High efficiency filter elements for hydraulic and lubrication oils
Proven solutions for long element life and consistent performance

Eaton’s hydraulic filtration product line features more than 4,000 high-quality filter elements with a high dirt-holding capacity to ensure consistent filter efficiency and long element life. These elements are available with various filter materials, different construction types and micron ratings to help protect critical system components.

Eaton’s wide range of filter elements provide trouble-free operation when filtering hydraulic fluids, cooling lubricants or water-based fluids and are designed to achieve cleanliness class requirements. Eaton can perform fluid analysis on-site or in our lab to determine the best filter element for your hydraulic and lubrication system requirements.

Benefits:
- The multi-layer design in combination with one of the largest filter surfaces on the market results in a high dirt holding capacity and improved service life
- Consistent filter efficiency, even at high differential pressure
- Improved system protection
- Decreased number of maintenance operations
- Extended filter element life
- Customized solutions for specific filtration challenges
- Laboratory services
- Technical consulting and engineering support

Markets:
- Power generation
- Agriculture and construction
- Material handling
- Wind
- Oil and gas

Applications:
- Compressors
- Gearboxes
- Power units
- Lubrication modules
- Mobile hydraulics
- Factory equipment
01.E pressure filter elements
Nominal sizes: 30 – 1350 (30 bar and 160 bar)
These elements are ideal for use in medium and high pressure in-line filters to protect system components such as valves and hydraulic motors.

01.NR return-line filter elements
Nominal sizes: 63 – 1000 (10 bar)
These elements meet DIN 24550-4 standards and are ideal for use in return-line filters to reduce oil contamination.

01.AS and TS suction filter elements
Nominal sizes: 180 – 631
These elements are ideal for use in suction filters to protect sensitive hydraulic pumps.

01.E return-line filter elements
Nominal sizes: 41 – 950 (16 bar)
These elements are ideal for use in return-line filters to reduce the oil contamination in the hydraulic system.

01.NL in-line filter elements
Nominal sizes: 40 – 1000 (30 bar and 160 bar)
These elements meet DIN 24550-3 standards and are ideal for use in pressure filters to protect system components.

01.WSNR Watersorp off-line filter elements
Nominal sizes: 250 – 1000 (10 bar)
These elements are ideal for use in off-line filters to remove particles and water from the hydraulic system.

01.NBF breather filter elements
Nominal sizes: 25 – 125
These elements are ideal for use in tank breather filters to protect the hydraulic fluid from contamination in the ambient air.

01.N in-line filter elements
Nominal size: 100 (16 bar)
These elements are ideal for use in low pressure in-line filters to protect system components such as valves and hydraulic motors.
Eaton’s filter elements are designed to flow from the outside to the inside except for the AS and TS suction filter elements, which flow from the inside to the outside.

For oil conductivity below 300 pS/m we recommend specification IS27.

Example for product key: **01.NL 630.10 VG.30.E.P.**

---

### Filter element type

<table>
<thead>
<tr>
<th>Filter element type</th>
<th>Series</th>
<th>Nominal size</th>
<th>Grade of filter fineness</th>
<th>Filter material</th>
<th>Δ p resistance</th>
<th>Design</th>
<th>Sealing material</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure filter elements</td>
<td>01.E</td>
<td>30, 60, 90, 150, 170, 240, 360, 450, 660, 900, 1350</td>
<td>3 VG, 6 VG, 10 VG, 16 VG, 25 VG</td>
<td>VG</td>
<td>30 = 30 bar, 160 = 160 bar (high resistance)</td>
<td>E = single open end</td>
<td>P = Nitrile, V = Viton, others on request</td>
<td>IS06 = HFC and Polyglycol applications, IS07 = NH3 applications, IS08 = High temperature applications, IS27 = Electrostatic critical applications</td>
</tr>
<tr>
<td>Return-line filter elements</td>
<td>01.E</td>
<td>41, 55, 70, 120, 175, 210, 320, 330, 425, 625, 631, 950</td>
<td>3 VG, 6 VG, 10 VG, 16 VG, 25 VG</td>
<td>VG</td>
<td>16 = 16 bar</td>
<td>E = single open end, S = bypass valve with several opening pressure options</td>
<td>P = Nitrile, V = Viton, others on request</td>
<td>IS06 = HFC and Polyglycol applications, IS07 = NH3 applications, IS08 = High temperature applications, IS27 = Electrostatic critical applications</td>
</tr>
<tr>
<td>Lubrication filter elements</td>
<td>01.E</td>
<td>631, 1201, 1501, 2001, 3001, 4001</td>
<td>3 VG, 6 VG, 10 VG, 16 VG, 25 VG</td>
<td>VG</td>
<td>10 = 10 bar</td>
<td>E = single open end, S = bypass valve with several opening pressure options</td>
<td>P = Nitrile, V = Viton, others on request</td>
<td>IS06 = HFC and Polyglycol applications, IS07 = NH3 applications, IS08 = High temperature applications, IS27 = Electrostatic critical applications</td>
</tr>
<tr>
<td>Return-line filter elements according to DIN 24550-4</td>
<td>01.NR</td>
<td>63, 100, 160, 250, 400, 630, 1000</td>
<td>3 VG, 6 VG, 10 VG, 16 VG, 25 VG</td>
<td>VG</td>
<td>10 = 10 bar</td>
<td>B = double open end</td>
<td>P = Nitrile, V = Viton, others on request</td>
<td>IS06 = HFC and Polyglycol applications, IS07 = NH3 applications, IS08 = High temperature applications, IS27 = Electrostatic critical applications</td>
</tr>
<tr>
<td>In-line filter elements according to DIN 24550-3</td>
<td>01.NL</td>
<td>40, 63, 100, 160, 250, 400, 630, 1000</td>
<td>3 VG, 6 VG, 10 VG, 16 VG, 25 VG</td>
<td>VG</td>
<td>30 = 30 bar, 160 = 160 bar (high resistance)</td>
<td>E = single open end, S = bypass valve with several opening pressure options</td>
<td>P = Nitrile, V = Viton, others on request</td>
<td>IS06 = HFC and Polyglycol applications, IS07 = NH3 applications, IS08 = High temperature applications, IS27 = Electrostatic critical applications</td>
</tr>
<tr>
<td>In-line filter elements</td>
<td>01.N</td>
<td>100</td>
<td>3 VG, 6 VG, 10 VG, 16 VG, 25 VG</td>
<td>VG</td>
<td>16 = 16 bar</td>
<td>E = single open end, S = bypass valve with several opening pressure options</td>
<td>P = Nitrile, V = Viton, others on request</td>
<td>IS06 = HFC and Polyglycol applications, IS07 = NH3 applications, IS08 = High temperature applications, IS27 = Electrostatic critical applications</td>
</tr>
<tr>
<td>Suction filter elements</td>
<td>01.AS</td>
<td>180, 220, 630, 631</td>
<td>10 G, 25 G, 40 G, 80 G</td>
<td>G</td>
<td>-</td>
<td>B = double open end</td>
<td>-</td>
<td>IS06 = HFC and Polyglycol applications, IS07 = NH3 applications, IS08 = High temperature applications, IS27 = Electrostatic critical applications</td>
</tr>
<tr>
<td>Tank/Suction filter elements</td>
<td>01.TS</td>
<td>210, 310, 425, 625</td>
<td>10 G, 25 G, 40 G, 80 G</td>
<td>G</td>
<td>-</td>
<td>B = double open end</td>
<td>-</td>
<td>IS06 = HFC and Polyglycol applications, IS07 = NH3 applications, IS08 = High temperature applications, IS27 = Electrostatic critical applications</td>
</tr>
<tr>
<td>Breather filter elements</td>
<td>01.NBF</td>
<td>25, 40, 55, 85, 125</td>
<td>3 VL, 6 VL, 10 VL, 20 VL</td>
<td>VL</td>
<td>-</td>
<td>-</td>
<td>V = Viton</td>
<td>-</td>
</tr>
<tr>
<td>Watersorp off-line filter elements</td>
<td>01.WSNR</td>
<td>250, 630, 1000</td>
<td>2 WVG, 10 WVG WVG</td>
<td>10 = 10 bar</td>
<td>B = double open end</td>
<td>P = Nitrile, V = Viton, others on request</td>
<td>-</td>
<td>IS06 = HFC and Polyglycol applications, IS07 = NH3 applications, IS08 = High temperature applications, IS27 = Electrostatic critical applications</td>
</tr>
</tbody>
</table>

---

1. VG = Glas fiber fleece, API = Glas fiber fleece, S = Stainless steel wire mesh, VL = Glas fiber fleece, P = Paper, WVG = Glas fiber fleece with absorption layer
2. IS06 = HFC and Polyglycol applications, IS07 = NH3 applications, IS08 = High temperature applications, IS27 = Electrostatic critical applications
Assignments of filter element to filter housing

<table>
<thead>
<tr>
<th>Filter housing type</th>
<th>Series</th>
<th>Filter element series and nominal size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return-line filters with suction connection</td>
<td></td>
<td>TRS 01.E 30 - 1350 01.E 41 - 950 01.E 631 - 4001 01.N 63 - 1000 01.NL 40 - 1000 01.N 100 01.AS 180 - 631 01.RS 225 01.TS 210 - 625 01.NBF 25 - 125 01.WS 250 - 1000</td>
</tr>
<tr>
<td>Duplex pressure filters</td>
<td></td>
<td>TRS 01.E 30 - 1350 01.E 41 - 950 01.E 631 - 4001 01.N 63 - 1000 01.NL 40 - 1000 01.N 100 01.AS 180 - 631 01.RS 225 01.TS 210 - 625 01.NBF 25 - 125 01.WS 250 - 1000</td>
</tr>
<tr>
<td>Pressure filters, PN &lt; 100 bar</td>
<td></td>
<td>TRS 01.E 30 - 1350 01.E 41 - 950 01.E 631 - 4001 01.N 63 - 1000 01.NL 40 - 1000 01.N 100 01.AS 180 - 631 01.RS 225 01.TS 210 - 625 01.NBF 25 - 125 01.WS 250 - 1000</td>
</tr>
<tr>
<td>Pressure filters, PN &gt; 100 bar</td>
<td></td>
<td>TRS 01.E 30 - 1350 01.E 41 - 950 01.E 631 - 4001 01.N 63 - 1000 01.NL 40 - 1000 01.N 100 01.AS 180 - 631 01.RS 225 01.TS 210 - 625 01.NBF 25 - 125 01.WS 250 - 1000</td>
</tr>
<tr>
<td>Manifold mounted pressure filter, PN &gt; 100 bar</td>
<td></td>
<td>TRS 01.E 30 - 1350 01.E 41 - 950 01.E 631 - 4001 01.N 63 - 1000 01.NL 40 - 1000 01.N 100 01.AS 180 - 631 01.RS 225 01.TS 210 - 625 01.NBF 25 - 125 01.WS 250 - 1000</td>
</tr>
<tr>
<td>Tank mounted suction filters</td>
<td></td>
<td>TRS 01.E 30 - 1350 01.E 41 - 950 01.E 631 - 4001 01.N 63 - 1000 01.NL 40 - 1000 01.N 100 01.AS 180 - 631 01.RS 225 01.TS 210 - 625 01.NBF 25 - 125 01.WS 250 - 1000</td>
</tr>
<tr>
<td>Tank breathers</td>
<td></td>
<td>TRS 01.E 30 - 1350 01.E 41 - 950 01.E 631 - 4001 01.N 63 - 1000 01.NL 40 - 1000 01.N 100 01.AS 180 - 631 01.RS 225 01.TS 210 - 625 01.NBF 25 - 125 01.WS 250 - 1000</td>
</tr>
</tbody>
</table>
Filter element material layers

**Glass fiber fleece (VG)**
Multilayer, pleated construction made with synthetic glass fibers.

**Features:**
- High retention of fine contaminates while maintaining performance over the life of the element
- High dirt-holding capacity
- High stability to variable operating pressures and flow rates
- High collapse resistance for added protection

**Glass fiber fleece (API)**
Multilayer, pleated construction made with synthetic glass fibers.

**Features:**
- Low differential pressure design for lubrication applications
- Fulfills the requirements of API 614 standard

**Glass fiber fleece with absorption layer (WVG)**
Multilayer, pleated construction made with synthetic glass fibers.

**Feature:**
- Combines removal of solid contamination and water removal by using a microglass and a water absorption layer

**Stainless steel wire mesh (G)**
Single or multilayer, pleated construction made with stainless steel wire mesh in different weaves, depending on retention ratings.

**Features:**
- Removes particulate from coarse contaminated fluids
- Protects pumps with a minimal pressure drop decreasing the risk of cavitation
- Compatible with a wide range of fluid types

**Paper (P)**
Single layer, pleated construction made with organic cellulose fiber fleece used for flushing operations.
Filter efficiency data

Filtration quotient $\beta_{x \mu m(c)}$ for filter materials

![Graph showing filtration quotient $\beta_{x \mu m(c)}$ for filter materials with various $\beta$-values and particle sizes.]

Multi-pass performance according to ISO 16889

**Calculation of the filtration quotient $\beta_{x \mu m(c)}$**

$$\beta_{x \mu m(c)} = \frac{\text{amount of particles of the size } \geq x \mu m(c) \text{ before the filter}}{\text{amount of particles of the size } \geq x \mu m(c) \text{ after the filter}}$$

**Conversion of filtration quotient $\beta_{x \mu m(c)}$ into filtration efficiency (in %)**

$$\text{filtration quotient} - 1 \times 100 = \%$$

*e.g.*

$$\beta_{10 \mu m(c)} = 200 \rightarrow \frac{(200-1)}{200} \times 100 = 99.5\%$$

Systems sensitivity and optimal cleanliness class

<table>
<thead>
<tr>
<th>System types</th>
<th>Application case</th>
<th>Req. class acc. to ISO 4406:99</th>
<th>Req. class acc. to NAS 1638</th>
<th>Recommended Eaton filter material</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO 2941</td>
<td>Verification of collapse/burst pressure rating</td>
<td>16/12/8</td>
<td>2-3</td>
<td>1 VG</td>
</tr>
<tr>
<td>ISO 2942</td>
<td>Verification of fabrication integrity</td>
<td>17/13/9</td>
<td>3-4</td>
<td>3 VG</td>
</tr>
<tr>
<td>ISO 2943</td>
<td>Verification of material compatibility with fluids</td>
<td>19/15/11</td>
<td>4-6</td>
<td>6 VG</td>
</tr>
<tr>
<td>ISO 3723</td>
<td>Method for end load test</td>
<td>20/16/13</td>
<td>7-8</td>
<td>10 VG</td>
</tr>
<tr>
<td>ISO 3724</td>
<td>Determination of resistance to flow fatigue using particulate contaminant</td>
<td>22/18/14</td>
<td>7-9</td>
<td>16 VG</td>
</tr>
<tr>
<td>ISO 3968</td>
<td>Evaluation of pressure drop versus flow characteristics</td>
<td>23/19/15</td>
<td>9-11</td>
<td>25 VG</td>
</tr>
</tbody>
</table>

The cleanliness of the oil in a hydraulic system is determined by the micron rating of the filter element, the specific contaminant, and the size and distribution of the particles in the fluid.

This table presents standard data values. The quality of a particular oil can be determined using established analysis procedures.