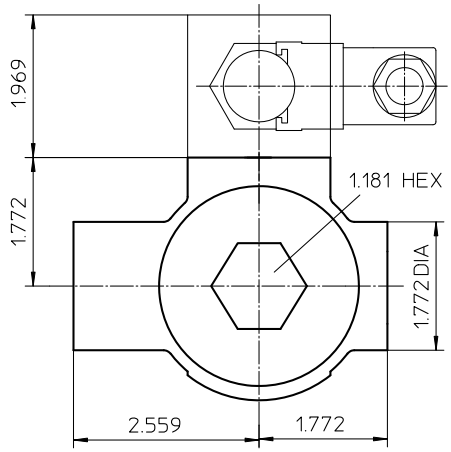
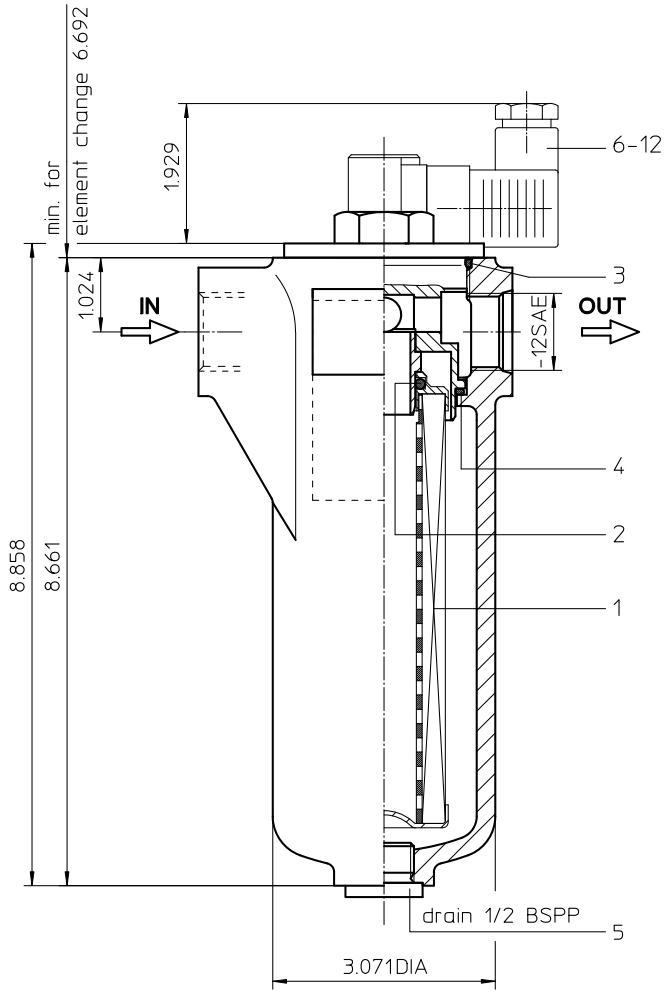
Series LF 63
363 PSI





Weight: approx. 4.40 lbs.
Dimensions: inches

Designs and performance values are subject to change.

Pressure Filter
Series LF 63
363 PSI

Description:

In-line filter series LF 63 have a working pressure up to 363 PSI. Pressure peaks can be absorbed with a sufficient safety margin. The LF filter is mounted in-line. It can be used as suction filter, pressure filter and return-line filter.

The filter element consists of star-shaped, pleated filter material which is supported on the inside by a perforated core tube and is bonded to the end caps with a high-quality adhesive. The flow direction is from outside to inside.

For cleaning the mesh element or changing the glass fiber element, remove the cover and take out the element. The mesh elements are not guaranteed to maintain 100% performance after cleaning.

For filtration finer than 40 µm, use the disposable elements made of microglass. Filter elements as fine as 5 µm(c) are available; finer filter elements upon request.

Eaton-filter elements are known for a high intrinsic stability and an excellent filtration capability, a high dirt-retaining capacity and a long service life.

Eaton filter elements are suitable for all petroleum based fluids, HW-emulsions, most synthetic hydraulic fluids and lubrication oils.

The by-pass valve is integrated into the filter head. After reaching the by-pass pressure setting, the by-pass valve will send unfiltered partial flow around the filter.

Ship classifications available upon request.

1. Type index:

1.1. Complete filter: (ordering example)

LF.	63.	10VG.	30.	E.	P.	-.	UG.	4.	-.	-.	AE
1	2	3	4	5	6	7	8	9	10	11	12

1 **series:**
LF = In-line filter

2 **nominal size:** 63

3 **filter-material and filter-fineness:**
80G, 40G, 25G, 10G stainless steel wire mesh
25VG, 16VG, 10VG, 6VG, 3VG microglass

4 **filter element collapse rating:**
30 = ∆p 435 PSI

5 **filter element design:**
E = single-end open

6 **sealing material:**
P = Nitrile (NBR)
V = Viton (FPM)

7 **filter element specification:** (see catalog)
- = standard
VA = stainless steel
IS06 = for HFC applications, see sheet-no. 31601
IS07 = for oil/amonia mixtures (NH3), see sheet-no. 31602

8 **process connection:**
UG = thread connection

9 **process connection size:**
4 = -12 SAE

10 **filter housing specification:** (see catalog)
- = standard
IS06 = for HFC applications, see sheet-no. 31605

11 **internal valve:**
- = without
S1 = with by-pass valve ∆p 51 PSI

12 **clogging indicator or clogging sensor:**
- = without
AOR = visual, see sheet-no. 1606
AOC = visual, see sheet-no. 1606
AE = visual-electric, see sheet-no. 1615
VS5 = electronic, see sheet-no. 1619

To add an indicator to your filter, use the corresponding indicator data sheet to find the indicator details and add them to the filter assembly model code.

1.2. Filter element: (ordering example)

01NL.	63.	10VG.	30.	E.	P.	-
1	2	3	4	5	6	7

1 **series:**
01NL. = standard filter element according to DIN 24550, T3

2 **nominal size:** 63

3 - 7 see type index-complete filter

Technical data:

design temperature:	14 °F to +212 °F
operating temperature:	14 °F to +176 °F
operating medium	mineral oil, other media on request
max. operating pressure:	363 PSI
test pressure:	522 PSI
process connection:	thread connection
housing material:	aluminium-cast
sealing material:	Nitrile (NBR) or Viton (FPM), other materials on request
installation position:	vertical
measure connections:	BSPP ¼
drain- and bleeder connections:	BSPP ½
volume tank:	.18 Gal.

Classified under the Pressure Equipment Directive 2014/68/EC for mineral oil (fluid group 2), Article 4, Para. 3.
Classified under ATEX Directive 2014/34/EC according to specific application (see questionnaire sheet-no. 34279-4).

Pressure drop flow curves:

Filter calculation/sizing

The pressure drop of the assembly at a given flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{assembly} = \Delta p_{housing} + \Delta p_{element}$
$\Delta p_{housing}$ = *(see Δp = f (Q) - characteristics)*

$$\Delta p_{element}\,(PSI) = Q\,(GPM)\ x\ \frac{MSK}{1000}\left(\frac{PSI}{GPM}\right) x\ \nu\,(SUS)\ x\ \frac{\rho}{0.876}\left(\frac{kg}{dm^3}\right)$$

For ease of calculation our Filter Selection tool is available online at www.eatonpowersource.com/calculators/filtration/

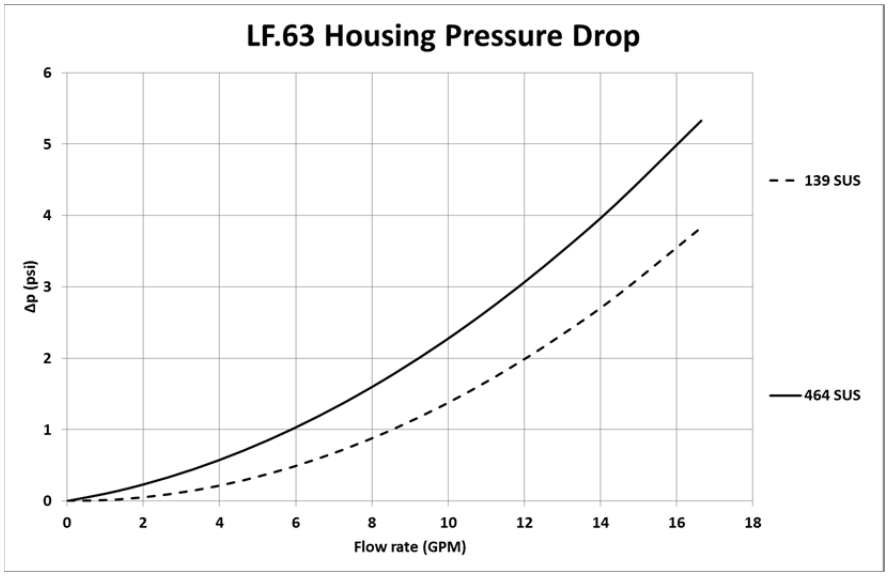
Material gradient coefficients (MSK) for filter elements

The material gradient coefficients in psi/gpm apply to mineral oil (HLP) with a density of 0.876 kg/dm³ and a kinematic viscosity of 139 SUS (30 mm²/s). The pressure drop changes proportionally to the change in kinematic viscosity and density.

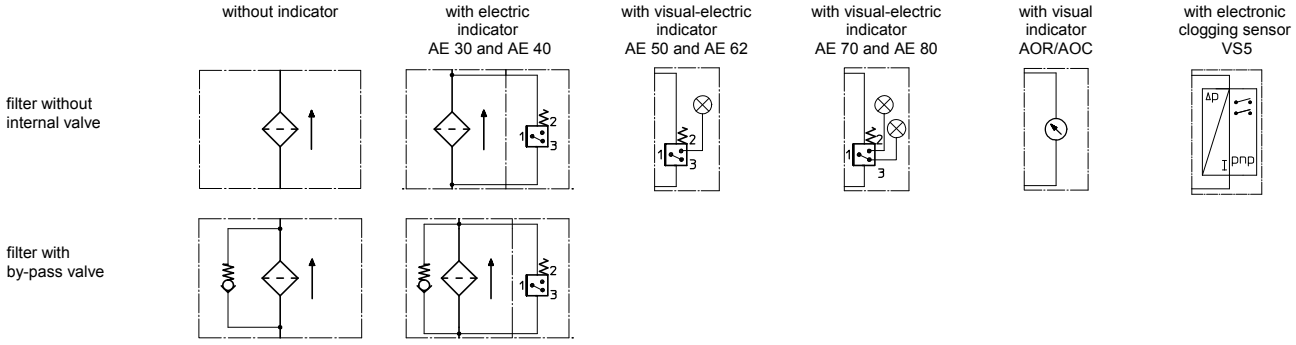
LF	VG					G		
	3VG	6VG	10VG	16VG	25VG	25G	40G	80G
63	4.214	2.926	1.873	1.631	11.4	0.1131	0.1056	0.0723

Δp = f(Q) – characteristics according to ISO 3968

The pressure drop characteristics apply to mineral oil (HLP) with a density of 0.876 kg/dm³. The pressure drop changes proportionally to the density.



Symbols:



Spare parts:

item	qty.	designation	dimension	article-no.	
1	1	filter element	01NL.63…		
2	1	O-ring	22 x 3,5	304341 (NBR)	304392 (FPM)
3	1	O-ring	56 x 3	305072 (NBR)	305322 (FPM)
4	1	O-ring	48 x 3	304357 (NBR)	304404 (FPM)
5	1	screw plug	½ BSPP	304678	
6	1	clogging indicator, visual	AOR or AOC	see sheet-no. 1606	
7	1	clogging indicator, visual-electrical	AE	see sheet-no. 1615	
8	1	clogging sensor, electronical	VS5	see sheet-no. 1619	
9	1	O-ring	15 x 1,5	315357 (NBR)	315427 (FPM)
10	1	O-ring	22 x 2	304708 (NBR)	304721 (FPM)
11	1	O-ring	14 x 2	304342 (NBR)	304722 (FPM)
12	2	screw plug	$^{1}/_{8}$ BSPP	305496	

item 12 execution only without clogging indicator or clogging sensor

Test methods:

Filter elements are tested according to the following ISO standards:

ISO 2941	Verification of collapse/burst resistance
ISO 2942	Verification of fabrication integrity
ISO 2943	Verification of material compatibility with fluids
ISO 3723	Method for end load test
ISO 3724	Verification of flow fatigue characteristics
ISO 3968	Evaluation of pressure drop versus flow characteristics
ISO 16889	Multi-pass method for evaluating filtration performance

Manual and maintenance instructions

for INTERNORMEN-line filters LF 15, 60, 63

Sheet No.
34341-4

These instructions refer to data sheets 1104 and 1109, and they contain general requirements in order to ensure the perfect operation of the filter. In appropriate cases, these requirements should be expanded by the user's special regulations.

1. Installing the filter

The filter should be connected tension-free in a vertical position to the tapholes of the conduit in such a way that

- the contamination indicator is accessible and visible
- the discharge connection G 1/2 is also accessible
- the required demounting height for removing the filter unit is available.

The threaded joints of the conduit system must be correctly screwed on to the "IN" and "OUT" filter flange facings in such a way that no or very little force is transmitted from the conduits onto the filter flange facings. During this procedure measures should be taken to ensure that no dirt or foreign bodies can get into the filter.

The following tightening torques are recommended for the screwed plugs of the screwed pipe joints:

G 3/8	G 3/4
60 Nm	150 Nm

For filters with an electric or electronic contamination indicator, the appliance plugs must be connected to the corresponding current supply.

2. Commissioning

Prior to initial commissioning of the system or the machine, i.e., prior to filling with oil, the filter must be opened by removing the filter cover or the screw plug and its internal condition checked (housing clean, filter unit and seals present, etc.).
After closing the filter housing by installing the filter cover or the screw plug the filter may be commissioned.

3. Maintenance

Filters with a contamination indicator must be exchanged or cleaned when the indicator reads "Filter unit contaminated".

Caution!

Sufficient replacement units must be kept in stock for filters with a disposable unit, i.e., with units awaiting replacement.

3.1. Exchanging the filter unit

The procedure for exchanging the filter unit is as follows:

- Switch off the installation and decompress filter
- Open discharge connection G 1/2 or G 3/8 "dirt side"
- Remove filter cover with the compression spring (compression spring only with LF 15 and 60) and collect oil running out of the filter housing
- Remove the filter unit
- Close the discharge connection and remove the cover near the centring pivot
- Check the filter cover seal and exchange the O-ring if necessary
- Unpack the replacement unit, ensure that the order number concurs with the order number on the used unit and insert into the filter housing (prior to doing so the seals forming part of the unit should be determined and checked to ensure that they are intact).
- Install the filter cover with compression spring (compression spring only with LF 15 and 60) ,
  the tightening torque of the screw plug M 60x2 is 20 Nm
  the tightening torque of the hexagonal head bolt M6 is 5 Nm

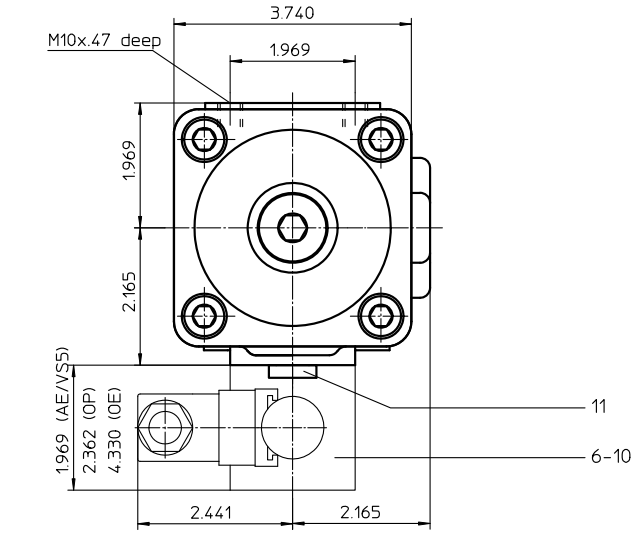
3.2 Cleaning the filter unit

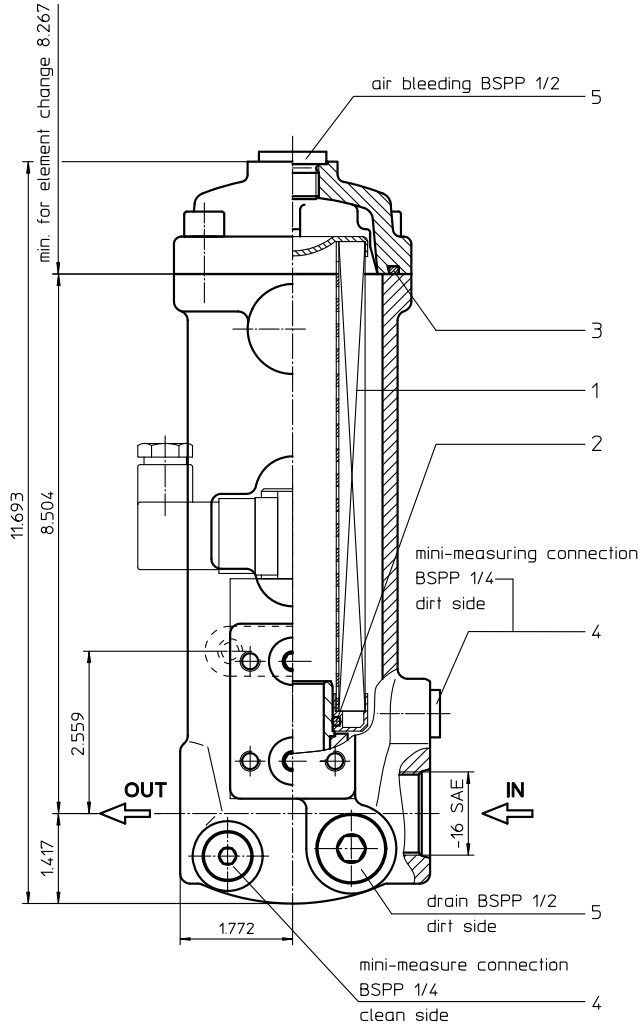
Metallic tissue filter units can be reused provided they have been cleaned properly.
Cleaning must be carried out in compliance with Regulations for Cleaning INTERNORMEN Metallic Tissue Filter Units No. 21070-4.

4. Measuring the pressure differential

The drop in pressure via the filter is determined and shown internally by the flanged contamination indicator.

Series LF 101
464 PSI





Weight: approx. 8.0 lbs.
Dimensions: inches

Designs and performance values are subject to change.

Pressure Filter
Series LF 101
464 PSI

Description:

In-line filters series LF 101 have a working pressure up to 464 PSI. Pressure peaks can be absorbed with a sufficient safety margin. The LF filter is mounted in-line. It can be used as suction filter, pressure filter and return-line filter.

The filter element consists of star-shaped, pleated filter material which is supported on the inside by a perforated core tube and is bonded to the end caps with a high-quality adhesive. The flow direction is from outside to inside.

For cleaning the mesh element or changing the glass fiber element, remove the cover and take out the element. The mesh elements are not guaranteed to maintain 100% performance after cleaning.

For filtration finer than 40 µm, use the disposable elements made of microglass. Filter elements as fine as 5 µm(c) are available; finer filter elements upon request.

Eaton filter elements are known for a high intrinsic stability and an excellent filtration capability, a high dirt-retaining capacity and a long service life.

Eaton filter elements are suitable for all petroleum based fluids, HW-emulsions, most synthetic hydraulic fluids and lubrication oils.

Ship classifications available upon request.

1. Type index:

1.1. Complete filter: (ordering example)

LF.	101.	10VG.	16.	E.	P.	-.	UG.	5.	-.	AE
1	2	3	4	5	6	7	8	9	10	11

1 **series:**
LF = In-line filter

2 **nominal size:** 101

3 **filter-material and filter-fineness:**
80G, 40G, 25G, 10G stainless steel wire mesh
25VG, 16VG, 10VG, 6VG, 3VG microglass
25API, 10API microglass according to API

4 **filter element collapse rating:**
16 = ∆p 232 PSI

5 **filter element design:**
E = single-end open
S = with by-pass valve ∆p 29 PSI
S1 = with by-pass valve ∆p 51 PSI

6 **sealing material:**
P = Nitrile (NBR)
V = Viton (FPM)

7 **filter element specification:** (see catalog)
- = standard
VA = stainless steel
IS06 = for HFC applications, see sheet-no. 31601
IS07 = for oil/amonia mixtures (NH3), see sheet-no. 31602

8 **process connection:**
UG = thread connection

9 **process connection size:**
5 = -16 SAE

10 **filter housing specification:** (see catalog)
- = standard
IS06 = for HFC applications, see sheet-no. 31605

11 **clogging indicator or clogging sensor:**
- = without
AE = visual-electric, see sheet-no. 1609
OP = visual, see sheet-no. 1628
OE = visual-electric, see sheet-no. 1628
VS5 = electronic, see sheet-no. 1641

To add an indicator to your filter, use the corresponding indicator data sheet to find the indicator details and add them to the filter assembly model code.

1.2. Filter element: (ordering example)

01N.	100.	10VG.	16.	E.	P.	-
1	2	3	4	5	6	7

1 **series:**
01N. = filter element according to company standard

2 **nominal size:** 100

3 - 7 see type index-complete filter

.

Technical data:

design temperature:	14 °F to +212 °F
operating temperature:	14 °F to +176 °F
operating medium	mineral oil, other media on request
max. operating pressure:	464 PSI
test pressure:	900 PSI
process connection:	thread connection
housing material:	aluminium-cast
sealing material:	Nitrile (NBR) or Viton (FPM), other materials on request
installation position:	vertical
measure connections:	BSPP ¼
drain- and bleeder connections:	BSPP ½
volume tank:	.26 Gal.

Classified under the Pressure Equipment Directive 2014/68/EC for mineral oil (fluid group 2), Article 4, Para. 3.
Classified under ATEX Directive 2014/34/EC according to specific application (see questionnaire sheet-no. 34279-4).

Pressure drop flow curves:

Filter calculation/sizing

The pressure drop of the assembly at a given flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{assembly} = \Delta p_{housing} + \Delta p_{element}$
$\Delta p_{housing}$ = *(see Δp = f (Q) - characteristics)*

$$\Delta p_{element}\,(PSI) = Q\,(GPM)\ x\ \frac{MSK}{1000}\left(\frac{PSI}{GPM}\right) x\ \nu\,(SUS)\ x\ \frac{\rho}{0.876}\left(\frac{kg}{dm^3}\right)$$

For ease of calculation our Filter Selection tool is available online at www.eatonpowersource.com/calculators/filtration/

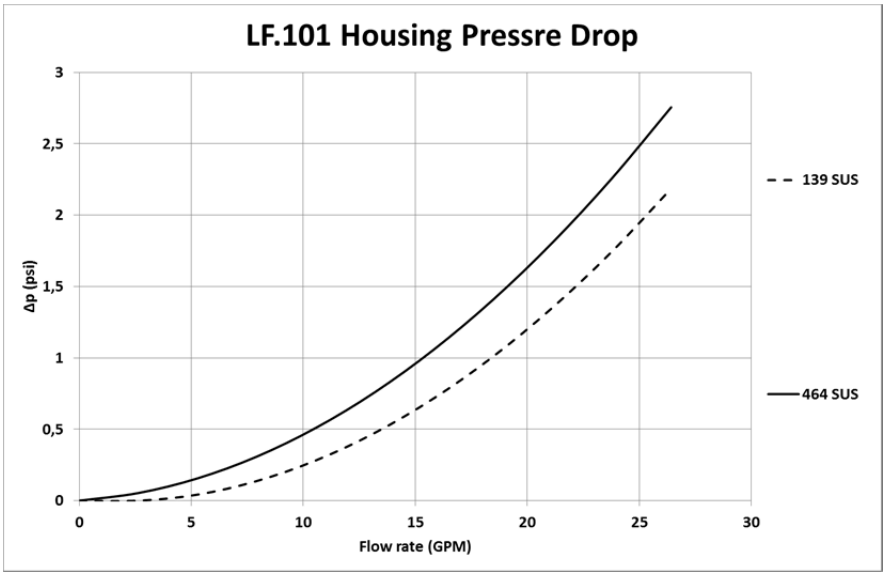
Material gradient coefficients (MSK) for filter elements

The material gradient coefficients in psi/gpm apply to mineral oil (HLP) with a density of 0.876 kg/dm³ and a kinematic viscosity of 139 SUS (30 mm²/s). The pressure drop changes proportionally to the change in kinematic viscosity and density.

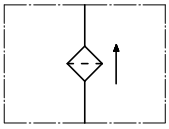
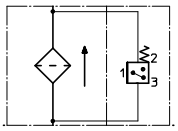
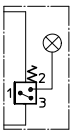
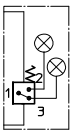
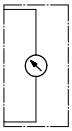
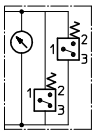
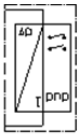
LF	VG					G		
	3VG	6VG	10VG	16VG	25VG	25G	40G	80G
101	2.473	1.717	1.099	0.957	0.654	0.0651	0.0607	0.0416

Δp = f(Q) – characteristics according to ISO 3968

The pressure drop characteristics apply to mineral oil (HLP) with a density of 0.876 kg/dm³. The pressure drop changes proportionally to the density.



Symbols:

without indicator	with electric indicator AE 30 and AE 40	with visual-electric indicator AE 50 and AE 62	with visual-electric indicator AE 70 and AE 80	with visual indicator OP	with visual-electric indicator OE	with electronic clogging sensor VS5
						

Spare parts:

item	qty.	designation	dimension	article-no.	
1	1	filter element	01N.100…		
2	1	O-ring	32 x 3,5	304378 (NBR)	304401 (FPM)
3	1	O-ring	76 x 4	305599 (NBR)	310291 (FPM)
4	2	screw plug	BSPP ¼	305003	
5	2	screw plug	BSPP ½	304678	
6	1	clogging indicator, visual	OP	see sheet-no. 1628	
7	1	clogging indicator, visual-electric	OE	see sheet-no. 1628	
8	1	clogging indicator, visual-electric	AE	see sheet-no. 1609	
9	1	clogging sensor, electronic	VS5	see sheet-no. 1641	
10	2	O-ring	14 x 2	304342 (NBR)	304722 (FPM)
11	2	screw plug	BSPP ¼	305003	

item 11 execution only without clogging indicator or clogging sensor

Test methods:

Filter elements are tested according to the following ISO standards:

ISO 2941	Verification of collapse/burst resistance
ISO 2942	Verification of fabrication integrity
ISO 2943	Verification of material compatibility with fluids
ISO 3723	Method for end load test
ISO 3724	Verification of flow fatigue characteristics
ISO 3968	Evaluation of pressure drop versus flow characteristics
ISO 16889	Multi-pass method for evaluating filtration performance

Manual and maintenance instructions

for INTERNORMEN-line filters
LF 101, 251, 401, 631, 1001, 1950, 2200, 2005, 3005, 4005 related specifications

This manual is effective for all filters of the type series LF 101/251/401/631/1001/1100/1950/2200/2005/3005/4005 and related specifications. It contains certain requirements and instructions which ensure unobjectionable operation of the filter. It can be completed with specific additional instructions by the operator himself if necessary.

1. Safety instructions

- Prior to operating the filter, manual and maintenance instructions have to be read carefully.
- Follow the instructions of this manual under any circumstances!
- The manufacturer does not assume liability for any damage, which occurs due to the disregarding of these instructions.
- If operations are carried out differently, the safety of the pressurized device can not be assured!
- Operating conditions given in the data sheet, especially excess pressure and temperature range, have to be followed unconditionally. Variation of these parameters can cause damage to important pressure holding parts and sealing. Also take in consideration the compatibility of filter components with the operating fluid.
- Under working conditions the filter housing is pressurized. Do not try to loosen or remove any part of the filter or the filter housing during operation. The operating fluid could escape at high pressure and high temperatures.
- Leaking operating fluid always brings a danger of injuries and burns!
- Do not open the filter housing until you made sure that it is not pressurized any more!
- Touching parts of the filter may cause burning, depending on the operating temperature.
- When exchanging the filter keep in mind that it might have operating temperature. Danger of burning!
- Always wear safety goggles and gloves when working on the filter!
- If you come into contact with the operating fluid please follow the instructions of the fluid manufacturer!
- Only use original spare parts.

For filters being used in hazardous locations the INTERNORMEN documentation N° 41269 "Supplementation of the Operating Manual for the use of filters in potential explosive areas.

2. Installation of the filter

Note the safety instructions!

The filter has to be installed without any potential in an upright position using the fixing installations intended for these purposes.
Also make sure, that

- sufficient fixation of the element is ensured.
- the clogging indicator is accessible and can be checked easily.
- the drain valve (G ½ A, bottom), air bleeding valve (2x G ½ A, top) and pressure measuring connections (2x G¼ A) can be accessed easily.
- there is enough room above the filter to remove and replace elements (also check the data sheet).
- sufficient measures were taken to prevent corrosion
- the filter is protected from other mechanical influences (such as impacts and hits).

Counterflanges of the pipe-system have to be connected properly to the „In“ and the “Out” flanges of the filter, in order to prevent any force to be applied onto the filter from the pipes. When performing these steps make sure no contamination or other particles enter the filter.

Following fastening torques are suggested for the counterflanges:

LF 101/251/401/631	LF 1001/1100/1950/2200/2005/3005/4005
60 Nm	130 Nm

Appropriate pipework (pipes, hoses) ensures that drain and air-bleed valves are connected to proper containers. For these purposes original INTERNORMEN-Technology drain and air-bleed valves can be used.

Filters with electric or electronic clogging indicators require the connection of these devices to suitable power supply. Please note the data sheet and the instructions of the clogging indicators.

3. Initial operation

Note the safety instructions!

3.1 Prior to initial operation

Prior to the initial operation of the system or the machine, which means prior to filling in any fluid, check the internal condition of the filter. Proceed as follows:

- Open the filter housing by removing the lit. Check the cleanness of the housing, the presence of an element, the sealing, etc..
- Close the housing tight.

3.2 Filling and bleeding

- Open the air-bleed valve
- Fill the filter until the operating fluid leaks from the air-bleed valve free of bubbles.
- Close the air-bleed valve

Afterwards the filter is ready for operation.

4. Maintenance and inspection

Also please note all particular site-related instructions for inspection.

Using filters equipped with clogging indicators it is necessary to exchange or clean the element if the signal “Clogged filter” is emitted (also note the data sheet or the instructions of the clogging indicators).
Contaminated elements have to be replaced as soon as possible! If a clogged element is not removed it may cause severe damage to the entire system!

Caution!

Always exchange elements with sealing. If a cleaned metal mesh element type „G“ is reused replace its sealing. The exact markings can be found in spare part lists for each element.

4.1 Installing the filter element

Note safety instructions!

Maintenance or the exchange of contaminated filter elements has to be performed as follows:

- Shut down the entire machine and relieve the system pressure from the filter. Equalize the pressure with the surrounding atmosphere.
- Open the drain valve,
- Remove the lit of the filter and lead off the escaping operating fluid into qualified containers.
- Remove the element by light swaying and pulling.
- Cover or close the adaptor end inside the housing and clean the entire inside.
- Close the drain valve and remove the cover of the adaptor end.
- Check the sealing of the filter lit and replace the O-ring if necessary.
- Take the replacing element, make sure the serial number matches the number of the old element, and insert it into the housing (prior check if the elements sealing are undamaged and tighten them)
- close the filter with it’s lit,
- finally perform the steps described in 3.2 “Filling and bleeding”

4.2 Cleaning the filter element

Metal mesh filter elements can be recycled after cleaning. This cleaning procedure can be performed based on the cleaning instructions for INTERNORMEN metal mesh filter elements on sheets no. 21070-4 and 39448-4.
When removing and reinserting the element please proceed as described in 4.1 “Installing the filter element”.

Caution!

When using a filter with single-service elements always keep enough replacing elements in stock!

5. Measuring pressure difference

Note safety instructions!

The pressure drop on the filter, which indicates the contamination of the element, is measured using the installed clogging indicator. If a certain limit value (also see specification of the element) is reached, a signal (visual or electrical) will be emitted.
In addition to that, the pressure loss can be determined externally using the measuring connections G ¼ A based on DIN 3852 T2 on both inlet and outlet of the filter. Miniature measuring connections EMA 3/R ¼ Ermeto are preferred as the connecting elements for pressure difference detection.

6. Service

The service will be performed by

EATON Technologies GmbH
Friedensstr. 41
D-68804 Altlussheim
Germany

phone: +49(0)6205-2094-0
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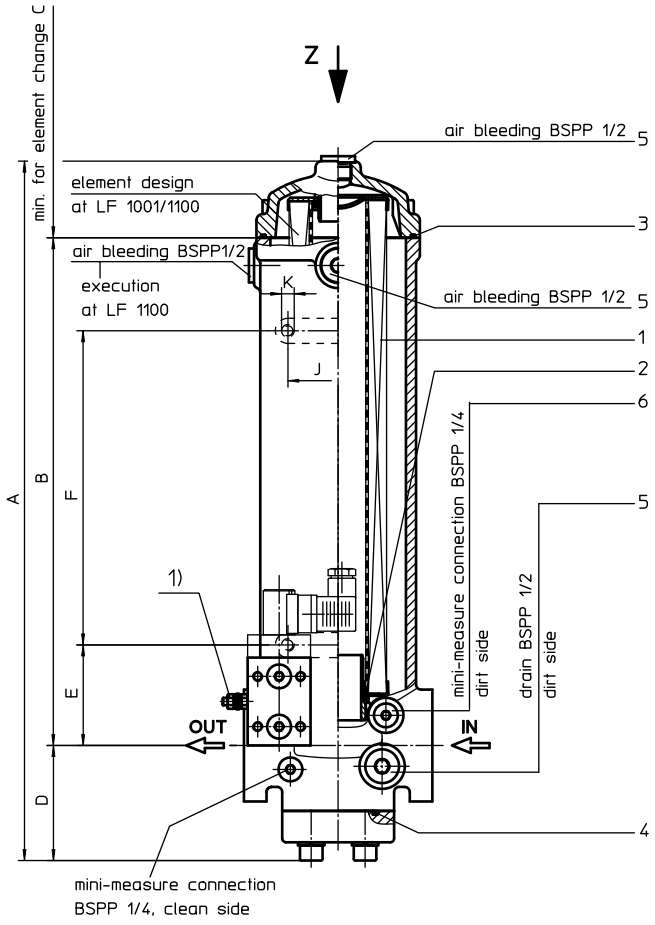
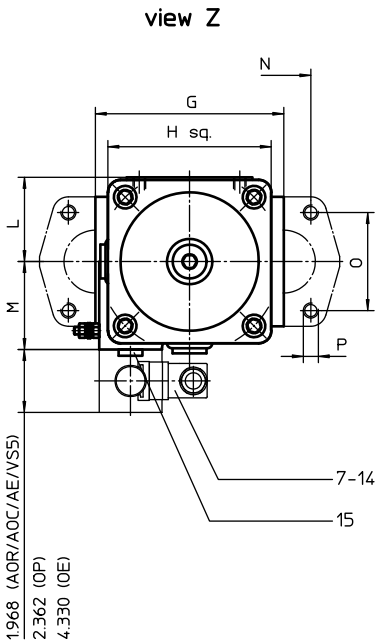
Special questions about the operation of the filter will also be answered within this area.
Spare parts respectively wearing parts have to be ordered according to the spare part list of the filter-data-sheet.

Series LF 251-1100
464 PSI





1) Connect the stand grounding tab to a suitable earth ground point.

Dimensions:

type	LF 251	LF 401	LF 631	LF 1001	LF 1100
connection	SAE 1 ½“	SAE 2“	SAE 2 ½“	SAE 3“	SAE 5“
A	13.94	21.65	22.09	23.03	25.24
B	10.00	15.91	15.98	15.91	16.93
C	10.24	16.14	16.14	16.14	16.14
D	1.54	3.35	3.39	3.94	5.19
E	3.15	3.15	3.15	3.54	4.57
F	-	9.84	9.84	9.84	9.84
G	5.51	5.91	6.69	8.66	8.66
H	5.12	5.12	6.30	8.07	8.07
J	3.15	3.15	3.15	4.57	4.57
K	M10x.47 deep	M10x.47 deep	M12x.71 deep	M12x.71 deep	M12x.71 deep
L	2.64	2.64	3.23	4.17	4.17
M	2.83	2.76	3.39	4.17	4.17
N	1.40	1.68	2.00	2.44	3.62
O	2.75	3.06	3.50	4.19	6.00
P	M12x.74deep	M10x.74 deep	M12x.74 deep	M16x.94 deep	M16x.94 deep
weight	35 lbs.	55 lbs.	77 lbs.	99 lbs.	112 lbs.
volume tank	.63 Gal.	1.0 Gal.	1.4 Gal.	3,0 Gal.	3,0 Gal.

Dimensions: inches

Designs and performance values are subject to change.

Pressure Filter
Series LF 251-1100
464 PSI

Description:

In-line filter series LF 251-1100 have a working pressure up to 464 PSI. Pressure peaks can be absorbed with a sufficient safety margin. The LF filter is mounted in-line. It can be used as suction filter, pressure filter and return-line filter.

The filter element consists of star-shaped, pleated filter material which is supported on the inside by a perforated core tube and is bonded to the end caps with a high-quality adhesive. The flow direction is from outside to inside.

For cleaning the mesh element or changing the glass fiber element, remove the cover and take out the element. The mesh elements are not guaranteed to maintain 100% performance after cleaning.

For filtration finer than 40 µm, use the disposable elements made of microglass. Filter elements as fine as 5 µm(c) are available; finer filter elements upon request.

Eaton-filter elements are known for a high intrinsic stability and an excellent filtration capability, a high dirt-retaining capacity and a long service life.

Eaton filter elements are suitable for all petroleum based fluids, HW-emulsions, most synthetic hydraulic fluids and lubrication oils.

The by-pass valve is integrated into the filter head. After reaching the by-pass pressure setting, the by-pass valve will send unfiltered partial flow around the filter.

Ship classifications available upon request.

1. Type index:

1.1. Complete filter: (ordering example)

LF.	401.	10VG.	30.	E.	P.	-.	FS.	8.	-.	-.	AE
1	2	3	4	5	6	7	8	9	10	11	12

1 **series:**
LF = In-line filter

2 **nominal size:** 251, 401, 631, 1001, 1100

3 **filter-material and filter-fineness:**
80G, 40G, 25G, 10G stainless steel wire mesh
25VG, 16VG, 10VG, 6VG, 3VG microglass
25API, 10API microglass according to API

4 **filter element collapse rating:**
10 = ∆p 145 PSI (01NR.1000)
30 = ∆p 435 PSI (01NL.250-630)

5 **filter element design:**
E = single-end open
B = both sides open (01NR.1000)
S = with by-pass valve ∆p 29 PSI
S1 = with by-pass valve ∆p 51 PSI

6 **sealing material:**
P = Nitrile (NBR)
V = Viton (FPM)

7 **filter element specification:** (see catalog)
- = standard
VA = stainless steel
IS06 = for HFC applications, see sheet-no. 31601
IS07 = for oil/ammonia mixtures (NH3), see sheet-no. 31602

8 **process connection:**
FS = SAE-flange 3000 PSI

9 **process connection size:**
7 = 1 ½“ (LF251)
8 = 2“ (LF401)
9 = 2 ½“ (LF631)
A = 3“ (LF1001)
C = 5“ (LF1100)

10 **filter housing specification:** (see catalog)
- = standard
IS06 = for HFC applications, see sheet-no. 31605
IS20 = ASME VIII Div.1 with ASME equivalent material, see sheet-no. 55217 (operating pressure max. 232 PSI)

11 **internal valve:**
- = without
S = with by-pass valve ∆p 29 PSI (LF1001/1100)
S1 = with by-pass valve ∆p 51 PSI (LF1001/1100)

12 **clogging indicator or clogging sensor:**
- = without
AOR = visual, see sheet-no. 1606
AOC = visual, see sheet-no. 1606
AE = visual-electric, see sheet-no. 1609
OP = visual, see sheet-no. 1628
OE = visual-electric, see sheet-no. 1628
VS5 = electronic, see sheet-no. 1641

To add an indicator to your filter, use the corresponding indicator data sheet to find the indicator details and add them to the filter assembly model code.

1.2. Filter element: (ordering example)

01NL.	401.	10VG.	30.	E.	P.	-
1	2	3	4	5	6	7

1 **series:**
01NL. = standard filter element according to DIN 24550, T3
01NR. = standard return line filter element according to DIN 24550, T4

2 **nominal size:** 250, 400, 630 (01NL.), 1000 (01NR.)

3 - 7 see type index-complete filter

Accessories:

- gauge port - and bleeder connection, see sheet-no. 1650
- drain- and bleeder connection, see sheet-no. 1651
- SAE-counter flange, see sheet-no. 1652

Technical data:

design temperature:	14 °F to +212 °F
operating temperature:	14 °F to +176 °F
operating medium	mineral oil, other media on request
max. operating pressure:	464 PSI
max. operating pressure at IS20:	232 PSI
test pressure:	900 PSI
test pressure at IS20:	464 PSI
process connection:	SAE-flange 3000 PSI
housing material:	EN-GJS-400-18-LT
sealing material:	Nitrile (NBR) or Viton (FPM), other materials on request
installation position:	vertical
measure connections:	BSPP ¼
drain- and bleeder connections:	BSPP ½

Classified under the Pressure Equipment Directive 2014/68/EC for mineral oil (fluid group 2), Article 4, Para. 3.
Classified under ATEX Directive 2014/34/EC according to specific application (see questionnaire sheet-no. 34279-4).

Pressure drop flow curves:

Filter calculation/sizing

The pressure drop of the assembly at a given flow rate Q is the sum of the housing Δp and the element Δp and is calculated as follows:

$\Delta p_{assembly} = \Delta p_{housing} + \Delta p_{element}$
$\Delta p_{housing}$ = *(see Δp = f (Q) - characteristics)*

$$\Delta p_{element}\,(PSI) = Q\ (GPM)\ x\ \frac{MSK}{1000}\left(\frac{PSI}{GPM}\right) x\ \nu\,(SUS)\ x\ \frac{\rho}{0.876}\left(\frac{kg}{dm^3}\right)$$

For ease of calculation our Filter Selection tool is available online at www.eatonpowersource.com/calculators/filtration/

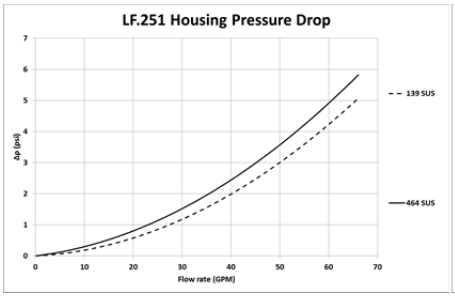
Material gradient coefficients (MSK) for filter elements

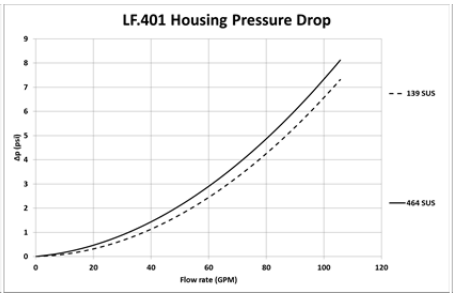
The material gradient coefficients in psi/gpm apply to mineral oil (HLP) with a density of 0.876 kg/dm³ and a kinematic viscosity of 139 SUS (30 mm²/s). The pressure drop changes proportionally to the change in kinematic viscosity and density.

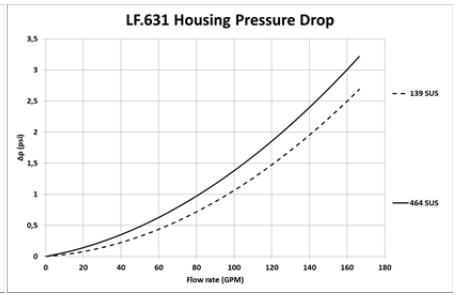
LF	VG					G			API	
	3VG	6VG	10VG	16VG	25VG	25G	40G	80G	10API	25API
251	1.14	0.646	0.414	0.360	0.246	0.0277	0.0258	0.0177	0.212	0.097
401	0.700	0.397	0.254	0.221	0.151	0.0169	0.0158	0.0108	0.130	0.059
631	0.534	0.303	0.194	0.169	0.115	0.1417	0.1322	0.0906	0.099	0.045
1001	0.237	0.165	0.105	0.092	0.063	0.0061	0.0057	0.0039	0.053	0.024
1100	0.237	0.165	0.105	0.092	0.063	0.0061	0.0057	0.0039	0.053	0.024

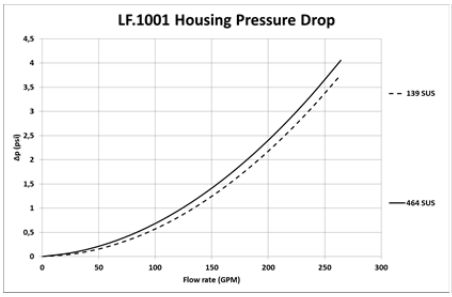
Δp = f(Q) – characteristics according to ISO 3968

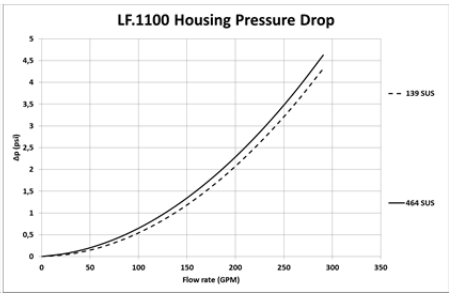
The pressure drop characteristics apply to mineral oil (HLP) with a density of 0,876 kg/dm³. The pressure drop changes proportionally to the density.



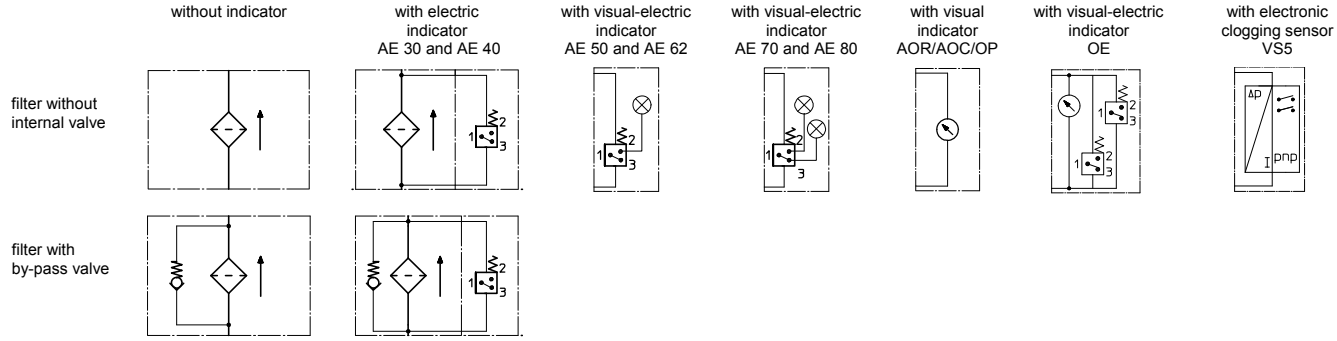








Symbols:



Spare parts:

item	designation	qty.	dimension and article-no. LF 251	qty.	dimension and article-no. LF 401	qty.	dimension and article-no. LF 631	qty.	dimension and article-no. LF 1001/1100
1	filter element	1	01NL.250…	1	01NL 400…	1	01NL 630…	1	01NR.1000…
2	O-ring	1	40 x 3 304389 (NBR) 304391 (FPM)	1	40 x 3 304389 (NBR) 304391 (FPM)	1	60 x 3,5 304377 (NBR) 304398 (FPM)	1	90 x 4 306941 (NBR) 307031 (FPM)
3	O-ring	1	115 x 3 303963 (NBR) 307762 (FPM)	1	115 x 3 303963 (NBR) 307762 (FPM)	1	125 x 3 306025 (NBR) 307358 (FPM)	1	185 x 4 305593 (NBR) 306309 (FPM)
4	O-ring (LF 401-1001)	-	-	1	56,75 x 3,53 306035 (NBR) 310264 (FPM)	1	69,45 x 3,53 305868 (NBR) 307357 (FPM)	1	85,32 x 3,53 305590 (NBR) 306308 (FPM)
	O-ring (LF 1100)	-	-	-	-	-	-	1	136,12 x 3,53 320162 (NBR) 320163 (FPM)
5	screw plug	3	BSPP ½ 304678	3	BSPP ½ 304678	3	BSPP ½ 304678	3	BSPP ½ 304678
6	screw plug	2	BSPP ¼ 305003						
7	clogging indicator, visual	1	AOR or AOC				see sheet-no. 1606		
8	clogging indicator, visual	1	OP				see sheet-no. 1628		
9	clogging indicator, visual-electric	1	OE				see sheet-no. 1628		
10	clogging indicator, visual-electric	1	AE				see sheet-no. 1609		
11	clogging sensor, electronic	1	VS5				see sheet-no. 1641		
12	O-ring	1	15 x 1,5 315357 (NBR) 315427 (FPM)						
13	O-ring	1	22 x 2 304708 (NBR) 304721 (FPM)						
14	O-ring	2	14 x 2 304342 (NBR) 304722 (FPM)						
15	screw plug	2	BSPP ¼ 305003						

item 15 execution only without clogging indicator or clogging sensor

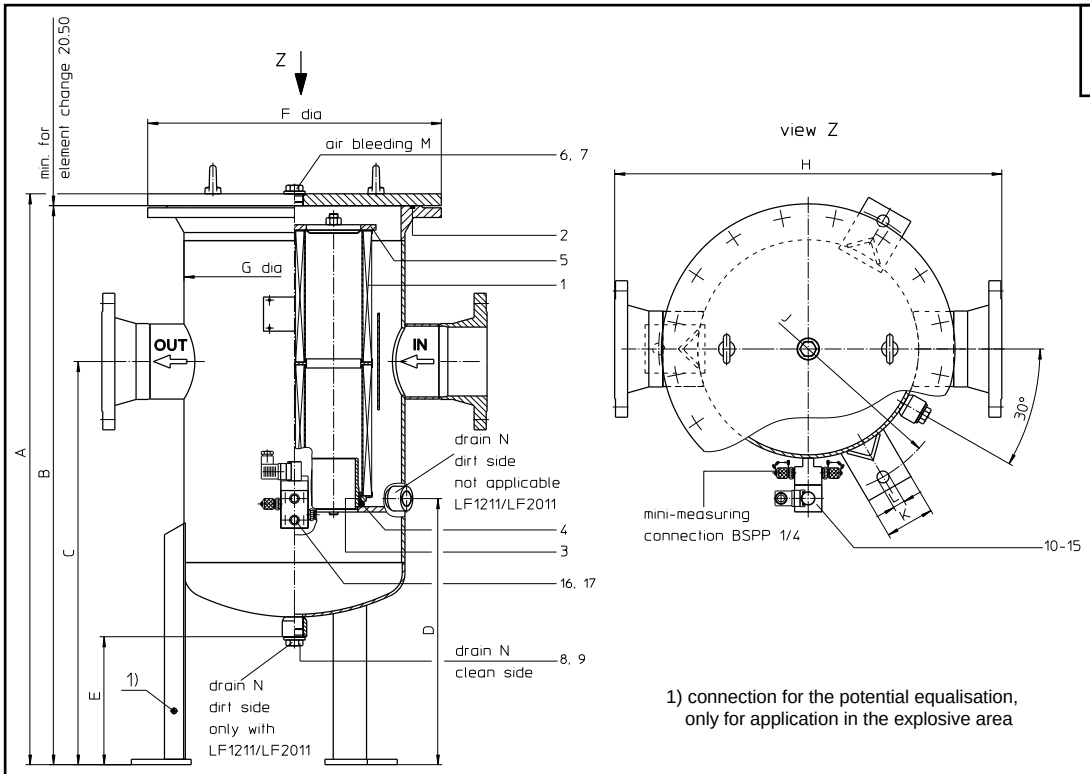
Test methods:

Filter elements are tested according to the following ISO standards:

ISO 2941	Verification of collapse/burst resistance
ISO 2942	Verification of fabrication integrity
ISO 2943	Verification of material compatibility with fluids
ISO 3723	Method for end load test
ISO 3724	Verification of flow fatigue characteristics
ISO 3968	Evaluation of pressure drop versus flow characteristics
ISO 16889	Multi-pass method for evaluating filtration performance

PRESSURE FILTER
Series LF 1211-10011 145 PSI

Sheet No. **1127 C**



1) connection for the potential equalisation, only for application in the explosive area

3. Dimensions: inch

type	conn. ANSI	A	B	C	D	E	F	G	H	J	K	L	M	N	weight lbs.	volume tank
LF 1211	2“	41.42	40.47	15.75	-	7.40	13.38	8.62	17.95	12.99	2.76	.71	½ BSPP	1 BSPP	132	6.8 Gal
	2 ½“	42.20	41.22													7.1 Gal
	3“	41.42	40.47													6.8 Gal
	4“	44.40	43.46													7.6 Gal
LF 2011	2 ½“	43.03	42.00	16.73	-	7.32	15.55	10.75	21.96	14.96	2.76	.71	1 BSPP	1 BSPP	242	11.5 Gal
	3“	43.77	42.75													11.7 Gal
	4“	43.30	42.28													11.5 Gal
	5“	46.77	45.74													12.6 Gal
LF 2411	2 ½“	40.00	38.98	27.56	17.52	7.20	17.51	12.46	25.98	17.72	2.76	.71	1 BSPP	1 BSPP	286	14.5 Gal
	3“															
	4“															
	5“															
LF 3611	3“	41.96	40.94	29.53	19.49	9.37	22.24	15.98	28.03	21.65	3.54	.87	1 BSPP	1 BSPP	572	23.7 Gal
	4“															
	5“															
	6“															
LF 4811/ 6011	4“	43.62	42.52	31.50	21.06	9.13	26.37	20.00	34.48	25.95	3.54	.87	1 BSPP	1 BSPP	682	38.3 Gal
	5“															
	6“															
	8“															
LF 10011	5“	45.11	43.70	31.50	22.44	11.14	35.23	27.99	41.73	35.43	4.72	.87	1 ½ BSPP	1 ½ BSPP	1232	74.7 Gal
	6“															
	8“															
	10“															

EDV 08/12

1. Type index:

1.1. Complete filter: (ordering example)

LF. 2011. 10VG. 10. E. P. -. FA11. 9. -. AE

1	2	3	4	5	6	7	8	9	10	11

1 **series:**
LF = in-line filter

2 **nominal size:** 1211, 2011, 2411, 3611, 4811, 6011, 10011

3 **filter material and filter fineness:**
80 G = 80 µm, 40 G = 40 µm, 25 G = 25 µm stainless steel wire mesh,
25 VG = 20 $\mu m_{(c)}$, 16 VG = 15 $\mu m_{(c)}$, 10 VG = 10$\mu m_{(c)}$, 6 VG = 7 $\mu m_{(c)}$, 3 VG = 5 $\mu m_{(c)}$ Interpor fleece (glass fiber)
25 API = 20 µm, 10 API = 10 µm Interpor fleece (glass fiber) according to API

4 **resistance of pressure difference for filter element:**
10 = Δp 145 PSI

5 **filter element design:**
E = without by-pass valve; S = with by-pass valve Δp 29 PSI

6 **sealing material:**
P = Nitrile (NBR) ; V = Viton (FPM)

7 **filter element specification:** (see catalog)
- = standard
VA = stainless steel
IS06 = see sheet-no. 31601

8 **connection:**
FA11 = ANSI-flange CLASS 150 PSI sealing surface rough grind 1600-3600 µin
FA12 = ANSI-flange CLASS 150 PSI, sealing surface rough grind < 640 µin

9 **connection size:**

DN	filter nominal size						
8 = 2“	1211						
9 = 2 ½“	1211	2011	2411				
A = 3“	1211	2011	2411	3611			
B = 4“	1211	2011	2411	3611	4811	6011	
C = 5“		2011	2411	3611	4811	6011	10011
D = 6“				3611	4811	6011	10011
E = 8“					4811	6011	10011
F = 10“							10011

10 **filter housing specification:** (see catalog)
- = standard
IS06 = see sheet-no. 31605

11 **clogging indicator or clogging sensor:**
- = without
AE = visual-electrical, see sheet-no.1609
OP = visual, see sheet-no.1628; VS1 = electronical, see sheet-no.1607
OE = visual-electrical, see sheet-no 1628; VS2 = electronical, see sheet-no.1608

1.2. Filter element: (ordering example)

01E. 2001. 10VG. 10. E. P. -

1	2	3	4	5	6	7

1 **series:**
01E. = filter element according to company standard

2 **nominal size:** 1201, 2001

3 - 7 see type index-complete filter

2. Accessories:

- measure-and bleeder -connections, see sheet-no. 1650
- evacuation- and bleeder-connections, see sheet-no. 1651
- counter flanges, ANSI-flange 150 PSI
- lifting mechanism, see sheet-no. 1661

Changes of measures and design are subject to alteration!

4. Spare parts:

4.1. Depending on different series:

item	designation	qty.	dimension and article-no. LF 1211	dimension and article-no. LF 2011	qty.	dimension and article-no. LF 2411	qty.	dimension and article-no. LF 3611	qty.	dimension and article-no. LF 4811	qty.	dimension and article-no. LF 6011	qty.	dimension and article-no. LF 10011
1	filter element	1	01E.1201	01E.2001	2	01E.1201	3	01E.1201	4	01E.1201	3	01E.2001	5	01E.2001
2	O-ring	1	225 x 5 308652 (NBR) 311473 (FPM)	275 x 5 307414 (NBR) 310288 (FPM)	1	330 x 5 303080 (NBR) 310275 (FPM)	1	429 x 6 308659 (NBR) 310273 (FPM)	1	516 x 6 301962 (NBR) 311474 (FPM)	1	516 x 6 301962 (NBR) 311474 (FPM)	1	722 x 8 308145 (NBR) 311805 (FPM)
3	O-ring	1	93 x 5 307588 (NBR) 307589 (FPM)	135 x 5 306016 (NBR) 307045 (FPM)	2	93 x 5 307588 (NBR) 307589 (FPM)	3	93 x 5 307588 (NBR) 307589 (FPM)	4	93 x 5 307588 (NBR) 307589 (FPM)	3	135 x 5 306016 (NBR) 307045 (FPM)	5	135 x 5 306016 (NBR) 307045 (FPM)
4	O-ring	1	85 x 10 304386 (NBR) 304541 (FPM)	125 x 10 304388 (NBR) 306006 (FPM)	2	85 x 10 304386 (NBR) 304541 (FPM)	3	85 x 10 304386 (NBR) 304541 (FPM)	4	85 x 10 304386 (NBR) 304541 (FPM)	3	125 x 10 304388 (NBR) 306006 (FPM)	5	125 x 10 304388 (NBR) 306006 (FPM)
5	spring	1	304414		-	-	-	-	-	-	-	-	-	-
	pressure plate	-	-		1	309851	1	313116	1	314718	1	313335	1	313062
6	screw plug	1	½ BSPP 309730	1 BSPP 309732	1	1 BSPP 309732							1	1 ½ BSPP 318556
7	gasket	1	A 22 x 27 305564	A 33 x 39 308257	1	A 33 x 39 308257							1	A 48 x 55 309764
8	screw plug	1	1 BSPP 309732	1 BSPP 309732	2	1 BSPP 309732							2	1 ½ BSPP 318556
9	gasket	1	A 33 x 39 308257	A 33 x 39 308257	2	A 33 x 39 308257							2	A 48 x 55 309764

4.2. Independing on the series:

item	qty.	designation	dimension	article-no.	
10	1	clogging indicator, visual	OP	see sheet-no. 1628	
11	1	clogging indicator, visual-electrical	OE	see sheet-no. 1628	
12	1	clogging indicator, visual-electrical	AE	see sheet-no. 1609	
13	1	clogging sensor, electronical	VS1	see sheet-no. 1607	
14	1	clogging sensor, electronical	VS2	see sheet-no. 1608	
15	2	O-ring	14 x 2	304342 (NBR)	304722 (FPM)
16	2	screw plug	¼ BSPP	309734	
17	2	gasket	A 14 x 18	306330	

5. Description:

In-line filters of the series LF 1211-10011 are suitable for a working pressure up to 145 PSI.
Pressure peaks can be absorbed with a sufficient margin of safety.
The filter is in-line mounted. Inlet and outlet are on the same level. The filters can be installed as suction-filter, pressure-filter or return-line filter.
The filter element consist of star-shaped, pleated filter material which is supported on the inside by a perforated core tube and is bonded to the end caps with a high-quality adhesive. The flow direction is from outside to the inside. The particles are hold back on the outside. For cleaning (see special leaflet 21070-4 resp. 39448-4) the mesh element respectively to change the glass fiber element remove the cover and take out the element.
Filter finer than 40 µm should use throuw-away elements made of paper or Interpor fleece (glass fiber). Filter elements as fine as 5 $\mu m_{(c)}$ are available; finer filter elements on request.
Internormen Product Line filter elements are known as elements with a high intrinsic stability and an excellent filtration capability, a high dirt-retaining capacity and a long service life.
Internormen Product Line filter are suitable for all petroleum based fluids, HW-emulsions, most synthetic hydraulic fluids and lubrication oils.
Approvals according to TÜV, and the mayor „Shipyard Classification Societies“ D.N.V.; B.V.; G.L.; L.R.S.; R.I.N.A.; A.B.S.; P.R.S.;USS.R.S. and others are possible.

6. Technical data:

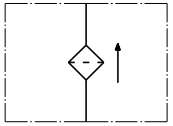
temperature range:	+14°F to +176°F (for a short time +212°F)
operating medium:	mineral oil, other media on request
max. operating pressure:	145 PSI
test pressure:	208 PSI
connection system:	ANSI-flange connection CLASS 150 PSI
housing material:	C-steel
sealing material:	Nitrile (NBR) or Viton (FPM), other materials on request
installation position:	vertical
mini-measuring connection:	¼ BSPP

Classified under the Pressure Equipment Directive 97/23/EC for mineral oil (fluid group 2), Article 3, Para. 3.
Classified under ATEX Directive 94/9/EC according to specific application (see questionnaire sheet-no. 34279-4).

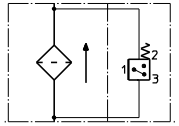
US 1127 C

7. Symbols:

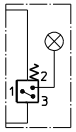
without indicator



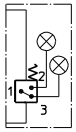
with electrical indicator
AE 30 and AE 40



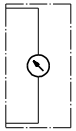
with visual - electrical indicator
AE 50 and AE 62



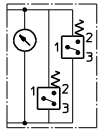
with visual - electrical indicator
AE 70 and AE 80



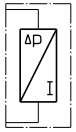
with visual indicator
OP



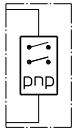
with visual - electrical indicator
OE



with electronical clogging sensor
VS1



with electronical clogging sensor
VS2



8. Pressure drop flow curves:

Precise flow rates see ‘Interactive Product Specifier’, respectively Δp-curves; depending on filter fineness and viscosity.

9. Test methods:

Filter elements are tested according to the following ISO standards:

ISO 2941	Verification of collapse/burst resistance
ISO 2942	Verification of fabrication integrity
ISO 2943	Verification of material compatibility with fluids
ISO 3723	Method for end load test
ISO 3724	Verification of flow fatigue characteristics
ISO 3968	Evaluation of pressure drop versus flow characteristics
ISO 16889	Multi-pass method for evaluating filtration performance

Manual and maintenance instructions

for INTERNORMEN-line filters
LF/ELF 1201-10001, 1211-10011, LNR 1001-8001, LNA, related specifications

This manual is effective for all filters of the type series LF/ELF 1201-10001, 1211-10011, LNR 1001-8001, LNA, and related specifications. It contains certain requirements and instructions which ensure unobjectionable operation of the filter. It can be completed with specific additional instructions by the operator himself if necessary.

1. Safety instructions

- Prior to operating the filter, manual and maintenance instructions have to be read carefully.
- Follow the instructions of this manual under any circumstances!
- The manufacturer does not assume liability for any damage, which occurs due to the disregarding of these instructions.
- If operations are carried out differently, the safety of the pressurized device can not be assured!
- Operating conditions given in the data sheet, especially excess pressure and temperature range, have to be followed unconditionally. Variation of these parameters can cause damage to important pressure holding parts and sealing. Also take in consideration the compatibility of filter components with the operating fluid.
- Under working conditions the filter housing is pressurized. Do not try to loosen or remove any part of the filter or the filter housing during operation. The operating fluid could escape at high pressure and high temperatures.
- Leaking operating fluid always brings a danger of injuries and burns!
- Do not open the filter housing until you made sure that it is not pressurized any more!
- Touching parts of the filter may cause burning, depending on the operating temperature.
- When exchanging the filter keep in mind that it might have operating temperature. Danger of burning!
- Always wear safety goggles and gloves when working on the filter!
- If you come into contact with the operating fluid please follow the instructions of the fluid manufacturer!
- Only use original spare parts.

For filters being used in hazardous locations the INTERNORMEN documentation N° 41269 "Supplementation of the Operating Manual for the use of filters in potential explosive areas.

2. Installation of the filter

Note the safety instructions!

The filter has to be installed without any potential in an upright position using the fixing installations intended for these purposes.
Also make sure, that

- sufficient fixation of the element is ensured.
- the clogging indicator is accessible and can be checked easily.
- the drain valve (G ½ A, bottom), air bleeding valve (2x G ½ A, top) and pressure measuring connections (2x G¼ A) can be accessed easily.
- there is enough room above the filter to remove and replace elements (also check the data sheet).
- sufficient measures were taken to prevent corrosion
- the filter is protected from other mechanical influences (such as impacts and hits).

Counterflanges of the pipe-system have to be connected properly to the „In“ and the “Out” flanges of the filter, in order to prevent any force to be applied onto the filter from the pipes. When performing these steps make sure no contamination or other particles enter the filter.

Appropriate pipework (pipes, hoses) ensures that drain and air-bleed valves are connected to proper containers. For these purposes original INTERNORMEN-Technology drain and air-bleed valves can be used.

Filters with electric or electronic clogging indicators require the connection of these devices to suitable power supply. Please note the data sheet and the instructions of the clogging indicators.

3. Initial operation

Note the safety instructions!

3.1 Prior to initial operation

Prior to the initial operation of the system or the machine, which means prior to filling in any fluid, check the internal condition of the filter. Proceed as follows:

- Open the filter housing by removing the lit. Check the cleanness of the housing, the presence of an element, the sealing, etc..
- Close the housing tight.

3.2 Filling and bleeding

- Open the air-bleed valve
- Fill the filter until the operating fluid leaks from the air-bleed valve free of bubbles.
- Close the air-bleed valve

Afterwards the filter is ready for operation.

4. Maintenance and inspection

Also please note all particular site-related instructions for inspection.

Using filters equipped with clogging indicators it is necessary to exchange or clean the element if the signal “Clogged filter” is emitted (also note the data sheet or the instructions of the clogging indicators).
Contaminated elements have to be replaced as soon as possible! If a clogged element is not removed it may cause severe damage to the entire system!

Caution!

Always exchange elements with sealing. If a cleaned metal mesh element type „G“ is reused replace its sealing. The exact markings can be found in spare part lists for each element.

4.1 Installing the filter element

Note safety instructions!

Maintenance or the exchange of contaminated filter elements has to be performed as follows:

- Shut down the entire machine and relieve the system pressure from the filter. Equalize the pressure with the surrounding atmosphere.
- Open the drain valve,
- Remove the lit of the filter and lead off the escaping operating fluid into qualified containers.
- Remove the element by light swaying and pulling.
- Cover or close the adaptor end inside the housing and clean the entire inside.
- Close the drain valve and remove the cover of the adaptor end.
- Check the sealing of the filter lit and replace the O-ring if necessary.
- Take the replacing element, make sure the serial number matches the number of the old element, and insert it into the housing (prior check if the elements sealing are undamaged and tighten them)
- close the filter with it’s lit,
- finally perform the steps described in 3.2 “Filling and bleeding”

4.2 Cleaning the filter element

Metal mesh filter elements can be recycled after cleaning. This cleaning procedure can be performed based on the cleaning instructions for INTERNORMEN metal mesh filter elements on sheets no. 21070-4 and 39448-4.
When removing and reinserting the element please proceed as described in 4.1 “Installing the filter element”.

Caution!

When using a filter with single-service elements always keep enough replacing elements in stock!

5. Measuring pressure difference

Note safety instructions!

The pressure drop on the filter, which indicates the contamination of the element, is measured using the installed clogging indicator. If a certain limit value (also see specification of the element) is reached, a signal (visual or electrical) will be emitted.
In addition to that, the pressure loss can be determined externally using the measuring connections G ¼ A based on DIN 3852 T2 on both inlet and outlet of the filter. Miniature measuring connections EMA 3/R ¼ Ermeto are preferred as the connecting elements for pressure difference detection.

6. Service

The service will be performed by

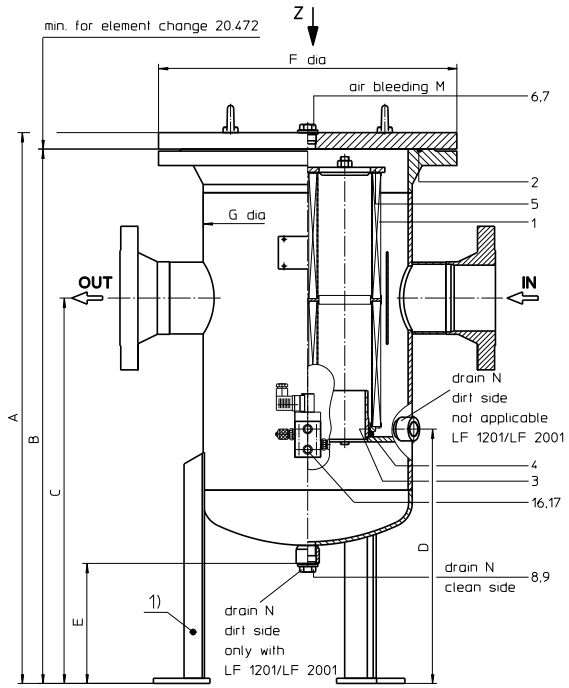
EATON Technologies GmbH
Friedensstr. 41
D-68804 Altlussheim
Germany

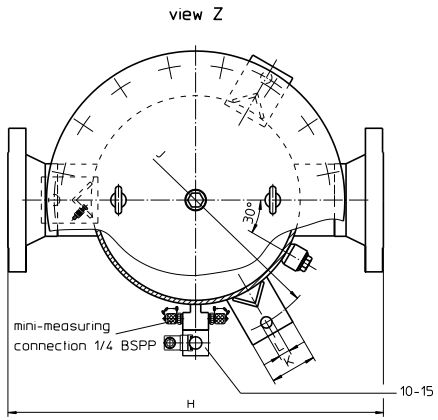
phone: +49(0)6205-2094-0
fax: +49(0)6205-2094-40

Special questions about the operation of the filter will also be answered within this area.
Spare parts respectively wearing parts have to be ordered according to the spare part list of the filter-data-sheet.

PRESSURE FILTER
Series LF 1201-10001 232 PSI

Sheet No. **1118 L**





1) connection for the potential equalisation, only for application in the explosive area

3. Dimensions: inch

type	conn. ANSI	A	B	C	D	E	F	G	H	J	K	L	M	N	weight lbs.	volume tank
LF 1201	2“	41.42	40.47	15.75	-	7.40	13.38	8.62	18.66	12.99	2.76	.71	½ BSPP	1 BSPP	132	6.8 Gal
	2 ½“	42.20	41.22													7.1 Gal
	3“	41.42	40.47													6.8 Gal
	4“	44.40	43.46													7.6 Gal
LF 2001	2 ½“	43.03	42.00	16.73	-	7.32	15.94	10.75	22.68	14.96	2.76	.71	1 BSPP	1 BSPP	242	11.5 Gal
	3“	43.77	42.75													11.7 Gal
	4“	43.30	42.28													11.5 Gal
	5“	46.77	45.74													12.6 Gal
LF 2401	2 ½“	40.08	38.98	27.56	17.52	7.20	18.11	12.46	26.77	17.72	2.76	.71	1 BSPP	1 BSPP	286	14.5 Gal
	3“															
	4“															
	5“															
LF 3601	3“	42.20	40.94	29.53	19.49	9.37	22.83	15.98	28.74	21.65	3.54	.87	1 BSPP	1 BSPP	572	23.7 Gal
	4“															
	5“															
	6“															
LF 4801/ 6001	4“	43.94	42.52	31.50	21.06	9.13	28.15	20.00	35.04	25.95	3.54	.87	1 BSPP	1 BSPP	682	38.3 Gal
	5“															
	6“															
	8“															
LF 9001	5“	53.77	52.36	36.41	21.06	9.13	28.15	20.00	35.04	25.95	3.54	.87	1 BSPP	1 BSPP	804	58.0 Gal
	6“															
LF 10001	5“	45.27	43.70	31.50	22.44	11.14	35.83	27.99	42.91	35.43	4.72	.87	1 ½ BSPP	1 ½ BSPP	1232	74.7 Gal
	6“															
	8“															
	10“															

EDV 08/12

1. Type index:

1.1. Complete filter: (ordering example)

LF. 2001. 10VG. 10. E. P. -. FA1. 9. -. AE

1	2	3	4	5	6	7	8	9	10	11

1 **series:**
LF = in-line filter

2 **nominal size:** 1201, 2001, 2401, 3601, 4801, 6001, 9001, 10001

3 **filter material and filter fineness:**
80 G = 80 µm, 40 G = 40 µm, 25 G = 25 µm stainless steel wire mesh,
25 VG = 20 $\mu m_{(c)}$, 16 VG = 15 $\mu m_{(c)}$, 10 VG = 10 $\mu m_{(c)}$, 6 VG = 7 $\mu m_{(c)}$, 3 VG = 5 $\mu m_{(c)}$ Interpor fleece (glass fiber)
25 API = 20 µm, 10 API = 10 µm Interpor fleece (glass fiber) according to API

4 **resistance of pressure difference for filter element:**
10 = Δp 145 PSI

5 **filter element design:**
E = without by-pass valve
S = with by-pass valve Δp 29 PSI

6 **sealing material:**
P = Nitrile (NBR) ; V = Viton (FPM)

7 **filter element specification:** (see catalog)
- = standard; VA = stainless steel
IS06 = see sheet-no. 31601

8 **connection:**
FA 1 = ANSI-flange connection CLASS 300 PSI, sealing surface rough grind 1600-3600 µin
FA 2 = ANSI-flange connection CLASS 300 PSI, sealing surface rough grind < 640µin

9 **connection size:**

connection	filter nominal size							
8 = 2“	1201							
9 = 2 ½“	1201	2001	2401					
A = 3“	1201	2001	2401	3601				
B = 4“	1201	2001	2401	3601	4801	6001		
C = 5“		2001	2401	3601	4801	6001	9001	10001
D = 6“				3601	4801	6001	9001	10001
E = 8“					4801	6001		10001
F = 10“								10001

10 **filter housing specification:** (see catalog)
- = standard
IS06 = see sheet-no. 31605

11 **clogging indicator or clogging sensor:**
- = without
AE = visual-electrical, see sheet-no.1609
OP = visual, see sheet-no.1628; VS1 = electronical, see sheet-no.1607
OE = visual-electrical, see sheet-no 1628; VS2 = electronical, see sheet-no.1608

1.2. Filter element: (ordering example)

01E. 2001. 10VG. 10. E. P. -

1	2	3	4	5	6	7

1 **series:**
01E. = filter element according to company standard

2 **nominal size:** 1201, 2001, 3001

3 - 7 see type index-complete filter

2. Accessories:

- measure-and bleeder -connection see sheet-no. 1650
- evacuation- and bleeder-connection see sheet-no. 1651
- counter flange, ANSI-flange CLASS 300 PSI
- lifting mechanism see sheet-no. 1661

Changes of measures and design are subject to alteration!

4. Spare parts:

4.1. Depending on different series:

item	designation	qty.	dimension and article-no. LF 1201	dimension and article-no. LF 2001	qty.	dimension and article-no. LF 2401	qty.	dimension and article-no. LF 3601	qty.	dimension and article-no. LF 4801	qty.	dimension and article-no. LF 6001	qty.	dimension and article-no. LF 9001	qty.	dimension and article-no. LF 10001
1	filter element	1	01E.1201	01E.2001	2	01E.1201	3	01E.1201	4	01E.1201	3	01E.2001	3	01E.3001	5	01E.2001
2	O-ring	1	225 x 5 308652 (NBR) 311473 (FPM)	275 x 5 307414 (NBR) 310288 (FPM)	1	330 x 5 303080 (NBR) 310275 (FPM)	1	429 x 6 308659 (NBR) 310273 (FPM)	1	516 x 6 301962 (NBR) 311474 (FPM)	1	516 x 6 301962 (NBR) 311474 (FPM)	1	516 x 6 301962 (NBR) 311474 (FPM)		722 x 8 308145 (NBR) 311805 (FPM)
3	O-ring	1	93 x 5 307588 (NBR) 307589 (FPM)	135 x 5 306016 (NBR) 307045 (FPM)	2	93 x 5 307588 (NBR) 307589 (FPM)	3	93 x 5 307588 (NBR) 307589 (FPM)	4	93 x 5 307588 (NBR) 307589 (FPM)	3	135 x 5 306016 (NBR) 307045 (FPM)	3	135 x 5 306016 (NBR) 307045 (FPM)	5	135 x 5 306016 (NBR) 307045 (FPM)
4	O-ring	1	85 x 10 304386 (NBR) 304541 (FPM)	125 x 10 304388 (NBR) 306006 (FPM)	2	85 x 10 304386 (NBR) 304541 (FPM)	3	85 x 10 304386 (NBR) 304541 (FPM)	4	85 x 10 304386 (NBR) 304541 (FPM)	3	125 x 10 304388 (NBR) 306006 (FPM)	3	125 x 10 304388 (NBR) 306006 (FPM)	5	125 x 10 304388 (NBR) 306006 (FPM)
5	spring	1	304414		-	-	-	-	-	-	-	-	-		-	
	pressure plate	-	-		1	309851	1	313116	1	314718	1	313335	1	313335	1	313062
6	screw plug	1	½ BSPP 309730	1 BSPP 309732	1	1 BSPP 309732										1 ½ BSPP 318556
7	gasket	1	A 22 x 27 305564	A 33 x 39 308257	1	A 33 x 39 308257										A 48 x 55 309764
8	screw plug	1	1 BSPP 309732	1 BSPP 309732	2	1 BSPP 309732										1 ½ BSPP 318556
9	gasket	1	A 33 x 39 308257	A 33 x 39 308257	2	A 33 x 39 308257										A 48 x 55 309764

4.2. Independing on the series:

item	qty.	designation	dimension	article-no.	
10	1	clogging indicator, visual	OP	see sheet-no. 1628	
11	1	clogging indicator, visual-electrical	OE	see sheet-no. 1628	
12	1	clogging indicator, visual-electrical	AE	see sheet-no. 1609	
13	1	clogging sensor, electronical	VS1	see sheet-no. 1607	
14	1	clogging sensor, electronical	VS2	see sheet-no. 1608	
15	2	O-ring	14 x 2	304342 (NBR)	304722 (FPM)
16	2	screw plug	¼ BSPP	309734	
17	2	gasket	A 14 x 18	306330	

5. Description:

In-line filters of the series LF 1201-10001 are suitable for a working pressure up to 232 PSI.
Pressure peaks can be absorbed with a sufficient margin of safety.
The filter is in-line mounted. Inlet and outlet are on the same level. The filters can be installed as suction-filter, pressure-filter or return-line filter.
The filter element consist of star-shaped, pleated filter material which is supported on the inside by a perforated core tube and is bonded to the end caps with a high-quality adhesive. The flow direction is from outside to the inside. The particles are hold back on the outside.
For cleaning (see special leaflet 21070-4 resp. 39448-4) the mesh element respectively to change the glass fiber element remove the cover and take out the element.
Filter finer than 40 µm should use throw-away elements made of paper or Interpor fleece (glass fiber). Filter elements as fine as 5 $\mu m_{(c)}$ are available; finer filter elements on request.
Internormen Product Line filter elements are known as elements with a high intrinsic stability and an excellent filtration capability, a high dirt-retaining capacity and a long service life.
Internormen Product Line filter are suitable for all petroleum based fluids, HW-emulsions, most synthetic hydraulic fluids and lubrication oils.
Approvals according to TÜV, and the major „Shipyard Classification Societies“ D.N.V.; B.V.; G.L.; L.R.S.; R.I.N.A.; A.B.S.; P.R.S.;USS.R.S. and others are possible.

6. Technical data:

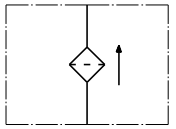
temperature range:	+14°F to +176°F (for a short time +212°F)
operating medium:	mineral oil, other media on request
max. operating pressure:	232 PSI
test pressure:	333 PSI
connection system:	ANSI-flange connection CLASS 300 PSI
housing material:	C-steel
sealing material:	Nitrile (NBR) or Viton (FPM), other materials on request
installation position:	vertical
mini-measuring connection:	¼ BSPP

Classified under the Pressure Equipment Directive 97/23/EC for mineral oil (fluid group 2), Article 3, Para. 3.
Classified under ATEX Directive 94/9/EC according to specific application (see questionnaire sheet-no. 34279-4).

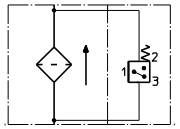
US 1118 L

7. Symbols:

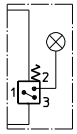
without indicator



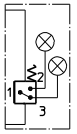
with electrical indicator AE 30 and AE 40



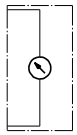
with visual - electrical indicator AE 50 and AE 62



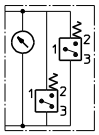
with visual - electrical indicator AE 70 and AE 80



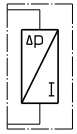
with visual indicator OP



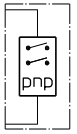
with visual - electrical indicator OE



with electronical clogging sensor VS1



with electronical clogging sensor VS2



8. Pressure drop flow curves:

Precise flow rates see ‘Interactive Product Specifier’, respectively Δp-curves; depending on filter fineness and viscosity.

9. Test methods:

Filter elements are tested according to the following ISO standards:

ISO 2941	Verification of collapse/burst resistance
ISO 2942	Verification of fabrication integrity
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ISO 3723	Method for end load test
ISO 3724	Verification of flow fatigue characteristics
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- Operating conditions given in the data sheet, especially excess pressure and temperature range, have to be followed unconditionally. Variation of these parameters can cause damage to important pressure holding parts and sealing. Also take in consideration the compatibility of filter components with the operating fluid.
- Under working conditions the filter housing is pressurized. Do not try to loosen or remove any part of the filter or the filter housing during operation. The operating fluid could escape at high pressure and high temperatures.
- Leaking operating fluid always brings a danger of injuries and burns!
- Do not open the filter housing until you made sure that it is not pressurized any more!
- Touching parts of the filter may cause burning, depending on the operating temperature.
- When exchanging the filter keep in mind that it might have operating temperature. Danger of burning!
- Always wear safety goggles and gloves when working on the filter!
- If you come into contact with the operating fluid please follow the instructions of the fluid manufacturer!
- Only use original spare parts.

For filters being used in hazardous locations the INTERNORMEN documentation N° 41269 "Supplementation of the Operating Manual for the use of filters in potential explosive areas.

2. Installation of the filter

Note the safety instructions!

The filter has to be installed without any potential in an upright position using the fixing installations intended for these purposes.
Also make sure, that

- sufficient fixation of the element is ensured.
- the clogging indicator is accessible and can be checked easily.
- the drain valve (G ½ A, bottom), air bleeding valve (2x G ½ A, top) and pressure measuring connections (2x G¼ A) can be accessed easily.
- there is enough room above the filter to remove and replace elements (also check the data sheet).
- sufficient measures were taken to prevent corrosion
- the filter is protected from other mechanical influences (such as impacts and hits).

Counterflanges of the pipe-system have to be connected properly to the „In“ and the “Out” flanges of the filter, in order to prevent any force to be applied onto the filter from the pipes. When performing these steps make sure no contamination or other particles enter the filter.

Appropriate pipework (pipes, hoses) ensures that drain and air-bleed valves are connected to proper containers. For these purposes original INTERNORMEN-Technology drain and air-bleed valves can be used.

Filters with electric or electronic clogging indicators require the connection of these devices to suitable power supply. Please note the data sheet and the instructions of the clogging indicators.

3. Initial operation

Note the safety instructions!

3.1 Prior to initial operation

Prior to the initial operation of the system or the machine, which means prior to filling in any fluid, check the internal condition of the filter. Proceed as follows:

- Open the filter housing by removing the lit. Check the cleanness of the housing, the presence of an element, the sealing, etc..
- Close the housing tight.

3.2 Filling and bleeding

- Open the air-bleed valve
- Fill the filter until the operating fluid leaks from the air-bleed valve free of bubbles.
- Close the air-bleed valve

Afterwards the filter is ready for operation.

4. Maintenance and inspection

Also please note all particular site-related instructions for inspection.

Using filters equipped with clogging indicators it is necessary to exchange or clean the element if the signal “Clogged filter” is emitted (also note the data sheet or the instructions of the clogging indicators).
Contaminated elements have to be replaced as soon as possible! If a clogged element is not removed it may cause severe damage to the entire system!

Caution!

Always exchange elements with sealing. If a cleaned metal mesh element type „G“ is reused replace its sealing. The exact markings can be found in spare part lists for each element.

4.1 Installing the filter element

Note safety instructions!

Maintenance or the exchange of contaminated filter elements has to be performed as follows:

- Shut down the entire machine and relieve the system pressure from the filter. Equalize the pressure with the surrounding atmosphere.
- Open the drain valve,
- Remove the lit of the filter and lead off the escaping operating fluid into qualified containers.
- Remove the element by light swaying and pulling.
- Cover or close the adaptor end inside the housing and clean the entire inside.
- Close the drain valve and remove the cover of the adaptor end.
- Check the sealing of the filter lit and replace the O-ring if necessary.
- Take the replacing element, make sure the serial number matches the number of the old element, and insert it into the housing (prior check if the elements sealing are undamaged and tighten them)
- close the filter with it’s lit,
- finally perform the steps described in 3.2 “Filling and bleeding”

4.2 Cleaning the filter element

Metal mesh filter elements can be recycled after cleaning. This cleaning procedure can be performed based on the cleaning instructions for INTERNORMEN metal mesh filter elements on sheets no. 21070-4 and 39448-4.
When removing and reinserting the element please proceed as described in 4.1 “Installing the filter element”.

Caution!

When using a filter with single-service elements always keep enough replacing elements in stock!

5. Measuring pressure difference

Note safety instructions!

The pressure drop on the filter, which indicates the contamination of the element, is measured using the installed clogging indicator. If a certain limit value (also see specification of the element) is reached, a signal (visual or electrical) will be emitted.
In addition to that, the pressure loss can be determined externally using the measuring connections G ¼ A based on DIN 3852 T2 on both inlet and outlet of the filter. Miniature measuring connections EMA 3/R ¼ Ermeto are preferred as the connecting elements for pressure difference detection.

6. Service

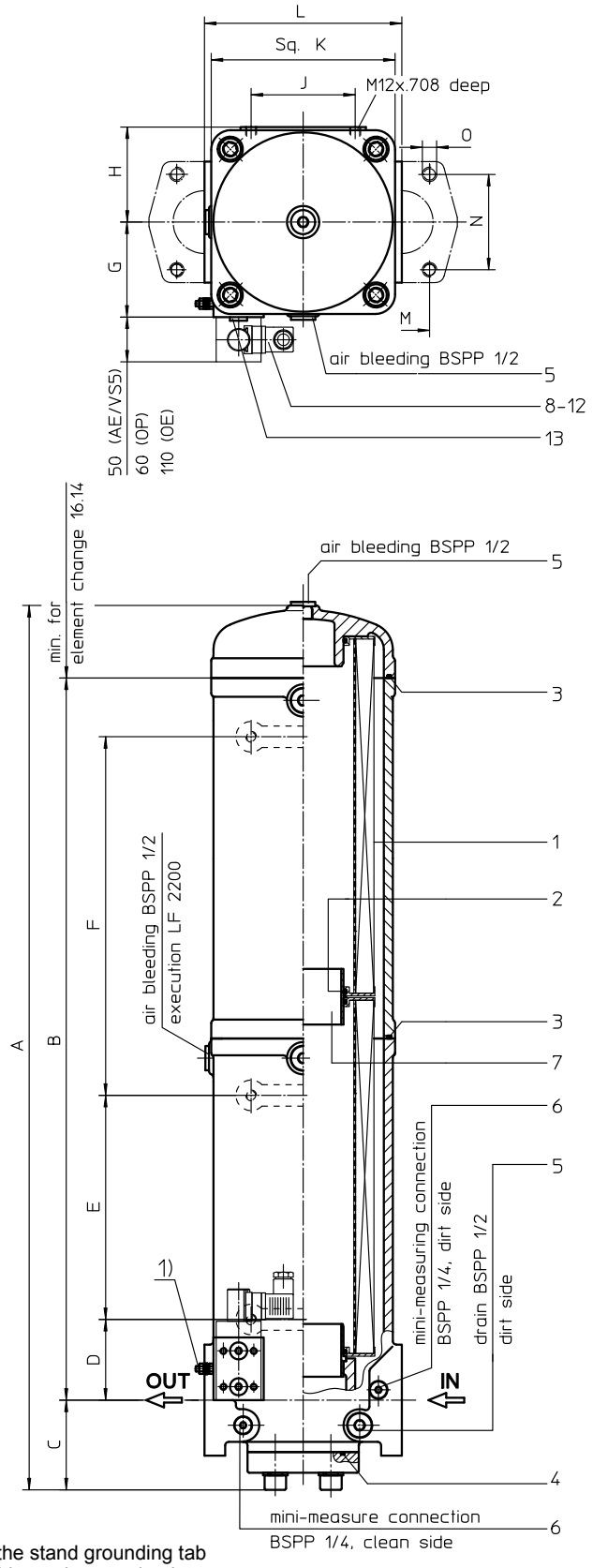
The service will be performed by

EATON Technologies GmbH
Friedensstr. 41
D-68804 Altlussheim
Germany

phone: +49(0)6205-2094-0
fax: +49(0)6205-2094-40

Special questions about the operation of the filter will also be answered within this area.
Spare parts respectively wearing parts have to be ordered according to the spare part list of the filter-data-sheet.

Series LF 1950-2200
464 PSI



Dimensions:

type	LF1950	LF2200
connection	SAE 3“	SAE 5“
A	38.86	41.10
B	31.73	32.75
C	3.94	5.12
D	3.54	4.57
E	9.84	9.84
F	15.75	15.75
G	4.17	4.17
H	4.17	4.17
J	4.57	4.57
K	8.07 sq.	8.07 sq.
L	8.66	8.66
M	2.44	3.62
N	4.19	6.00
O	M16x .94 deep	M16x .94 deep
weight	150 lbs.	163 lbs.
volume tank	5.7 Gal.	5.8 Gal.

1) Connect the stand grounding tab to a suitable earth ground point.

Dimensions: inches

Designs and performance values are subject to change.

Pressure Filter
Series LF 1950-2200
464 PSI

Description:

In-line filter series LF 1950-2200 have a working pressure up to 464 PSI. Pressure peaks can be absorbed with a sufficient safety margin. The LF filter is mounted in-line. It can be used as suction filter, pressure filter and return-line filter.

The filter element consists of star-shaped, pleated filter material which is supported on the inside by a perforated core tube and is bonded to the end caps with a high-quality adhesive. The flow direction is from outside to inside.

For cleaning the mesh element or changing the glass fiber element, remove the cover and take out the element. The mesh elements are not guaranteed to maintain 100% performance after cleaning.

For filtration finer than 40 µm, use the disposable elements made of microglass. Filter elements as fine as 5 µm(c) are available; finer filter elements upon request.

Eaton-filter elements are known for a high intrinsic stability and an excellent filtration capability, a high dirt-retaining capacity and a long service life.

Eaton filter elements are suitable for all petroleum based fluids, HW-emulsions, most synthetic hydraulic fluids and lubrication oils.

The by-pass valve is integrated into the filter head. After reaching the by-pass pressure setting, the by-pass valve will send unfiltered partial flow around the filter.

Ship classifications available upon request.

1. Type index:

1.1. Complete filter: (ordering example)

LF.	1950.	10VG.	10.	B.	P.	-.	FS.	A.	-.	-.	AE
1	2	3	4	5	6	7	8	9	10	11	12

1 **series:**
LF = In-line filter

2 **nominal size:** 1950, 2200

3 **filter-material and filter-fineness:**
80G, 40G, 25G, 10G stainless steel wire mesh
25VG, 16VG, 10VG, 6VG, 3VG microglass
25API, 10API microglass according to API

4 **filter element collapse rating:**
10 = ∆p 145 PSI

5 **filter element design:**
B = both sides open

6 **sealing material:**
P = Nitrile (NBR)
V = Viton (FPM)

7 **filter element specification:** (see catalog)
- = standard
VA = stainless steel
IS06 = for HPC applications, see sheet-no. 31601
IS07 = for oil/ammonia mixtures (NH3), see sheet-no. 31602

8 **process connection:**
FS = SAE-flange 3000 PSI

9 **process connection size:**
A = 3“ (LF1950)
C = 5“ (LF2200)

10 **filter housing specification:** (see catalog)
- = standard
IS06 = for HFC application, see sheet-no. 31605
IS20 = ASME VIII Div.1 with ASME equivalent material, see sheet-no. 55217 (operating pressure max. 232 PSI)

11 **internal valve:**
- = without
S = with by-pass valve ∆p 29 PSI
S1 = with by-pass valve ∆p 51 PSI

12 **clogging indicator or clogging sensor:**
- = without
AE = visual-electric, see sheet-no. 1609
OP = visual, see sheet-no. 1628
OE = visual-electric, see sheet-no. 1628
VS5 = electronic, see sheet-no. 1641

To add an indicator to your filter, use the corresponding indicator data sheet to find the indicator details and add them to the filter assembly model code.

1.2. Filter element: (ordering example)

01NR.	1000.	10VG.	10.	B.	P.	-
1	2	3	4	5	6	7

1 **series:**
01NR. = standard returen line filter element according to DIN 24550, T4

2 **nominal size:** 1000

3 - 7 see type index-complete filter

Accessories:

- gauge port- and bleeder connection, see sheet-no. 1650
- drain- and bleeder connection, see sheet-no. 1651
- SAE-counter flange, see sheet-no. 1652

Technical data:

design temperature:	14 °F to +212 °F
operating temperature:	14 °F to +176 °F
operating medium	mineral oil, other media on request
max. operating pressure:	464 PSI
max. operating pressure at IS20:	232 PSI
test pressure:	900 PSI
test pressure at IS20:	464 PSI
process connection:	SAE-flange 3000 PSI
housing material:	EN-GJS-400-18-LT
sealing material:	Nitrile (NBR) or Viton (FPM), other materials on request
installation position:	vertical
measure connections:	BSPP ¼
drain- and bleeder connections:	BSPP ½

Classified under the Pressure Equipment Directive 2014/68/EC for mineral oil (fluid group 2), Article 4, Para. 3.
Classified under ATEX Directive 2014/34/EC according to specific application (see questionnaire sheet-no. 34279-4).

Pressure drop flow curves:

Filter calculation/sizing

The pressure drop of the assembly at a given flow rate Q is the sum of the housing ∆p and the element ∆p and is calculated as follows:

$\Delta p_{assembly} = \Delta p_{housing} + \Delta p_{element}$
$\Delta p_{housing}$ = *(see ∆p = f (Q) - characteristics)*

$$\Delta p_{element}\,(PSI) = Q\ (GPM)\ x\ \frac{MSK}{1000}\left(\frac{PSI}{GPM}\right) x\ \nu\,(SUS)\ x\ \frac{\rho}{0.876}\left(\frac{kg}{dm^3}\right)$$

For ease of calculation our Filter Selection tool is available online at www.eatonpowersource.com/calculators/filtration/

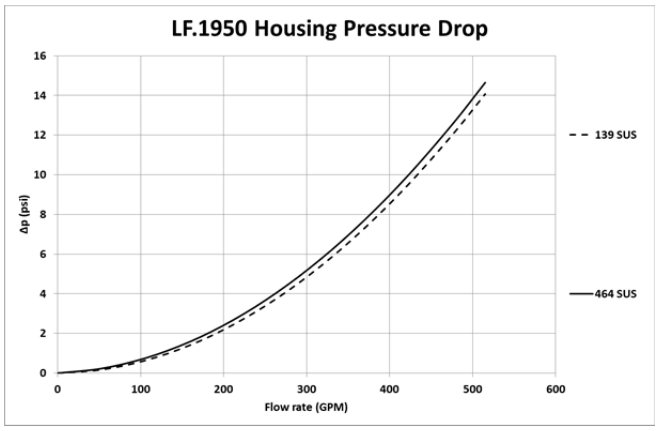
Material gradient coefficients (MSK) for filter elements

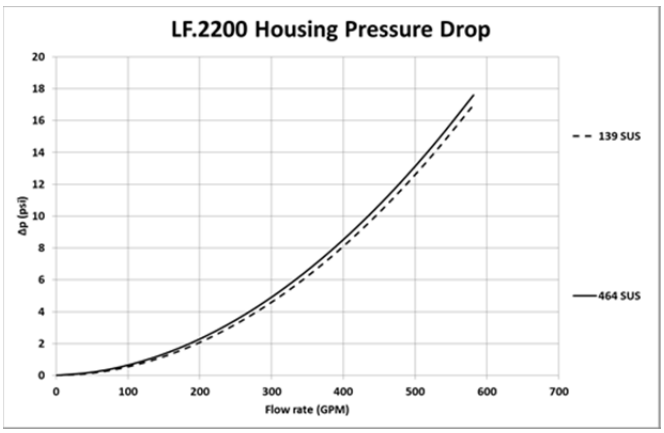
The material gradient coefficients in psi/gpm apply to mineral oil (HLP) with a density of 0.876 kg/dm³ and a kinematic viscosity of 139 SUS (30 mm²/s). The pressure drop changes proportionally to the change in kinematic viscosity and density.

LF	VG					G			API	
	3VG	6VG	10VG	16VG	25VG	25G	40G	80G	10API	25API
1950	0.118	0.082	0.053	0.046	0.031	0.0030	0.0028	0.0019	0.027	0.012
2200	0.118	0.082	0.053	0.046	0.031	0.0030	0.0028	0.0019	0.027	0.012

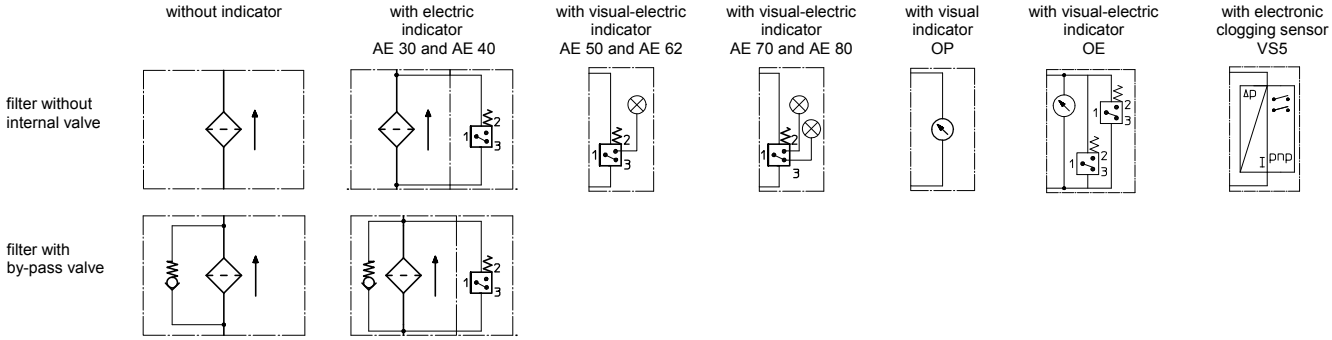
∆p = f(Q) – characteristics according to ISO 3968

The pressure drop characteristics apply to mineral oil (HLP) with a density of 0.876 kg/dm³. The pressure drop changes proportionally to the density.





Symbols:



Spare parts:

item	qty.	designation	dimension	article-no.	
1	2	filter element	01NR.1000…		
2	4	O-ring	90 x 4	306941 (NBR)	307031 (FPM)
3	2	O-ring	185 x 4	305593 (NBR)	306309 (FPM)
4	1	O-ring LF 1950	85,32 x 3,53	305590 (NBR)	306308 (FPM)
	1	O-ring LF 2200	136,12 x 3,53	320162 (NBR)	320163 (FPM)
5	4	screw plug	½ BSPP	304678	
6	2	screw plug	¼ BSPP	305003	
7	1	connecting pipe	21689-4	313233	
8	1	clogging indicator, visual	OP	see sheet-no. 1628	
9	1	clogging indicator, visual-electric	OE	see sheet-no. 1628	
10	1	clogging indicator, visual-electric	AE	see sheet-no. 1609	
11	1	clogging sensor, electronic	VS5	see sheet-no. 1641	
12	2	O-ring	14 x 2	304342 (NBR)	304722 (FPM)
13	2	screw plug	¼ BSPP	305003	

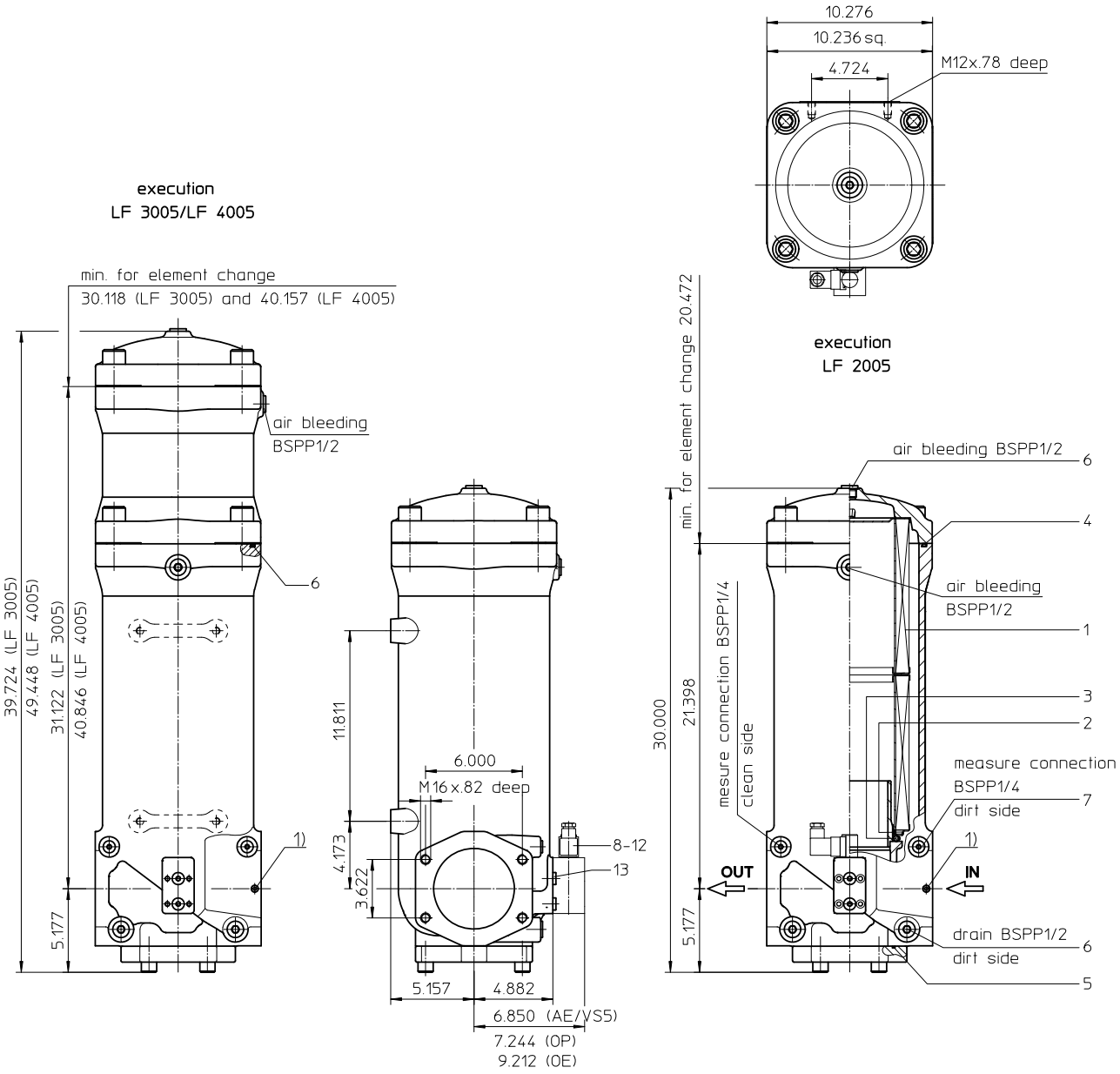
item 13 execution only without clogging indicator or clogging sensor

Test methods:

Filter elements are tested according to the following ISO standards:

ISO 2941	Verification of collapse/burst resistance
ISO 2942	Verification of fabrication integrity
ISO 2943	Verification of material compatibility with fluids
ISO 3723	Method for end load test
ISO 3724	Verification of flow fatigue characteristics
ISO 3968	Evaluation of pressure drop versus flow characteristics
ISO 16889	Multi-pass method for evaluating filtration performance

Series LF 2005-4005
464 PSI



1) Connect the stand grounding tab to a suitable earth ground point.

Weight LF 2005: approx. 392 lbs.
Weight LF 3005: approx. 545 lbs.
Weight LF 4005: approx. 626 lbs.

Dimensions: inches

Designs and performance values are subject to change.

Pressure Filter
Series LF 2005-4005
464 PSI

Description:

In-line filter series LF 2005-4005 have a working pressure up to 464 PSI. Pressure peaks can be absorbed with a sufficient safety margin. The LF filter is mounted in-line. It can be used as suction filter, pressure filter and return-line filter.

The filter element consists of star-shaped, pleated filter material which is supported on the inside by a perforated core tube and is bonded to the end caps with a high-quality adhesive. The flow direction is from outside to inside.

For cleaning the mesh element or changing the glass fiber element, remove the cover and take out the element. The mesh elements are not guaranteed to maintain 100% performance after cleaning.

For filtration finer than 40 µm, use the disposable elements made of microglass. Filter elements as fine as 5 µm(c) are available; finer filter elements upon request.

Eaton-filter elements are known for a high intrinsic stability and an excellent filtration capability, a high dirt-retaining capacity and a long service life.

Eaton filter elements are suitable for all petroleum based fluids, HW-emulsions, most synthetic hydraulic fluids and lubrication oils.

The by-pass valve is integrated into the filter head. After reaching the by-pass pressure setting, the by-pass valve will send unfiltered partial flow around the filter.

Ship classifications available upon request.

1. Type index:

1.1. Complete filter: (ordering example)

LF.	2005.	10VG.	10.	E.	P.	-.	FS.	C.	-.	AE
1	2	3	4	5	6	7	8	9	10	11

1 **series:**
LF = In-line filter

2 **nominal size:** 2005, 3005, 4005

3 **filter-material and filter-fineness:**
80G, 40G, 25G, 10G stainless steel wire mesh
25VG, 16VG, 10VG, 6VG, 3VG microglass
25API, 10API microglass according to API

4 **filter element collapse rating:**
10 = ∆p 145 PSI

5 **filter element design:**
E = without by-pass valve
S = with by-pass valve ∆p 29 PSI

6 **sealing material:**
P = Nitrile (NBR)
V = Viton (FPM)

7 **filter element specification:** (see catalog)
- = standard
VA = stainless steel
IS06 = for HFC applications, see sheet-no. 31601

8 **process connection:**
FS = SAE-flange 3000 PSI

9 **process connection size:**
C = 5“

10 **filter housing specification:** (see catalog)
- = standard
IS06 = for HFC applications, see sheet-no. 31605
IS20 = ASME VIII Div.1 with ASME equivalent material, see sheet-no. 55217 (operating pressure max. 232 PSI

11 **internal valve:**
- = without
S = with by-pass valve ∆p 29 PSI
S1 = with by-pass valve ∆p 51 PSI

12 **clogging indicator or clogging sensor:**
- = without
AE = visual-electric, see sheet-no. 1609
OP = visual, see sheet-no. 1628
OE = visual-electric, see sheet-no. 1628
VS5 = electronic, see sheet-no. 1641

1.2. Filter element: (ordering example)

01E.	2001.	10VG.	10.	E.	P.	-
1	2	3	4	5	6	7

1 **series:**
01E. = filter element according to company standard

2 **nominal size:** 2001

3 - 7 see type index-complete filter

Accessories:

- gauge port- and bleeder connection, see sheet-no. 1650
- drain- and bleeder connection, see sheet-no. 1651
- SAE-counter flange, see sheet-no. 1652

.

Technical data:

design temperature:	14 °F to +212 °F
operating temperature:	14 °F to +176 °F
operating medium	mineral oil, other media on request
max. operating pressure:	464 PSI
max. operating pressure at IS20:	232 PSI
test pressure:	900 PSI
test pressure at IS20:	464 PSI
process connection:	SAE-flange 3000 PSI
housing material:	EN-GJS-400-18-LT
sealing material:	Nitrile (NBR) or Viton (FPM), other materials on request
installation position:	vertical
measure connections:	BSPP ¼
drain- and bleeder connections:	BSPP ½
volume tank LF 2005:	6 Gal.
LF 3005:	8 Gal.
LF 4005.	10 Gal.

Classified under the Pressure Equipment Directive 2014/68/EC for mineral oil (fluid group 2), Article 4, Para. 3.
Classified under ATEX Directive 2014/34/EC according to specific application (see questionnaire sheet-no. 34279-4).

Pressure drop flow curves:

Filter calculation/sizing

The pressure drop of the assembly at a given flow rate Q is the sum of the housing ∆p and the element ∆p and is calculated as follows:

$\Delta p_{assembly} = \Delta p_{housing} + \Delta p_{element}$
$\Delta p_{housing}$ = *(see $\Delta p = f(Q)$ - characteristics)*

$$\Delta p_{element}\,(PSI) = Q\,(GPM)\ x\ \frac{MSK}{1000}\left(\frac{PSI}{GPM}\right) x\ \nu(SUS)\ x\ \frac{\rho}{0.876}\left(\frac{kg}{dm^3}\right)$$

For ease of calculation our Filter Selection tool is available online at www.eatonpowersource.com/calculators/filtration/

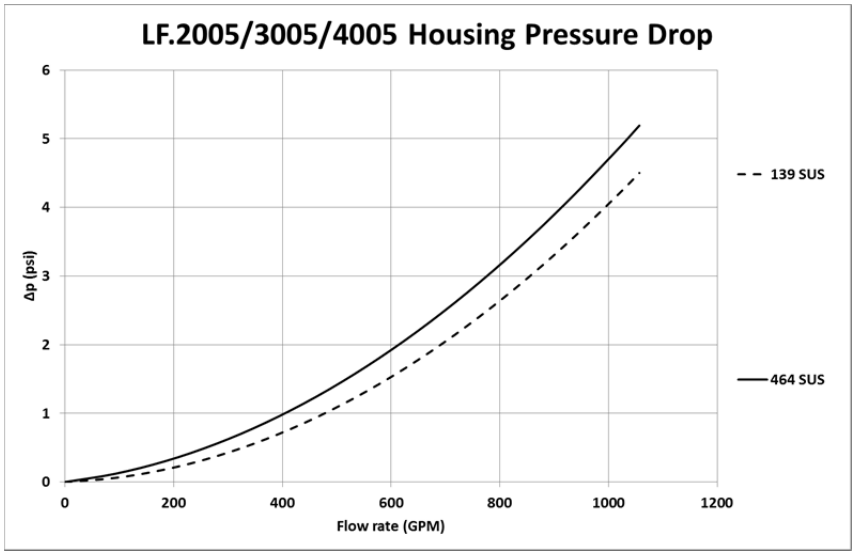
Material gradient coefficients (MSK) for filter elements

The material gradient coefficients in psi/gpm apply to mineral oil (HLP) with a density of 0.876 kg/dm³ and a kinematic viscosity of 139 SUS (30 mm²/s). The pressure drop changes proportionally to the change in kinematic viscosity and density.

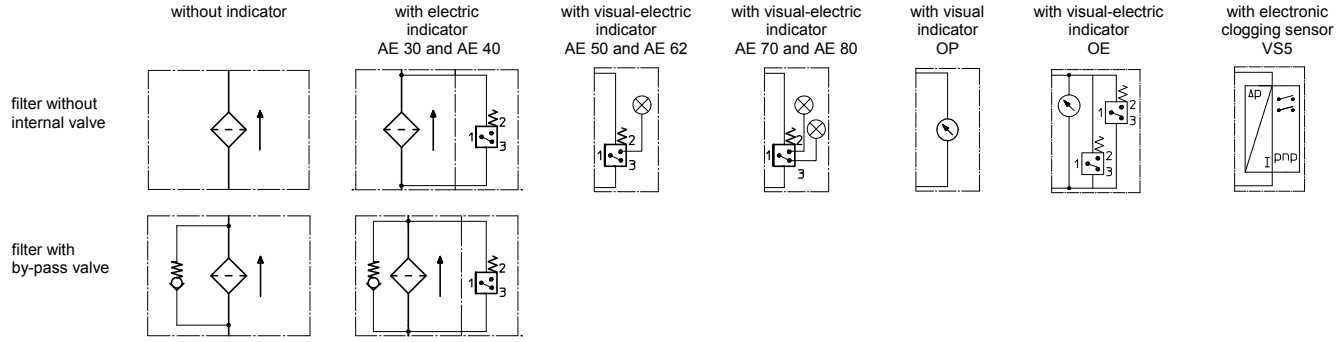
LF	VG					G			API	
	3VG	6VG	10VG	16VG	25VG	25G	40G	80G	10API	25API
2005	0.177	0.123	0.079	0.068	0.047	0.0059	0.0055	0.0038	0.040	0.018
3005	0.118	0.082	0.052	0.046	0.031	0.0040	0.0037	0.0025	0.027	0.012
4005	0.088	0.061	0.039	0.034	0.023	0.0030	0.0028	0.0019	0.020	0.009

∆p = f(Q) – characteristics according to ISO 3968

The pressure drop characteristics apply to mineral oil (HLP) with a density of 0.876 kg/dm³. The pressure drop changes proportionally to the density.



Symbols:



Spare parts:

item	qty.	designation	dimension and article-no. LF 2005	dimension and article-no. LF 3005	dimension and article-no. LF 4005
1	1	filter element	01E.2001…	01E.3001…	01E.4001…
2	1	O-ring	135 x 10	306016 (NBR) 307045 (FPM)	
3	1	O-ring	125 x 10	304388 (NBR) 306006 (FPM)	
4	1	O-ring (LF 2005)	240 x 5	307592 (NBR) 328793 (FPM)	
	2	O-ring (LF 3005/4005)			
5	1	O-ring	136,12 x 3,53	320162 (NBR) 320163 (FPM)	
6	4	screw plug (LF 2005)	BSPP ½	304678	
	5	screw plug (LF 3005/4005)			
7	2	screw plug	BSPP ¼	305003	
8	1	clogging indicator visual-electric	OE	see seet-no. 1628	
9	1	clogging indicator visual	OP	see seet-no. 1628	
10	1	clogging indicator visual-electric	AE	see seet-no. 1609	
11	1	clogging sensor electronic	VS5	see seet-no. 1641	
12	2	O-ring	14 x 2	304342 (NBR) 304722 (FPM)	
13	2	screw plug	BSPP ¼	305003	

item 13 execution only without clogging indicator or clogging sensor

Test methods:

Filter elements are tested according to the following ISO standards:

ISO 2941	Verification of collapse/burst resistance
ISO 2942	Verification of fabrication integrity
ISO 2943	Verification of material compatibility with fluids
ISO 3723	Method for end load test
ISO 3724	Verification of flow fatigue characteristics
ISO 3968	Evaluation of pressure drop versus flow characteristics
ISO 16889	Multi-pass method for evaluating filtration performance