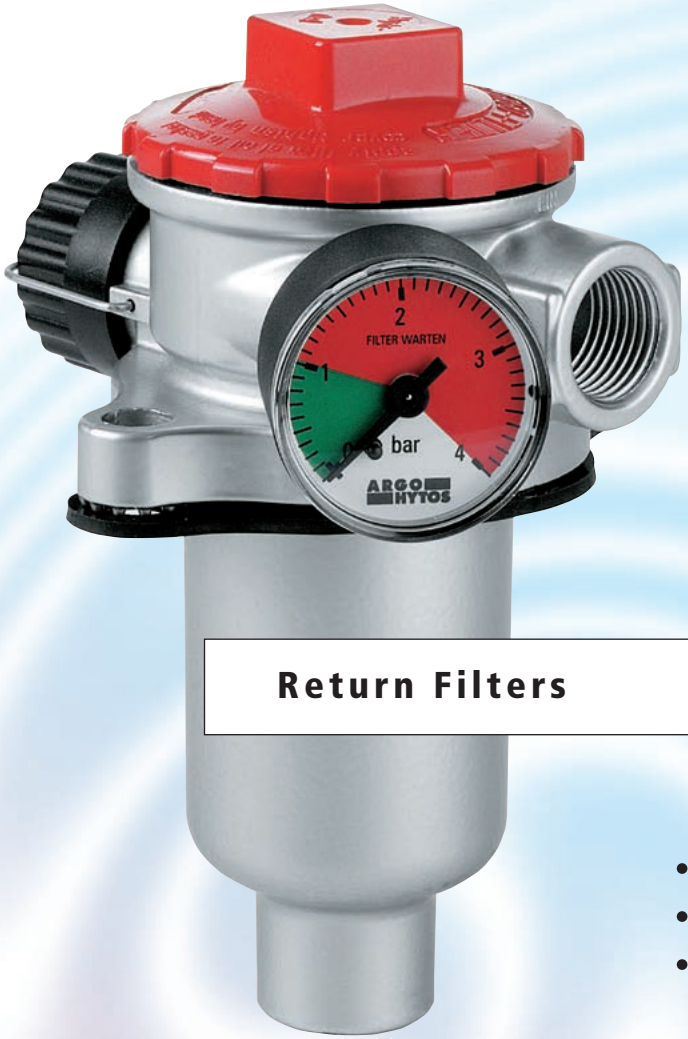
ARGO HYTOS



Return Filters

D 043

- Tank top mounting / In-line mounting
- Connection $G^1/_2$
- Nominal flow rate up to 45 l/min

20.10-4e

Description

Application
In the return line circuits of hydraulic systems.

Performance features

Protection against wear:	By means of filter elements that, in full-flow filtration, meet even the highest demands regarding cleanliness classes.
Protection against malfunction:	By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

Special features

By-pass valve:	The location close to the inlet port prevents dirt particles retained by the filter element from entering into the clean oil side.
Dirt collecting bowl:	Prevents back-flushing of collected dirt particles during element replacement.
Connection:	A female thread in the bowl outlet makes in-line mounting possible.

Filter elements
Flow direction from outside to centre. The star-shaped pleating of the filter material results in:
- large filter surfaces
- low pressure drop
- high dirt-holding capacities
- long service life

In filters with a magnetic system, the ferromagnetic particles in the fluid pass first through a strong magnetic field and are separated.

Ventilating Filter
Ventilation of the reservoir by an integral star-shape pleated filter element:
- removable (replace annually!)
- splash-proof
- fineness 2 µm

Some versions are also available with galvanized steel wool.

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

Materials

Screw-on cap:	Polyamide, GF reinforced
Housing:	Aluminium alloy
Seals:	NBR (Viton on request)
Filter media:	EXAPOR®MAX – inorganic microfibre web Paper – cellulose web, impregnated with resin Stainless steel wire mesh (1.4301) with mesh size 40 and 60 µm.

Accessories
An optional oil separator (Part No. D 023.1702) prevents oil splashing through the ventilating filter at mobile applications.
Electrical and optical clogging indicators are available.
Dimensions and technical data see catalogue sheet 60.20.

Characteristics

Nominal flow rate
Up to 45 l/min (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:
- closed by-pass valve at $\nu \leq 200$ mm²/s
- element service life > 1000 operating hours at an average fluid contamination of 0,07 g per l/min flow volume
- flow velocity in the connection lines ≤ 4,5 m/s

Connection
Threaded ports according to ISO 228 or DIN 13. Sizes see Selection Chart, column 6 (other port threads on request)

Filter fineness
12 µm(c) ... 60 µm(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 or HETG, see info-sheet 00.20)
With high filling conditions we recommend an electrical conductivity ≥ 500 pS/m at 20 °C.

Temperature range
-30 °C ... +100 °C (temporary -40 °C ... +120 °C)

Viscosity at nominal flow rate
- at operating temperature: $\nu < 60$ mm²/s
- as starting viscosity: $\nu_{max} = 1200$ mm²/s
- 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.

Operating pressure
Max. 16 bar

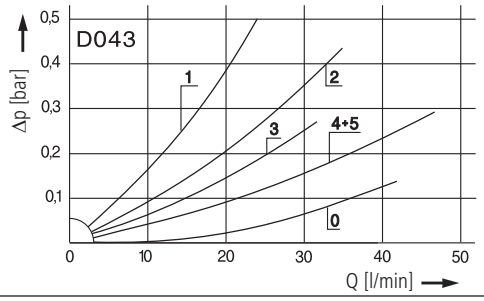
Mounting position
Preferably vertical, outlet downwards

Diagrams

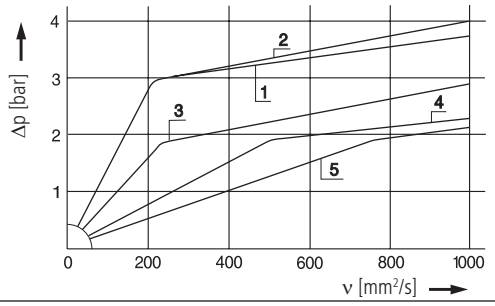
Δp-curves for complete filters in Selection Chart, column 3

D1

Pressure drop as a function of the **flow volume** at $\nu = 35\ mm^2/s$ (0 = casing empty)



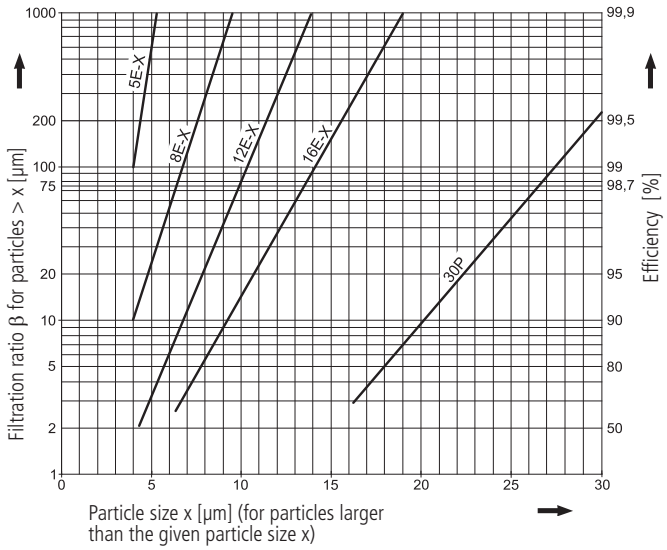
Pressure drop as a function of the **kinematic viscosity** at nominal flow



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®MAX- and Paper elements:

5 E-X	= $\overline{\beta}_{5\,(c)}$	= 200	EXAPOR®MAX
8 E-X	= $\overline{\beta}_{8\,(c)}$	= 200	EXAPOR®MAX
12 E-X	= $\overline{\beta}_{12\,(c)}$	= 200	EXAPOR®MAX
16 E-X	= $\overline{\beta}_{16\,(c)}$	= 200	EXAPOR®MAX
30 P	= $\overline{\beta}_{30\,(c)}$	= 200	Paper

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

For screen elements:

40 S	=	screen material with mesh size 40 µm
60 S	=	screen material with mesh size 60 µm
100 S	=	screen material with mesh size 100 µm

Tolerances for mesh size according to DIN 4189

For ventilating filter elements:
2 CL = 99,5 % filter efficiency for particles of size 2 µm

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

Selection Chart

Part No.	Nominal flow	Pressure drop see diagram **D**/curve no.	Filter fineness see Diagr. **Dx**	Dirt-holding capacity Filter surface in ( )	Connection A/B	Cracking pressure of by-pass	Symbol	Replacement filter element Part No.	Weight	Replacement ventilating filter Part No. (Filter fineness see diagrams)	Remarks
	l/min			g		bar			kg		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
D 043-106	23	**D1**/1	12 E-X	5,3	G½	2,5	1	V3.0510-56	0,4	-	-
D 043-88	35	**D1**/2	16 E-X	5,7	G½	2,5	1	V3.0510-58	0,4	-	-
D 043-73	30	**D1**/3	30 P	4,0	G½	1,5	1	P3.0510-51	0,4	-	-
D 043-05	40	**D1**/4	40 S	(220 cm²)	G½	1,5	4	S3.0508-55	0,47	-	[1]
D 043-10	45	**D1**/5	60 S	(220 cm²)	G½	1,5	4	S3.0508-50	0,47	-	[1]

All filters are delivered with a plugged clogging indicator connection M12 x 1,5.
As clogging indicators either manometers or electrical pressure switches can be used.

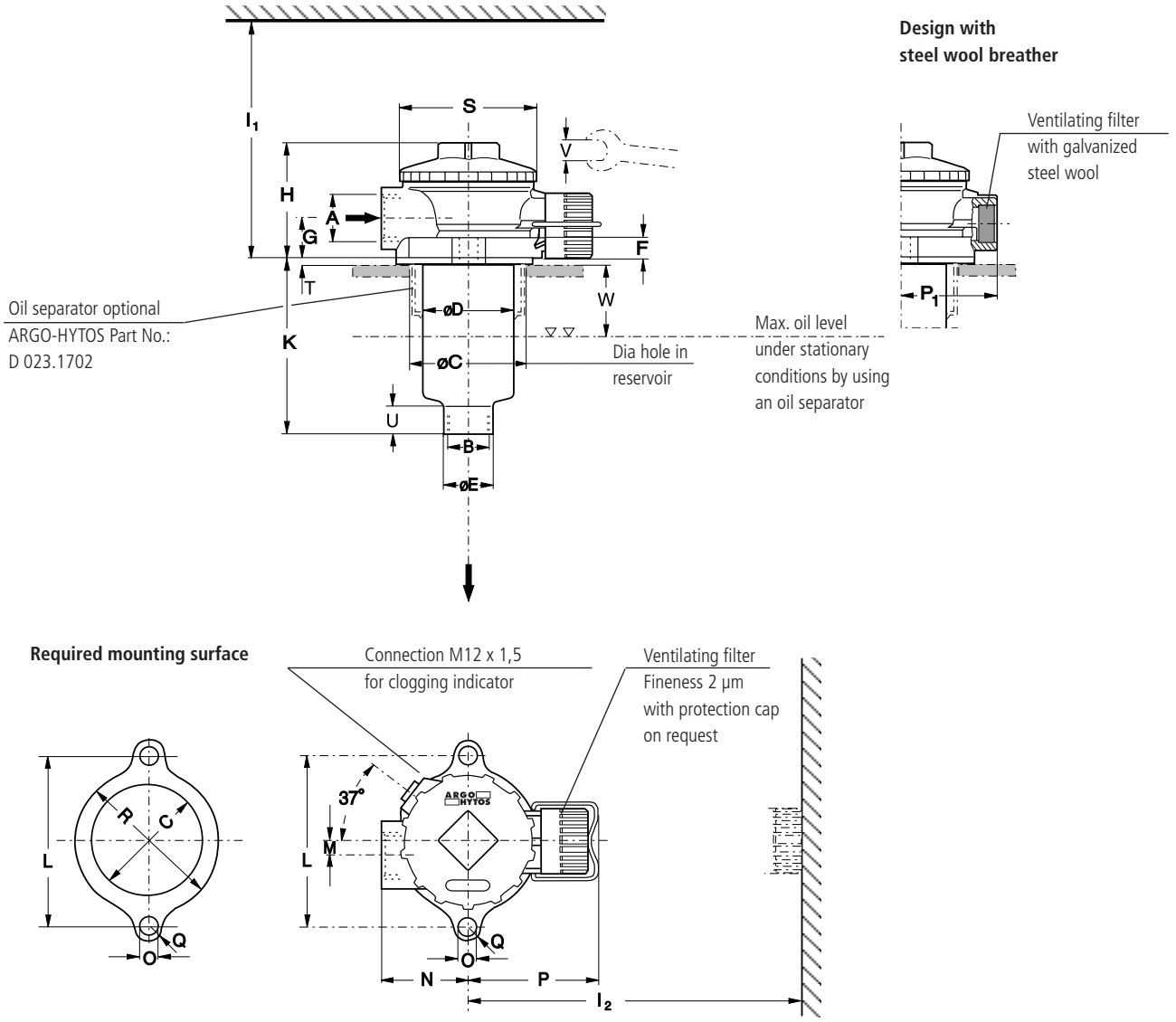
For the appropriate clogging indicator see catalogue sheet 60.20.

Remarks:

- The switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- The clogging indicators are optionally available and will then be loosely provided.
- The filters listed in this chart are standard filters. If modifications are required, e.g. different filter finenesses or with ventilating filter, we kindly ask for your request.

[1] with steel wool breather and magnetic system

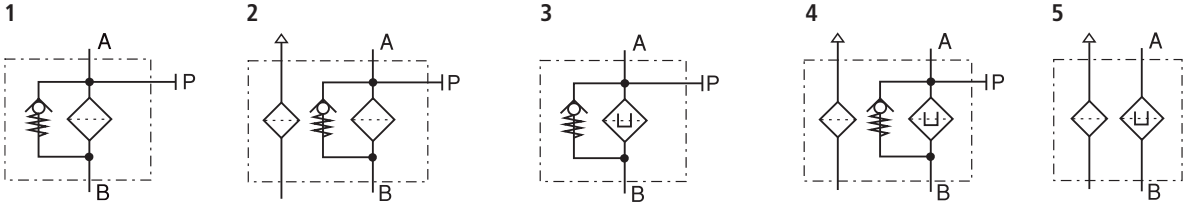
Dimensions



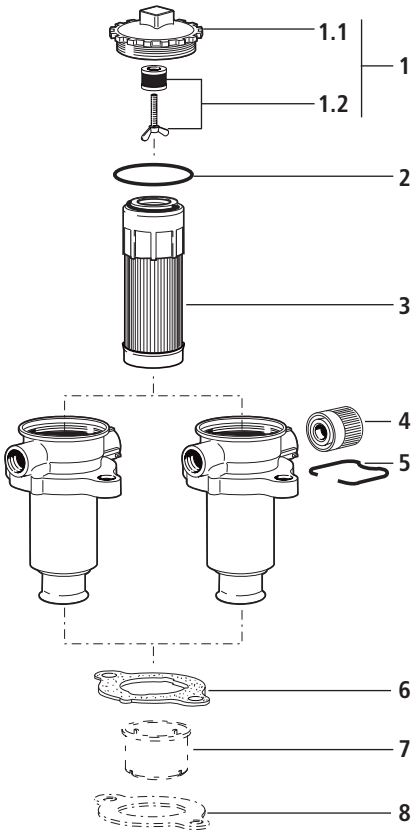
Measurements

Type	A	B	C min./max.	D	E	F	G	H	I_1	I_2	K	L	M	N	O	P	P_1	Q	R	S
D 043	G½	G½	60/63	52	27,8	11,5	24	67	150	120	87,5	88	9	50	11	68,5	45	9,5	75,5	73,5
Type	T	U	V	W																
D 043	2	18	27	42																

Symbols



Spare Parts



Pos.	Designation	Part No.
1	Screw-on cap (with Pos. 2) for D 043 with magnetic system	D 043.1210
1.1	Screw-on cap	D 043.2202
1.2	Magnetic system	M0.2501-00
2	Flat gasket	N 031.0562
3	Filter element	see Chart / col. 9
4	Ventilating filter (with Pos. 5)	L1.0406-01K7
5	Clip	N 026.0253
6	Flat gasket	D 023.0704
7	Oil separator (with Pos. 8)	D 023.1702
8	Flat gasket for D 043 with oil separator	D 023.0718

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 DIN and ISO standards:

DIN ISO 2941 Verification of collapse/burst resistance
DIN ISO 2943 Verification of material compatibility with fluids
DIN ISO 3724 Verification of flow fatigue characteristics

ISO 2942 Verification of fabrication integrity (Bubble Point Test)
ISO 3968 Evaluation of pressure drop versus flow characteristics
ISO 16889 Multi-Pass-Test (evaluation of filter fineness and dirt-holding capacity)

Various quality controls during the production process guarantee the leakfree function and solidity of our filters.

Our engineers will be glad to advice you in questions concerning filter application, selection as well as the cleanliness class of the filtered medium attainable under practical operating conditions.

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

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Subject to change · 9107163-e · 0309

ARGO HYTOS

Return Filters

E 043 · E 072

- Tank top mounting
- Connection up to G¾
- Nominal flow rate up to 70 l/min

20.20-4e

Description

Application
In the return line circuits of hydraulic systems.

Performance features

Protection against wear:	By means of filter elements that, in full-flow filtration, meet even the highest demands regarding cleanliness classes.
Protection against malfunction:	By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

Special features

By-pass valve:	The location close to the inlet port prevents dirt particles retained by the filter element from entering into the clean oil side.
Removable bowl:	In case of maintenance the filter bowl is removed together with the filter element – therefore dirt particles are not flushed back into the tank.
Extension pipe:	Easy and fast adaptation to various lengths due to the "do-it-yourself"-system.

Filter elements
Flow direction from outside to centre. The star-shaped pleating of the filter material results in:
- large filter surfaces
- low pressure drop
- high dirt-holding capacities
- long service life

Ventilating filter
Ventilation of the reservoir by an integral star-shape pleated filter element:
- removable (replace annually!)
- splash-proof
- fineness 2 µm

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

Materials

Screw-on cap:	Polyamide, GF reinforced
Filter head:	Aluminium alloy
Filter bowl:	Polyamide, CF reinforced, electrically conducting
Seals:	NBR (Viton on request)
Filter media:	EXAPOR®MAX – inorganic multi-layer microfibre web Paper – cellulose web, impregnated with resin

Accessories
An optional oil separator (Part No. E 043.1701) prevents oil splashing through the ventilating filter at mobile applications.
Electrical and optical clogging indicators are available. Dimensions and technical data see catalogue sheet 60.20.

For mounting of extension pipes ("do-it-yourself"-system) the following parts are needed:

Aluminium pipe (Length xxx in mm)	Part No. FR 043.Lxxx
O-Ring	Part No. N 007.0203
Crimping tool	Part No. FR 043.1770

Characteristics

Nominal flow rate
Up to 70 l/min (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:
- closed by-pass valve at $\nu \leq 200$ mm²/s
- element service life > 1000 operating hours at an average fluid contamination of 0,07 g per l/min flow volume
- flow velocity in the connection lines ≤ 4,5 m/s

Connection
Threaded ports according to ISO 228 or DIN 13.
Sizes see Selection Chart, column 6 (other port threads on request)

Filter fineness
5 µm(c) ... 30 µm(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 or HETG, see info-sheet 00.20)
With high filling conditions we recommend
an electrical conductivity ≥ 500 pS/m at 20 °C.

Temperature range
-30 °C ... +100 °C (temporary -40 °C ... +120 °C)

Viscosity at nominal flow rate
- at operating temperature: $\nu < 60$ mm²/s
- as starting viscosity: $\nu_{max} = 1200$ mm²/s
- 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.

Operating pressure
Max. 10 bar

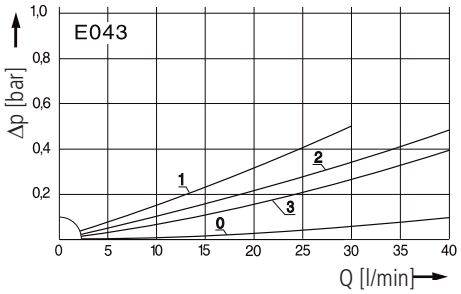
Mounting position
Preferably vertical, outlet downwards

Diagrams

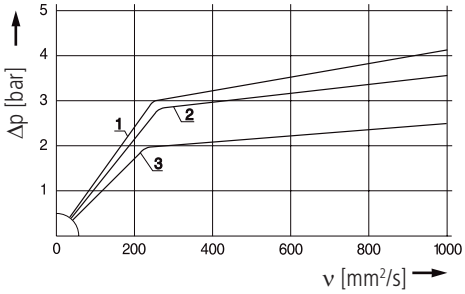
Δp-curves for complete filters in Selection Chart, column 3

D1

Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s (0 = casing empty)

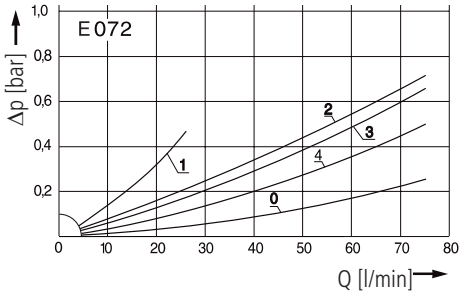


Pressure drop as a function of the **kinematic viscosity**
at nominal flow

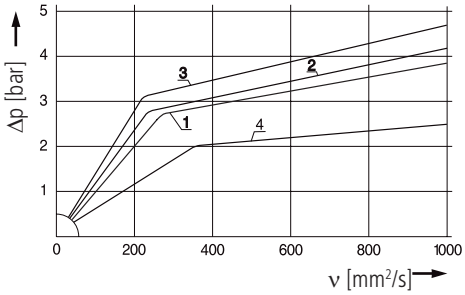


D2

Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s (0 = casing empty)



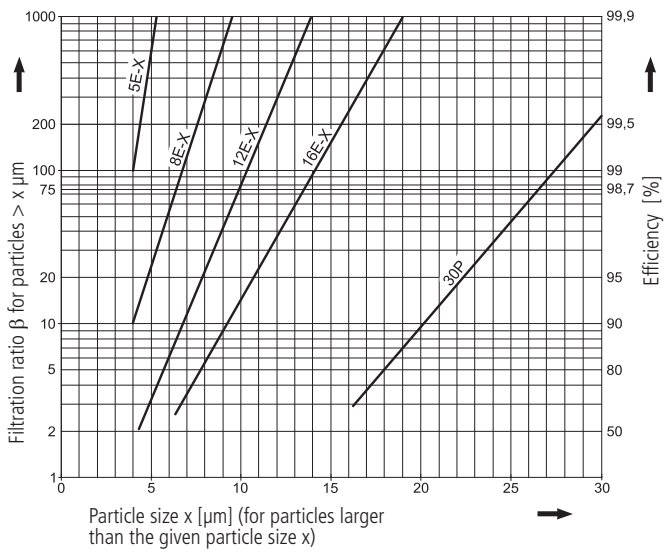
Pressure drop as a function of the **kinematic viscosity**
at nominal flow



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®MAX- and Paper elements:

5 E-X	= $\overline{\beta}_{5\,(c)}$	= 200	EXAPOR®MAX
8 E-X	= $\overline{\beta}_{8\,(c)}$	= 200	EXAPOR®MAX
12 E-X	= $\overline{\beta}_{12\,(c)}$	= 200	EXAPOR®MAX
16 E-X	= $\overline{\beta}_{16\,(c)}$	= 200	EXAPOR®MAX
30 P	= $\overline{\beta}_{30\,(c)}$	= 200	Paper

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

For screen elements:

40 S	=	screen material with mesh size 40 µm
60 S	=	screen material with mesh size 60 µm
100 S	=	screen material with mesh size 100 µm

Tolerances for mesh size accordung to DIN 4189

For ventilating filter elements:
2 CL = 99,5 % efficiency for particles of size 2 µm

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

Selection Chart

Part No.	Nominal flow	Pressure drop see diagram **D**/curve no.	Filter fineness see Diagr. **Dx**	Dirt-holding capacity	Connection A	Cracking pressure of by-pass	Symbol	Replacement element Part No.	Weight	Replacement ventilating filter Part No. (Filter fineness see diagrams)	Remarks
	l/min			g		bar			kg		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
E 043-156	25	**D1**/1	12 E-X	5,3	$G^1/_2$	2,5	2	V3.0510-56	0,6	L1.0403-01 (2 CL)	-
E 043-166	25	**D1**/1	12 E-X	5,3	$G^1/_2$	2,5	1	V3.0510-56	0,6	-	-
E 043-158	35	**D1**/2	16 E-X	5,7	$G^1/_2$	2,5	2	V3.0510-58	0,6	L1.0403-01 (2 CL)	-
E 043-168	35	**D1**/2	16 E-X	5,7	$G^1/_2$	2,5	1	V3.0510-58	0,6	-	-
E 043-151	30	**D1**/3	30 P	4,0	$G^1/_2$	1,5	2	P3.0510-51	0,6	L1.0403-01 (2 CL)	-
E 043-161	30	**D1**/3	30 P	4,0	$G^1/_2$	1,5	1	P3.0510-51	0,6	-	-
E 072-153	25	**D2**/1	5 E-X	6,7	$G^3/_4$	2,5	2	V3.0520-53	0,8	L1.0403-01 (2 CL)	-
E 072-163	25	**D2**/1	5 E-X	6,7	$G^3/_4$	2,5	1	V3.0520-53	0,8	-	-
E 072-156	50	**D2**/2	12 E-X	11	$G^3/_4$	2,5	2	V3.0520-56	0,8	L1.0403-01 (2 CL)	-
E 072-166	50	**D2**/2	12 E-X	11	$G^3/_4$	2,5	1	V3.0520-56	0,8	-	-
E 072-158	70	**D2**/3	16 E-X	12	$G^3/_4$	2,5	2	V3.0520-58	0,8	L1.0403-01 (2 CL)	-
E 072-168	70	**D2**/3	16 E-X	12	$G^3/_4$	2,5	1	V3.0520-58	0,8	-	-
E 072-151	50	**D2**/4	30 P	6,6	$G^3/_4$	1,5	2	P3.0520-51*	0,8	L1.0403-01 (2 CL)	-
E 072-161	50	**D2**/4	30 P	6,6	$G^3/_4$	1,5	1	P3.0520-51*	0,8	-	-

All filters are delivered with a plugged clogging indicator connection M12 x 1,5. As clogging indicators either manometers or electrical pressure switches can be used. Optional extension pipes adapt the filter length to various tank depths. For ordering of accessories please use the below mentioned codes.

Order example: The filter E 072-156 has to be supplied with an extension pipe (EV) for a mounting depth of 495 mm.

Order description: **E 072-156 / EV 495**

Part No. (basic unit)

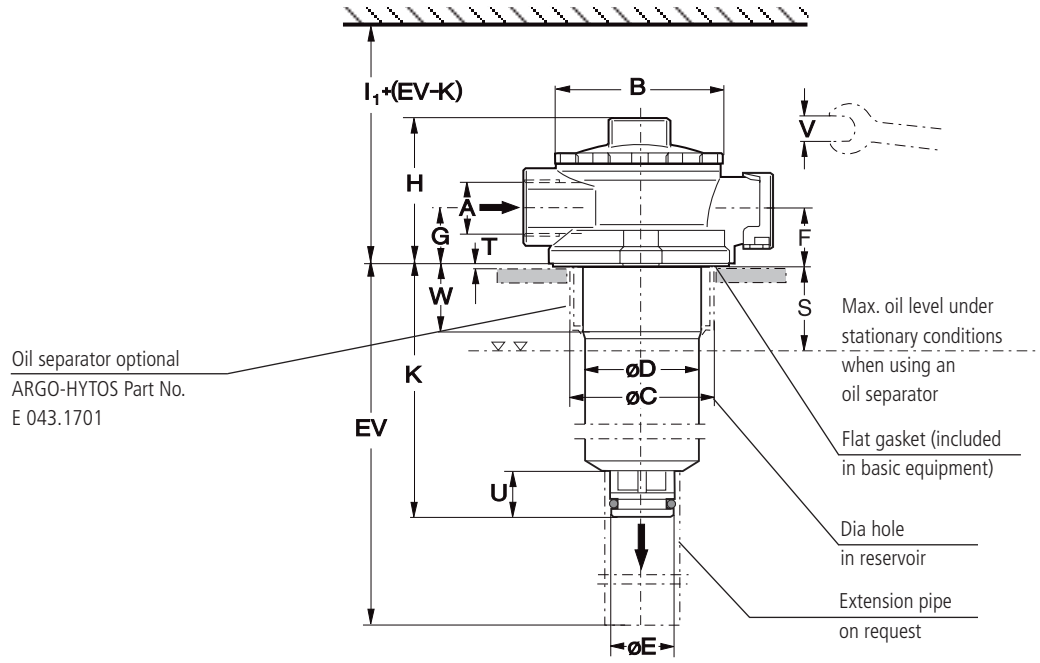
Extension pipe (5 various lengths are available)
EV = K + 65 / + 115 / + 215 / + 315 / + 415 mm (see dimensions and measurements)

For the appropriate clogging indicators see catalogue sheet 60.20.

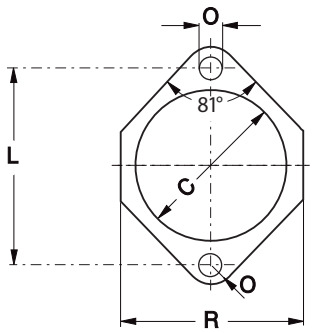
Remarks:
- The switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- The clogging indicators are optionally available and will then be loosely provided.
- The filters listed in this chart are standard filters. Other designs available on request.

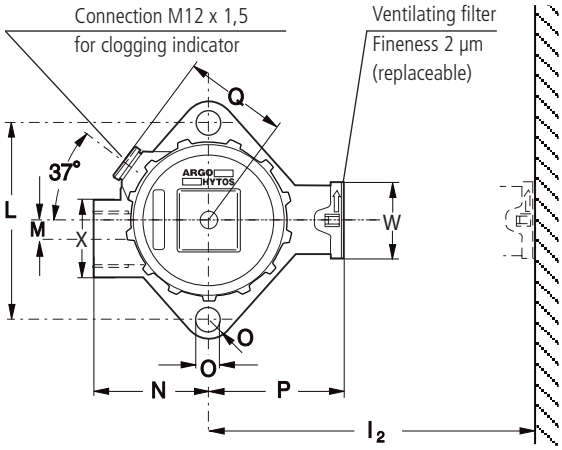
* Paper media supported with metal gauze

Dimensions



Required mounting surface



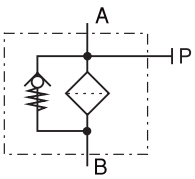


Measurements

Type	A	B	C min./max.	D	E	F	G	H	I_1	I_2	K	L	M	N	O	P	Q	R	S	T
E 043	$G^1/_2$	75	60/63	51	27,8	24	26	67	175	110	83	88	9	51	11	59,5	46	79	42	2
E 072	$G^3/_4$	75	60/63	51	27,8	24	26	67	270	110	180	88	9	51	11	59,5	46	79	42	2
Type	**U**	**V**	**W**	**X**																
E 043	21	SW 27	35	SW 36																
E 072	21	SW 27	35	SW 36																

Symbols

1



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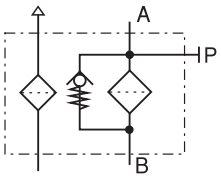
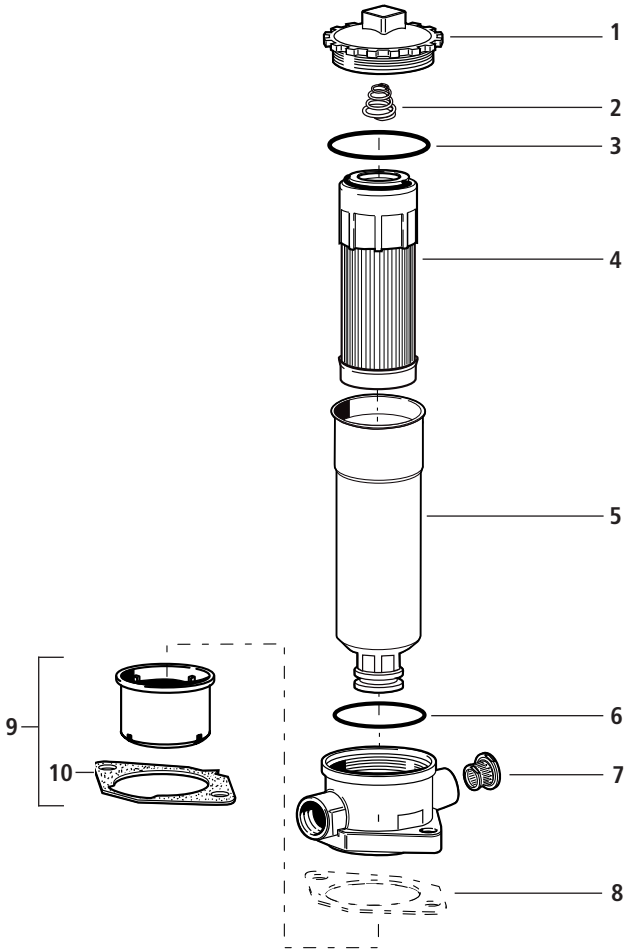


Spare Parts



Pos.	Designation	Part No.
1	Screw-on cap	FR 043.0201
2	Compression spring	N 015.1606
3	O-ring 57 x 3	N 007.0573
4	Filter element	see Chart / col. 9
5	Filter bowl E043 *	FR 043.0107
5	Filter bowl E072 *	FR 072.0104
6	O-ring 50 x 2	N 007.0501
7	Ventilating filter	L1.0403-01
8	Flat gasket (for versions without oil separator)	D 043.0113
9	Oil separator with Pos. 10	E 043.1701
10	Flat gasket (for versions with oil separator)	D 043.0118

* Specify mounting depth (EV) in mm

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 DIN and ISO standards:

DIN ISO 2941 Verification of collapse/burst resistance
DIN ISO 2943 Verification of material compatibility with fluids
DIN ISO 3724 Verification of flow fatigue characteristics
ISO 2942 Verification of fabrication integrity (Bubble Point Test)
ISO 3968 Evaluation of pressure drop versus flow characteristics
ISO 16889 Multi-Pass-Test (evaluation of filter fineness and dirt-holding capacity)

Various quality controls during the production process guarantee the leakfree function and solidity of our filters.

Our engineers will be glad to advice you in questions concerning filter application, selection as well as the cleanliness class of the filtered medium attainable under practical operating conditions.

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

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Subject to change · 13346 · 0307

ARGO HYTOS

Return Filters - lightline

FR 043 · FR 072

- Tank top mounting / In-line mounting
- Hose connection up to ID 19 mm
- Nominal flow rate up to 70 l/min

20.15-3e

Description

Application
In the return line circuits of hydraulic systems.

Performance features

Protection against wear:	By means of filter elements that, in full-flow filtration, meet even the highest demands regarding cleanliness classes.
Protection against malfunction:	By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

Special features

Connection:	Hose nipple
By-pass valve:	The location close to the inlet port prevents dirt particles retained by the filter element from entering into the clean oil side.
Removable bowl:	In case of maintenance the filter bowl is removed together with the filter element - therefore dirt particles are not flushed back into the tank.
Oil separator:	Prevents oil splashing through the breather on mobile application.
Extension pipe:	Easy and fast adaption to various lengths.

Filter elements
Flow direction from outside to centre. The star-shaped pleating of the filter material results in:
- large filter surfaces
- low pressure drop
- high dirt-holding capacities
- long service life

Ventilating Filter
Ventilation of the reservoir by an integral star-shape pleated filter element:
- removable (replace annually!)
- splash-proof
- fineness 2 µm

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

Materials

Screw-on cap:	Polyester, GF reinforced
Housing:	Polyamide, GF reinforced*
Seals:	NBR (Viton on request)
Filter media:	EXAPOR®MAX - inorganic multi-layer microfibre web Paper - cellulose web, impregnated with resin

* due to the conductable plastic material no static charge can occur

Accessories
Electrical and optical clogging indicators are available.
Dimensions and technical data see catalogue sheet 60.20.

Recommended hose clamps according to DIN 3017 Part 2 or equivalent for hose OD 23 mm or 26 mm. For orders use ARGO-HYTOS Part No. 332 70 03 or 332 70 04.
For mounting of extension pipes following parts are needed:

Aluminium pipe (Length xxx in mm)	Part No. FR 043.Lxxx
O-ring	Part No. N 007.0203
Crimping tool	Part No. FR 043.1770

Characteristics

Nominal flow rate
Up to 70 l/min (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:
- closed by-pass valve at $\nu \leq 200$ mm²/s
- element service life > 1000 operating hours at an average fluid contamination of 0,07 g per l/min flow volume
- flow velocity in the connection lines ≤ 4,5 m/s

Connection
Hose nipple for hose up to ID 19 mm. Sizes see Selection Chart, column 6 (other connections on request)

Filter fineness
12 µm(c) ... 30 µm(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 or HETG, see info-sheet 00.20)
With high filling conditions we recommend
an electrical conductivity ≥ 500 pS/m at 20 °C.

Temperature range
- 30 °C ... + 80 °C (short intervals to + 100 °C)

Viscosity at nominal flow rate
- at operating temperature: $\nu < 60$ mm²/s
- as starting viscosity: $\nu_{max} = 1200$ mm²/s
- at first 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.

Operating pressure
Max. 6 bar

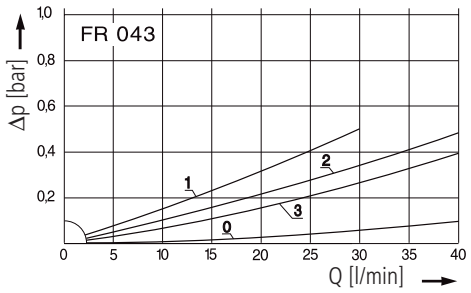
Mounting position
Preferably vertical, outlet downwards

Diagrams

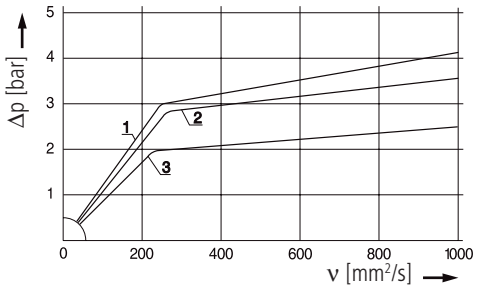
Δp-curves for complete filters in Selection Chart, column 3

D1

Pressure drop as a function of the **flow volume** at ν = 35 mm²/s (0 = casing empty)

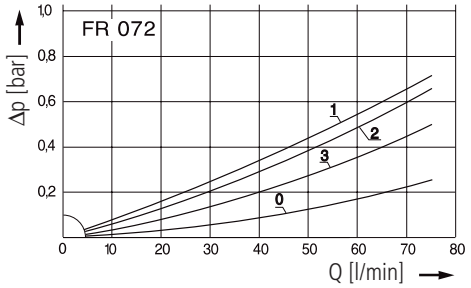


Pressure drop as a function of the **kinematic viscosity** at nominal flow

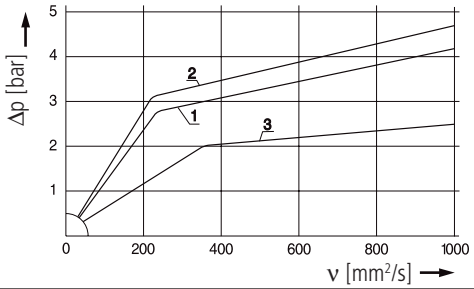


D2

Pressure drop as a function of the **flow volume** at ν = 35 mm²/s (0 = casing empty)



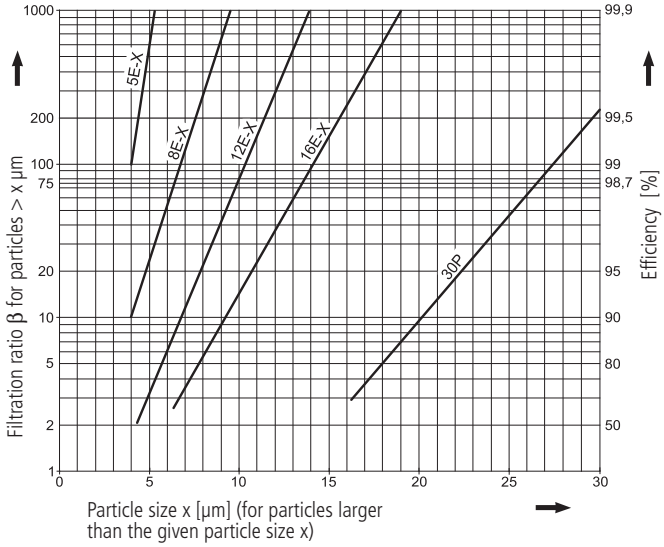
Pressure drop as a function of the **kinematic viscosity** at nominal flow



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®MAX- and Paper elements:

5 E-X	= $\bar{\beta}_{5\,(c)}$	= 200	EXAPOR®MAX
8 E-X	= $\bar{\beta}_{8\,(c)}$	= 200	EXAPOR®MAX
12 E-X	= $\bar{\beta}_{12\,(c)}$	= 200	EXAPOR®MAX
16 E-X	= $\bar{\beta}_{16\,(c)}$	= 200	EXAPOR®MAX
30 P	= $\bar{\beta}_{30\,(c)}$	= 200	Paper

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

For screen elements:

40 S	=	screen material with mesh size 40 µm
60 S	=	screen material with mesh size 60 µm
100 S	=	screen material with mesh size 100 µm

Tolerances for mesh size according to DIN 4189

For ventilating filter elements:

2 CL = 99,5 % filter efficiency for particles of size 2 µm

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

Selection Chart

Part No.	Nominal flow	Pressure drop see Diagram **D**/curve no.	Filter fineness see Diagr. **Dx**	Dirt-holding capacity	Connection A	Cracking pressure of by-pass	Symbol	Replacement filter element Part No.	Weight	Replacement ventilating filter Part No.	Filter fineness see Diagrams	Remarks
	l/min			g		bar			kg			
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**		**12**
FR 043-156	25	**D1**/1	12 E-X	5,3	17,5	2,5	1	V3.0510-56	0,42	L1.0403-51 (2 CL)		-
FR 043-166	25	**D1**/1	12 E-X	5,3	17,5	2,5	2	V3.0510-56	0,42	L1.0403-51 (2 CL)		M12 x 1,5 for indicator
FR 043-158	35	**D1**/2	16 E-X	5,7	17,5	2,5	1	V3.0510-58	0,42	L1.0403-51 (2 CL)		-
FR 043-178	35	**D1**/2	16 E-X	5,7	17,5	2,5	2	V3.0510-58	0,42	L1.0403-51 (2 CL)		M12 x 1,5 for indicator
FR 043-151	30	**D1**/3	30 P	4,0	17,5	1,5	1	P3.0510-51	0,42	L1.0403-51 (2 CL)		-
FR 043-161	30	**D1**/3	30 P	4,0	17,5	1,5	2	P3.0510-51	0,42	L1.0403-51 (2 CL)		M12 x 1,5 for indicator
FR 072-156	50	**D2**/1	12 E-X	11	20,5	2,5	1	V3.0520-56	0,58	L1.0403-51 (2 CL)		-
FR 072-166	50	**D2**/1	12 E-X	11	20,5	2,5	2	V3.0520-56	0,58	L1.0403-51 (2 CL)		M12 x 1,5 for indicator
FR 072-158	70	**D2**/2	16 E-X	12	20,5	2,5	1	V3.0520-58	0,58	L1.0403-51 (2 CL)		-
FR 072-168	70	**D2**/2	16 E-X	12	20,5	2,5	2	V3.0520-58	0,58	L1.0403-51 (2 CL)		M12 x 1,5 for indicator
FR 072-151	50	**D2**/3	30 P	6,6	20,5	1,5	1	P3.0520-51*	0,58	L1.0403-51 (2 CL)		-
FR 072-171	50	**D2**/3	30 P	6,6	20,5	1,5	2	P3.0520-51*	0,58	L1.0403-51 (2 CL)		M12 x 1,5 for indicator

As clogging indicators either manometers or electrical pressure switches can be used. Optional extension pipes adapt the filter length to various tank depths. For ordering of accessories please use the below mentioned codes.

Order example: The filter FR 043-166 has to be supplied with an extension pipe (EV) for a mounting depth of 300 mm.

Order description: **FR 043-166 / EV 300**

Part No. (Basic unit)

Extension pipe (5 various lengths are available)
EV = K + 65 / + 115 / + 215 / + 315 / + 415 (see dimensions and measurements)

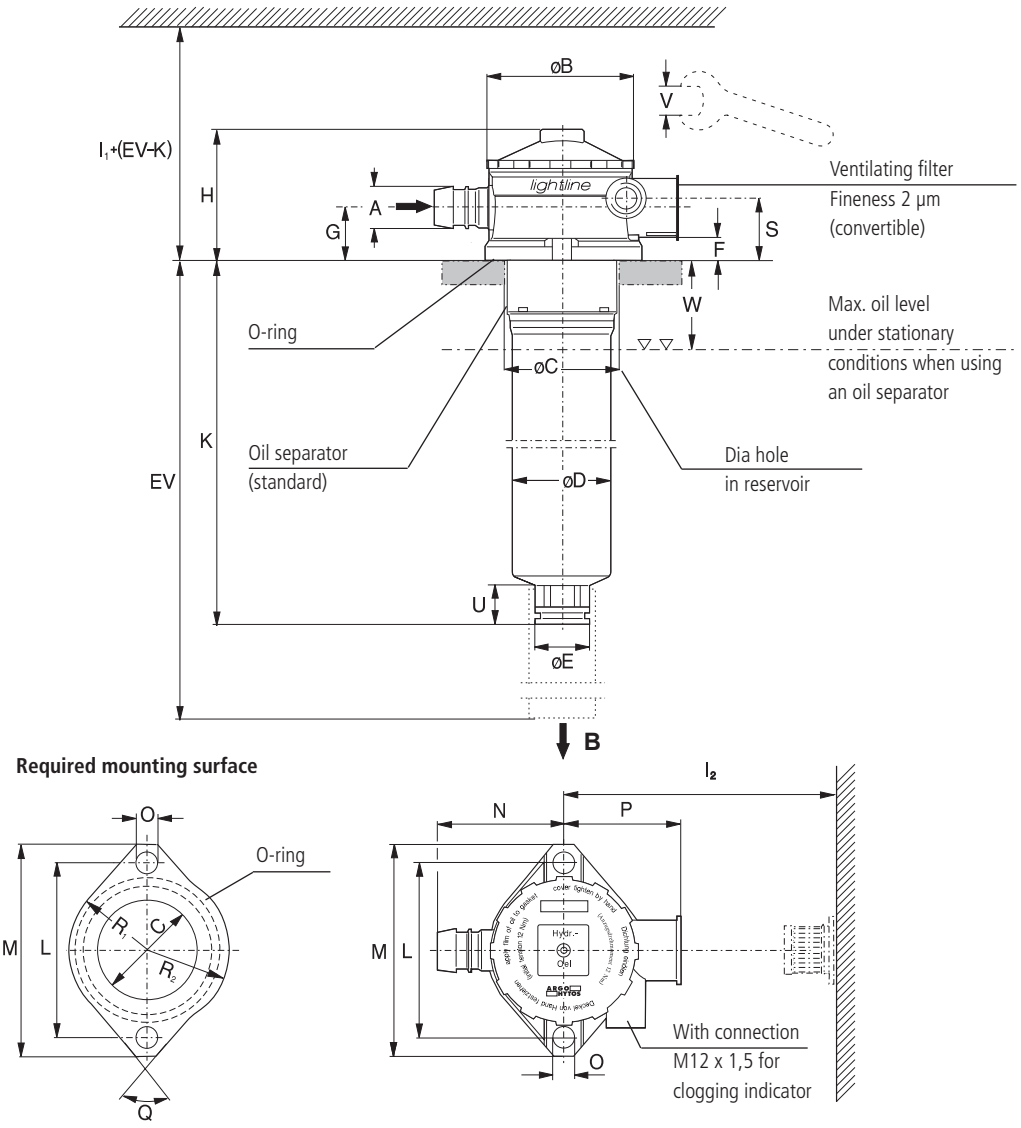
For the appropriate clogging indicator see data sheet 60.20.

When using pressure switches of series DG 813 sealing by means of an O-ring (order no. N 007.0103, to be ordered separately) has to be guaranteed (torque 4 Nm). When using manometers of series DG 200 variants with preformed sealing ring are to be used.

Remarks:
- The switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- The clogging indicators are optionally available and will then be loosely provided.
- For fastening the filter the enclosed spring washers have to be used. Mounting force 15^{+5} Nm.
- The filters listed in this chart are standard filters. Other designs available on request.

* Paper media supported with metal gauze

Dimensions



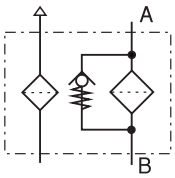
Measurements

Type	A	B	C min./max.	D	E	F*	G	H	I_1	I_2	K	L	M	N	O	P	Q	R_1	R_2	S
FR 043	17,5	75	60/61	51	27,8	11	22	65	175	30	85	88	108	65	11	59	80°	39	42	27
FR 072	20,5	75	60/61	51	27,8	11	22	65	270	30	182	88	108	65	11	59	80°	39	42	27
Type	**U**	**V**	**W**																	
FR 043	20	27	40																	
FR 072	20	27	40																	

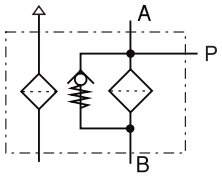
* including the enclosed spring washers Ø10, DIN 137 shape B, corrugated

Symbols

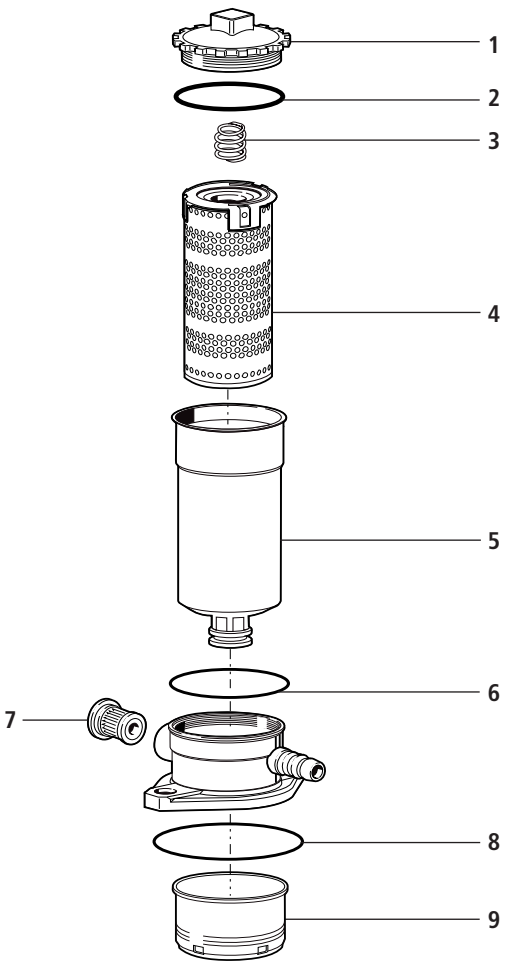
1



2



Spare Parts



Pos.	Designation	Part No.
1	Screw-on cap	FR 043.0201
2	O-ring 57 x 3	N 007.0573
3	Compression spring	N 015.1606
4	Filter element	s. Chart / col. 9
5	Filter bowl FR 043 *	FR 043.0107
5	Filter bowl FR 072 *	FR 072.0104
6	O-ring 50 x 2	N 007.0501
7	Ventilating filter	L1.0403-51
8	O-ring 69 x 4	N 007.0704
9	Oil separator	FR 043.0701

* Specify mounting depth in mm

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 DIN and ISO standards:

DIN ISO 2941 Verification of collapse/burst resistance
DIN ISO 2943 Verification of material compatibility with fluids
DIN ISO 3724 Verification of flow fatigue characteristics
ISO 2942 Verification of fabrication integrity (Bubble Point Test)
ISO 3968 Evaluation of pressure drop versus flow characteristics
ISO 16889 Multi-Pass-Test (evaluation of filter fineness and dirt-holding capacity)

Various quality controls during the production process guarantee the leakfree function and solidity of our filters.

Our engineers will be glad to advice you in questions concerning filter application, selection as well as the cleanliness class of the filtered medium attainable under practical operating conditions.

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We produce fluid power solutions
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Subject to change · 9107164-e · 0905

ARGO HYTOS

Return Filters

E 094 · E 103 · E 143

- Tank top mounting
- Connection up to G1
- Nominal flow rate up to 135 l/min

20.30-5e

Description

Application
In the return line circuits of hydraulic systems.

Performance features

Protection against wear:	By means of filter elements that, in full-flow filtration meet even the highest demands regarding cleanliness classes.
Protection against malfunction:	By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

Special features

By-pass valve:	The location close to the inlet port prevents dirt particles retained by the filter element from entering into the clean oil side.
Removable bowl:	In case of maintenance the filter bowl is removed together with the filter element - therefore dirt particles are not flushed back into the tank.

Filter elements
Flow direction from outside to centre. The star-shaped pleating of the filter material results in:
- large filter surfaces
- low pressure drop
- high dirt-holding capacities
- long service life

Ventilating Filter
Ventilation of the reservoir by an integral star-shape pleated filter element:
- removable (replace annually!)
- splash-proof
- fineness 2 µm

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

Materials

Screw-on cap:	Polyamide, GF reinforced
Filter head:	Aluminium alloy
Filter bowl:	Polyamide, GF reinforced*
Seals:	NBR (Viton on request)
Filter media:	EXAPOR®MAX - inorganic multi-layer microfibre web Paper - cellulose web, impregnated with resin

* due to the conductable plastic material no static charge can occur

Accessories
An optional oil separator (Part No. E 103.1702) prevents oil splashing through the ventilating filter at mobile applications.
Electrical and optical clogging indicators are available. Dimensions and technical data see cataologue sheet 60.20.

Characteristics

Nominal flow rate
Up to 135 l/min (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:
- closed by-pass valve at $\nu \leq 200$ mm²/s
- element service life > 1000 operating hours at an average fluid contamination of 0,07 g per l/min flow volume
- flow velocity in the connection lines ≤ 4,5 m/s

Connection
Threaded ports according to ISO 228 or DIN 13.
Sizes see Selection Chart, column 6 (other port threads on request)

Filter fineness
5 µm(c) ... 30 µm(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)
With high filling conditions we recommend an electrical conductivity ≥ 500 pS/m at 20 °C.

Temperature range
- 30° C ... + 100° C (temporary - 40 °C ... + 120 °C)

Viscosity at nominal flow rate
- at operating temperature: $\nu < 60$ mm²/s
- as starting viscosity: $\nu_{max} = 1200$ mm²/s
- at first 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.

Operating pressure
Max. 10 bar

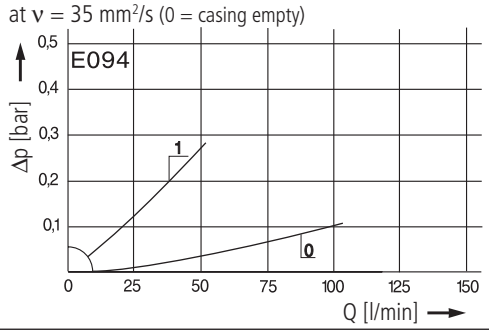
Mounting position
Preferably vertical, outlet downwards

Diagrams

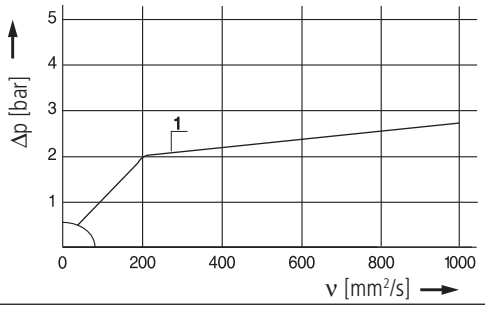
Δp-curves for complete filters in Selection Chart, column 3

D1

Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s (0 = casing empty)

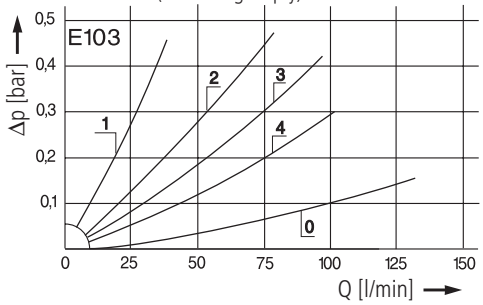


Pressure drop as a function of the **kinematic viscosity**
at nominal flow

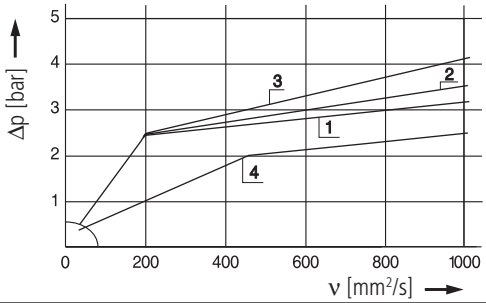


D2

Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s (0 = casing empty)

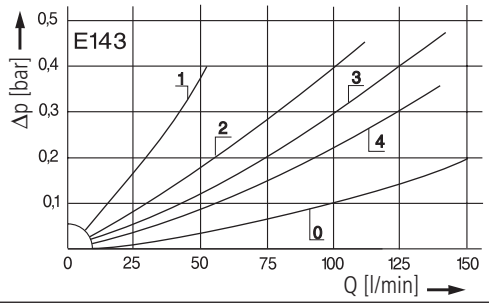


Pressure drop as a function of the **kinematic viscosity**
at nominal flow

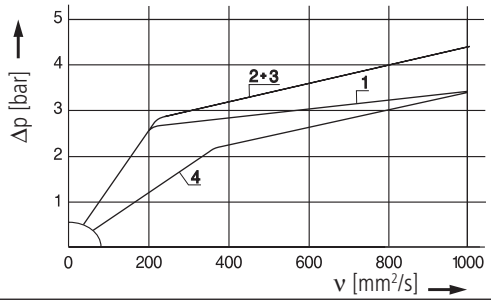


D3

Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s (0 = casing empty)



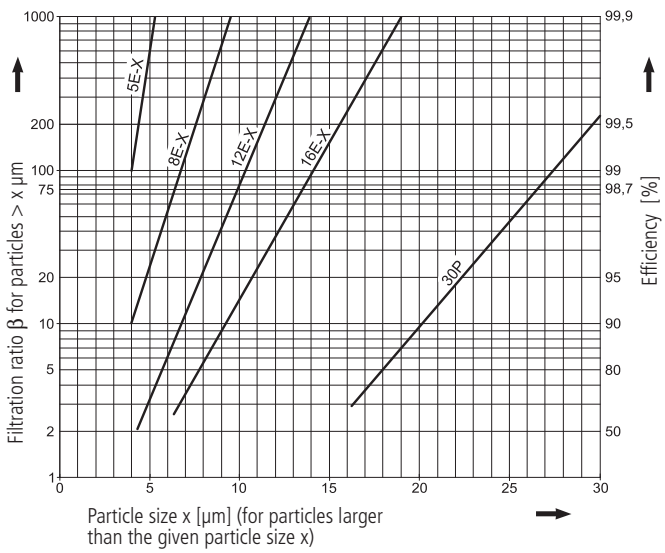
Pressure drop as a function of the **kinematic viscosity**
at nominal flow



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®MAX- and Paper elements:

5 E-X	= $\bar{\beta}_{5\,(c)}$	= 200	EXAPOR®MAX
8 E-X	= $\bar{\beta}_{8\,(c)}$	= 200	EXAPOR®MAX
12 E-X	= $\bar{\beta}_{12\,(c)}$	= 200	EXAPOR®MAX
16 E-X	= $\bar{\beta}_{16\,(c)}$	= 200	EXAPOR®MAX
30 P	= $\bar{\beta}_{30\,(c)}$	= 200	Paper

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

For screen elements:

40 S	= screen material with mesh size	40 µm
60 S	= screen material with mesh size	60 µm
100 S	= screen material with mesh size	100 µm

Tolerances for mesh size accordung to DIN 4189

For ventilating filter elements:
2 CL = 99,5 % efficiency for particles of size 2 µm

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

Selection Chart

Part No.	Nominal flow	Pressure drop see Diagram **D**/curve no.	Filter fineness see Diagr. **Dx**	Dirt-holding capacity	Connection A	Cracking pressure of by-pass	Symbol	Replacement element Part No.	Weight	Replacement ventilating filter Part No.	Filter fineness see Diagrams	Remarks
	l/min			g		bar			kg			
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**		**12**
E 094-661	50	**D1**/1	30 P	11	G 3/4	1,5	2	P3.0613-51	0,8	L1.0503-03 (2 CL)		-
E 094-671	50	**D1**/1	30 P	11	G 3/4	1,5	1	P3.0613-51	0,8	-		-
E 103-657	35	**D2**/1	5 E-X	13	G 1/2	2,5	2	V3.0620-53	1,0	L1.0503-03 (2 CL)		-
E 103-677	35	**D2**/1	5 E-X	13	G 1/2	2,5	1	V3.0620-53	1,0	-		-
E 103-676	75	**D2**/2	12 E-X	22	G 3/4	2,5	2	V3.0620-56	1,0	L1.0503-03 (2 CL)		-
E 103-686	75	**D2**/2	12 E-X	22	G 3/4	2,5	1	V3.0620-56	1,0	-		-
E 103-898	95	**D2**/3	16 E-X	24	G1	2,5	2	V3.0620-58	1,0	L1.0503-03 (2 CL)		-
E 103-888	95	**D2**/3	16 E-X	24	G1	2,5	1	V3.0620-58	1,0	-		-
E 103-871	70	**D2**/4	30 P	11	G 3/4	1,5	2	P3.0620-51*	1,0	L1.0503-03 (2 CL)		-
E 103-861	70	**D2**/4	30 P	11	G 3/4	1,5	1	P3.0620-51*	1,0	-		-
E 143-657	55	**D3**/1	5 E-X	21	G 3/4	2,5	2	V3.0730-53	1,2	L1.0503-03 (2 CL)		-
E 143-667	55	**D3**/1	5 E-X	21	G 3/4	2,5	1	V3.0730-53	1,2	-		-
E 143-676	115	**D3**/2	12 E-X	32	G1	2,5	2	V3.0730-56	1,2	L1.0503-03 (2 CL)		-
E 143-686	115	**D3**/2	12 E-X	32	G1	2,5	1	V3.0730-56	1,2	-		-
E 143-888	135	**D3**/3	16 E-X	36	G1	2,5	2	V3.0730-58	1,2	L1.0503-03 (2 CL)		-
E 143-688	135	**D3**/3	16 E-X	36	G1	2,5	1	V3.0730-58	1,2	-		-
E 143-851	120	**D3**/4	30 P	17	G1	1,5	2	P3.0730-51*	1,2	L1.0503-03 (2 CL)		-
E 143-861	120	**D3**/4	30 P	17	G1	1,5	1	P3.0730-51*	1,2	-		-

All filters are delivered with a plugged clogging indicator connection M 12 x 1,5. As clogging indicators either manometers or electrical pressure switches can be used. Optional extension pipes adapt the filter length to various tank depths. For ordering of accessories please use the below mentioned codes.

Order example: The filter E 103-676 has to be supplied with an extension pipe for 300 mm length.

Order description: **E 103-676** **/** **EV 300**

Part No. (basic unit)

Extension pipe (7 various lengths are available)

EV = K (Bowl length) + 19 / + 79 / + 123 / + 173 / + 223 / + 323 / + 423 mm (see dimensions and measurements)

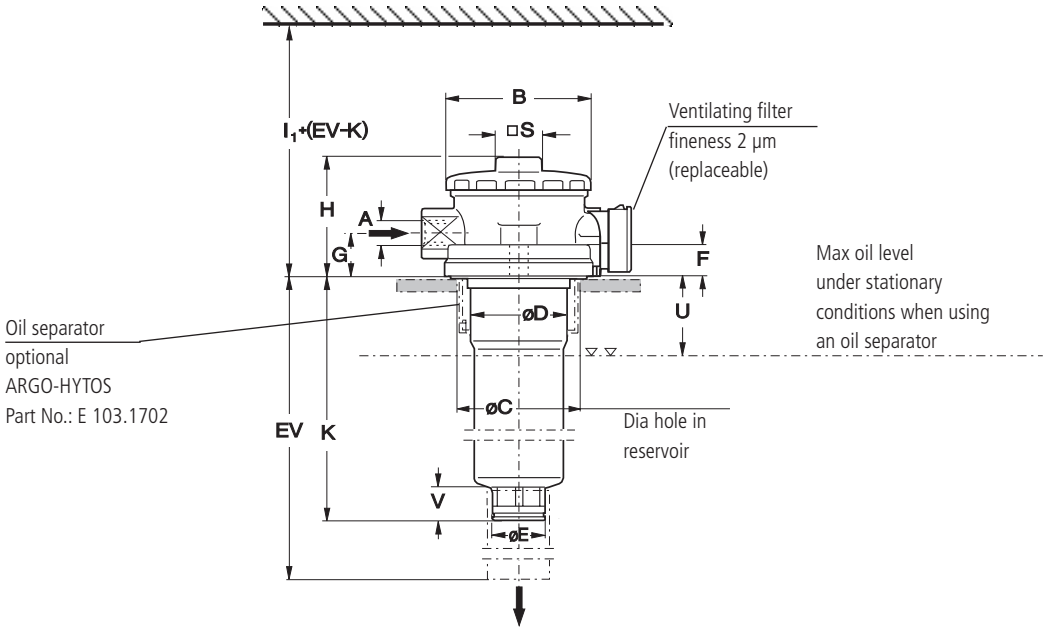
For the suitable clogging indicators please see catalogue sheet 60.20.

Remarks:

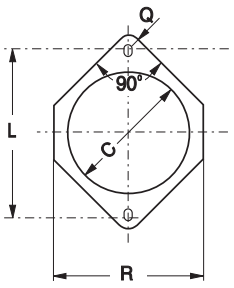
- The switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- The clogging indicators are always delivered detached from the filter.
- The filters listed in this chart are standard filters. Other designs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

* Paper media supported with metal gauze

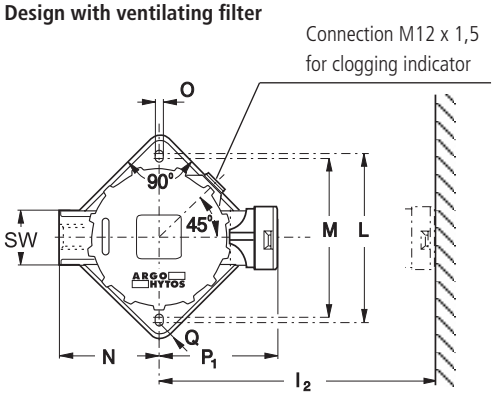
Dimensions



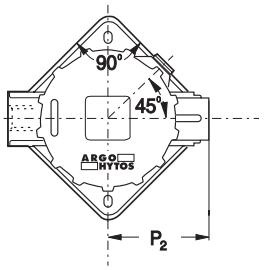
Required mounting surface



Design with ventilating filter



Design without ventilating filter



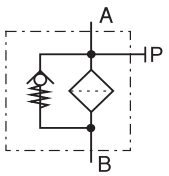
Measurements

Type	A	B	C min./max.	D	E	F	G	H	I_1	I_2	K	L	M	N	O	P_1	P_2	Q	R	S	SW	U	V
E 094	G¾	105	87 / 91	73,5	38	20,5	30	88,5	235	95	111	115	110	70	11	82	69	13,5	107,5	32	41	50	23
E 103	G½, G¾, G1	105	87 / 91	73,5	38	20,5	30	88,5	300	95	177	115	110	70	11	82	69	13,5	107,5	32	41	50	23
E 143	G¾, G1	105	87 / 91	73,5	38	20,5	30	88,5	400	95	278	115	110	70	11	82	69	13,5	107,5	32	41	50	23

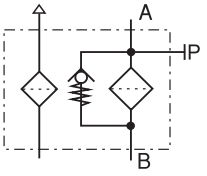
For calculation of EV use data in Selection Chart

Symbols

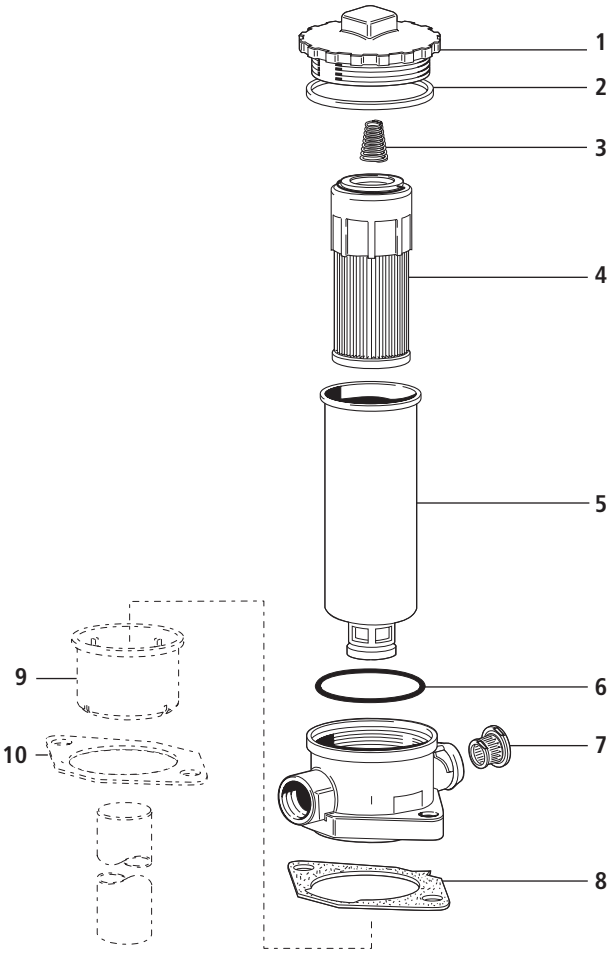
1



2



Spare Parts



Pos.	Designation	Part No.
1	Screw-on cap	E 103.0201
2	Seal	N 031.0841
3	Compression spring	N015.3703
4	Filter element	see Chart / col. 9
5	Filter bowl E094 *	E 094.0903
5	Filter bowl E103 *	E 103.0912
5	Filter bowl E143 *	E 143.0903
6	O-ring 69,5 x 3,5	N 007.0703
7	Ventilating filter	L1.0503-03K
8	Seal (for versions without oil separator)	E 103.0147
9	Oil separator with Pos. 10	E 103.1702
10	Seal (for versions with oil separator)	E 103.0148

* Specify mounting depth in mm

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 DIN and ISO standards:

DIN ISO 2941 Verification of collapse/burst resistance
DIN ISO 2943 Verification of material compatibility with fluids
DIN ISO 3724 Verification of flow fatigue characteristics
ISO 2942 Verification of fabrication integrity (Bubble Point Test)
ISO 3968 Evaluation of pressure drop versus flow characteristics
ISO 16889 Multi-Pass-Test (evaluation of filter fineness and dirt-holding capacity)

Various quality controls during the production process guarantee the leakfree function and solidity of our filters.

Our engineers will be glad to advice you in questions concerning filter application, selection as well as the cleanliness class of the filtered medium attainable under practical operating conditions.

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

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Subject to change · 9107166-e · 0905

ARGO HYTOS

Return Filters

E 212 · E 222

- Tank top mounting
- Connection up to G1¼
- Nominal flow rate up to 270 l/min

20.40-5e

Description

Application
In the return line circuits of hydraulic systems.

Performance features
Protection against wear: By means of filter elements that, in full-flow filtration, meet even the highest demands regarding cleanliness classes.
Protection against malfunction: By means of full-flow filtration in the system return, the pumps above all are proteced from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

Special features
By-pass valve: The location close to the inlet port prevents dirt particles retained by the filter element from entering into the clear oil side.
Removable bowl: In case of maintenance the filter bowl is removed together with the filter element - therefore dirt particles are not flushed back into the tank.
Filling filter/By-pass protection strainer: The filling filter is integrated in the filter element and prevents coarse particles from entering during filling or re-filling due to maintenance or repair reasons. Filling can be carried out at the filter. Therefore the cover must be removed.
In operation, the filling filter functions as a by-pass protection strainer and prevents dirt from entering into the tank when the by-pass valve is open.
Port for ventilating filter: The ventilating filter thread connection M 42x2 allows assembly of a ventilating filter, which assumes ventilation of the tank.
The ventilating filter has to be ordered separately.

Filter elements
Flow direction from outside to centre. 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
Screw-on cap: Polyester, GF reinforced
Filter head: Aluminium alloy
Filter bowl: Polyamide, CF reinforced, electrically conducting
Seals: NBR (Viton on request)
Filter media: EXAPOR®MAX 2 - inorganic multi-layer microfibre web
Paper - cellulose web, impregnated with resin
Filling filter: Polyamide, GF reinforced; Polyester web

Accessories
Extension pipes or diffusers are available on the bowl outlet.
Extension pipe: A correct extension pipe length ensures oil outlet below minimum oil level and prevents foaming.
Electrical and optical clogging indicators are available.
Dimensions and technical data see catalogue sheet 60.20.
Ventilating filters with connection thread M42x2 have to be ordered separately. Dimensions and technical data see catalogue sheet 50.20 and 50.30

Characteristics

Nominal flow rate
Return filter: Up to 270 l/min (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:
- closed by-pass valve at $\nu \leq 200$ mm²/s
- element service life > 1000 operating hours at an average fluid contamination of 0,07 g per l/min flow volume
- flow velocity in the connection lines ≤ 4,5 m/s

Filling filter: up to 20 l/min. (see Selection Chart, column 3)

Connection
Threaded ports according to ISO 228 or DIN 13. Sizes see Selection Chart, column 9 (other port threads on request)

Filter fineness
5 µm(c) ... 30 µm(c)
β-values according to ISO 16889
(see Selection Chart, column 5 and diagram Dx)

Dirt-holding capacity
Values in g test dust ISO MTD according to ISO 16889
(see Selection Chart, column 6)

Hydraulic fluids
Mineral oil and biodegradable fluids
(HEES or HETG, see info-sheet 00.20)
With high filling conditions we recommend an electrical conductivity ≥ 500 pS/m at 20 °C.

Temperature range
- 30 °C ... + 100 °C (temporary - 40 °C ... + 120 °C)

Viscosity at nominal flow rate
- at operating temperature: $\nu < 60$ mm²/s
- as starting viscosity: $\nu_{max} = 1200$ mm²/s
- 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.

Operating pressure
Max. 10 bar

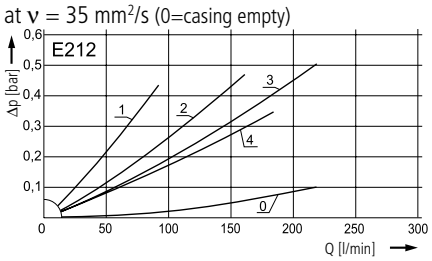
Mounting position
Preferably vertical, outlet downwards

Diagrams

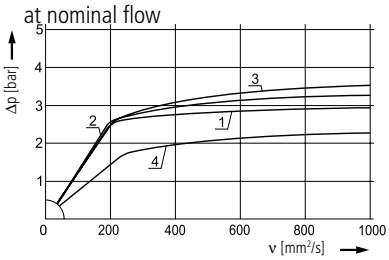
Δp-curves for complete filters in Selection Chart, column 4

D1

Pressure drop as a function of the **flow volume** at ν = 35 mm²/s (0=casing empty)

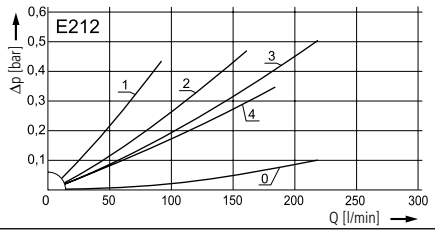


Pressure drop as a function of the **kinematic viscosity** at nominal flow

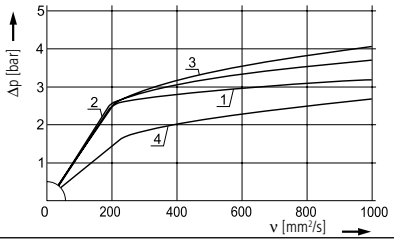


D2

Pressure drop as a function of the **flow volume** at ν = 35 mm²/s (0=casing empty)

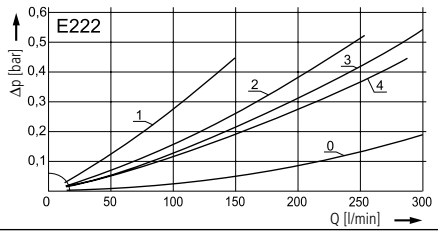


Pressure drop as a function of the **kinematic viscosity** at nominal flow

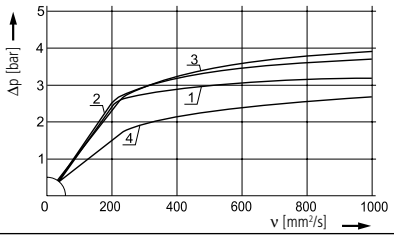


D3

Pressure drop as a function of the **flow volume** at ν = 35 mm²/s (0=casing empty)

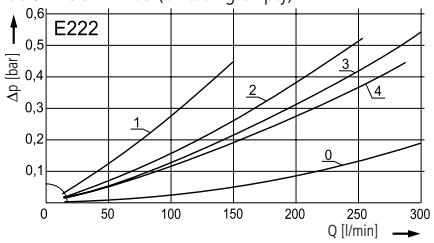


Pressure drop as a function of the **kinematic viscosity** at nominal flow

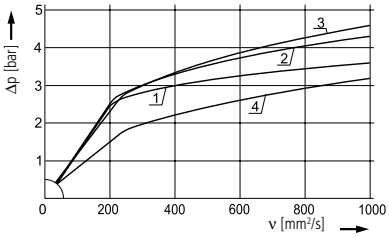


D4

Pressure drop as a function of the **flow volume** at ν = 35 mm²/s (0=casing empty)



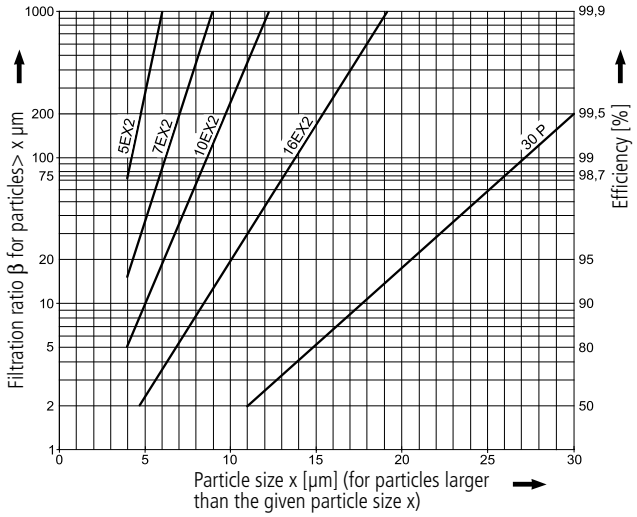
Pressure drop as a function of the **kinematic viscosity** at nominal flow



Filter fineness curves in Selection Chart, columm 5

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®MAX 2 and Paper elements:

5EX2	=	$\bar{\beta}_{5\,(c)}$	= 200 EXAPOR®MAX 2
7EX2	=	$\bar{\beta}_{7\,(c)}$	= 200 EXAPOR®MAX 2
10EX2	=	$\bar{\beta}_{10\,(c)}$	= 200 EXAPOR®MAX 2
16EX2	=	$\bar{\beta}_{16\,(c)}$	= 200 EXAPOR®MAX 2
30 P	=	$\bar{\beta}_{30\,(c)}$	= 200 Paper

For screen elements:

40 S	=	screen material with mesh size	40 µm
60 S	=	screen material with mesh size	60 µm
100 S	=	screen material with mesh size	100 µm

Tolerances for mesh size according to DIN 4189

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

Selection Chart

Part No.	Nominal flow return filter	Nominal flow filling filter[1]	Pressure drop see diagram **D**/curve no.	Filter fineness see diagr. **Dx**	Dirt-holding capacity	Filter fineness filling filter/ by-pass protection strainer	Filter surface filling filter/ by-pass protection strainer	Connection A	Cracking pressure of by-pass	Symbol	Replacement filter element Part No.	Ventilating filter thread connection M42x2	Weight	Remarks
	l/min	l/min			g	µm	cm^2		bar				kg	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
E 212-159	80	-	**D1**/1	5EX2	29	-	-	G1¼	2,5	1	V7.0820-03	-	1,7	
E 212-156	140	-	**D1**/2	10EX2	43	-	-	G1¼	2,5	1	V7.0820-06	-	1,7	
E 212-158	190	-	**D1**/3	16EX2	43	-	-	G1¼	2,5	1	V7.0820-08	-	1,7	
E 212-151	160	-	**D1**/4	30 P	21	-	-	G1¼	1,5	1	P7.0820-11[2]	-	1,7	
E 212-359	80	20	**D2**/1	5EX2	29	450	85	G1¼	2,5	3	K7.0820-03	•	2,0	[3]
E 212-356	140	20	**D2**/2	10EX2	43	450	85	G1¼	2,5	3	K7.0820-06	•	2,0	[3]
E 212-358	190	20	**D2**/3	16EX2	43	450	85	G1¼	2,5	3	K7.0820-08	•	2,0	[3]
E 212-351	160	20	**D2**/4	30 P	21	450	85	G1¼	1,5	3	K7.0820-11[2]	•	2,0	[3]
E 222-159	130	-	**D3**/1	5EX2	50	-	-	G1¼	2,5	1	V7.0833-03	-	2,1	
E 222-156	220	-	**D3**/2	10EX2	74	-	-	G1¼	2,5	1	V7.0833-06	-	2,1	
E 222-158	270	-	**D3**/3	16EX2	76	-	-	G1¼	2,5	1	V7.0833-08	-	2,1	
E 222-151	250	-	**D3**/4	30 P	35	-	-	G1¼	1,5	1	P7.0833-11[2]	-	2,1	
E 222-359	130	20	**D4**/1	5EX2	50	450	85	G1¼	2,5	3	K7.0833-03	•	2,4	[3]
E 222-356	220	20	**D4**/2	10EX2	74	450	85	G1¼	2,5	3	K7.0833-06	•	2,4	[3]
E 222-358	270	20	**D4**/3	16EX2	76	450	85	G1¼	2,5	3	K7.0833-08	•	2,4	[3]
E 222-351	250	20	**D4**/4	30 P	35	450	85	G1¼	1,5	3	K7.0833-11[2]	•	2,4	[3]

All filters are delivered with a plugged clogging indicator connection M 12 x 1,5. As clogging indicators either manometers or electrical pressure switches can be used. Optional extension pipes adapt the filter length to various tank depths.
For ordering of accessories please use the below mentioned codes.

Order example: The filter E 212-156 has to be supplied with an extension pipe (EV) for a mounting depth of 300 mm.

Order description: **E 212-156 / EV 300**

Part No. (Basic unit)

Extension pipe (4 various lengths are available)
EV = K + 87 / + 153 / + 187 / + 253 mm (see dimensions and measurements)

For the appropriate ventilating filters with M42x2 thread connection see catalogue sheet 50.20 and 50.30, for the appropriate clogging indicators see catalogue sheet 60.20.

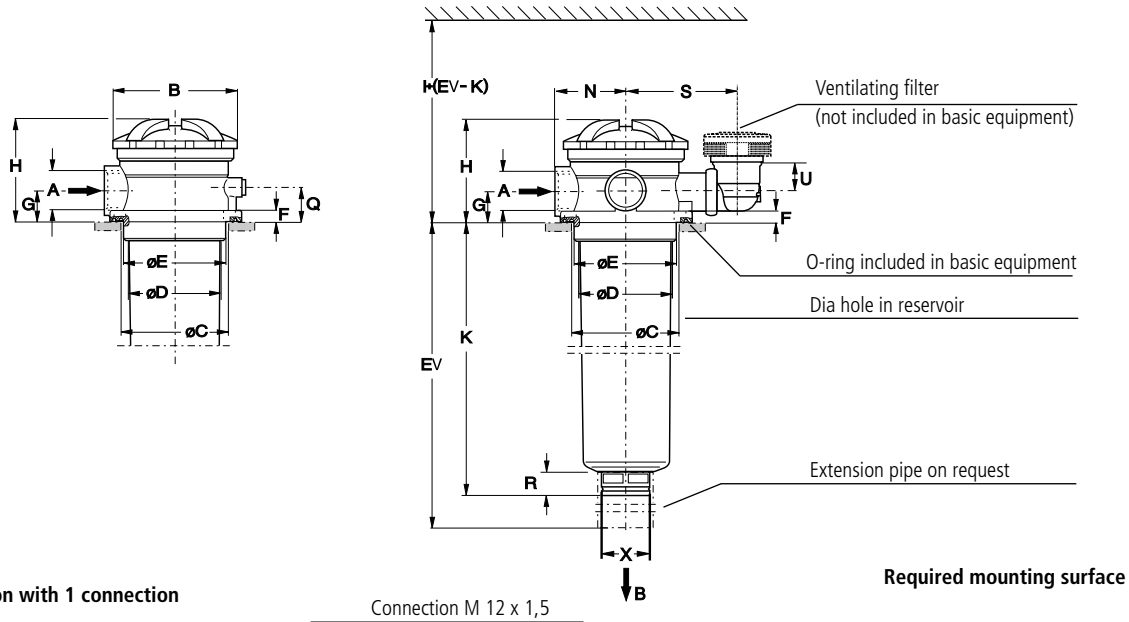
Remarks:
- The switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 10).
- The clogging indicators are optionally available and will then be loosely provided.
- The filters listed in this chart are standard filters. Other designs available on request.

[1] at 200 mm^2/s (ISO VG46 at ca. 15°C)
[2] Paper media supported with metal gauze
[3] Open connection for ventilating filter. Please assemble ventilating filter before operating.

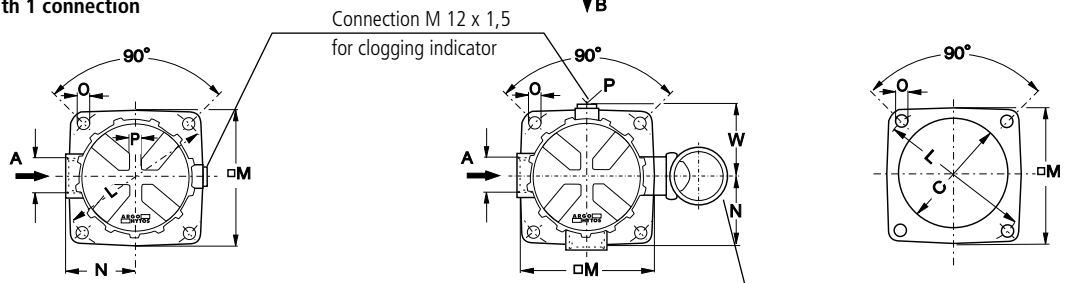
Dimensions

Version without connection for ventilating filter

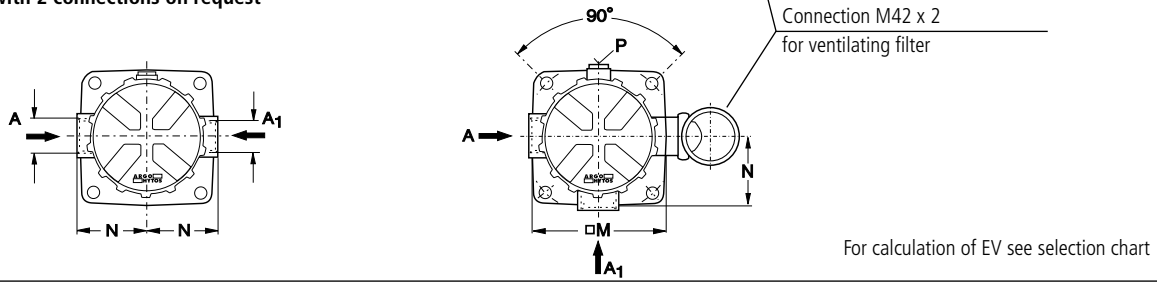
Version with connection for ventilating filter



Version with 1 connection



Version with 2 connections on request

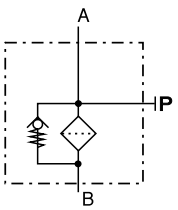


Measurements

Type	A	B	C min./max.	D	E	F	G	H	I	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
E 212	G1¼	126,5	118/121	95	110	11,5	32	106	325	213	165	141	76	11	13	35	23	113	49	28,5	77	74	44
E 222	G1¼	126,5	118/121	95	110	11,5	32	106	455	347	165	141	76	11	13	35	23	113	49	28,5	77	74	44

Symbols

1



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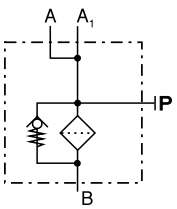

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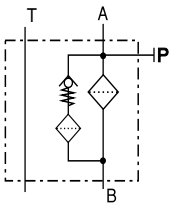

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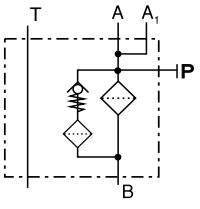
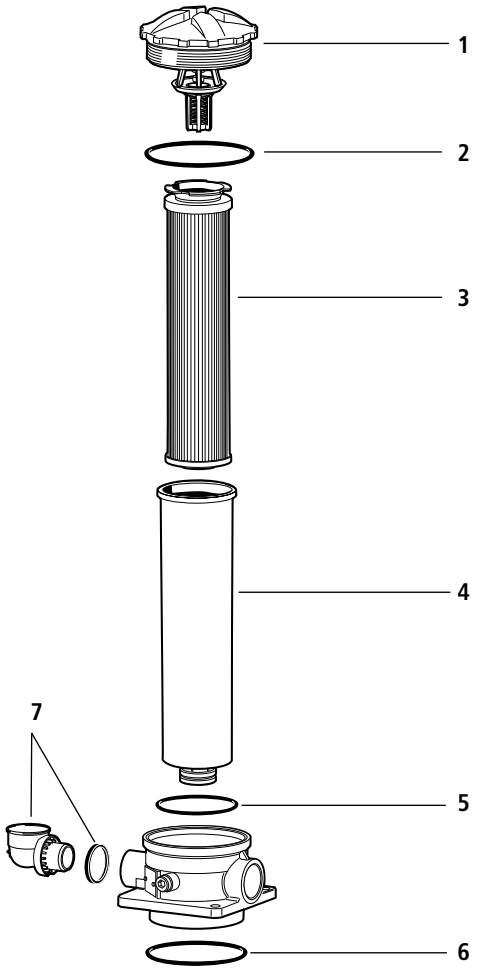


Spare Parts



Pos.	Designation	Part No.
1	Screw-on cap with valve (2,5 bar) and Pos. 2	E 221.1200
1	Screw-on cap with valve (1,5 bar) and Pos. 2	E 221.1210
2	O-ring 100 x 4	N007.1004
3	Filter element	see Chart/col.12
4	Filter bowl E 212*	E 212.0901
4	Filter bowl E 222*	E 222.0901
5	O-ring 90 x 4	N007.0904
6	O-ring 126 x 4	N007.1264
7	Connection for ventilating filter O-ring 31 x 4	E 222.1900

*Specify mounting depth (EV) in mm

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 DIN and ISO standards:

DIN ISO 2941 Verification of collapse/burst resistance
DIN ISO 2943 Verification of material compatibility with fluids
DIN ISO 3724 Verification of flow fatigue characteristics
ISO 2942 Verification of fabrication integrity (Bubble Point Test)
ISO 3968 Evaluation of pressure drop versus flow characteristics
ISO 16889 Multi-Pass-Test (evaluation of filter fineness and dirt-holding capacity)

Various quality controls during the production process guarantee the leakfree function and solidity of our filters.

Our engineers will be glad to advice you in questions concerning filter application, selection as well as the cleanliness class of the filtered medium attainable under practical operating conditions.

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

We produce fluid power solutions
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Subject to change · E212_2040_5e · 0710

ARGO HYTOS

Return Filters

E 443 · E 453 · E 463
E 643

- Tank top mounting
- Connection up to SAE 2
- Nominal flow rate up to 550 l/min

20.50-4e

Description

Application
In the return line circuits of hydraulic systems.

Performance features

Protection against wear:	By means of filter elements that, in full-flow filtration, meet even the highest demands regarding cleanliness classes.
Protection against malfunction:	By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

Special features

By-pass valve:	The location close to the inlet port prevents dirt particles retained by the filter element from entering into the clear oil side.
Removable bowl:	In case of maintenance the filter bowl is removed together with the filter element - therefore dirt particles are not flushed back into the tank.

Filter elements
Flow direction from outside to centre. The star-shaped pleating of the filter material results in:
- large filter surfaces
- low pressure drop
- high dirt-holding capacities
- long service life

In filters with a magnetic system, the ferromagnetic particles in the fluid pass first through a strong magnetic field and are separated.

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

Materials

Filter head cover:	Aluminium alloy
Filter head:	Aluminium alloy
Filter bowl:	Steel
Seals:	NBR (Viton on request)
Filter media:	EXAPOR®MAX - inorganic multi-layer microfibre web Paper - cellulose web, impregnated with resin Stainless steel wire mesh (1.4301)

Accessories
Extension pipes and diffusers are available on the bowl outlet.

Extension pipe:	A correct extension pipe length ensures oil outlet below minimum oil level and prevents foaming.
Diffuser:	Diffusers reduce oil velocity and direct the oil to 90° outlet flow. This function prevents also oil foaming and whirling up of solid particles settled at the tank bottom. The mesh screen element filters the oil in case of an open by-pass valve. Electrical and optical clogging indicators are available. Dimensions and technical data see catalogue sheet 60.20.

Characteristics

Nominal flow rate
Up to 550 l/min (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:
- closed by-pass valve at $\nu \leq 200$ mm²/s
- element service life > 1000 operating hours at an average fluid contamination of 0,07 g per l/min flow volume
- flow velocity in the connection lines ≤ 4,5 m/s

Connection
Threaded ports according to ISO 228 or DIN 13 and SAE-flange (3000 psi). Sizes see Selection Chart, column 6 (other port threads on request)

Filter fineness
5 µm(c) ... 60 µm(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)

Viscosity at nominal flow rate
- at operating temperature: $\nu < 60$ mm²/s
- as starting viscosity: $\nu_{max} = 1200$ mm²/s
- at first operation: The recommanded 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.

Operating pressure
Max. 10 bar

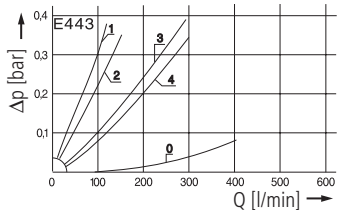
Mounting position
Preferably vertical, outlet downwards

Diagrams

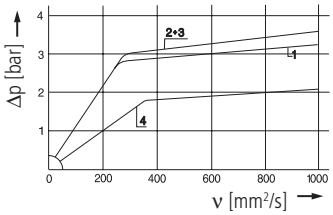
Δp-Kennlinien für die Komplettfilter in der Auswahltabelle, Spalte 3

D1

Pressure drop as a function of the **flow volume** at ν = 35 mm²/s (0=casing empty)

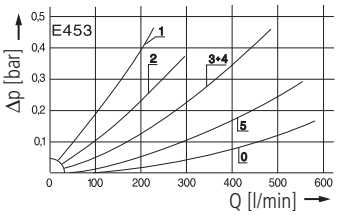


Pressure drop as a function of the **kinematic viscosity** at nominal flow

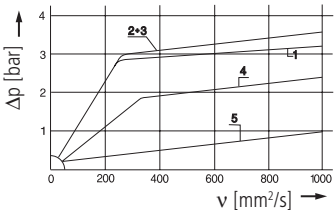


D2

Pressure drop as a function of the **flow volume** at ν = 35 mm²/s (0=casing empty)

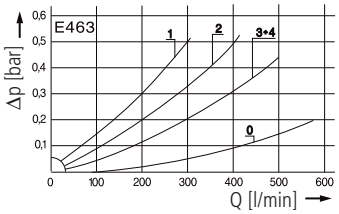


Pressure drop as a function of the **kinematic viscosity** at nominal flow

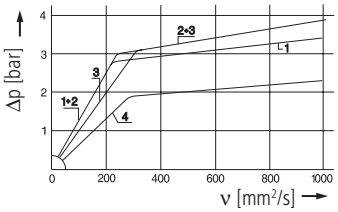


D3

Pressure drop as a function of the **flow volume** at ν = 35 mm²/s (0=casing empty)

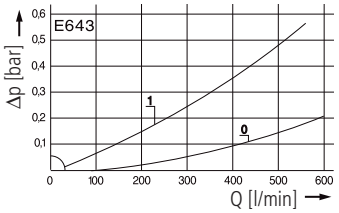


Pressure drop as a function of the **kinematic viscosity** at nominal flow

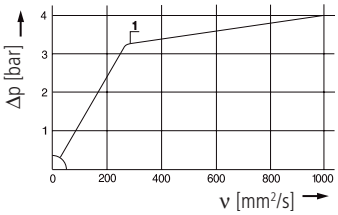


D4

Pressure drop as a function of the **flow volume** at ν = 35 mm²/s (0=casing empty)



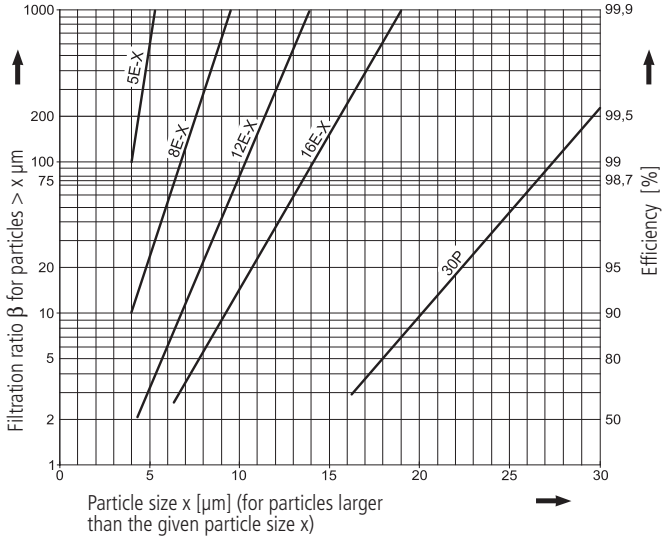
Pressure drop as a function of the **kinematic viscosity** at nominal flow



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®MAX- and Paper elements:

5 E-X	= $\beta_{5\,(c)}$	= 200	EXAPOR®MAX
8 E-X	= $\beta_{8\,(c)}$	= 200	EXAPOR®MAX
12 E-X	= $\beta_{12\,(c)}$	= 200	EXAPOR®MAX
16 E-X	= $\beta_{16\,(c)}$	= 200	EXAPOR®MAX
30 P	= $\beta_{30\,(c)}$	= 200	Paper

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

screen elements:

40 S	= screen material with mesh size	40 µm
60 S	= screen material with mesh size	60 µm
100 S	= screen material with mesh size	100 µm

Tolerances for mesh size according to DIN 4189

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

Selection Chart

Part No.	Nominal flow	Pressure drop see Diagram **D**/curve no.	Filter fineness see Diagr. **Dx**	Dirt-holding capacity Filter surface in ( )	Connection A SAE (3000 psi)	Cracking pressure of by-pass	Symbol	Replacement filter element Part No.	Weight	Remarks
	l/min			g		bar			kg	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
E 443-159	85	**D1**/1	5 E-X	34	G1½ / SAE2	2,5	1	V2.1217-03	4,4	-
E 443-156	130	**D1**/2	12 E-X	53	G1½ / SAE2	2,5	1	V2.1217-36	4,4	-
E 443-168	210	**D1**/3	16 E-X	57	G1½ / SAE2	2,5	1	V2.1217-08	4,4	-
E 443-181	175	**D1**/4	30 P	29	G1½ / SAE2	1,5	1	P2.1217-21*	4,4	-
E 453-159	170	**D2**/1	5 E-X	68	G1½ / SAE2	2,5	1	2 x V2.1217-03	6,1	-
E 453-156	260	**D2**/2	12 E-X	106	G1½ / SAE2	2,5	1	2 x V2.1217-36	6,1	-
E 453-168	410	**D2**/3	16 E-X	114	G1½ / SAE2	2,5	1	2 x V2.1217-08	6,1	-
E 453-153	350	**D2**/4	30 P	58	G1½ / SAE2	1,5	1	2 x P2.1217-21*	6,1	-
E 453-100	525	**D2**/5	60 S	(3600 cm²)	G1½ / SAE2	1,5	4	2 x S2.1217-00	6,4	with magnetic system
E 463-159	250	**D3**/1	5 E-X	102	G1½ / SAE2	2,5	1	3 x V2.1217-03	7,8	-
E 463-156	390	**D3**/2	12 E-X	159	G1½ / SAE2	2,5	1	3 x V2.1217-36	7,8	-
E 463-168	500	**D3**/3	16 E-X	171	G1½ / SAE2	2,5	1	3 x V2.1217-08	7,8	-
E 463-153	480	**D3**/4	30 P	87	G1½ / SAE2	1,5	1	3 x P2.1217-21*	7,8	-
E 643-176	550	**D4**/1	12 E-X	210	G1½ / SAE2	3,0	1	V2.1260-26	9,5	-

All filters are delivered with a plugged clogging indicator connection M12 x 1,5. (Mounting holes for differential pressure switches on request). As clogging indicators either manometers or electrical pressure switches can be used. Two different head pieces with three various connecting options are available. All filters can also be supplied with an outlet diffuser. Optional extension pipes adapt the filter length to various tank depths. For ordering of accessories please use the below mentioned codes.

Order example: **The filter E 453-156 has to be supplied with 2 connections (A and A3), an outlet diffuser and an extension pipe for 564 mm length.**

Order description: **E 453-2 56 / VD / EV 564**

Connections:
3 various options are available

one connection (A)	- G1½ / SAE 2	1
two connections (A and A3)	- G1½ / SAE 2 and G¾	2
four connections (A1, A2, A3 and A4)	- 2 x G1¼ / SAE 1½, G¾ and G1	4

Options:
2 various options are available
VD: Outlet diffuser, **RV:** Extension pipe

Extension pipe:
7 various lengths are available
EV = K (Bowl length) + 81 / + 136 / + 196 / + 231 / + 356 / + 446 / + 626 mm (see section dimensions and measurements)

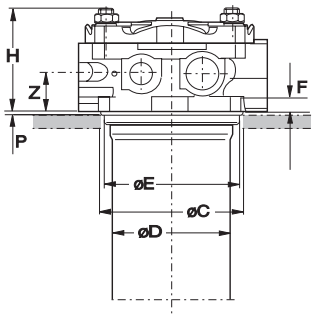
For the appropriate clogging indicators see catalogue sheet 60.20.

Remarks:
- The switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- The clogging indicators are optional and always delivered detached from the filter.
- The filters listed in this chart are standard filters. Other designs, e.g. with screen elements (mesh size 450 µm) at the bowl outlet, are available on request.

* Paper media supported with metal gauze

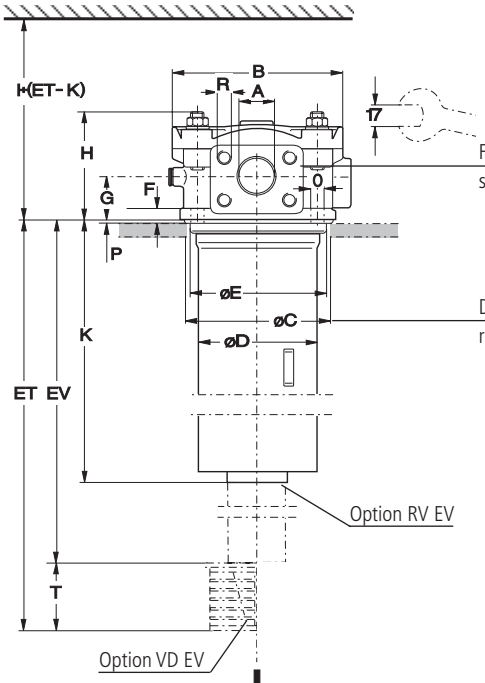
Dimensions

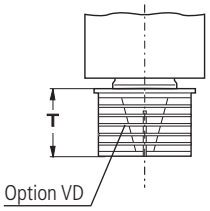
Version with 4 connections

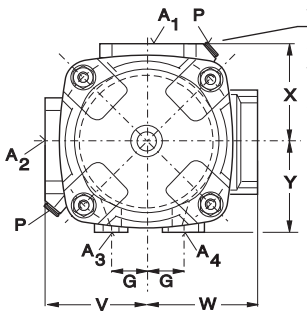


Tank surface sealing either with flat gasket E442.0103 or O-ring N007.1375 (both items included in basic equipment

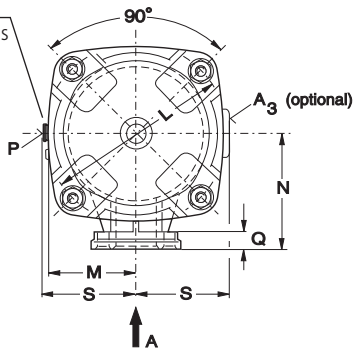
Versions with 1 or 2 connections



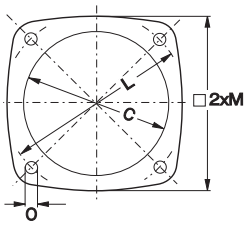




Connection M12 x 1,5 for clogging indicator standard (mounting holes for differential pressure switches on request)



Required mounting surface



For calculation of EV see Selection Chart

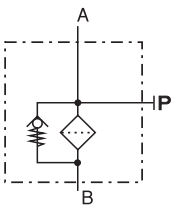
Measurements

Type	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	Q	R	S	T	V	W	X	Y	Z
E 443	G1½ / SAE 2	174	141	131	139,9	12	36/35*	97	370	201	185	86,5	116	11,5	2	18	M12	92	58	96	106	96	89	32,5
E 453	G1½ / SAE 2	174	141	131	139,9	12	36/35*	97	540	368	185	86,5	116	11,5	2	18	M12	92	58	96	106	96	89	32,5
E 463	G1½ / SAE 2	174	141	131	139,9	12	36/35*	97	710	536	185	86,5	116	11,5	2	18	M12	92	58	96	106	96	89	32,5
E 643	G1½ / SAE 2	174	141	131	139,9	12	36/35*	97	840	634	185	86,5	116	11,5	2	18	M12	92	58	96	106	96	89	32,5

* for design with 4 connections

Symbols

1



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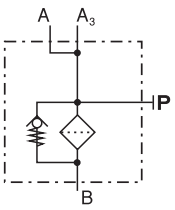

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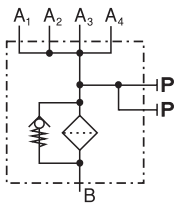

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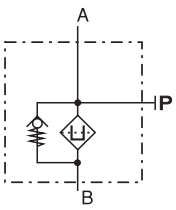

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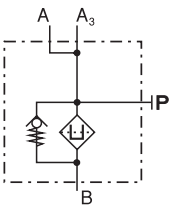

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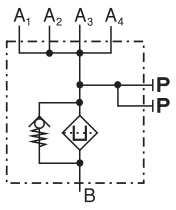
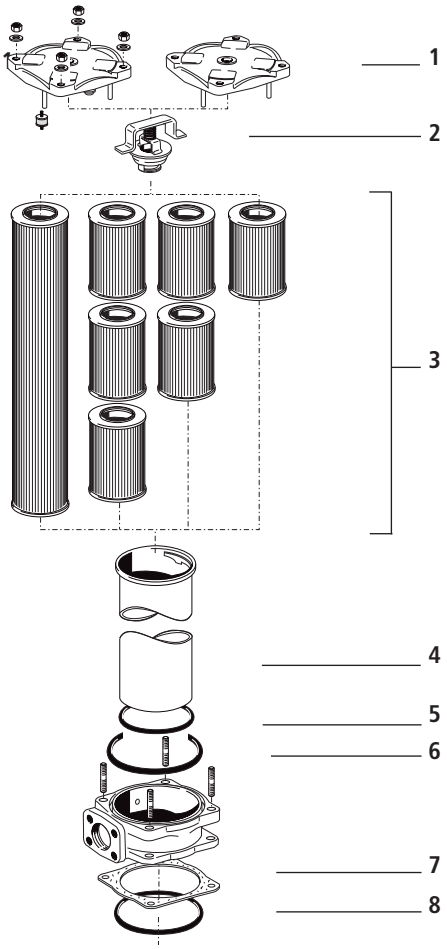


Spare Parts



Pos.	Designation	Part No.
1	Cover assy	E 443.1200
1a	cover with magnetic system	E 443.1210
2	By-pass assy (1,5 bar)	E 440.1500
2	By-pass assy (2,5 bar)	E 460.1520
2	By-pass assy (3,0 bar)	E 640.1510
3	Filter elements	see Chart / col. 9
4	Filter bowl E 443 *	E 440.1960
4	Filter bowl E 453 *	E 450.1906
4	Filter bowl E 463 *	E 460.1915
4	Filter bowl E 643 *	E 640.1910
5	O-ring 125 x 6	N 007.1256
6	O-ring 151,76 x 5,33	N 007.1525
7	Flat gasket	E 442.0103
8	O-ring 136,5 x 5,34	N 007.1375

* Please indicate options (VD, VDEV, resp. RVEV)

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 DIN and ISO standards:

DIN ISO 2941 Verification of collapse/burst resistance
DIN ISO 2943 Verification of material compatibility with fluids
DIN ISO 3724 Verification of flow fatigue characteristics
ISO 2942 Verification of fabrication integrity (Bubble Point Test)
ISO 3968 Evaluation of pressure drop versus flow characteristics
ISO 16889 Multi-Pass-Test (evaluation of filter fineness and dirt-holding capacity)

Various quality controls during the production process guarantee the leakfree function and solidity of our filters.

Our engineers will be glad to advice you in questions concerning filter application, selection as well as the cleanliness class of the filtered medium attainable under practical operating conditions.

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

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Subject to change · 9107168-e · 0905

ARGO HYTOS

Return Filters

E 440 · E 450 · E 460
E 640 · E 700

- Tank mounting
- Nominal flow rate up to 680 l/min

20.60-3e

Description

Application
In the return line circuits of hydraulic systems.

Performance features
Protection against wear: By means of filter elements that, in full-flow filtration meet even the highest demands regarding cleanliness classes.
Protection against malfunction: By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

Special features
Installation: Installation directly into a separate tank section for the return oil. This solution allows a number of return line connections and does not show any restriction by a filter head.
By-pass valve: The location close to the inlet port prevents dirt particles retained by the filter element from entering into the clear oil side.
Removable bowl: In case of maintenance the filter bowl is removed together with the filter element - therefore dirt particles are not flushed back into the tank.

Filter elements
Flow direction from outside to centre. The star-shaped pleating of the filter material results in:
- large filter surfaces
- high dirt-holding capacities
- low pressure drop
- 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
Filter bowl: Steel
Seals: NBR (Viton on request)
Filter media: EXAPOR®MAX - inorganic multi-layer microfibre web
Paper - cellulose web, impregnated with resin

Accessories
Extension pipes and diffusers are available on the bowl outlet.
Extension pipe: A correct extension pipe length ensures oil outlet below minimum oil level and prevents foaming.
Diffusers: Diffusers reduce oil velocity and direct the oil to 90° outlet flow. This function prevents also oil foaming and whirling up of solid particles settled at the tank bottom. The mesh screen element filters the oil in case of an open by-pass valve.
Electrical and optical clogging indicators are available.
Dimensions and technical data see catalogue sheet 60.20.

Characteristics

Nominal flow rate
Up to 680 l/min (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:
- closed by-pass valve at $\nu \leq 200$ mm²/s
- element service life > 1000 operating hours at an average fluid contamination of 0,07 g per l/min flow volume
- flow velocity in the connection lines ≤ 4,5 m/s

Installation
Tank immersed installation in a separate return oil chamber of the reservoir.

Filter fineness
12 µm(c) ... 30 µm(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)

Viscosity at nominal flow rate
- at operating temperature: $\nu < 60$ mm²/s
- as starting viscosity: $\nu_{max} = 1200$ mm²/s
- at first operation: The recommanded 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.

Operating pressure
Max. 10 bar

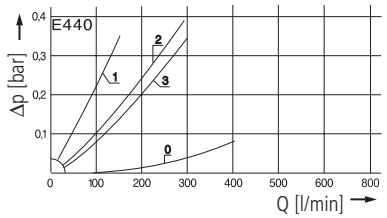
Mounting position
Preferably vertical, outlet downwards

Diagrams

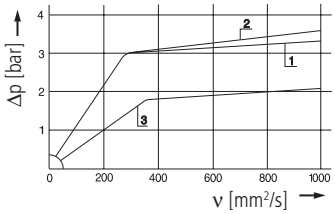
Δp-curves for complete filters in Selection Chart, column 3

D1

Pressure drop as a function of the **flow volume** at ν = 35 mm²/s (0=casing empty)

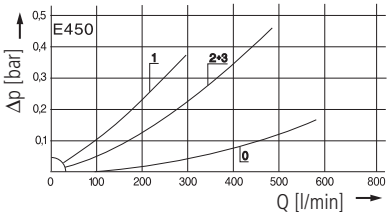


Pressure drop as a function of the **kinematic viscosity** at nominal flow

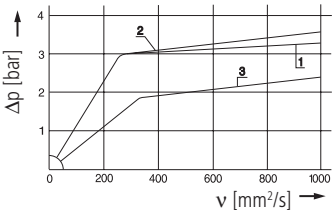


D2

Pressure drop as a function of the **flow volume** at ν = 35 mm²/s (0=casing empty)

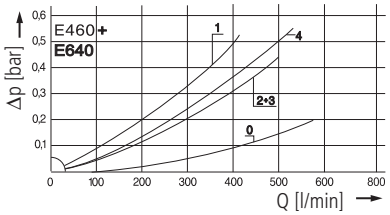


Pressure drop as a function of the **kinematic viscosity** at nominal flow

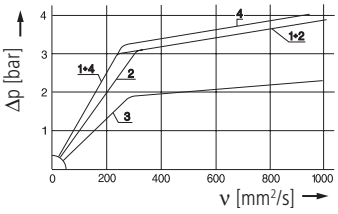


D3

Pressure drop as a function of the **flow volume** at ν = 35 mm²/s (0=casing empty)

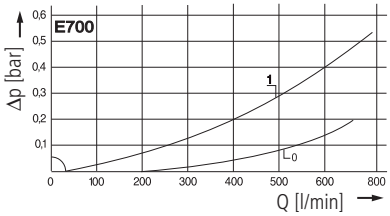


Pressure drop as a function of the **kinematic viscosity** at nominal flow

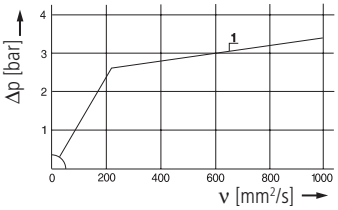


D4

Pressure drop as a function of the **flow volume** at ν = 35 mm²/s (0=casing empty)



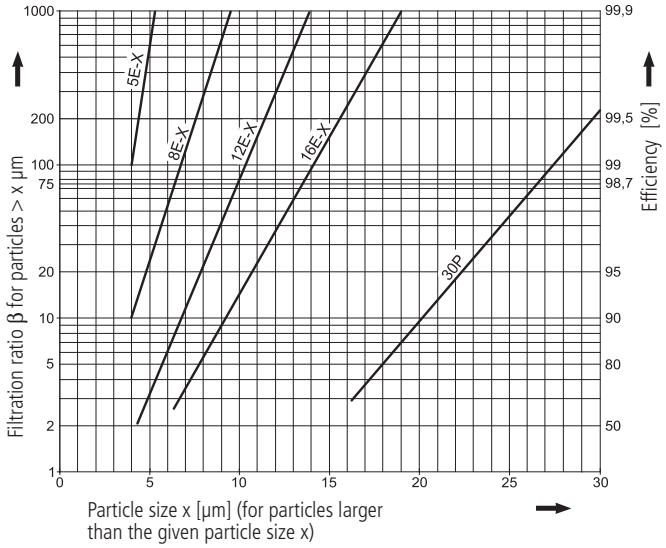
Pressure drop as a function of the **kinematic viscosity** at nominal flow



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®MAX- and Paper elements:

5 E-X	= $\bar{\beta}_{5\,(c)}$	= 200	EXAPOR®MAX
8 E-X	= $\bar{\beta}_{8\,(c)}$	= 200	EXAPOR®MAX
12 E-X	= $\bar{\beta}_{12\,(c)}$	= 200	EXAPOR®MAX
16 E-X	= $\bar{\beta}_{16\,(c)}$	= 200	EXAPOR®MAX
30 P	= $\bar{\beta}_{30\,(c)}$	= 200	Paper

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

For screen elements:

40 S	= screen material with mesh size	40 µm
60 S	= screen material with mesh size	60 µm
100 S	= screen material with mesh size	100 µm

Tolerances for mesh size according to DIN 4189.

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

Selection Charts

Part No.	Nominal flow	Pressure drop see Diagram **D**/curve no.	Filter fineness see Diagr. **Dx**	Dirt-holding capacity	connection A	Cracking pressure of by-pass	Symbol	Replacement filter element Part No.	Weight	Remarks
	l/min			g		bar			kg	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
E 440-156	130	**D1**/1	12 E-X	53	-	2,5	1	V2.1217-36	2,4	-
E 440-168	210	**D1**/2	16 E-X	57	-	2,5	1	V2.1217-08	2,4	-
E 440-153	175	**D1**/3	30 P	29	-	1,5	1	P2.1217-21*	2,4	-
E 450-156	260	**D2**/1	12 E-X	106	-	2,5	1	2 x V2.1217-36	4,1	-
E 450-168	410	**D2**/2	16 E-X	114	-	2,5	1	2 x V2.1217-08	4,1	-
E 450-153	350	**D2**/3	30 P	58	-	1,5	1	2 x P2.1217-21*	4,1	-
E 460-156	390	**D3**/1	12 E-X	159	-	2,5	1	3 x V2.1217-36	5,8	-
E 460-168	500	**D3**/2	16 E-X	171	-	2,5	1	3 x V2.1217-08	5,8	-
E 460-153	480	**D3**/3	30 P	87	-	1,5	1	3 x P2.1217-21*	5,8	-
E 640-76	550	**D3**/4	12 E-X	210	-	3,0	1	V2.1260-26	7,5	-
E 700-156	680	**D4**/1	12 E-X	270	-	2,5	1	V2.1460-26	12,4	-

As clogging indicators either manometers or electrical pressure switches can be used. Filters can also be supplied with an outlet diffuser. Optional extension pipes adapt the filter length to various tank depths. For ordering of accessories please use the below mentioned codes.

Order example: The filter E 450-156 has to be supplied with an outlet diffuser and an extension pipe for 580 mm length.

Order description: **E 450-156 / VD / EV 580**

Part No. (Basic unit)

Options
Two various options are available
VD: Outlet diffuser, RV: Extension pipe

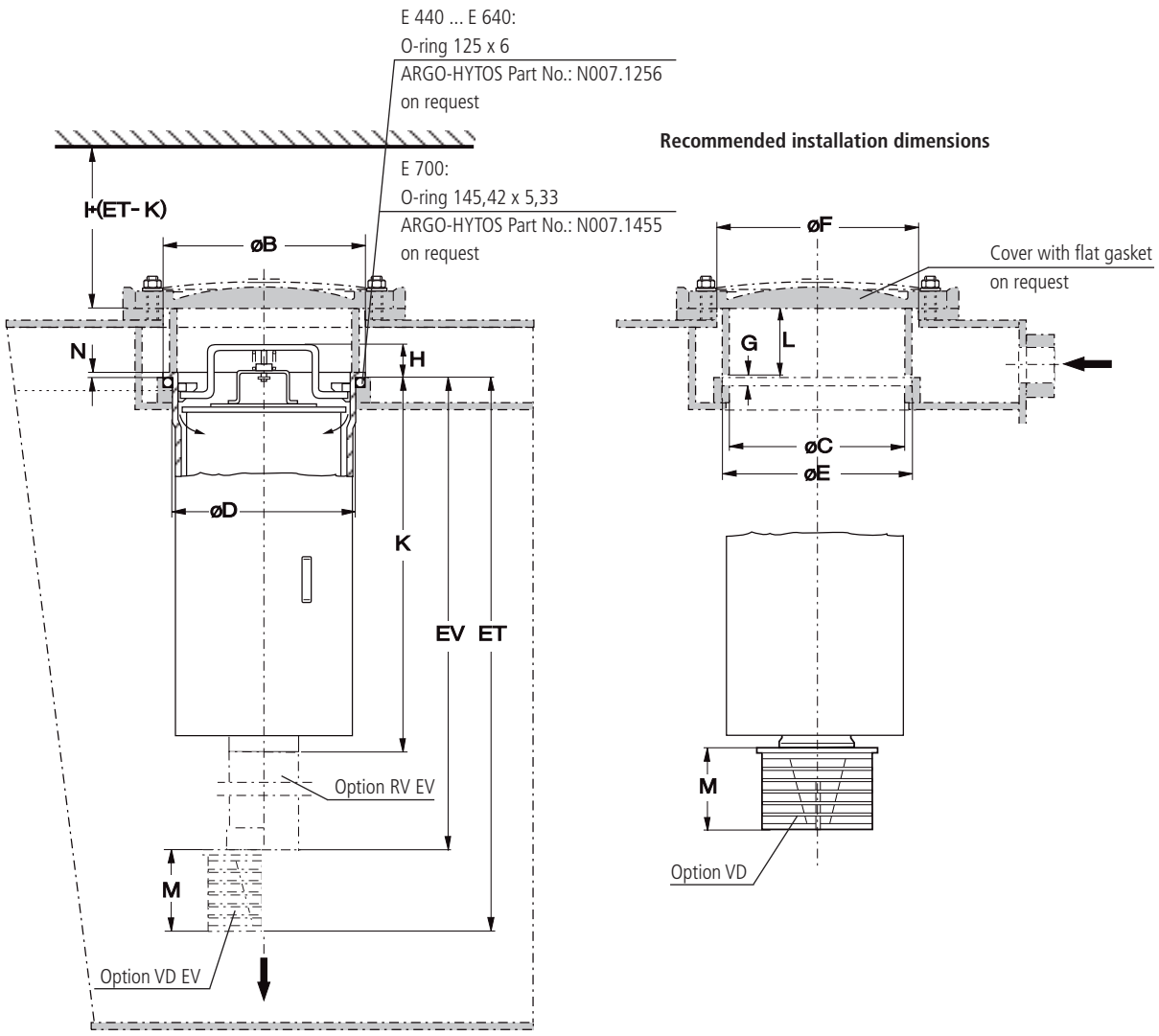
Extension pipes:
7 various lengths are available
E 440 / E 450 / E 460 / E 640
EV = K + 81 / + 136 / + 196 / + 231 / + 356 / + 446 / + 626 mm (see section dimensions and measurements)
E 700
EV on request.

For the appropriate clogging indicators see catalogue sheet 60.20.

Remarks:
- The switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- The clogging indicators are optional and always delivered detached from the filter.
- The filters listed in this chart are standard filters. Other designs e.g. with screen elements (mesh size 450 µm) at the bowl outlet, are available on request.

* Paper media supported with metal gauze

Dimensions



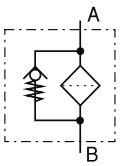
Measurements

Type	A	B	C	D	E	F	G	H	I	K	L	M	N
E 440	-	142^{+2}	132	130,5	145	>145	6,5	26	250	217	48	58	1,5
E 450	-	142^{+2}	132	130,5	145	>145	6,5	26	410	384	48	58	1,5
E 460	-	142^{+2}	132	130,5	145	>145	6,5	26	580	552	48	58	1,5
E 640	-	142^{+2}	132	130,5	145	>145	6,5	26	680	650	48	58	1,5
E 700	-	167^{+2}	156,5	155	170	>170	6,5	27	700	651	82	58	1,5

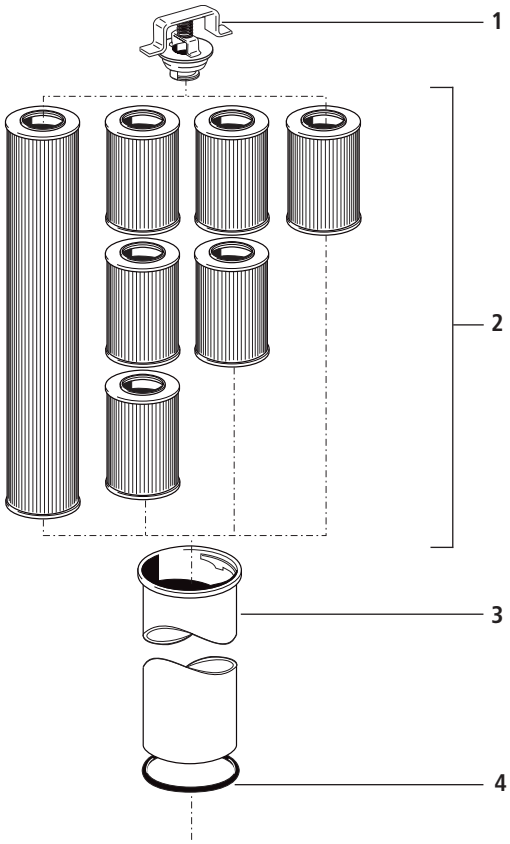
For calculation of EV use data in Selection Chart

Symbols

1



Spare Parts



Pos.	Designation	Part No.
1	By-pass assy (1,5 bar)	E 440.1500
1	By-pass assy (2,5 bar)	E 460.1520
1	By-pass assy (3,0 bar)	E 640.1510
1	By-pass assy (2,5 bar) for E 700	E 703.1510
2	Filter elements	see Chart. / col. 9
3	Filter bowl E 440 [1]	E 440.1960
3	Filter bowl E 450 [1]	E 450.1906
3	Filter bowl E 460 [1]	E 460.1915
3	Filter bowl E 640 [1]	E 640.1910
3	Filter bowl E 700	E 700.1900
4.1	O-ring 125 x 6 [2]	N 007.1256
4.2	O-ring 145,42 x 5,33 [2] for E 700	N 007.1455

[1] Please indicate options (VD, VDEV resp. RVEV)
[2] Not included in basic equipment

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 DIN and ISO standards:

DIN ISO 2941 Verification of collapse/burst resistance
DIN ISO 2943 Verification of material compatibility with fluids
DIN ISO 3724 Verification of flow fatigue characteristics
ISO 2942 Verification of fabrication integrity (Bubble Point Test)
ISO 3968 Evaluation of pressure drop versus flow characteristics
ISO 16889 Multi-Pass-Test (evaluation of filter fineness and dirt-holding capacity)

Various quality controls during the production process guarantee the leakfree function and solidity of our filters.

Our engineers will be glad to advice you in questions concerning filter application, selection as well as the cleanliness class of the filtered medium attainable under practical operating conditions.

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Subject to change · 9107169-e · 0905

ARGO HYTOS

Return Filters

E 303 · E 503 · E 703

- Tank top mounting
- Connection up to SAE 2½
- Nominal flow rate up to 780 l/min

20.70-3e

Description

Application
In the return line circuits of hydraulic systems.

Performance features
Protection against wear: By means of filter elements that, in full-flow filtration, meet even the highest demands regarding cleanliness classes.
Protection against malfunction: By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

Special features
By-pass valve: The location close to the inlet port prevents dirt particles retained by the filter element from entering into the clear oil side.
Removable bowl: In case of maintenance the filter bowl is removed together with the filter element - therefore dirt particles are not flushed back into the tank.

Filter elements
Flow direction from outside to centre. 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
Filter head cover: Steel
Filter head: Aluminium alloy
Filter bowl: Steel
Seals: NBR (Viton on request)
Filter media: EXAPOR®MAX - inorganic multi-layer microfibre web

Accessories
Extension pipes or diffusers are available on the bowl outlet.
Extension pipe: A correct extension pipe length ensures oil outlet below minimum oil level and prevents foaming.
Diffuser: Diffusers reduce oil velocity and direct the oil to 90° outlet flow. This function prevents also oil foaming and whirling up of solid particles settled at the tank bottom. The mesh screen element filters the oil in case of an open by-pass valve.
Electrical and optical clogging indicators are available.
Dimensions and technical data see catalogue sheet 60.20.

Characteristics

Nominal flow
Up to 780 l/min (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:
- closed by-pass valve at $\nu \leq 200$ mm²/s
- element service life > 1000 operating hours at an average fluid contamination of 0,07 g per l/min flow volume
- flow velocity in the connection lines ≤ 4,5 m/s

Connection
SAE-flange (3000 psi). Sizes see Selection Chart, column 6 (other port threads on request)

Filter fineness
5 µm(c) ... 16 µm(c)
β-values according to ISO 16889
(see Selection Chart, column 4 and Diagram Dx)

Dirt-holding capacity
Values in g test dust ACFTD 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)

Viscosity at nominal flow rate
- at operating temperature: $\nu < 60$ mm²/s
- as starting viscosity: $\nu_{max} = 1200$ mm²/s
- at first 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.

Operating pressure
Max. 10 bar

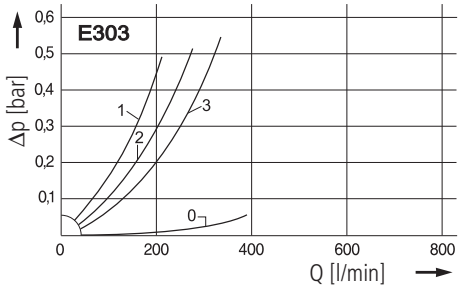
Mounting position
Preferably vertical, outlet downwards

Diagrams

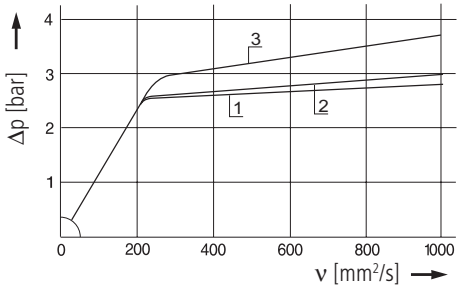
Δp-curves for complete filters in Selection Chart, column 3

D1

Pressure drop as a function of the **flow volume** at ν = 35 mm²/s (0=casing empty)

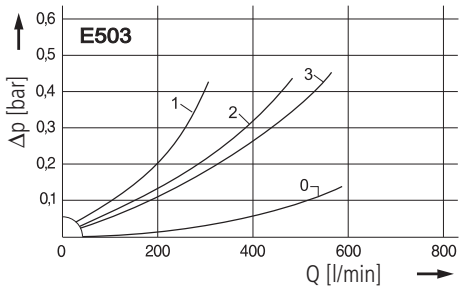


Pressure drop as a function of the **kinematic viscosity** at nominal flow

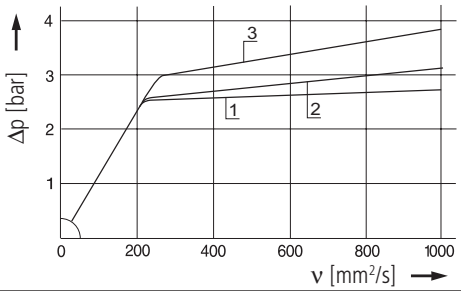


D2

Pressure drop as a function of the **flow volume** at ν = 35 mm²/s (0=casing empty)

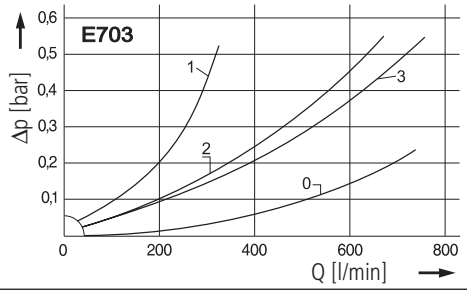


Pressure drop as a function of the **kinematic viscosity** at nominal flow

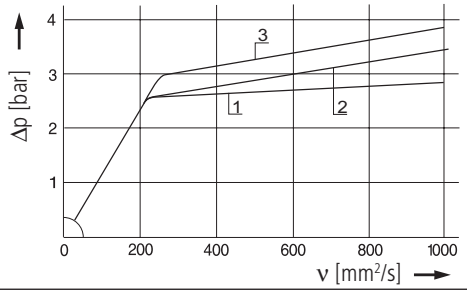


D3

Pressure drop as a function of the **flow volume** at ν = 35 mm²/s (0=casing empty)



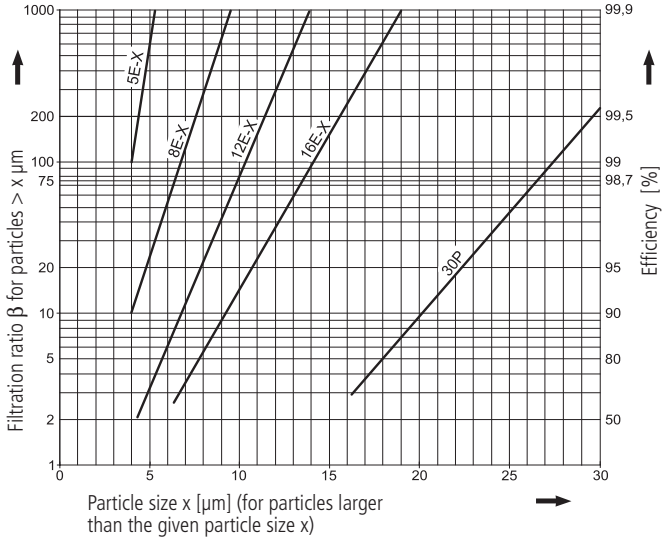
Pressure drop as a function of the **kinematic viscosity** at nominal flow



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®MAX- and Paper elements:

5 E-X	= $\beta_{5\,(c)}$	= 200	EXAPOR®MAX
8 E-X	= $\beta_{8\,(c)}$	= 200	EXAPOR®MAX
12 E-X	= $\beta_{12\,(c)}$	= 200	EXAPOR®MAX
16 E-X	= $\beta_{16\,(c)}$	= 200	EXAPOR®MAX
30 P	= $\beta_{30\,(c)}$	= 200	Paper

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

For screen elements:

40 S	= screen material with mesh size	40 µm
60 S	= screen material with mesh size	60 µm
100 S	= screen material with mesh size	100 µm

Tolerances for mesh size according to DIN 4189.

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

Selection Chart

Part No.	Nominal flow rate	Pressure drop Diagram **D**/curve no.	Filter fineness see Diagr. **Dx**	Dirt-holding capacity	Connection A SAE (3000 psi)	Cracking pressure of by-pass	Symbol	Replacement filter element Part no.	Weight	Remarks
	l/min			g		bar			kg	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
E 303-253	160	**D1**/1	5 E-X	68	SAE2½ + G1	2,5	1	V2.1425-23	8,9	-
E 303-256	280	**D1**/2	12 E-X	110	SAE2½ + G1	2,5	1	V2.1425-26	8,9	-
E 303-258	340	**D1**/3	16 E-X	115	SAE2½ + G1	2,5	1	V2.1425-28	8,9	-
E 503-253	260	**D2**/1	5 E-X	110	SAE2½ + G1	2,5	1	V2.1440-23	11,7	-
E 503-256	450	**D2**/2	12 E-X	180	SAE2½ + G1	2,5	1	V2.1440-26	11,7	-
E 503-258	550	**D2**/3	16 E-X	190	SAE2½ + G1	2,5	1	V2.1440-28	11,7	-
E 703-253	390	**D3**/1	5 E-X	170	SAE2½ + G1	2,5	1	V2.1460-23	15,4	-
E 703-256	680	**D3**/2	12 E-X	270	SAE2½ + G1	2,5	1	V2.1460-26	15,4	-
E 703-258	780	**D3**/3	16 E-X	290	SAE2½ + G1	2,5	1	V2.1460-28	15,4	-

All filters are delivered with a plugged clogging indicator connection M 12x1,5. (Mounting holes for differential pressure switches on request). As clogging indicators either manometers or electrical pressure switches can be used. Two different head pieces with three various connecting options are available. All filters can also be supplied with an outlet diffuser. Optional extension pipes adapt the filter length to various tank depths. For ordering of accessories please use the below mentioned codes.

Order example: **The filter E 703-256 has to be supplied with 4 connections (A1, A2, A3 and A4) and an extension pipe for 800 mm length.**

Order description: **E 703- 456 / RV / EV 800**

Connections:
four various options are available
two connections (A und A4)[1] - SAE2½ and G1 — 2
four connections (A1, A2, A3 and A4) - 2 x G1¼ / SAE1½, G¾ and G1 — 4

Bowl outlet:
two various options are available
VD - Outlet diffuser, RV - Only extension pipe

Extension pipe[2]:
four various lengths are available
EV = K (Bowl length) + 64 / + 164 / + 264 / + 454 mm (see section dimensions and measurements)

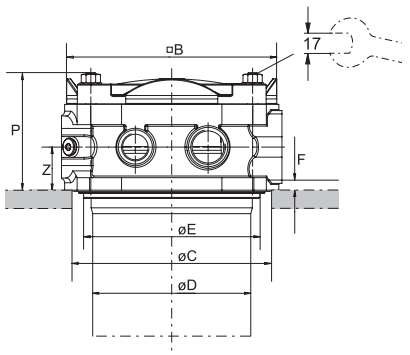
For the appropriate clogging indicators see catalogue sheet 60.20.

Remarks:
- The switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- The clogging indicators are optional and always delivered detached from the filter.
- The filters listed in this chart are standard filters. Other designs available on request.

[1] Connection G1 (A4) with locking screw [2] On request an outlet diffuser can be combined with an extension pipe

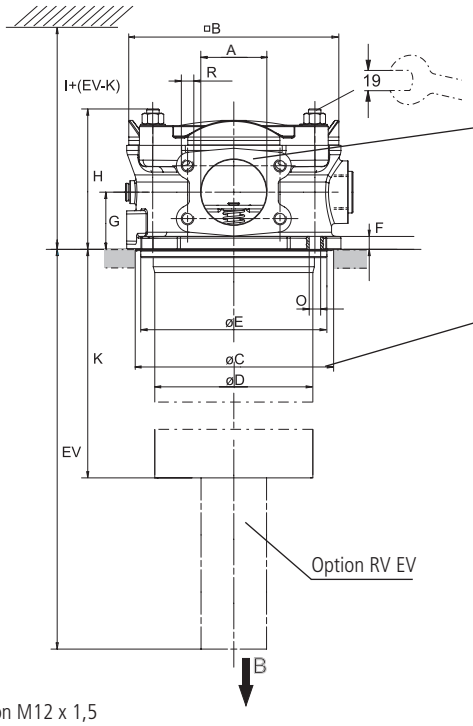
Dimensions

Version with 4 connections



Tank surface sealing
with O-ring N007.1806
(included in basic equipment)

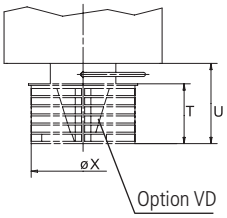
Version with 2 connections



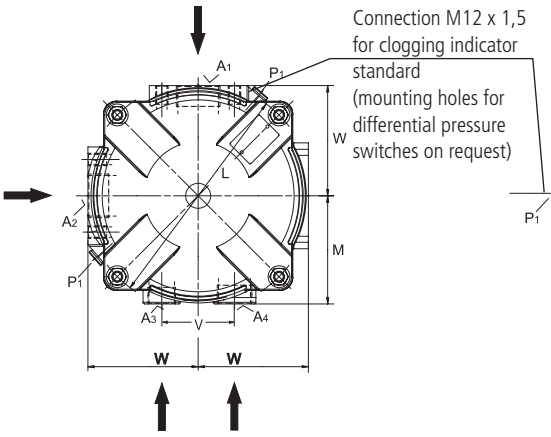
For use of SAE-flanges
see measurement G or Z

Dia hole
in reservoir

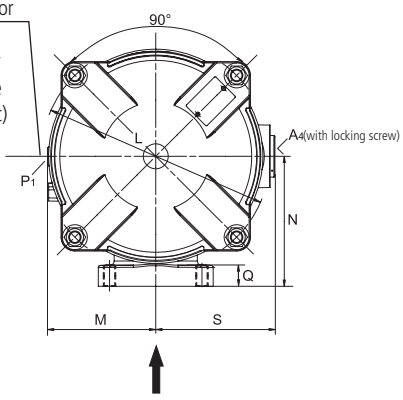
Option RV EV



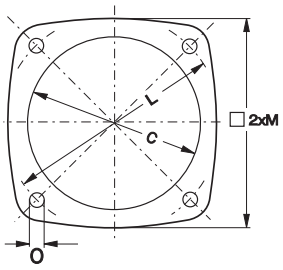
Option VD



Connection M12 x 1,5
for clogging indicator
standard
(mounting holes for
differential pressure
switches on request)



Required mounting surface



For calculation of EV see Selection Chart

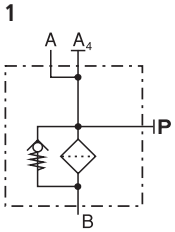
Measurements

Type	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Z
E 303	see	182	180	152	179	12	55	133	400	276	220	104	125	11,5*	113	20	M12	115	58	79	70	106	100	41,5
E 503	Selection	182	180	152	179	12	55	133	550	430	220	104	125	11,5*	113	20	M12	115	58	79	70	106	100	41,5
E 703	Chart	182	180	152	179	12	55	133	810	636	220	104	125	11,5*	113	20	M12	115	58	79	70	106	100	41,5

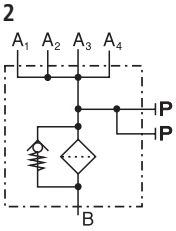
* for M10

Symbols

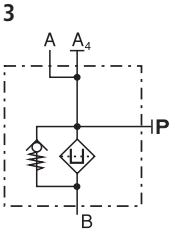
1



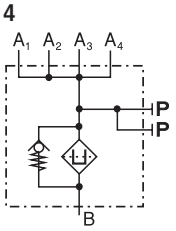
2



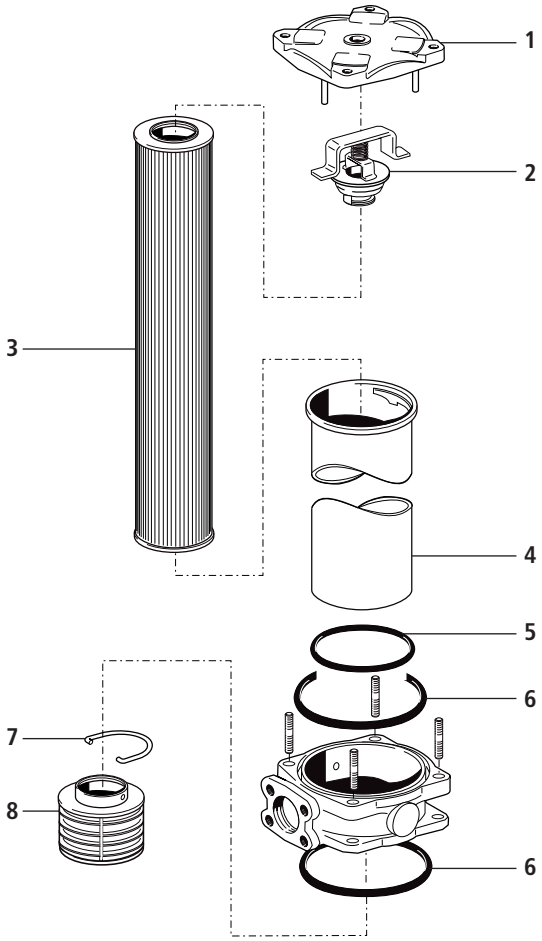
3



4



Spare Parts



Pos.	Designation	Part No.
1	Cover assy (2 connections)	E 303.1200
1	Cover (4 connections)	E 703.2202
2	By-pass assy (2,5 bar)	E 703.1510
3	Filter elements	see Chart / col. 9
4	Filter bowl E 303*	E 303.1900
4	Filter bowl E 503*	E 503.1910
4	Filter bowl E 703*	E 703.1900
5	O-ring 145,42 x 5,33	N007.1455
6	O-ring 180 x 6	N007.1806
7	Clip (only option VD)	N026.0311
8	Diffuser (only option VD)	E 703.0701

* Please indicate options (VD, VDEV resp. RVEV)

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 DIN and ISO standards:

DIN ISO 2941 Verification of collapse/burst resistance
DIN ISO 2943 Verification of material compatibility with fluids
DIN ISO 3724 Verification of flow fatigue characteristics
ISO 2942 Verification of fabrication integrity (Bubble Point Test)
ISO 3968 Evaluation of pressure drop versus flow characteristics
ISO 16889 Multi-Pass-Test (evaluation of filter fineness and dirt-holding capacity)

Various quality controls during the production process guarantee the leakfree function and solidity of our filters.

Our engineers will be glad to advice you in questions concerning filter application, selection as well as the cleanliness class of the filtered medium attainable under practical operating conditions.

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

We produce fluid power solutions
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