

**Return Filters**
**E 094 · E 103 · E 143**

Tank top mounting · Connection up to G1 / -16 SAE · Nominal flow rate up to 135 l/min / 35.7 gpm



Return Filter E 103

**Description**
**Application**

In the return line circuits of hydraulic systems.

**Performance features**
*Protection against wear:*

By means of filter elements that even in full-flow filtration meet 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:  
A correct extension pipe length ensures oil outlet below minimum oil level and prevents foaming.

**Filter elements**

Flow direction from outside to center.

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

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

**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:	Aluminum alloy
Filter bowl:	Polyamide, CF-reinforced, electrically conducting
Seals:	NBR (FPM on request)
Filter media:	EXAPOR®MAX 2 - inorganic multi-layer microfiber web Paper - cellulose web, impregnated with resin

## Accessories

Electrical and optical clogging indicators are available on request. Dimensions and technical data see catalog sheet 60.20.

An optional oil separator (Part No. E 103.1702) prevents oil splashing through the ventilating filter at mobile applications and is available on request.

Extension pipes on the bowl outlet are available in several lengths on request.

## Characteristics

### Nominal flow rate

Up to 135 l/min / 35.7 gpm (see Selection Chart, column 2). The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

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

### Connection

Threaded ports according to

- › ISO 228 or DIN 13
- › SAE standard J514

Sizes see Selection Chart, column 6, (other port threads on request).

### Filter fineness

5  $\mu\text{m(c)}$  ... 30  $\mu\text{m(c)}$   
 $\beta$ -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  $\geq 500 \text{ pS/m}$  at 20 °C / 68 °F.

### Temperature range

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

### Viscosity at nominal flow rate

- › at operating temperature:  $v < 60 \text{ mm}^2/\text{s} / 280 \text{ SUS}$
- › as starting viscosity:  $v_{\text{max}} = 1200 \text{ mm}^2/\text{s} / 5560 \text{ SUS}$
- › at initial operation:  
The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70%  $\Delta p$  of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the  $\Delta p$  curve at a point. Read this point on the horizontal axis for the viscosity.

### Operating pressure

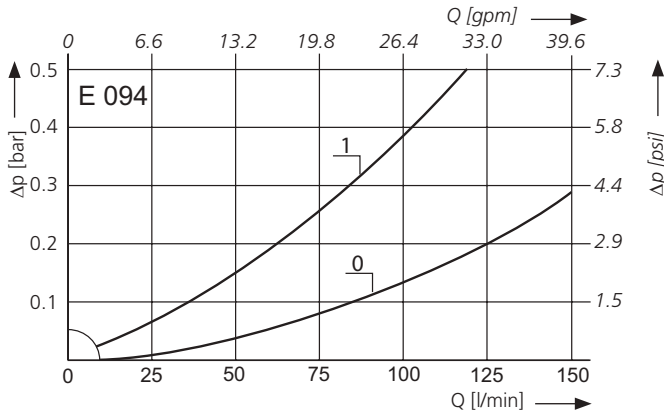
Max. 10 bar / 145 psi

### Mounting position

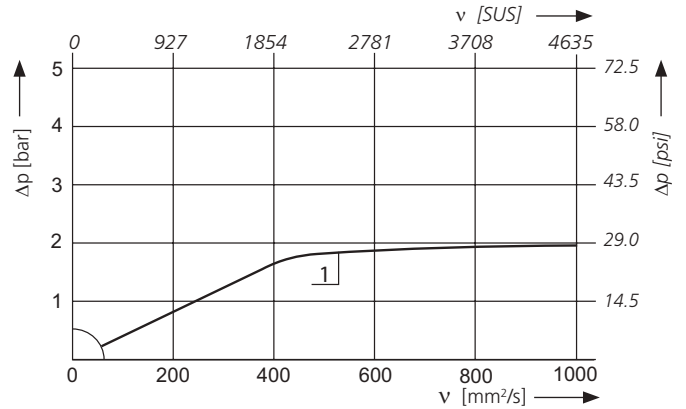
Preferably vertical, outlet downwards.

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

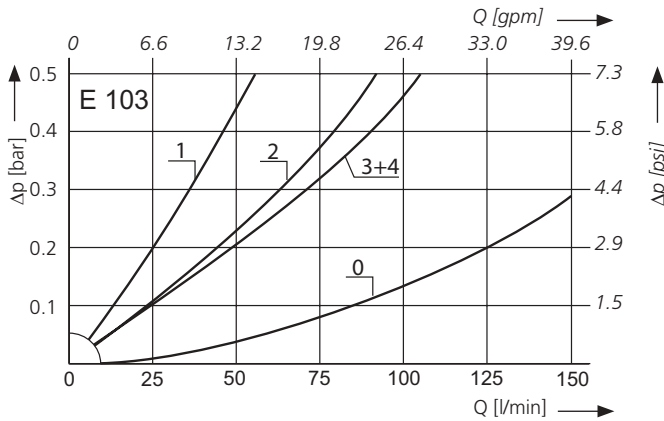
**D1** Pressure drop as a function of the **flow volume** at  $v = 35 \text{ mm}^2/\text{s} / 162 \text{ SUS}$  (0 = casing empty)



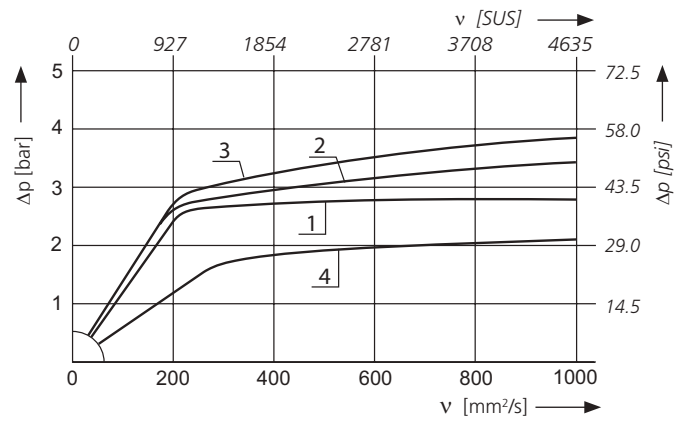
Pressure drop as a function of the **kinematic viscosity** at nominal flow



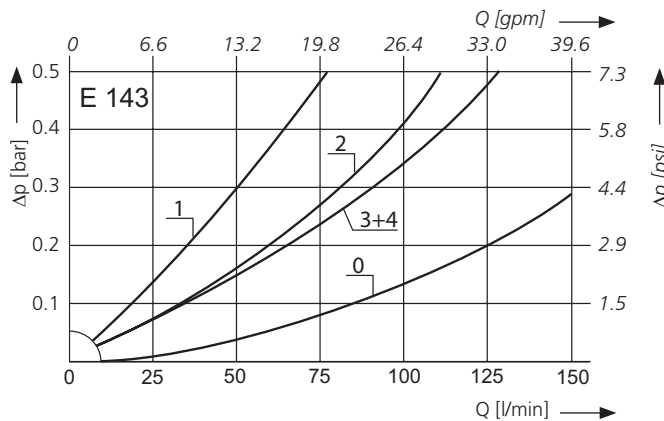
**D2** Pressure drop as a function of the **flow volume** at  $v = 35 \text{ mm}^2/\text{s} / 162 \text{ SUS}$  (0 = casing empty)



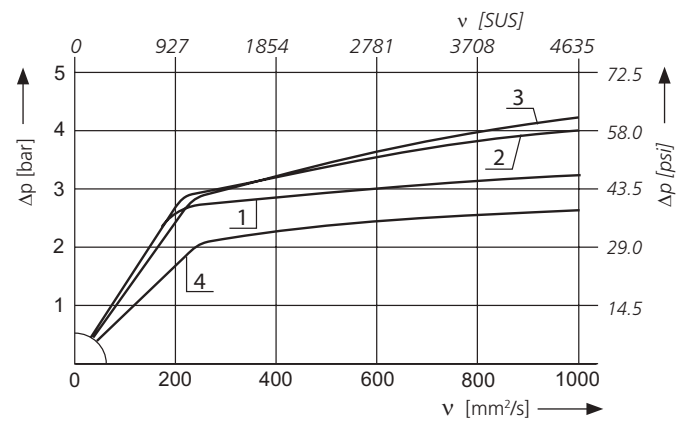
Pressure drop as a function of the **kinematic viscosity** at nominal flow



**D3** Pressure drop as a function of the **flow volume** at  $v = 35 \text{ mm}^2/\text{s} / 162 \text{ SUS}$  (0 = casing empty)

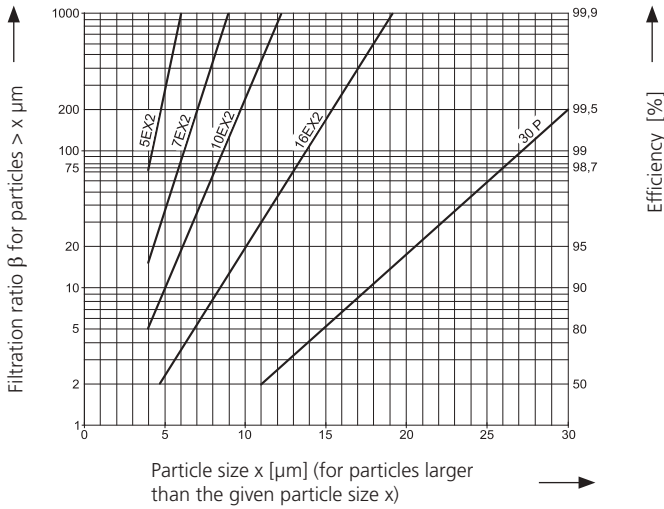


Pressure drop as a function of the **kinematic viscosity** at nominal flow



**Filter fineness curves in Selection Chart, column 4**

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



The abbreviations represent the following  $\beta$ -values resp. finenesses:

**For EXAPOR<sup>®</sup>MAX2 and Paper elements:**

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

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

**For screen elements:**

- 40S = screen material with mesh size 40  $\mu\text{m}$
- 60S = screen material with mesh size 60  $\mu\text{m}$
- 100S = screen material with mesh size 100  $\mu\text{m}$

Tolerances for mesh size according to DIN 4189

**For ventilating filter elements:**

2CL = 99.5 % filter efficiency for particles of size 2  $\mu\text{m}$

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



## Selection Chart

Part No.	Nominal flow rate	Pressure drop see diagram <b>D1</b> /curve no.	Filter fineness see <b>Dx</b>	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
1	gpm	3	4	g	SAE	psi	8	9	lbs	11	12
E 094-761	13.2	<b>D1</b> /1	30P	11	-16 <sup>2</sup>	22	2	P3.0613-51	1.8	L1.0503-03 (2CL)	incl. oil separator
E 094-751	13.2	<b>D1</b> /1	30P	11	-16 <sup>2</sup>	22	1	P3.0613-51	1.8	-	-
E 103-763	11.9	<b>D2</b> /1	5EX2	18	-16 <sup>2</sup>	36	2	V3.0620-53	2.2	L1.0503-03 (2CL)	incl. oil separator
E 103-753	11.9	<b>D2</b> /1	5EX2	18	-16 <sup>2</sup>	36	1	V3.0620-53	2.2	-	-
<b>E 103-777</b> <sup>1</sup>	21.1	<b>D2</b> /2	10EX2	25	-16 <sup>2</sup>	36	2	V3.0620-56	2.2	L1.0503-03 (2CL)	incl. oil separator
<b>E 103-756</b> <sup>1</sup>	21.1	<b>D2</b> /2	10EX2	25	-16 <sup>2</sup>	36	1	V3.0620-56	2.2	-	-
<b>E 103-798</b> <sup>1</sup>	29.1	<b>D2</b> /3	16EX2	25	-16 <sup>2</sup>	36	2	V3.0620-58	2.2	L1.0503-03 (2CL)	incl. oil separator
<b>E 103-788</b> <sup>1</sup>	29.1	<b>D2</b> /3	16EX2	25	-16 <sup>2</sup>	36	1	V3.0620-58	2.2	-	-
E 103-761	18.5	<b>D2</b> /4	30P	11	-16 <sup>2</sup>	22	2	P3.0620-51 <sup>3</sup>	2.2	L1.0503-03 (2CL)	incl. oil separator
E 103-751	18.5	<b>D2</b> /4	30P	11	-16 <sup>2</sup>	22	1	P3.0620-51 <sup>3</sup>	2.2	-	-
E 143-763	18.5	<b>D3</b> /1	5EX2	28	-16 <sup>2</sup>	36	2	V3.0730-53	2.7	L1.0503-03 (2CL)	incl. oil separator
E 143-753	18.5	<b>D3</b> /1	5EX2	28	-16 <sup>2</sup>	36	1	V3.0730-53	2.7	-	-
<b>E 143-776</b> <sup>1</sup>	30.4	<b>D3</b> /2	10EX2	38	-16 <sup>2</sup>	36	2	V3.0730-56	2.7	L1.0503-03 (2CL)	incl. oil separator
<b>E 143-786</b> <sup>1</sup>	30.4	<b>D3</b> /2	10EX2	38	-16 <sup>2</sup>	36	1	V3.0730-56	2.7	-	-
<b>E 143-788</b> <sup>1</sup>	35.7	<b>D3</b> /3	16EX2	38	-16 <sup>2</sup>	36	2	V3.0730-58	2.7	L1.0503-03 (2CL)	incl. oil separator
<b>E 143-798</b> <sup>1</sup>	35.7	<b>D3</b> /3	16EX2	38	-16 <sup>2</sup>	36	1	V3.0730-58	2.7	-	-
E 143-761	31.7	<b>D3</b> /4	30P	17	-16 <sup>2</sup>	22	2	P3.0730-51 <sup>3</sup>	2.7	L1.0503-03 (2 CL)	incl. oil separator
E 143-751	31.7	<b>D3</b> /4	30P	17	-16 <sup>2</sup>	22	1	P3.0730-51 <sup>3</sup>	2.7	-	-

<sup>1</sup> Preferred type, no minimum order quantity required

<sup>2</sup> Corresponds to 1<sup>5</sup>/<sub>16</sub> -12 UN-2B

<sup>3</sup> Paper media supported with metal gauze

All filters are delivered with a plugged clogging indicator connection M12 x 1.5 mm. 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 103-763 has to be supplied with an extension pipe for a mounting depth of 500 mm (resp. 19.69 inch).**

**Order description:** E 103-763 / EV 500

**Part No. (Basic unit)**

**Mounted extension pipe (7 various lengths are available on request)**

E 094: EV 130 (5.12 inch), EV 190 (7.48 inch), EV 234 (9.21 inch), EV 284 (11.18 inch), EV 334 (13.15 inch), EV 434 (17.09 inch), EV 534 (21.02 inch)

E 103: EV 196 (7.71 inch), EV 256 (10.08 inch), EV 300 (11.81 inch), EV 350 (13.78 inch), EV 400 (15.74 inch), EV 500 (19.69 inch), EV 600 (23.62 inch)

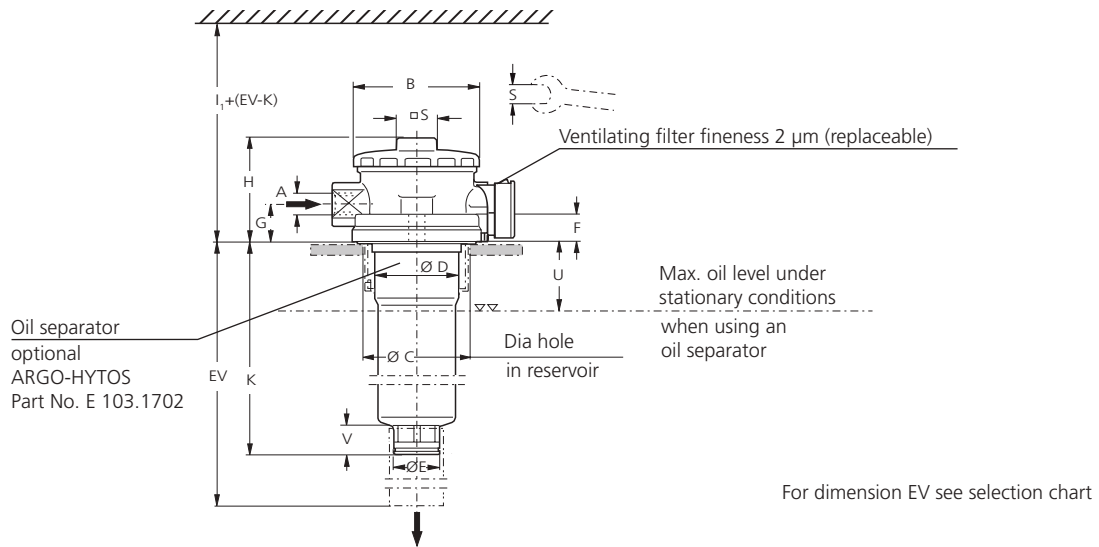
E 143: EV 297 (11.69 inch), EV 357 (14.06 inch), EV 400 (15.74 inch), EV 450 (17.71 inch), EV 500 (19.69 inch), EV 600 (23.62 inch), EV 700 (27.56 inch)

**For the suitable clogging indicators please see catalog sheet 60.20.**

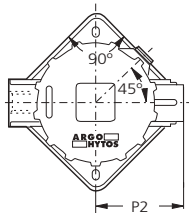
### Remarks:

- › 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).
- › 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.

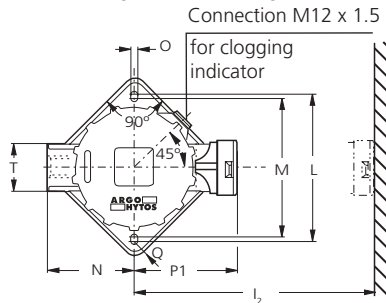
## Dimensions



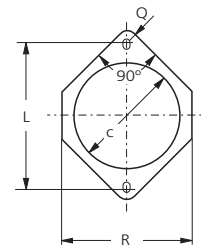
Design without ventilating filter



Design with ventilating filter



Required mounting surface



## Measurements in mm

Type	A	B	C min./max.	D	E	F	G	H	I <sub>1</sub>	I <sub>2</sub>	K	L	M	N	O
E 094	G ¾	105	87/91	73.5	38	20.5	30	88.5	235	125	111	115	110	70	11
E 103	G¾, G1	105	87/91	73.5	38	20.5	30	88.5	300	125	177	115	110	70	11
E 143	G¾, G1	105	87/91	73.5	38	20.5	30	88.5	400	125	278	115	110	70	11

Type	P <sub>1</sub>	P <sub>2</sub>	Q	R	S	T	U	V							
E 094	82	69	13.5	107.5	AF 32	AF 41	50	23							
E 103	82	69	13.5	107.5	AF 32	AF 41	50	23							
E 143	82	69	13.5	107.5	AF 32	AF 41	50	23							

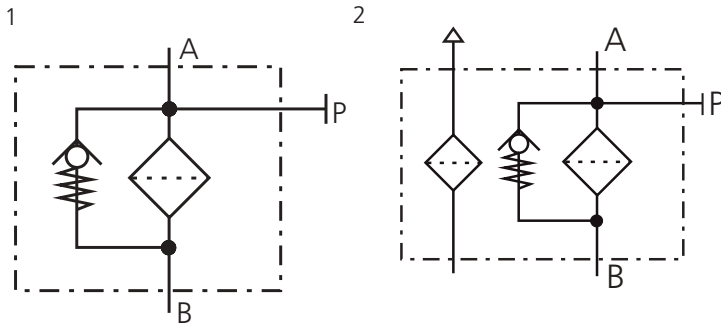
## Measurements in inch

Type	A SAE	B	C min./max.	D	E	F	G	H	I <sub>1</sub>	I <sub>2</sub>	K	L	M	N	O
E 094	-16	4.13	3.43/3.58	2.9	1.5	0.81	1.18	3.48	9.25	4.92	4.37	4.53	4.33	2.76	0.43
E 103	-16	4.13	3.43/3.58	2.9	1.5	0.81	1.18	3.48	11.81	4.92	6.97	4.53	4.33	2.76	0.43
E 143	-16	4.13	3.43/3.58	2.9	1.5	0.81	1.18	3.48	15.75	4.92	10.94	4.53	4.33	2.76	0.43

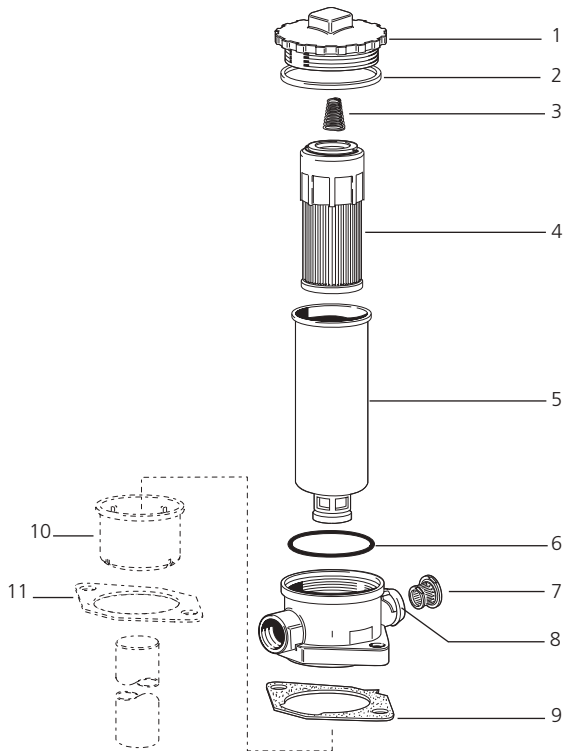
Type	P <sub>1</sub>	P <sub>2</sub>	Q	R	S mm	T mm	U	V							
E 094	3.23	2.72	0.53	4.23	AF 32	AF 41	1.97	0.91							
E 103	3.23	2.72	0.53	4.23	AF 32	AF 41	1.97	0.91							
E 143	3.23	2.72	0.53	4.23	AF 32	AF 41	1.97	0.91							

\* Corresponds to 1<sup>5</sup>/<sub>16</sub>-12 UN-2B

## Symbols



## Spare Parts



Pos.	Designation	Part No.
1	Screw-on cap	E 103.0201
2	Flat gasket	N031.0841
3	Compression spring	N015.3703
4	Replacement 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 mm 2.74 x 0.14 inch	N007.0703
7	Replacement ventilating filter	L1.0503-03K
8	Housing (for pos. 7)	L1.0503.0801
9	Flat gasket (for versions without oil separator)	E 103.0147
10	Oil separator (incl. pos. 11)	E 103.1702
11	Flat gasket (for versions with oil separator)	E 103.0148

\*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 ISO standards:

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

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

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