Filtration Products

Hydraulic and lubrication oil filters



Powering Business Worldwide



Eaton combines sales, engineering, manufacturing, customer service, and technical sales support into one focused business objective: provide customers with optimum filtration solutions.

Eaton is a leader in manufacturing high quality hydraulic and lubrication systems, filter media, condition monitoring, and hydraulic and lubrication accessories.

Eaton currently offers a selection of more than 4,000 different filter elements, including corresponding filter housings for mobile and stationary applications.

The importance of cleanliness

Contamination is any solid or liquid substance that is not part of a hydraulic system's working fluid. There are three principal means through which contamination can occur in a typical hydraulic system: it can be incorporated during system assembly, generated during system operation, or ingested by the system during operation. Having a reliable way to manage contamination is vital to your operation.

- Provides maximum efficient productivity
- Reduces equipment downtime
- Minimizes safety hazards and prevents contamination-related failure
- Increases the life of system components, improves operating profitability and decreases maintenance costs

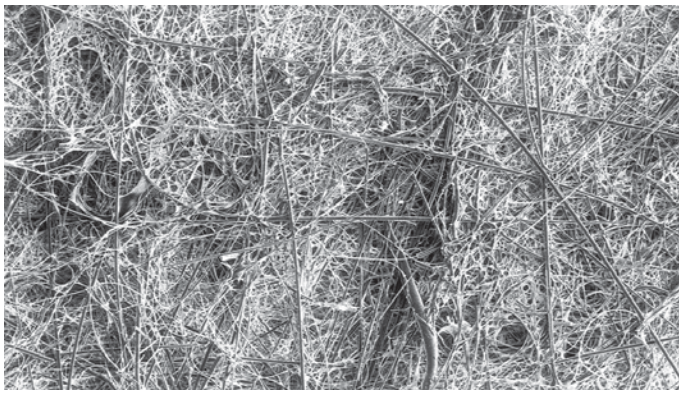
Eaton services

In addition to world-proven hydraulic and lubrication filter systems, Eaton provides a full range of services to help you maximize the potential of your operation.

- State-of-the-art testing lab facilities
- Calibration services: certifications, software updates, test runs
- Field service: inspections, start-up, repair, replacement, and maintenance
- Extensive network of sales and service representatives
- Worldwide technical support
- Product specialists dedicated to providing application engineering

Filter Media

All hydraulic and lubrication oil filter elements are available in the following three materials

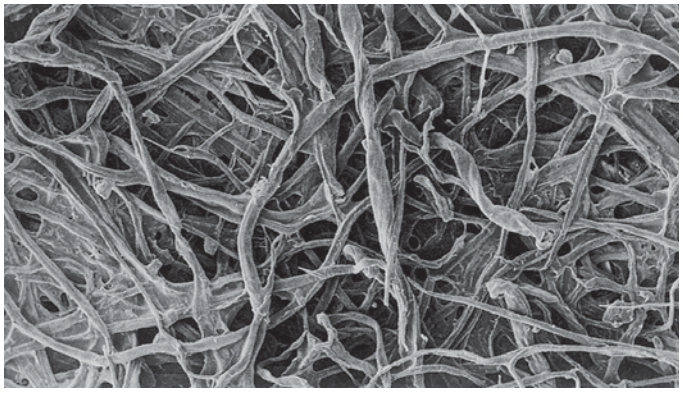


Glass fiber fleece

Glass fiber fleece (VG)

Features:

- Depth filtration
- High dirt-holding capacity
- Compatible with mineral oils, emulsions and for most synthetic hydraulic fluids and lubrication oils
- Filter fineness, acc. filtration quotient ßx(c) >= 200: 4 µm, 5 µm, 6 µm, 10 µm, 20 µm
- Special filter element design for lubrication applications available (10 API and 25 API)

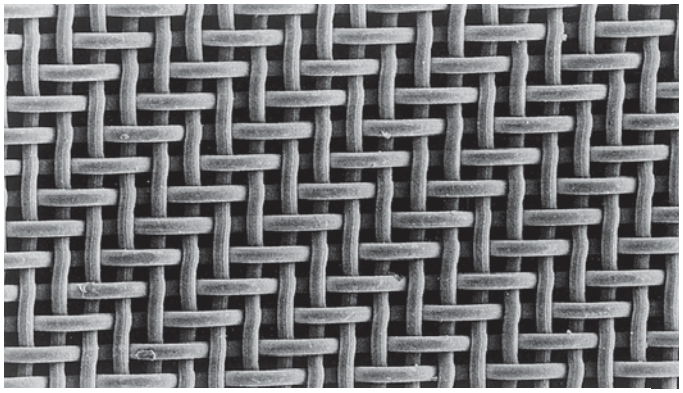


Paper

Paper (P)

Features:

- Depth filtration
- Consists of resin-reinforced cellulose fibers
- High burst strength
- Available in 10 µm



Stainless steel wire mesh

Stainless steel wire mesh (G)

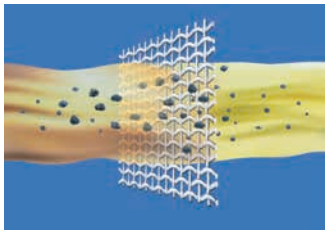
Single or multilayer, pleated construction made with stainless steel wire mesh in different weaves, depending on retention ratings.

Features:

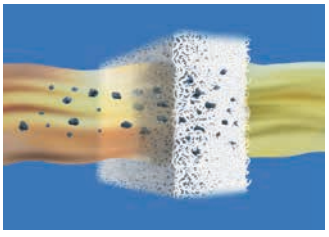
- Surface filtration
- Best resistance in all hydraulic and lubrication fluids
- Partially cleanable
- Available in 25 µm, 40 µm, and 80 µm (other micron ratings on request)



Surface filtration (mesh)



Depth filtration (microglass)



Low Pressure Filters PN < 1,450 psi (100 bar)



LA



ELA

Series LA, ELA

Application: Mounted in suction, pressure or return lines

Operating pressure: Up to 580 psi (40 bar)

Flow rates: Up to 264 gpm (1,000 l/min)

Material: LA: available in carbon steel,
ELA: available in stainless steel

Features: Designed according to ASME VIII Div. 1,
U-Stamp option available



LF 401



LF 101



LWF

Series LF, LWF, ELWF, LWFA, ELWFA

Application: Mounted in suction, pressure or return lines

Operating pressure: LF: 464 psi (32 bar), LWF, ELWF: 232 psi (16 bar), LWFA, ELWFA: 145 psi (10 bar)

Flow rates: LF: up to 1,057 gpm (4,000 l/min),
LWF, ELWF, LWFA, ELWFA: up to 1,585 gpm (6,000 l/min)

Material: LF, LWF, LWFA: available in carbon steel,
ELWF, LWFA, ELWFA: available in stainless steel

Features: LF filters have side inlets and bottom outlets on the same level

LWFA and ELWFA filters are designed according to ASME VIII Div. 1, U-Stamp option available



DU/DUA 2005



DU 1050

Series DU, DUA, DUV, DSF, EDU

Application: For continuous operation. Mounted in suction, pressure or return lines

Operating pressure: DU, DUV, EDU: 464 psi (32 bar),
DSF: 363 psi (25 bar), DUA: 320 psi (22 bar)

Flow rates: DU, DUA: up to 1,056 gpm (4,000 l/min),
DUV (vertical inlet/outlet): up to 528 gpm (2,000 l/min),
DSF: up to 87 gpm (330 l/min),
EDU: up to 166 gpm (630 l/min)

Material: DU, DUA, DUV, DSF: available in carbon steel,
EDU: available in stainless steel

Features: Designed according to AD2000, DUA designed according to ASME VIII Div. 1, U-Stamp option available



DWF



DNR

Series DWF, DWFA, EDWF, EDWFA, DNR, DNRA, EDNR, EDNRA

Application: For continuous operation. Mounted in suction, pressure or return lines

Operating pressures: DWF, EDWF, DNR, EDNR: 232 psi (16 bar), DWFA, EDWFA, DNRA, EDNRA: 145 psi (10 bar)

Flow rates:
DWF, DWFA, EDWF, EDWFA: up to 1,585 gpm (6,000 l/min),
DNR, DNRA, EDNR, EDNRA: up to 1,902 gpm (7,200 l/min)

Material: DWF, DWFA, DNR, DNRA: available in carbon steel,
EDWF, EDWFA, EDNR, EDNRA: available in stainless steel

Features: DWFA, EDWFA, DNRA, EDNRA filters are designed according to ASME VIII Div. 1, U-Stamp option available

Series DA, EDA

Application: For continuous operation.
Mounted in suction, pressure or return lines

Operating pressure: 580 psi (40 bar)

Flow rates: Up to 264 gpm (1,000 l/min)

Material: DA: available in carbon steel,
EDA: available in stainless steel

Features: Designed according to ASME VIII Div. 1,
U-Stamp option available



DA



EDA

Series TWF

Application: For use with wind turbine gearbox lubrication systems

Operating pressure: 363 psi (25 bar)

Flow rates: Up to 85 gpm (320 l/min)

Material: Available in aluminum

Features: Lightweight and corrosion resistant aluminum construction. The unique element design couples a stainless steel wire mesh filter with a high-performance glass fiber fleece filter. This design ensures continuous filtered oil to the gearbox during cold start by-pass conditions



TWF

Mid Pressure Filters PN 1,450–2,900 psi (100–200 bar)



ML

MNL

MF

Series ML, MLO, MNL, MF, MFO

Application: Mounted in pressure lines; threaded design

Operating pressure: Up to 2,320 psi (160 bar)

Flow rates: Up to 119 gpm (450 l/min)

Material: Available in carbon steel

Features: Economical, lightweight filter used for low to medium pressure applications. Filter requires minimal clearance during element change, saving valuable space



MDD

Series MDD

Application: Mounted in suction, pressure or return lines

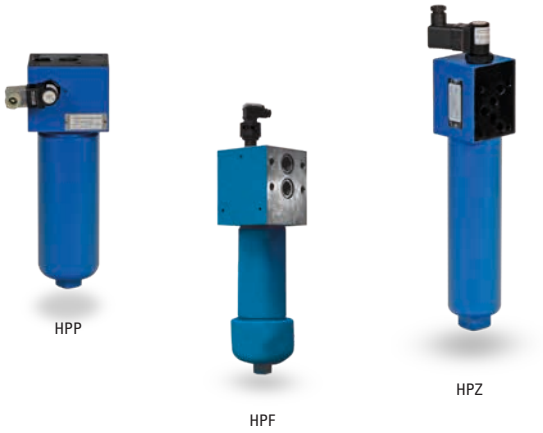
Operating pressure: 2,900 psi (200 bar)

Flow rates: Up to 26 gpm (100 l/min)

Material: Available in carbon steel

Features: For continuous filtration without system shutdown, the duplex design is equipped with a three-way changeover valve. This makes it possible for the user to divert the flow to the second filter for servicing or changing

High Pressure Filters PN > 2,900 psi (200 bar)



Series HPF, HPP, HPZ, EHP, EHPF

Application: Flange or manifold mounted in pressure lines

Operating pressure: HPF, HPP, HPZ: 4,568 psi (315 bar),
EHPF: 6,090 psi (420 bar),
EHP: 20,305 psi (1,400 bar)

Flow rates: HPZ, EHP: up to 24 gpm (90 l/min),
HPF, HPP: up to 359 gpm (1,360 l/min),
EHPF: up to 119 gpm (450 l/min)

Material: HPF, HPP, HPZ: available in carbon steel,
EHP, EHPF: available in stainless steel

Features: Simplified mounting saves valuable space and provides filtration directly at the point needed. Prevents contaminants from passing downstream during element changes



Series HP3, EH

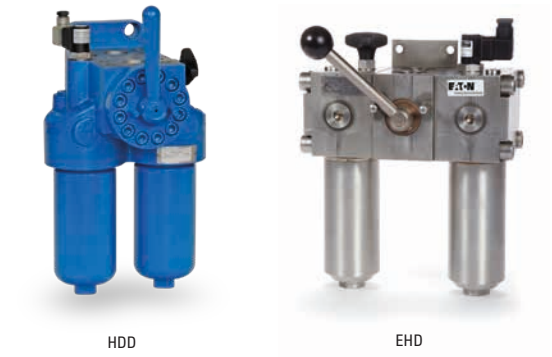
Application: High pressure filters

Operating pressure: HP3: up to 6,000 psi (420 bar),
EH: 6,090 psi (450 bar)

Flow rates: HP3: up to 357 gpm (1,350 l/min),
EH: up to 119 gpm (450 l/min)

Material: HP3: available in carbon steel,
EH: available in stainless steel

Features: In-line or flange mounting; various port options. Possible to accommodate very high flow rates with a single housing



Series HDD, EHD

Application: For continuous operation. Mounted in suction, pressure or return lines

Operating pressure: Up to 4,567 psi (315 bar)

Flow rates: Up to 356 gpm (1,350 l/min)

Material: HDD: available in carbon steel,
EHD: available in stainless steel

Features: For continuous filtration without system shutdown, the duplex design is equipped with a three-way changeover valve. This makes it possible for the user to divert the flow to the second filter for servicing or changing



Series MNU, HNU

Application: Flange and manifold mounted in pressure lines

Operating pressure: MNU: 3,626 psi (250 bar),
HNU: 4,569 psi (315 bar)

Flow rates: Up to 106 gpm (400 l/min)

Material: Available in carbon steel

Features: MNU are flanged to the mounting-surface, assemble position is on the bottom (inlet and outlet on the bottom), HNU shows an assembly position on the filter upper side

Return Line and Suction Filters

Series TEF, DTEF, TEFB, TRW

Application: Mounted on top or in the reservoir with the outlet port returning to the reservoir

Operating pressure: Up to 145 psi (10 bar)

Flow rates: Up to 1,902 gpm (7,200 l/min)

Material: Available in aluminum

Features: Lightweight and easy to change, minimizes chance of oil spillage during element change and the resulting environmental concern



Series TRS, TNRS

Application: Tank-mounted return-line filters with suction connection for mobile hydraulic applications having a minimum of two independent hydraulic circuits

Operating pressure: 145 psi (10 bar)

Flow rates: Up to 119 gpm (450 l/min)

Material: Available in aluminum

Features: Tank-top-mounted, in-line filters supply clean suction flow and prevent cavitation; custom designs available



Series AS, TS, TSW

Application: Mounted to the side of the reservoir below oil levels. It is positioned vertically in the TS and AS Series or horizontally in the TSW Series. The suction side faces the reservoir; a check valve prevents oil from draining from the reservoir during servicing

Operating pressure: AS: up to 1,305 psi (90 bar), TS, TSW: up to 725 psi (50 bar)

Flow rates: Up to 185 gpm (700 l/min)

Material: Available in aluminum

Features: Suction filters can be serviced from the outside of the reservoir with no additional check valve needed



Suction Strainer



ASF

Series ASF

Application: Filters coarse particles to prevent pump damage

Operating temperature: -20 to 210°F (-28 to 100°C)

Flow rates: Up to 100 gpm (380 l/min)

Off-line Filters



NF

Series NF

Application: Off-line filter for fine filtration of hydraulic and lubrication circuits; supplements the main filter

Operating pressure: 232 psi (16 bar)

Flow rates: Up to 264 gpm (1,000 l/min)

Water absorption elements are also available

Features: Offers a large filtration area in a compact size allowing for high dirt-holding capacity even with small grades of filter fineness. Filter element can be changed quickly and without tools

Tank Breathers



BFD

NBF



BR

Series NBF, EBF, TBF, BFD, BF-WP, BR

Application: Assures that no contamination reaches the tank through air exchange or water condensation in the reservoir

Flow rates: Up to 925 gpm (3,500 l/min)

Connection type:

- **NBF, BF-WP:** BSPP
- **EBF, TBF:** Bayonet
- **BFD:** BSPP, Bayonet
- **BR:** 1.5 UN (Bayonet and NPT with adapter)

Features: Protects system from airborne debris and/or moisture. BR available as BR110 H^2O-Gate with reversible flow through media, and BR210 Dirt-Gate

Spin-on Filters



WPL

Series WPL

Application: In-line filter, mounted into pressure and return lines for all hydraulic systems

Flow rates: Up to 48 gpm (180 l/min)

Filtration materials: Microglass standard, other materials on request

Features: Fits into many leading filter systems

Clogging Indicators

Eaton's differential pressure indicators can be installed on any pressure filter with a compatible connection. As the filter element becomes contaminated, the difference between the supply pressure and the output pressure increases. This pressure difference, regardless of the operating pressure, triggers visual and/or electrical signals. The indicators are available in various switching pressure stages.

Optical Clogging Indicators

AOR/AOC

Features: Visual differential pressure indicators with reset (AOR) and control function (AOC), threaded with G ½ (½ BSPP)
Operating pressure: Stainless steel: up to 6,000 psi (420 bar), Aluminum: up to 3,200 psi (220 bar)



AOR/AOC

OP

Features: Visual differential pressure indicators, in accordance with our OE series but without switch contacts, thread connection G ¼ (¼ BSPT) or G ½ (½ BSPT), or with flange connection
Operating pressure: Up to 914 psi (63 bar)



OP

O

Features: Only-visual pressure switch up to the given full scale value
Operating pressure: Up to 145 psi (10 bar)



O

Optical-electrical Clogging Indicators

AE

Features: Threaded with G ½ (½ BSPP) or flanged
AE 30, AE 40: electrical differential pressure indicators
AE 70, AE 90: combined optical and electrical differential pressure indicators with LED
AE 10: shows an explosion-protected design
Operating pressure: Up to 6,000 psi (420 bar)



AE

OE

Features: Combined visual and electrical differential pressure indicator, which is also available in explosion-protected design, thread connection G ¼ (¼ BSPT) or G ½ (½ BSPT), or with flange connection
Operating pressure: Up to 914 psi (63 bar)



OE

Electrical Clogging Indicators

E

Features: Electrical pressure switch with a changeover contact
Operating pressure: Up to 4,350 psi (300 bar)



E

E6

Features: Adjustable pressure switch with a changeover contact, thread connection G 1/8 (1/8 BSPT)
Operating pressure: Up to 1,450 psi (100 bar)



E6

Clogging Sensors

VS5

Features: Electronic differential pressure sensor, thread connection G ½ (½ BSPT) or with flange connection, output signal from 6 to 20 mA, operating temperature: -40 to 176°F (-40 to 80°C)
Operating pressure: Stainless steel: up to 6,000 psi (420 bar), Aluminum: up to 3,200 psi (220 bar)



VS5

VS6

Features: Electronic differential pressure sensor, thread connection G ½ (½ BSPP) or with flange connection, output signal from 4 to 20 mA, operating temperature: -4 to 176°F (-20 to 80°C)
Operating pressure: Stainless steel: up to 6,000 psi (420 bar), Aluminum: up to 3,200 psi (220 bar)

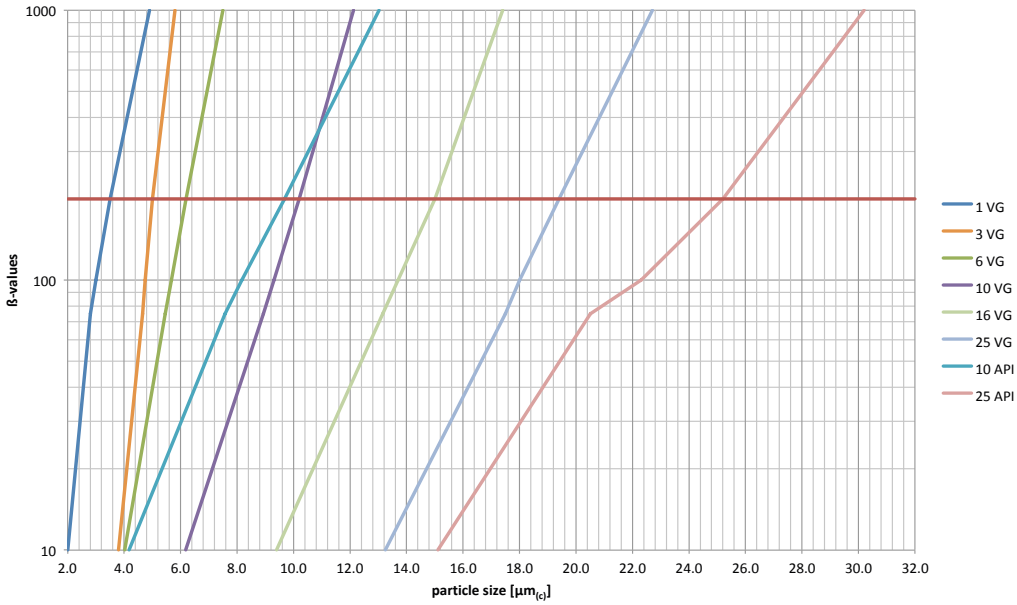


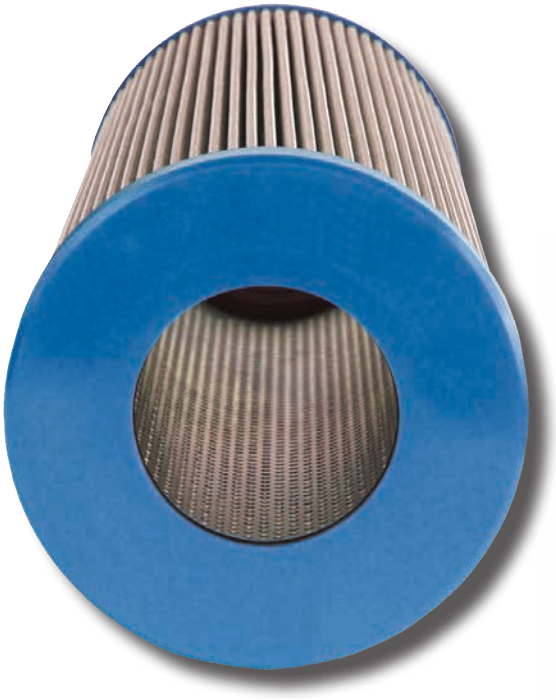
VS6

Filter Efficiency Data

Multi-pass performance according to ISO 16889

Filtration quotient $ß_{x(c)}$ for filter materials





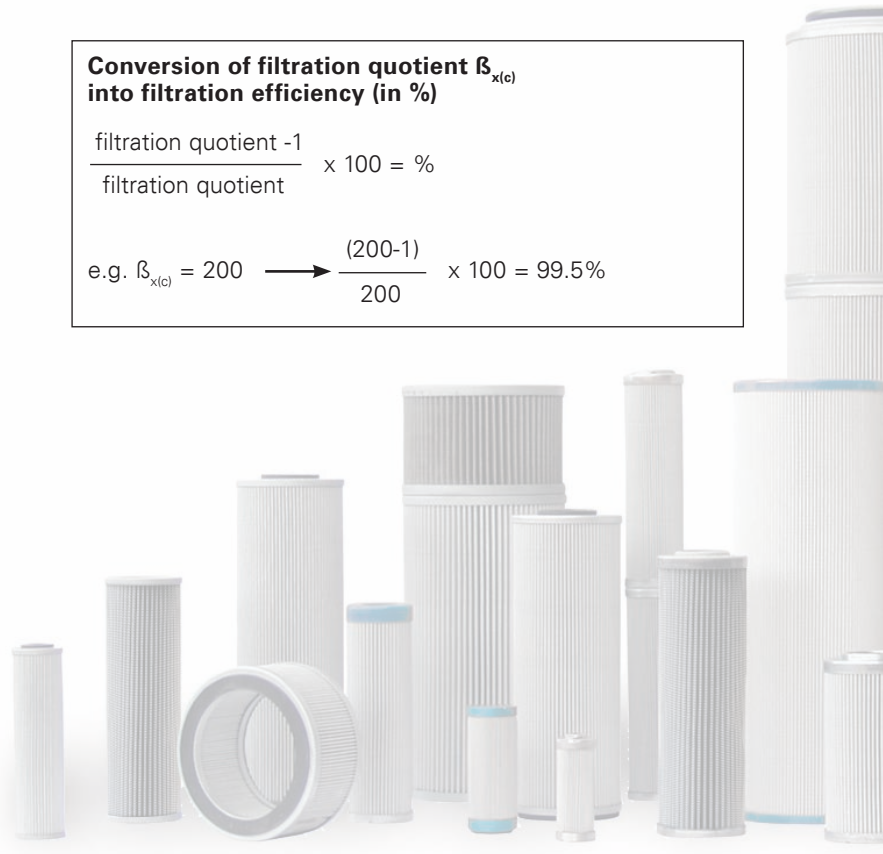
Calculation of the filtration quotient $ß_{x(c)}$

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

Conversion of filtration quotient $ß_{x(c)}$ into filtration efficiency (in %)

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

e.g. $ß_{x(c)} = 200 \longrightarrow \frac{(200-1)}{200} \times 100 = 99.5\%$

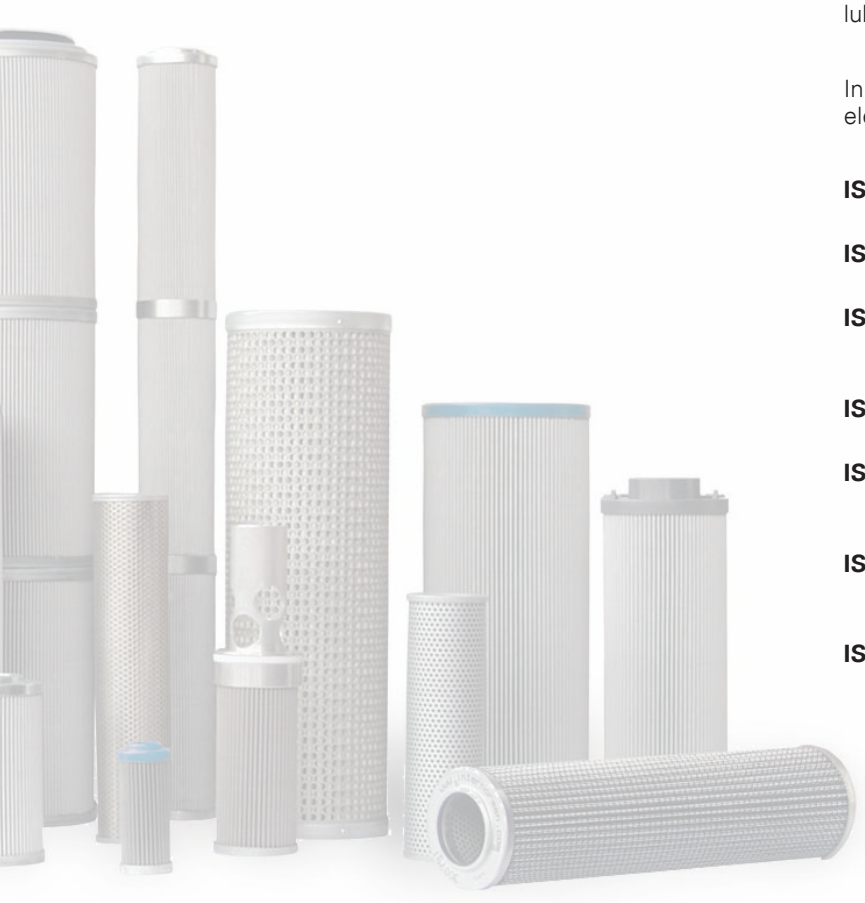


Systems sensitivity and optimal cleanliness class

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

This table presents standard data values. To determine the quality of the oil, it should be analyzed using established procedures.

System types Application case	Required class according to ISO 4406:99	Required class according to NAS 1638	Recommended Eaton filter material
Against fine soiling and gumming up of sensitive systems	16/12/8	2–3	1 VG
	17/13/9	3–4	3 VG
Heavy-duty servo motor systems; high pressure systems with long service life	19/15/11	4–6	6 VG
Proportional valves; industrial hydraulics with high operating safety	20/16/13	7–8	10 VG
Heavy industries; low pressure systems; mobile hydraulics	23/19/15	9–11	25 VG



In addition, Eaton's wide range of filter elements enables trouble-free operation of standard fluids, but also when filtering abrasive fluids, cooling lubricants or water-based fluids and are designed to achieve cleanliness class requirements. We can perform fluid analysis capabilities on-site or in our lab to determine the best filter element for your hydraulic and lubrication system requirements.

In addition to proprietary tests developed by Eaton, filter elements are tested according to several ISO standards:

ISO 2941 Verification of collapse/burst pressure rating

ISO 2942 Verification of fabrication integrity

ISO 2943 Verification of material compatibility with fluids

ISO 3723 Method for end load test

ISO 3724 Determination of resistance to flow fatigue using particulate contaminant

ISO 3968 Evaluation of pressure drop versus flow characteristics

ISO 16889 Multi-pass method for evaluating filtration performance

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QUALITY SYSTEM CERTIFICATION
DNV
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