

Offline Filter

Series NF 250

232 PSI

Description:

The offline filter series NF is used for fine filtration of hydraulic or lubrication circuits. This filter is designed to be installed in an offline filtration circuit, independent of the main circuit. This filter is designed to have a high dirt holding capacity which will provide a long service life.

The filter is flanged mounted to the line.

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. Filter elements are available down to 5 $\mu\text{m}_{(c)}$. Finer filtration is available upon request.

Changing the elements is possible without tools. Release the key handle and remove the cover to access the elements.

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

1. Type index:

1.1. Complete filter: (ordering example)

NF.	250.	10VG.	10.	B.	P.	-.	FS.	5.	-.	AE
1	2	3	4	5	6	7	8	9	10	11

- 1 | **series:**
NF = offline filter
- 2 | **nominal size:** 250
- 3 | **filter-material and filter-fineness:**
80G, 40G, 25G, 10G stainless steel wire mesh
25VG, 16VG, 10VG, 6VG, 3VG microglass
10WVG, 3WVG watersorp-filter element
- 4 | **resistance of pressure difference for filter element:**
10 = Δp 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 HFC applications, see sheet-no. 31601
- 8 | **process connection:**
FS = SAE-flange 3000 PSI ¹⁾
- 9 | **process connection size:**
5 = 1" ¹⁾
- 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

¹⁾ in addition available
thread -12 SAE according to DIN 3852 T2, design Z

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.	250.	10VG.	10.	B.	P.	-
1	2	3	4	5	6	7

- 1 | **series:**
01NR. = standard return line filter element according to DIN 24550, part 4
- 2 | **nominal size:** 250
- 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

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:	232 PSI
test pressure:	333 PSI
process connection:	SAE-flange 3000 PSI
housing material:	aluminium forging alloy
sealing material:	Nitrile (NBR) or Viton (FPM), other materials on request
installation position:	vertical
measure connections:	BSPP 1/8
drain- and bleeder connections:	BSPP 1/4
volume tank:	.87 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:

$$\Delta p_{assembly} = \Delta p_{housing} + \Delta p_{element}$$

$$\Delta p_{housing} = (\text{see } \Delta p = f(Q) \text{ - characteristics})$$

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

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

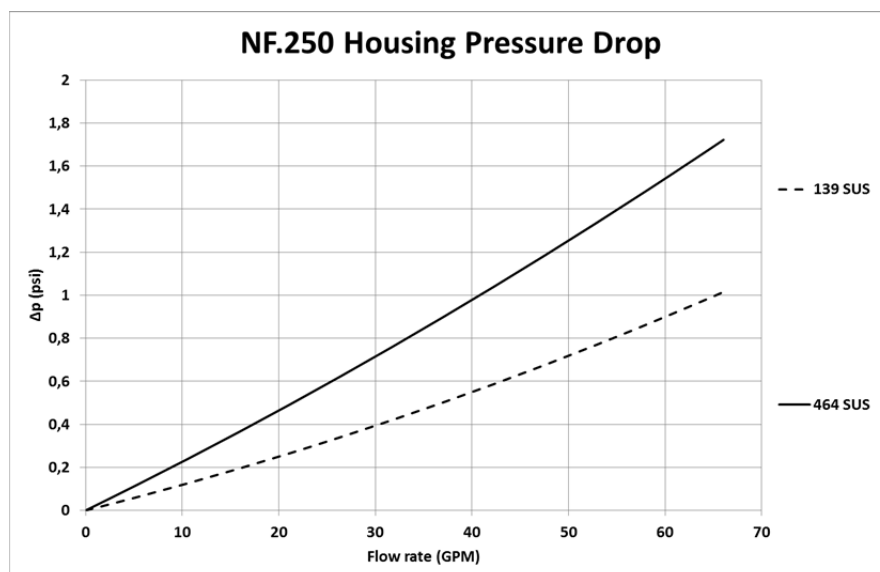
Material gradient coefficients (MSK) for filter elements

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.

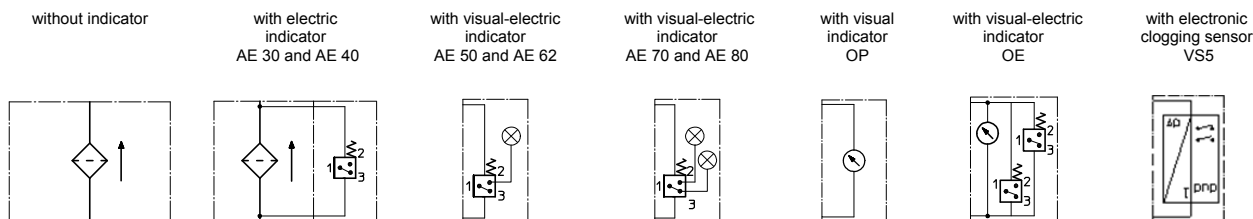
NF	VG				
	3VG	6VG	10VG	16VG	25VG
250	0.669	0.464	0.297	0.259	0.177

$\Delta p = f(Q)$ – 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	1	filter element	01NR.250...	
2	1	filter cover	30615-3	315437
3	1	mini-measuring connection	MA.1.ST	305453
4	2	screw plug	1/4 BSPP	305003
5	1	straining screw	30631-3	316404
6	1	O-ring	110 x 6	337001 (NBR) 337002 (FPM)
7	2	O-ring	52 x 3	314206 (NBR) 316698 (FPM)
8	1	O-ring	18 x 3	304359 (NBR) 304399 (FPM)
9	1	clogging indicator, visual	OP	see sheet-no. 1628
10	1	clogging indicator, visual-electric	OE	see sheet-no. 1628
11	1	clogging indicator, visual-electric	AE	see sheet-no. 1609
12	1	clogging sensor, electronic	VS5	see sheet-no. 1641
13	2	O-ring	14 x 2	304342 (NBR) 304722 (FPM)
14	2	screw plug	1/8 BSPP	304791
15	1	screw plug	1/8 BSPP	305496
16	1	O-ring	123 x 4	337003 (NBR) 337004 (FPM)

item 14 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

Offline Filter

Series NF 631

232 PSI

Description:

The offline filter series NF is used for fine filtration of hydraulic or lubrication circuits. This filter is designed to be installed in an offline filtration circuit, independent of the main circuit. This filter is designed to have a high dirt holding capacity which will provide a long service life.

The filter is flanged mounted to the line.

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. Filter elements are available down to 5 $\mu\text{m(c)}$. Finer filtration is available upon request.

Changing the elements is possible without tools. Release the key handle and remove the cover to access the elements.

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

1. Type index:

1.1. Complete filter: (ordering example)

NF. 631. 10VG. 10. B. P. -. FS. 6. -. AE

1	2	3	4	5	6	7	8	9	10	11
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- 1 series:**
NF = offline filter
- 2 nominal size:** 631
- 3 filter-material and filter-fineness:**
80G, 40G, 25G, 10G stainless steel wire mesh
25VG, 16VG, 10VG, 6VG, 3VG microglass
10WVG, 3WVG watersorp-filter element
- 4 filter element collapse rating:**
10 = Δp 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 HFC applications, see sheet-no. 31601
- 8 process connection:**
FS = SAE-flange 3000 PSI ¹⁾
- 9 process connection size:**
6 = 1 1/4" ¹⁾
- 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

¹⁾ in addition available
thread -16 SAE according to DIN 3852 T2, design Z

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. 630. 10VG. 10. B. P. -

1	2	3	4	5	6	7
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- 1 series:**
01NR. = standard return line filter element according to DIN 24550, part 4
- 2 nominal size:** 630
- 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:	232 PSI
test pressure:	333 PSI
process connection:	SAE-flange 3000 PSI
housing material:	aluminum forging alloy
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:	1.90 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:

$$\Delta p_{assembly} = \Delta p_{housing} + \Delta p_{element}$$

$$\Delta p_{housing} = (\text{see } \Delta p = f(Q) \text{ - characteristics})$$

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

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

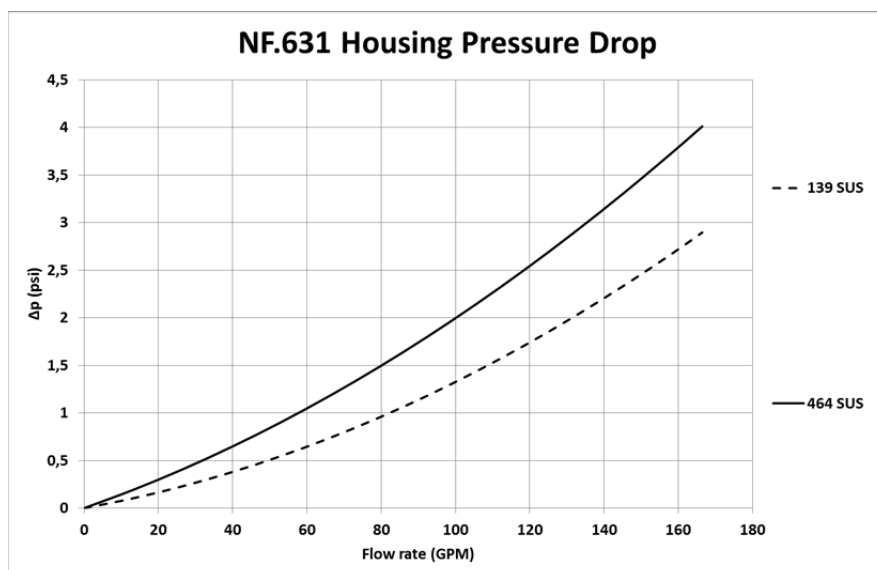
Material gradient coefficients (MSK) for filter elements

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.

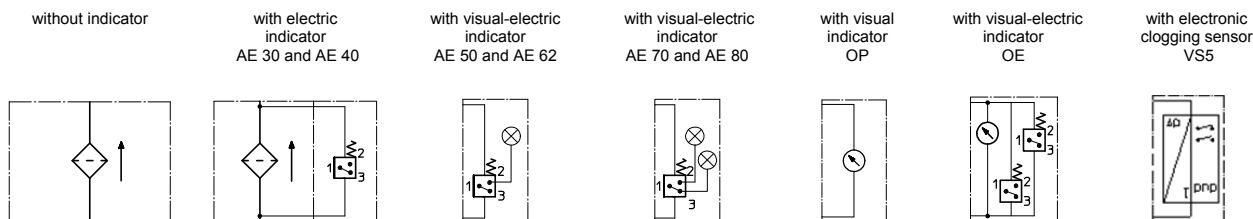
NF	VG				
	3VG	6VG	10VG	16VG	25VG
631	0.356	0.247	0.158	0.138	0.094

$\Delta p = f(Q)$ – 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	1	filter element	01NR.630...	
2	1	filter cover	30600-3	315492
3	1	mini-measuring connection	MA.1.St	305453
4	2	screw plug	1/8 BSPP	304678
5	1	straining screw	30595-3	316312
6	1	O-ring	140 x 6	315392 (NBR) 316322 (FPM)
7	2	O-ring	70 x 4	306253 (NBR) 310280 (FPM)
8	1	O-ring	22 x 3	304387 (NBR) 304931 (FPM)
9	1	clogging indicator, visual	OP	see sheet-no. 1628
10	1	clogging indicator, visual-electric	OE	see sheet-no. 1628
11	1	clogging indicator, visual-electric	AE	see sheet-no. 1609
12	1	clogging sensor, electronic	VS5	see sheet-no. 1641
13	2	O-ring	14 x 2	304342 (NBR) 304722 (FPM)
14	2	screw plug	1/8 BSPP	304791
15	1	screw plug	1/8 BSPP	305496
16	1	O-ring	153 x 4	320763 (NBR) 322368 (FPM)

item 14 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

Offline Filter

Series NF 1000

232 PSI

Description:

The offline filter series NF is used for fine filtration of hydraulic or lubrication circuits. This filter is designed to be installed in an offline filtration circuit, independent of the main circuit. This filter is designed to have a high dirt holding capacity which will provide a long service life.

The filter is flanged mounted to the line.

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. Filter elements are available down to 5 $\mu\text{m}_{(c)}$. Finer filtration is available upon request.

Changing the elements is possible without tools. Release the key handle and remove the cover to access the elements.

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

1. Type index:

1.1. Complete filter: (ordering example)

NF. 1000. 10VG. 10. B. P. -. FS. 3. -. -. AE

1	2	3	4	5	6	7	8	9	10	11	12
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- 1 | **series:**
NF = offline filter
- 2 | **nominal size:** 1000
- 3 | **filter-material and filter-fineness:**
80G, 40G, 25G, 10G stainless steel wire mesh
25VG, 16VG, 10VG, 6VG, 3VG microglass
10WVG, 3WVG watersorp-filter element
- 4 | **filter element collapse rating:**
10 = Δp 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 HFC applications, see sheet-no. 31601
- 8 | **connection:**
FS = SAE-flange 3000 PSI
- 9 | **no. of version:**

version	connection		
	A connection size	B connection size	C connection size
1	8	8	-
2	8	8	8
3	9	9	-
4	9	9	9

connection size: 8 = 2"
9 = 2 1/2"
- = without connection

- 10 | **filter housing specification:** (see catalog)
- = standard
IS06 = for HFC applications, see sheet-no. 31605
- 11 | **internal valve:**
- = without
S1 = with by-pass valve Δp 51 PSI
- 12 | **clogging indicator or clogging sensor :**
- = without
AE = visual-electrical, see sheet-no. 1609
OP = visual, see sheet-no. 1628
OE = visual-electrical, see sheet-no. 1628
VS5 = electrical, 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 return 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-connections, see sheet-no. 1651
- 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:	232 PSI
test pressure:	333 PSI
process connection:	SAE-flange 3000 PSI
housing material:	aluminium forging alloy
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:	3.0 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:

$$\Delta p_{assembly} = \Delta p_{housing} + \Delta p_{element}$$

$$\Delta p_{housing} = (\text{see } \Delta p = f(Q) \text{ - characteristics})$$

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

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

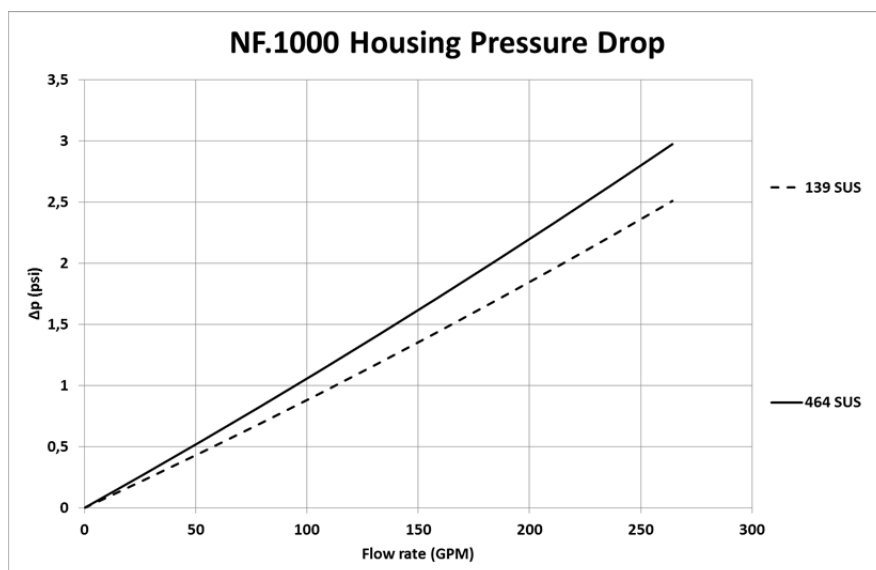
Material gradient coefficients (MSK) for filter elements

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.

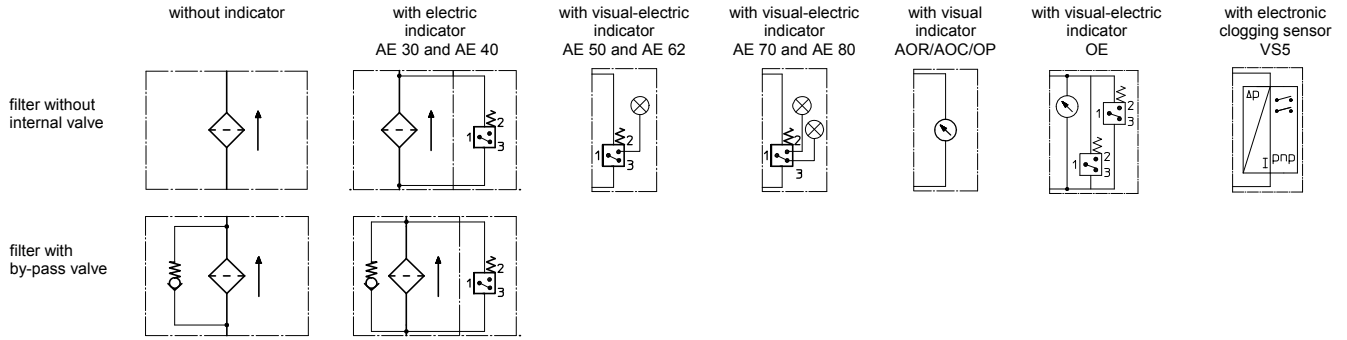
NF	VG				
	3VG	6VG	10VG	16VG	25VG
1000	0.237	0.165	0.105	0.092	0.063

$\Delta p = f(Q)$ – 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	1	filter element	01NR.1000...	
2	1	filter cover without by-pass valve	31065-3	
	1	filter cover with by-pass valve S1	31461-3	
3	1	mini-measuring connection	MA.3.ST	308630
4	3	screw plug	1/2 BSPP	304678
5	1	O-ring (only with by-pass valve)	22 x 3	304387 (NBR) 304931 (FPM)
6	1	O-ring	170 x 6	304799 (NBR) 306529 (FPM)
7	2	O-ring	90 x 4	306941(NBR) 307031(FPM)
8	1	O-ring	22 x 3	304387(NBR) 304931(FPM)
9	1	clogging indicator, visual	OP	see sheet-no. 1628
10	1	clogging indicator, visual-electric	OE	see sheet-no. 1628
11	1	clogging indicator, visual-electric	AE	see sheet-no. 1609
12	1	clogging sensor, electronic	VS5	see sheet-no. 1641
13	2	O-ring	14 x 2	304342 (NBR) 304722 (FPM)
14	2	screw plug	1/8 BSPP	304791
15	1	screw plug	1/8 BSPP	305496
16	1	O-ring	183 x 4	3337005(NBR) 337006(FPM)

item 14 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

These instructions refer to data sheets 1100, 1115 and 1116, 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 must be secured to the installation wall in a vertical position so that it is free of stresses, and so that:

- the contamination indicator is accessible and visible
- the connections for drainage (E2, E3 below), venting (E1 above) and pressure measurement (p1, p2) are also accessible
- the dismantling height required to remove the filter element is provided.

The counter flanges, respectively tube connections of the tube system have to be properly mapped and have to be screwed to the filter connections „IN“ and „OUT“ in such way that there is no or just little transmission of forces from the tube system of the filter housing.

When carrying out this process, dirt or foreign bodies must be prevented from penetrating into the filter.

The following tightening torques are recommended for the companion flanges:

NF 250	NF 631, NF1000
50 Nm	100 Nm

For filters with an electrical or electronic contamination indicator, the equipment plugs must be connected to the appropriate power supply.

For line connections with tube fittings the tightening torques according to the manufacturers' instructions are applicable.

2. Starting Operation

Before the system or the plant is operated for the first time, that is to say before it is filled with oil, the filter must be opened by dismantling the filter cover, and its interior condition must be checked (i.e. whether the housing is clean, whether the filter element and the filter element seals are present, etc.).

After the filter housing has been sealed by fitting the filter cover and venting while the filling process takes place (to do this, the drainage and venting connections G 1/2 A can be used as per Dimension Sheet 1651), the filter can be operated.

The filter is vented through the connection E1 in the upper part of the filter.

3. Maintenance

For filters with a contamination indicator, the filter element must be changed and/or cleaned when the "Filter Element Contaminated" signal is given.

Attention!

For a filter with a disposable element - i.e. when an exchange of element is due - sufficient spare elements must be kept in store.

3.1. Exchanging the Filter Elements

- turn the system off and relieve the pressure from the filter
- open drainage connection E2, "Contamination Side"
- dismantle the filter cover and collect the oil which runs out of the filter housing
- remove the filter element by gently swivelling it to and fro, and then by pulling it out
- cover or close off the locating journal in the filter housing and clean the interior of the housing
- close off the drainage connection and remove the covering on the locating journal
- check the seal in the filter cover and exchange the O-ring if necessary
- remove the replacement element from its packaging; check that the order number matches the order number on the used element; and insert the new element into the filter housing (before doing this, the seals which belong to the element must be fixed and inspected for integrity)
- fit the filter cover and the filter, fill and vent

3.2 Cleaning the Filter Elements

Metallic fabric filter elements can be used again after they have been suitably cleaned.

Cleaning must be carried out according to the Cleaning Instructions for INTERNORMEN Filter Elements Made of Metal Fabric, No. 21070-4 and 39448-4.

4. Pressure Difference Measurement

The fall in pressure over the filter is internally determined and reproduced by the flange-mounted contamination indicator.

Filter without flanged clogging indicator can be equipped with mini-measuring connections MA.1.ST according to data sheet 1650, connected to the measuring points p1, p2.