|---|---|
| 3 | **Filtering Media & Filtration Grade** | Nominal Filtration Grade | |
| | | SS Wire Mesh \| Cleanable with additional epoxy layer upstream for 10/25/40µm | **= G10 G25 G40 G60 G80 G100** Others on request |
| | | Paper \| Non-cleanable with epoxy mesh | **= P5 P10 P25** |
| | | Non-Woven \| Non-cleanable with epoxy mesh | **= VS10 VS25 VS40 VS60** |
| | | Absolute Filtration Grade (ISO16889) | |
| | | Glass Fibre \| Non-cleanable with epoxy mesh | **= H1XL H3XL H6XL H10XL H16XL H20XL** |
| | | Long Life Glass Fibre \| Non-cleanable with plastic mesh & outer sleeve | **= H3XP H5XP H10XP H15XP H20XP** |
| | | Long Life Glass Fibre \| Non-cleanable with epoxy mesh | **= H3XE H5XE H10XE H15XE H20XE** |
| | | Glass Fibre - Electrically Conductive Non-cleanable with epoxy mesh | **= H3XC H5XC H10XC H15XC H20XC** |
| | | Glass Fibre - Water Absorbing Non-cleanable with epoxy mesh | **= AS1 AS3 AS6 AS10 AS20** |
| | | SS Fibre \| Cleanable with SS mesh | **= M5 M10 M15** |
| 4 | **Differential Pressure of Element** | Maximum allowed differential pressure | |
| | | 15 bar [217 psid] (for 1.0145/0200 /0270/0297/1000) | **= 0** (standard) |
| | | 30 bar [435 psid] | **= A** (standard) |
| | | 60 bar [870 psid] | **= D** |
| | | 160 bar [2321 psid] | **= C** |
| | | 330 bar [4785 psid] | **= B** |
| | | (Breather Elements) Standard | **= S** (standard) |
| 5a | **Element Adhesive** | Standard Adhesive T=100°C [212°F] | **= 0** (standard) |
| | | Epoxy Adhesive (for fuels) | **= 1** |
| | | High Temp. Adhesive T=160°C [320°F] | **= E** |
| 5b | **Element Hardware (End Caps + Inner Tube)** | Carbon Steel + Carbon Steel | **= C** (standard) |
| | | Polyamide + Carbon Steel | **= P** (standard) |
| | | PU + Carbon Steel | **= U** (standard - 7. Series) |
| | | Stainless Steel + Stainless Steel | **= X** |
| | | Nickel Coated CS + Nickel Coated CS | **= D** |
| | | Carbon Steel + Stainless Steel | **= M** |
| 6 | **Bypass Valve** | Without | **= 0** (standard) |
| | | (fig.5 & 9/pg.2) With 3.5 bar [50.7 psid] | **= 7** (standard) |
| 7 | **Seal Material** | (fig.4 & 10 / pg.2) Without | **= 0** (standard) |
| | | Nitrile | **= P** (standard) |
| | | Viton | **= V** |
| | | EPDM | **= E** |
| | | Neoprene | **= N** |
| 8 | **Other Options** (multiple options possible) | Without | = - (standard) |
| | | With handle | **= H** |
| | | Special | = **Sp** |

* Before ordering, check for availability.

## Filtration grade / achievable oil cleanliness code

Besides the direct protection of machine components, the most important target when using an industrial filter is to achieve a given oil cleanliness. This is defined by oil cleanliness codes which classify the particle size distribution of the existing contamination.

The table on the right side contains recommendations for filter media selection dependent on application and shows typical reachable oil cleanliness codes per ISO 4406 or NAS 1638.

| Use | Required oil cleanliness in accordance with ISO 4406(NAS 1638) | Recommended Filter Media/ Filtration grade |
|---|---|---|
| System with extreme dirt sensitive parts & very high usage. Filling servo installations | ≤ 16/12/9 (3) | H1XL/1 µm |
| System with dirt sensitive parts & very high usage. Servo valve systems. | ≤ 18/13/10 (5) | H3XL/3 µm |
| Systems with proportional valves & pressure>160 bar | ≤ 19/14/11 (6) | H6XL/6 µm |
| Modern industrial hydraulic directional valves | ≤ 20/16/13 (8) | H10XL/10 µm |
| Industrial hydraulic with large tolerances & low dirt sensitivity. | ≤ 21/17/14 (10) | H20XL/20 µm |

## Filter performance

### Filtration ratio $\beta_x$

The filtration ratio $\beta_x$ represents the most important filter efficiency characteristic for a hydraulic filter. As an average value during initial and final test Δp it is measured by the multi pass test method according to ISO 16889, using ISOMTD test dust contaminant. It is defined as the ratio of particles upstream divided by the particles downstream larger than size of interest.

### Dirt holding capacity

This is also measured using the Multipass test and gives the amount of ISOMTD test dust that the filter media can retain until a definite increase in pressure is reached.

In comparison to the conventional filter material, the EPE glass fibre media displays superior dirt holding capacity, due to its superior media.

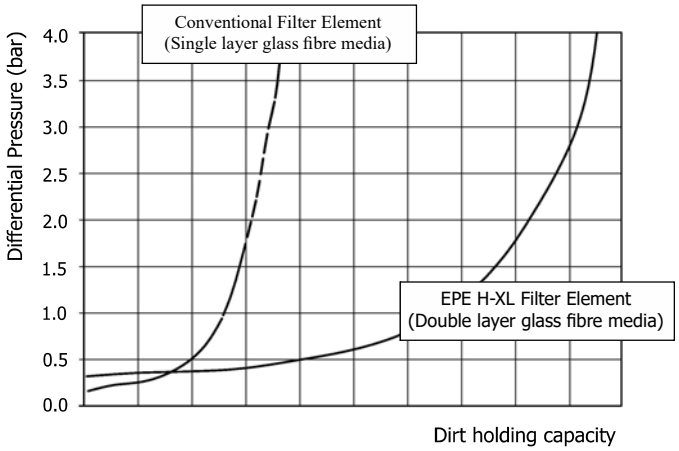
### Filter Element Test

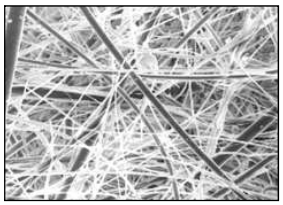
EPE Filter elements are tested at our own test benches in accordance with various ISO test standards.

Typical β values up to 4 bar Δ-p filter element

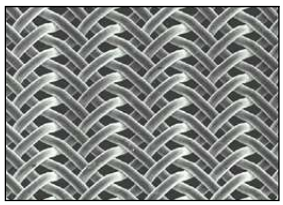
| Filter media | Particle size "x" for various β-ratios measured according to ISO 16889 | | |
|---|---|---|---|
| | βx = 75 | βx = 200 | βx = 1000 |
| H1XL | < 4.0µm(c) | < 4.0µm(c) | < 4.0µm(c) |
| H3XL | 4.0µm(c) | < 4.5µm(c) | 5.0µm(c) |
| H6XL | 4.8µm(c) | 5.5µm(c) | 7.5µm(c) |
| H10XL | 6.5µm(c) | 7.5µm(c) | 9.5µm(c) |
| H16XL | 13.5µm(c) | 16.0µm(c) | 19.5µm(c) |
| H20XL | 18.5µm(c) | 20.0µm(c) | 22.0µm(c) |

Superior dirt holding capacity of H-XL Filter Elements

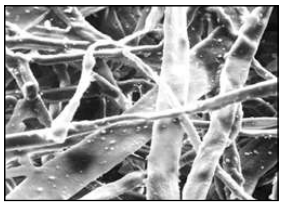


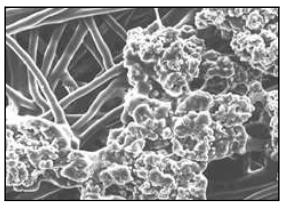
H...XL / H..XP (Glass Fibre)
1µm to 20µm



G... (Wire Mesh)
10µm to 1500µm



P... (Filter Paper)
5µm to 25µm



AS... (Water-absorbent)
1µm to 20µm

# Aquasorb - AS... Water-absorbing Elements

EPE Aquasorb filter elements are used to remove water from hydraulic and lubricating oil, as well as to dehumidify air.
Water, even when present in only small amounts above the adsorption level of oil, can accelerate the aging of the oil through oxidation.
Increased corrosion and a higher level of wear are the result. Water can also cause change of the condition of certain oil additives, and also produce precipitation in the form of solid, slimy substances that can prematurely block the pores of the filter in use.

## Operational Aspects

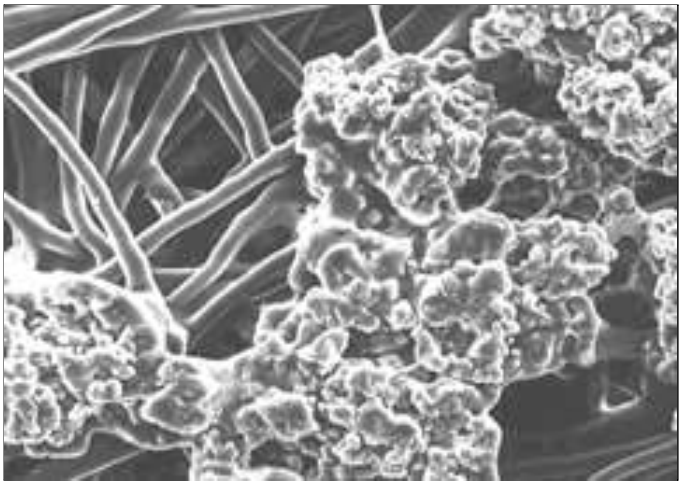
EPE Aquasorb filter elements, like the EPE industrial filter elements, have a pleated design, but also have a non woven media type layer covered with a water-adsorbing substance in form of granulates.
Depending upon filtration grade, the corresponding glass fibre filter media (1 µm - 20 µm) is fitted behind the nonwoven media.

## Effectiveness

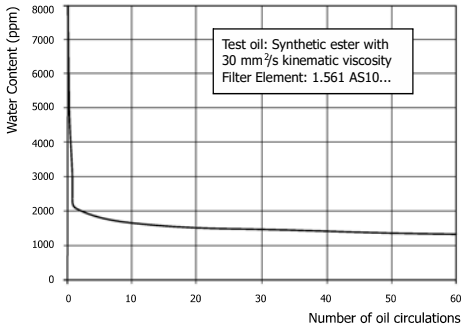
The effectiveness of the EPE Aquasorb elements has been proven in internal tests and in scientific experiments verified by an independent organisation.
The water content (free water) can be reduced to approximately the saturation level of the oil.
The effectiveness and the water adsorption are dependent on the surface pressure of the filter, the oil viscosity and the oil temperature.
The values of water adsorption and changes due to increased viscosity are shown opposite.

## Concept and Scope

EPE Aquasorb elements are to be so selected that drop of pressure at beginning does not exceed 0.2 bar [2.9 psid]. They are used preferably as by-pass filters in the low pressure < 5 bar [72.5 psi]. The filter element is to be changed when a differential pressure of 1.5 bar [21.7 psid] is reached.



Reduction of water content of hydraulic oil using AS elements



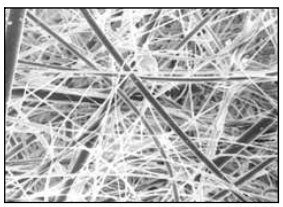

Typical water adsorption with a selection of EPE filter elements

| Filter Element | Nominal Flow[1)] (l/min) | Water Absorption[2)] (ml) |
|---|---|---|
| 1.561 | 37 | 476 |
| 1.1801 | 112 | 1428 |
| 1.0060 | 40 | 511 |
| 1.0270 | 267 | 3454 |
| 2.225 | 8 | 104 |
| 2.0045 | 28 | 365 |

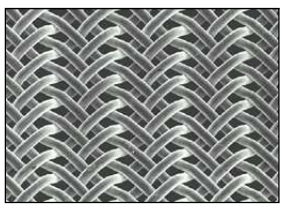
Water adsorption in relation to oil viscosity

| Oil Viscosity (mm2/s ) | 15[3)] | 30 | 46 | 120 |
|---|---|---|---|---|
| Water Absorption | 100% (= reference mark) | 70% | 58% | 38% |

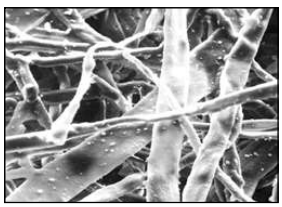
[1)] = Maximum recommended flow rate
[2)] = Water adsorption of free, undissolved water at 15 mm2/s and the indicated norminal flow rate
[3)] = Reference viscosity



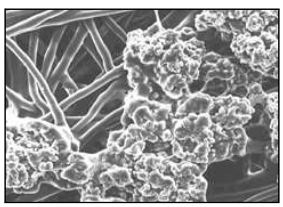
H...XL / H..XP (Glass Fibre)
1µm to 20µm



G... (Wire Mesh)
10µm to 1500µm



P... (Filter Paper)
5µm to 25µm



AS... (Water-absorbent)
1µm to 20µm

# Cleaning of G... & M... type Filter Elements

## Which filter elements are cleanable?

Before cleaning first check whether the filter element in use is re-usable (cleanable) or a disposable filter element.
EPE filter elements with the following materials are cleanable:

### Wire Mesh G10 - G40
As this material is a surface filter it is generally cleanable.
Cleaning is however time consuming, due to the fine mesh, when compared to coarse filter material.
Cleaning can be carried out in accordance with the instructions opposite.

### Wire Mesh G50 - G1500
This typical surface filter material can be readily cleaned.
Cleaning can be carried out in accordance with the instructions opposite.

### Metal Fibre M5, M10, M150
As this material is composed of stable stainless steel fibres that are closely woven and integrated together, it is classified as cleanable.
Cleaning if this material is difficult due to it's depth filtration and should be supported by an ultrasonic bath.

## Cleaning or Replacing?

Before a G-element can be cleaned, one must remove the filter element and check to see whether cleaning makes sense.
Does the fabric contain, for example, a good deal of fibrous substances with a material finer than G 40, an effective and complete cleaning is often no longer possible.
Wire mesh which has been recognizably damaged through too-frequent cleaning must be replaced.

Generally it is valid to say: The finer the mesh, the thinner the wire.
Therefore it is necessary, particularly with fine mesh, that a cleaning method must be chosen that is gentle to the materials.

Please make sure that the wire mesh and the metal fibre are not torn, otherwise you won't have sufficient filtration effect.

## Frequency of Cleaning
Experience shows that filter elements with G10, G25, G40 as well as M5 and M10 can be cleaned upto a maximum of ten times. Wire mesh > 50 µm can usually be used more than ten times. Repeated use is, however, heavily dependent on the amount and type of contamination as well as the pressure level (End-Δp before removing the filter element). To obtain maximum re-use, we recommend changing fine mesh when an End-Δp of 2.5 bar [36.2 psid] is reached. The values quoted are for obvious reasons only recommended values for which there is no guarantee.

Manual and simple cleaning methods for G-Elements

| **Method** | **Wire mesh G10, G25, G40<br>Metal fibre M5, M10, M15** |
|---|---|
| Pre-cleaning chemically | Allow the filter element to dry-out for approximately 1 hour.<br>Afterwards wash with solvent. |
| Pre-cleaning mechanically | Free from large direct particles with a soft brush. To prevent damage to the high quality filter material, do not use hard or sharp objects. |
| Main cleaning Mechanically/ chemically | Place the pre-cleaned element in a ultrasonic bath with special solvent.<br>Continue ultrasonic cleaning until contamination has disappeared. |
| Inspection | Visually check condition of material for intactness. Replace filter element when obviously damaged. |
| Preservation | After drying the cleaned element spray with conservation fluid and place in dust-proof plastic cover. |

| **Method** | **Wire Mesh G50 - G1500** |
|---|---|
| Pre-cleaning chemically | Allow the filter element to dry-out for approximately 1 hour.<br>Afterwards wash with solvent. |
| Pre-cleaning mechanically | Free from large dirt particles with a soft brush. To prevent damage to the high quality filter material, do not use hard or sharp objects. |
| Main cleaning mechanically/ chemically | Steam-out with hot wash solution (water with corrosion prevention fluid). |
| Inspection | Visually check condition of material for intactness. Replace filter element when obviously damaged. |
| Preservation | After drying the cleaned element, spray with conservation fluid and place In dust-proof plastic cover. |

Automatic Cleaning

| **Method** | **Wire mesh G10, G25, G40, G50-1500<br>Metal fibre M5, M10, M15** |
|---|---|
| Pre-cleaning Chemically | As detailed above. |
| Main cleaning mechanically/ chemically | With special cleaning equipment for filter elements. These usually involve a fully automatic and combined cleaning, including ultrasonic, mechanical and chemical cleaning. The best possible results are obtained through a gentle cleaning. |

# Test Laboratory

## Filter Element Tests - in accordance with the following standards.

| | |
|---|---|
| Production Quality (Bubble Point Test) | ISO 2942 |
| Filter Performance Test (Multipass Test) | ISO 16889 |
| ΔP (Pressure Loss) Characteristic Curves | ISO 3968 |
| Compatibility with Hydraulic Fluid | ISO 2943 |
| Collapse Pressure Test | ISO 2941 |
| Flow Fatigue Test | ISO 3724 |

## Oil Analysis - in accordance with the following standards.

| | |
|---|---|
| Gravimetric Analysis | ISO 4405 |
| Cleanliness of Oil / Particle Distribution | ISO 4406 |
| Component Cleanliness | ISO 16232 |
| Cleanliness of Oil / Particle Distribution | NAS 1638 |
| Cleanliness of Oil / Particle Distribution | SAE AS 4059 |