

Low-Pressure In-Line Filters**FNL 1000 · FNL 2000**

In-line mounting · Operating pressure up to 40 bar / 580 psi · Nominal flow rate up to 1450 l/min / 383 gpm

Low-Pressure In-Line Filter
FNL 1000**Description****Application**

In the pressure circuits of hydraulic and lubrication systems.

Performance features*Protection against wear:*

By means of filter elements that even meet the highest demands regarding cleanliness classes.

Protection against malfunction:

Through installation near to the control valves or other expensive components. The specific determined flow rate guarantees a closed by-pass valve even at $v \leq 200 \text{ mm}^2/\text{s}$ / 927 SUS (cold start condition).

Filter elements

Flow direction from outside to center.

The star-shaped pleating of the filter material results in:

- › large filter surfaces
- › low pressure drop
- › high dirt-holding capacities
- › long service life

Filter maintenance

By using a clogging indicator the correct moment for maintenance is stated and guarantees the optimum utilization of the filter life.

Materials

Cover:	Aluminum alloy
Filter housing:	Aluminum alloy
Seals:	NBR (FPM on request)
Filter media:	EXAPOR®MAX 2 - inorganic multi-layer microfiber web Paper - cellulose web, impregnated with resin

Accessories

Electrical and / or optical clogging indicators are available - optionally with one or two switching points resp. temperature suppression.

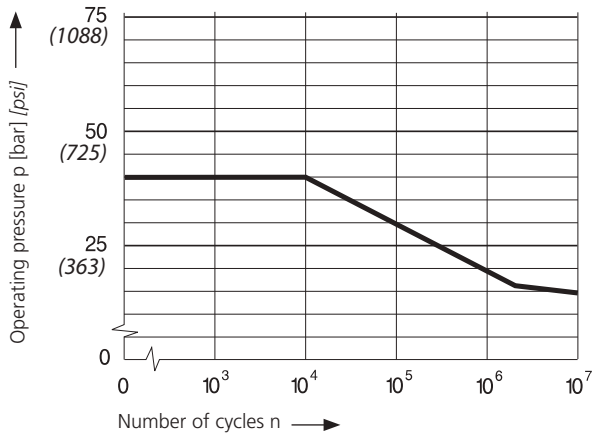
Dimensions and technical data see catalog sheet 60.30.

Operating pressure

0 ... 16 bar / 232 psi, min. 3×10^6 pressure cycles
Nominal pressure according to DIN 24550

0 ... 40 bar / 580 psi, min. 10^4 pressure cycles
Quasi-static operating pressure

Permissible pressures for other numbers of cycles



Nominal flow rate

Up to 1450 l/min / 383 gpm (see Selection Chart, column 2).
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- › closed by-pass valve at $v \leq 200 \text{ mm}^2/\text{s} / 927 \text{ SUS}$
- › element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- › flow velocity in the connection lines:
up to 25 bar $\leq 4.5 \text{ m/s} / 363 \text{ psi} \leq 14.8 \text{ ft/s}$

Filter fineness

5 $\mu\text{m(c)}$... 10 $\mu\text{m(c)}$
 β -values according to ISO 16889
(see Selection Chart, column 4 and diagram Dx).

Dirt-holding capacity

Values in g test dust ISO MTD according to ISO 16889
(see Selection Chart, column 5).

Hydraulic fluids

Mineral oil and biodegradable fluids
(HEEs and HETG, see info-sheet 00.20).

Temperature range

-30 °C ... +100 °C (temporary -40 °C ... +120 °C)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

Viscosity at nominal flow rate

- › at operating temperature: $v < 60 \text{ mm}^2/\text{s} / 280 \text{ SUS}$
- › as starting viscosity: $v_{\text{max}} = 1200 \text{ mm}^2/\text{s} / 5560 \text{ SUS}$
- › at initial operation:

The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% Δp of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the Δp curve at a point. Read this point on the horizontal axis for the viscosity.

Mounting position

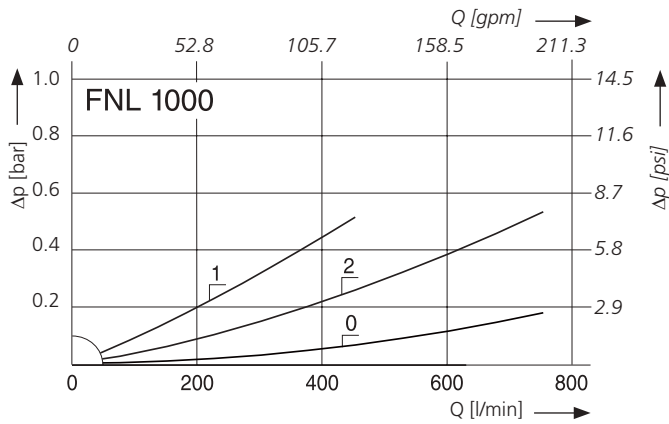
Preferably vertical, filter head at the bottom.

Connection

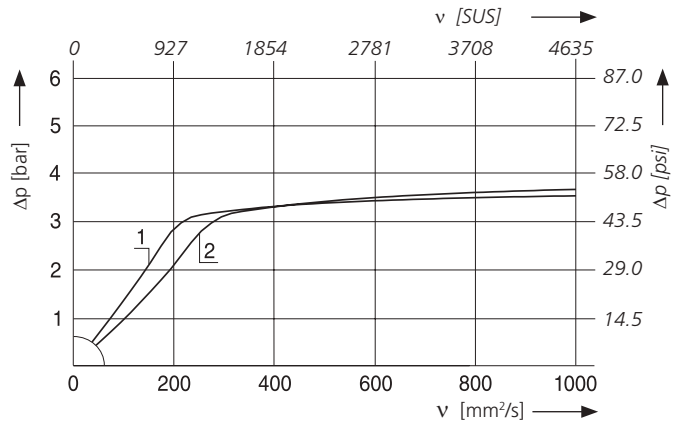
- › SAE-flange (3000 psi)
- Sizes see Selection Chart, line 6
(other connections on request).
Standard: connection ports A/B opposed.
Optional: connection port A sidewise, connection port B at the bottom.

Δp-curves for complete filters in Selection Chart, column 3

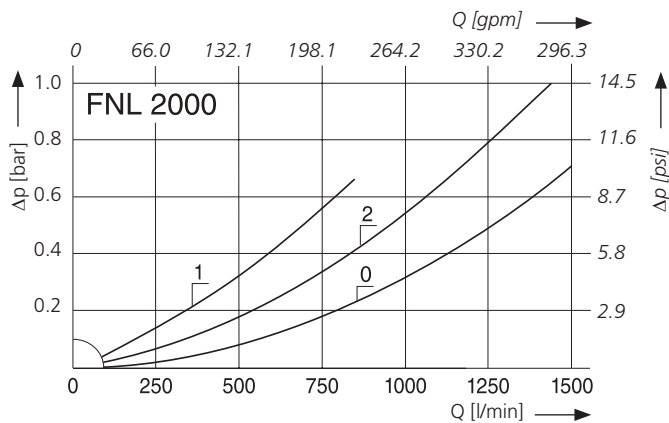
D1 Pressure drop as a function of the **flow volume** at $v = 35 \text{ mm}^2/\text{s} / 162 \text{ SUS}$ (0 = casing empty)



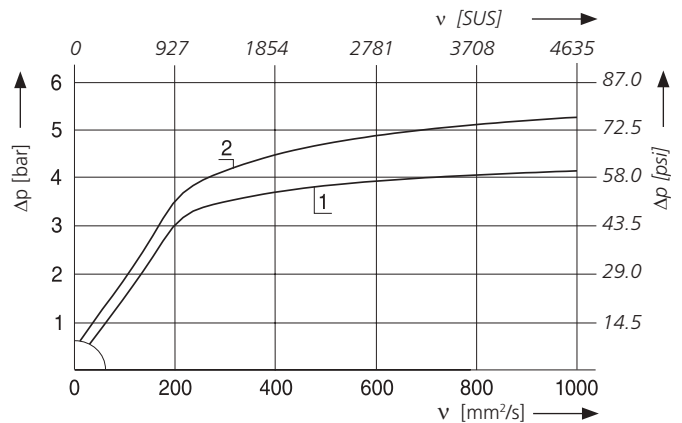
Pressure drop as a function of the **kinematic viscosity** at nominal flow



D2 Pressure drop as a function of the **flow volume** at $v = 35 \text{ mm}^2/\text{s} / 162 \text{ SUS}$ (0 = casing empty)

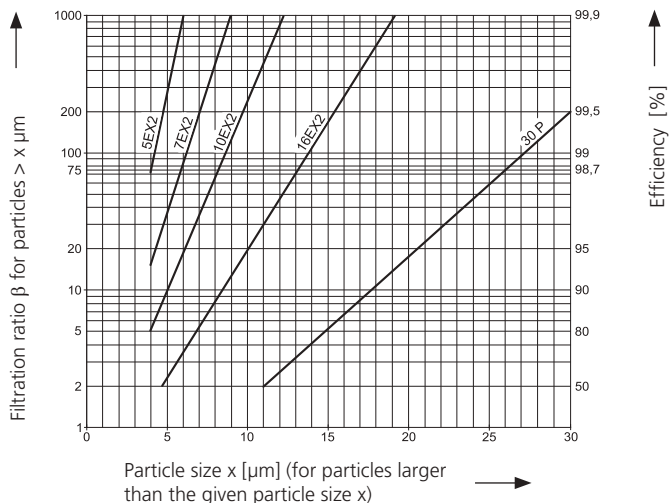


Pressure drop as a function of the **kinematic viscosity** at nominal flow



Filter fineness curves in Selection Chart, column 4

Dx Filtration ratio β as a function of particle size x obtained by the Multi-Pass-Test according to ISO 16889



The abbreviations represent the following β -values resp. finenesses:

For EXAPOR[®]MAX2 and Paper elements:

- 5EX2 = $\beta_{5(c)}$ = 200 EXAPOR[®]MAX 2
- 7EX2 = $\beta_{7(c)}$ = 200 EXAPOR[®]MAX 2
- 10EX2 = $\beta_{10(c)}$ = 200 EXAPOR[®]MAX 2
- 16EX2 = $\beta_{16(c)}$ = 200 EXAPOR[®]MAX 2
- 30P = $\beta_{30(c)}$ = 200 Paper

Based on the structure of the filter media of the 30P paper elements, deviations from the printed curves are quite probable.

For special applications, finenesses differing from these curves are also available by using special composed filter material.

Selection Chart

Part No.	Nominal flow rate	Pressure drop see diagram D /Curve no.	Filter fineness see diagr. Dx	Dirt-holding capacity	Connection A/B	Cracking pressure of bypass	Symbol	Replacement filter element Part No.	Weight	Clogging indicator	Remarks
	l/min		g		bar				kg		
1	2	3	4	5	6	7	8	9	10	11	12
FNL 1000-153	420	D1 /1	5EX2	130	SAE 2	3.0	4	V3.1449-53	21	retrofitable	-
FNL 1000-156	555	D1 /2	10EX2	190	SAE 2	3.0	4	V3.1449-56	21	retrofitable	-
FNL 2000-153	820	D2 /1	5EX2	260	SAE 4	3.0	4	V3.1493-53	28	retrofitable	-
FNL 2000-156	1450	D2 /2	10EX2	370	SAE 4	3.0	4	V3.1493-56	28	retrofitable	-

	gpm		g		psi				lbs		
1	2	3	4	5	6	7	8	9	10	11	12
FNL 1000-153	111.0	D1 /1	5EX2	130	SAE 2	43.5	4	V3.1449-53	46.3	retrofitable	-
FNL 1000-156	146.6	D1 /2	10EX2	190	SAE 2	43.5	4	V3.1449-56	46.3	retrofitable	-
FNL 2000-153	216.6	D2 /1	5EX2	260	SAE 4	43.5	4	V3.1493-53	61.7	retrofitable	-
FNL 2000-156	383.0	D2 /2	10EX2	370	SAE 4	43.5	4	V3.1493-56	61.7	retrofitable	-

Optical or electrical indicators are available to monitor the clogging condition of the element. If the indicator should be already mounted onto the filter head use the abbreviation "M" behind the part number of the indicator. The printed order acknowledgements show both items separately.

Order example: The Filter FNL 1000-153 has to be supplied with electrical clogging indicator - response pressure 2.5 bar / 36 psi.

Order description: FNL 1000-153 / DG 041-32 M
Part No. (basic unit) _____ Mounted
Clogging indicator _____

For the appropriate clogging indicator see catalog sheet 60.30.

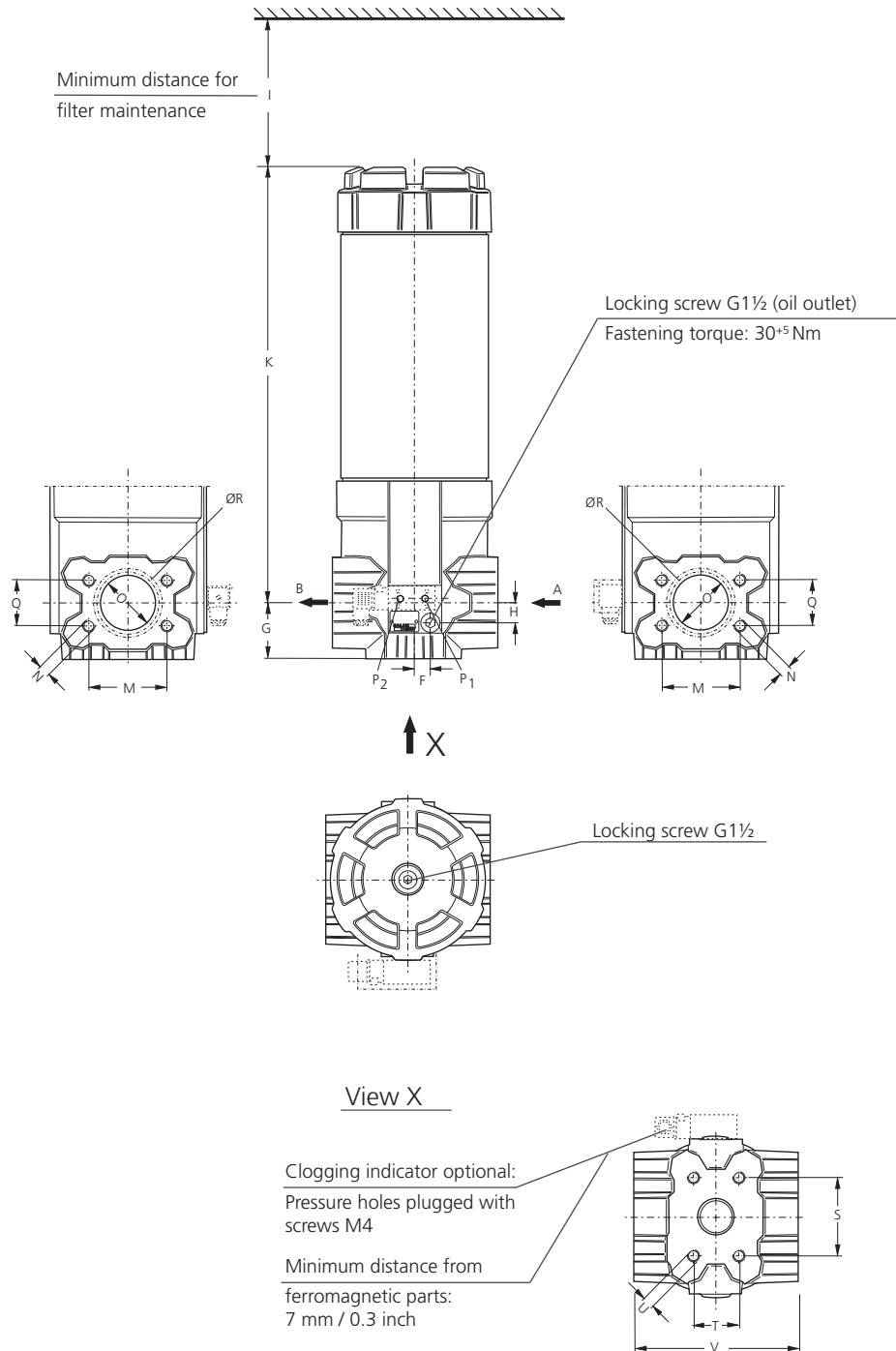
Remarks:

- › The switching pressure of the clogging indicator has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- › The filters listed in this chart are standard filters. Other designs available on request.

Options:

- › Other filter finenesses on request.
- › Check valve in filter head on request.
- › Connection port A sidewise, connection port B at the bottom (standard: connection ports A/B opposed).

Dimensions



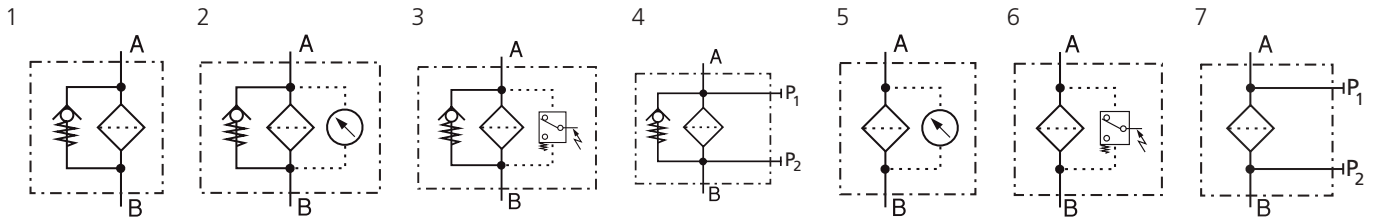
Measurements in mm

Type	A/B	F	G	H	I	K	M	N	O	Q	R	S	T	U	V
FNL 1000	SAE 2	19	76.5	26.5	450	593	77.8	M12	Ø 50	42.6	56 - 64	130.2	77.8	M16	224
FNL 2000	SAE 4	19	76.5	26.5	890	1033	130.2	M16	Ø 100	77.8	110 - 118	130.2	77.8	M16	224

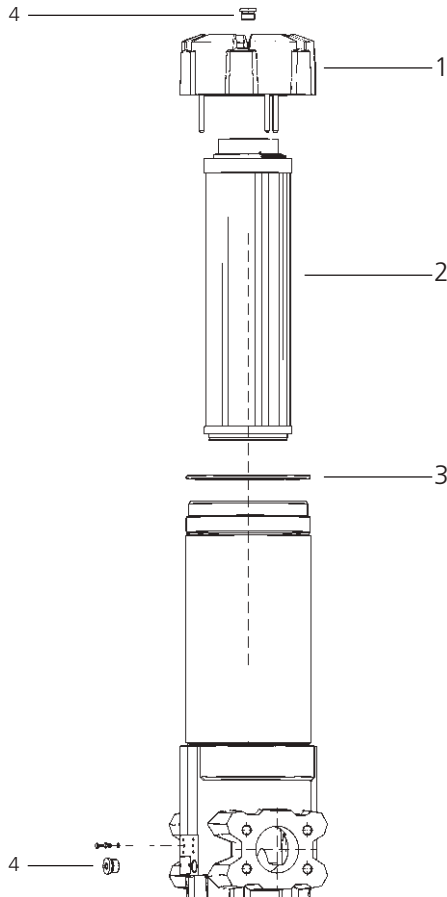
Measurements in inch

Type	A/B	F	G	H	I	K	M	N	O	Q	R	S	T	U	V
FNL 1000	SAE 2	0.75	3.01	1.04	17.72	23.35	3.06	M12	Ø1.97	1.68	2.20 - 2.52	5.13	3.06	M16	8.82
FNL 2000	SAE 4	0.75	3.01	1.04	35.04	40.67	5.13	M16	Ø3.94	3.06	4.33 - 4.65	5.13	3.06	M16	8.82

Symbols



Spare Parts



Pos.	Designation	Part No.
1	Cover (complete)	FNL 1000.1200
2	Replacement filter element	see Chart / col. 9
3	O-ring	N007.1905
4	Locking screw	SV 0620.08

The functions of the complete filters as well as the outstanding features of the filter elements assured by ARGO-HYTOS can only be guaranteed if original ARGO-HYTOS spare parts are used.

Quality Assurance

Quality management according to DIN EN ISO 9001

To ensure constant quality in production and operation, ARGO-HYTOS filter elements undergo strict controls and tests according to the following ISO standards:

ISO 2941	Verification of collapse / burst pressure rating
ISO 2942	Verification of fabrication integrity (Bubble Point Test)
ISO 2943	Verification of material compatibility with fluids
ISO 3968	Evaluation of pressure drop versus flow characteristics
ISO 16889	Multi-Pass-Test (evaluation of filter fineness and dirt-holding capacity)
ISO 23181	Determination of resistance to flow fatigue using high viscosity fluid

Before release into the series production the filter casing is tested for fatigue strength in our pressure pulse test rig. Various quality controls during the production process guarantee the leakfree function and solidity of our filters.

Illustrations may sometimes differ from the original. ARGO-HYTOS is not responsible for any unintentional mistake in this specification sheet.