

MANN Filters for Liquids



We know our customers' needs and speak their language

The wide range of products manufactured by MANN+HUMMEL include products and services for a variety of industrial applications.

In order to be flexible and serve our customers individually the MANN+HUMMEL group is divided into two divisions – the automotive technology division and the industrial technology division – organised in eight business units.

The business units of the automotive technology division:

- Air Filter Systems
- Intake Manifolds Systems
- Liquid Filter Systems
- Cabin Filters
- Filters

The business units of the industrial technology division:

- Industrial Filters
- ProTec
- Hydromatation

Industrial Filters Business Unit – Filter solutions for many industrial applications

The customers of the Industrial Filters Business Unit include companies from nearly every area of industry. Our aim is to offer comprehensive after-sales service to our customers within each sector and therefore the business unit is divided into four business areas, each with its own team:

- Mechanical engineering and production technology
- Industrial engines, construction equipment and agricultural machinery
- Pneumatics and vacuum technology
- Representatives

In each team sales engineers and technicians work closely together – to meet your specific requirements.

And – it is very easy to find the right contact person:

If you don't have a contact person yet at MANN+HUMMEL or with one of our representatives please phone

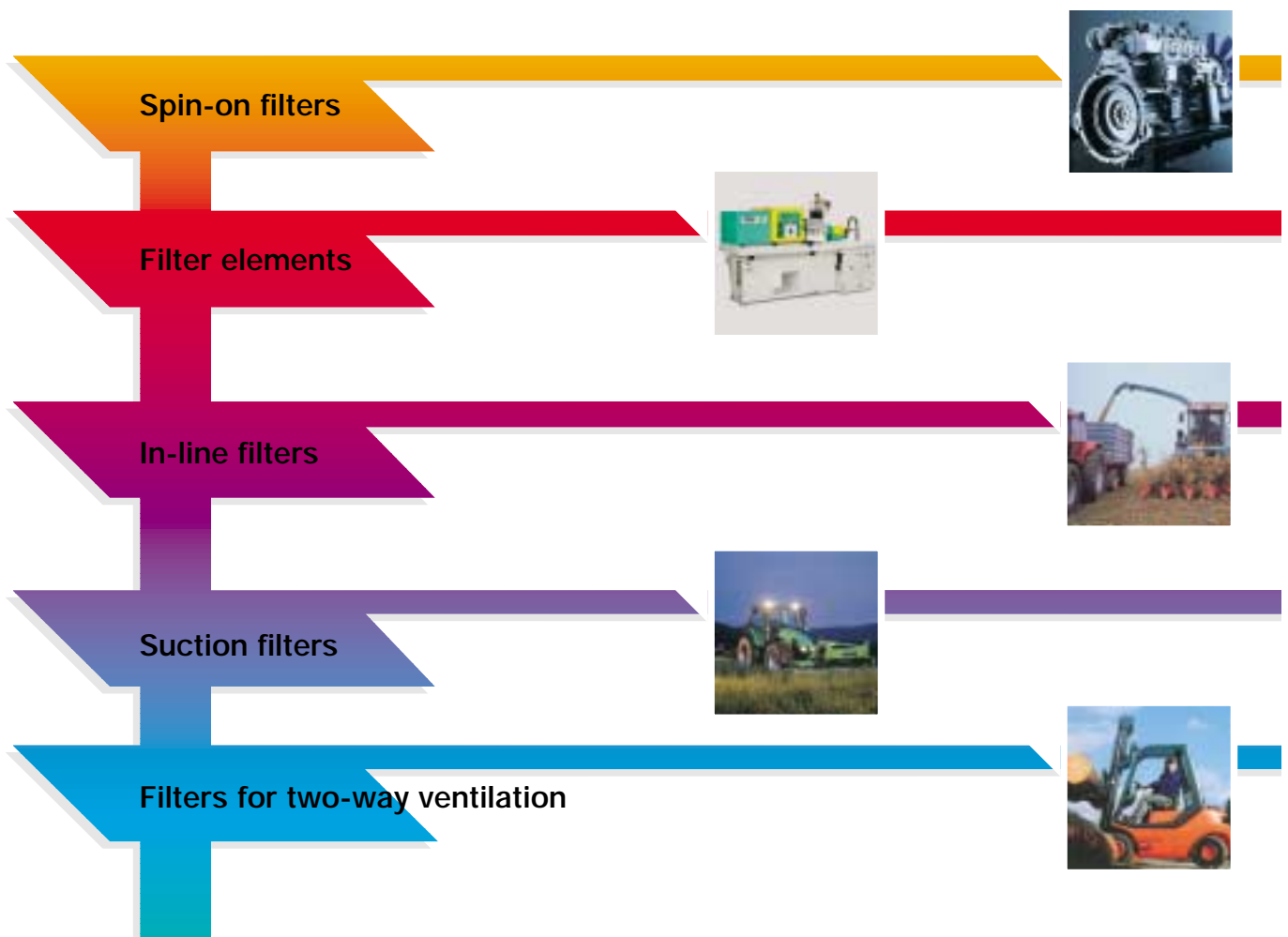
+49 (62 32) 53 80

and tell us your industrial application. We will immediately put you through to your sales engineer.

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Matching filters ...



... for every fluid

Page 7
Page 13

- For the filtration of fuels, lube and hydraulic oils
- Application: motors, gears, general machinery

Page 19

- For the filtration of fuels, lube and hydraulic oils, coolants and paints
- Application: motors, gears, general machinery

Page 25

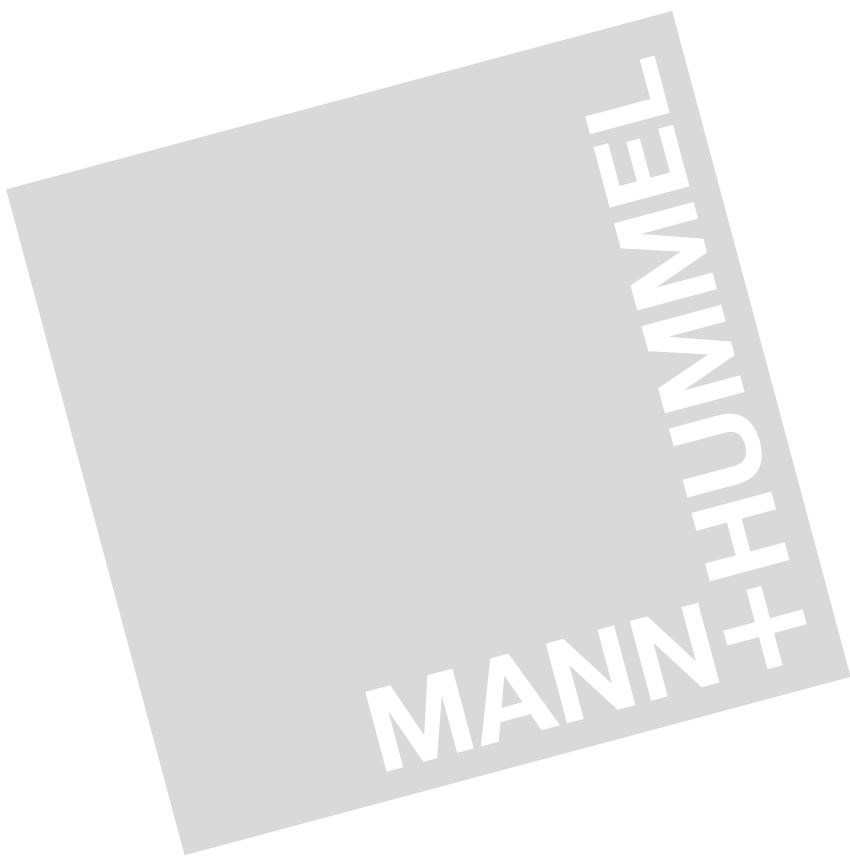
- For the filtration of fuels, lube oils and hydraulic fluids
- Application: motors, machines, plants, automotive hydraulics

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- For the filtration of lube and hydraulic oils
- Application: hydraulic systems, gears

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- For aeration and ventilation
- Application: gears, tanks for liquids



MANN micro-Top Spin-on filters for lube and hydraulic oils



MANN micro-Top Spin-on filters

MANN Spin-on filters are fine filters used for the filtration of lube and hydraulic oils as well as in engines, machines and installations.

The fineness of the MANN micro-Top filter elements (star-pleated paper) is in the μm range.

Design

The MANN micro-Top filter element is fixed into the housing. The inlet and outlet for the liquid to be filtered are located in the threaded cover. The spin-on filters are simply screwed on specially provided connections on engines and machines.



Operation

Spin-on filters are generally used as full-flow filters, i.e. they are installed in the circuit in a way ensuring that all the liquid to be cleaned passes through them every time it circulates.

Deposit of dirt particles on the paper element causes the flow resistance to increase.

When a certain differential pressure is reached (e.g. upon cold start or when the filtering element is clogged), a bypass valve in the filter opens, ensuring sufficient lubrication.

For the opening pressure of the bypass valve, please see the relevant table.

An optionally integrated non-return valve prevents the running dry of the filter. In this way the operating pressure is reached quickly after starting the engine.

MANN micro-Top Spin-on filters

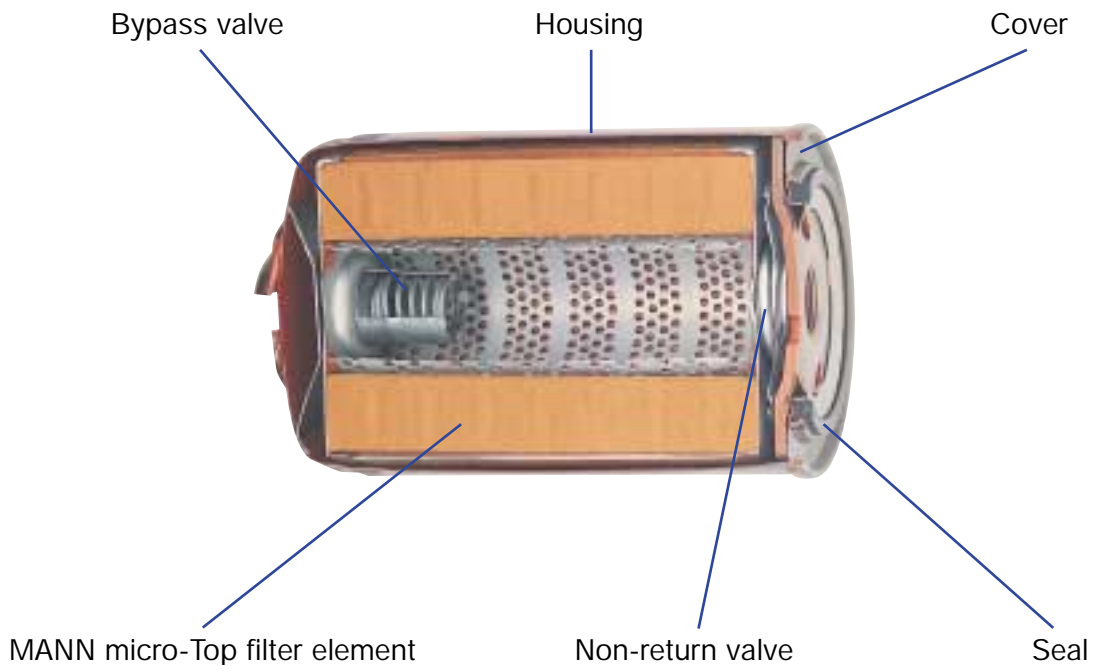
Maintenance

Usually, the maintenance frequency is determined by the engine or machine manufacturer. The maintenance work to be performed is limited to the replacement of the complete spin-on filter. The removal tool shown on page 12 helps in loosening the filter.

On the Spin-on filters suitable for pressures up to 14 bar (1.4 MPa), an integrated non-return valve prevents oil to flow out during the servicing.

Configuration

The stated values in the table are standard which – depending on the application – can be adjusted upwards. For further information please ask your sales engineer.



Technical data

Filter fineness:	12 µm 50 % fractional separation efficiency (single pass) 30 µm 99 % fractional separation efficiency (single pass) Other filter fineness upon request
Nominal flow rate:	25 to 540 l/min.
Operating pressure:	14; 20; 25 or 35 bar (1.4; 2; 2.5 or 3.5 MPa)
Operating temperature:	Max. 120 °C
Bypass valve:	Opens at differential pressures of 0.8 to 2.5 / 3.5 bar with or without non-return valve

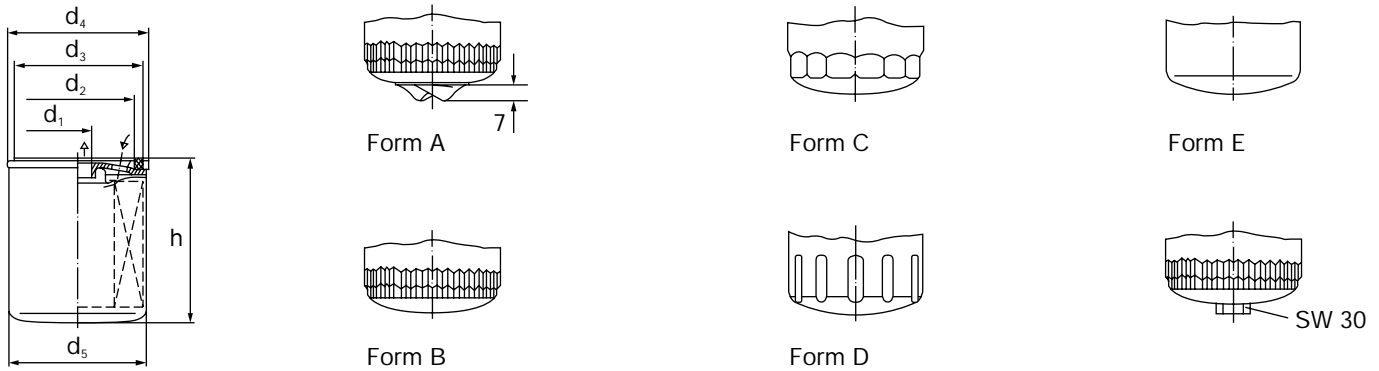
MANN micro-Top Spin-on filters

Nominal pressure 14 bar (1.4 MPa)

Spin-on filters for this pressure range are used primarily for the filtration of lube oils.

Applications for other liquids upon request.

- Opening pressure of bypass: 0.8 to 2.5 bar (80 to 250 kPa).
- With non-return valve.



Filter mounting: metric thread

Part No.	Form	Nominal flow rate [l/min]	Dimensions in mm and inches						Non-return valve [bar] [KPa]		Bypass valve [bar] [KPa]	
			d ₁	d ₂	d ₃	d ₄	d ₅	h				
W 712/15	D	15	M 18x1.5	62	71	80	76	94	0.12	12	1.0	100
W 815	D	20	M 20x1.5	62	71	90	86	89	0.12	12	1.5	150
W 920/25	B	20	M 20x1.5	62	71	96	93	95	0.12	12	0.8	80

Filter mounting: unified thread in inches

Part No.	Form	Nominal flow rate [l/min]	Dimensions in mm and inches						Non-return valve [bar] [KPa]		Bypass valve [bar] [KPa]		Short designation to DIN ISO 71457
			d ₁	d ₂	d ₃	d ₄	d ₅	h					
W 712/1	C	12	3/4 - 16 UNF	62	71	80	76	79	0.12	12	-	-	-
W 712/4	C	15	3/4 - 16 UNF	62	71	80	76	93	0.12	12	2.5	250	A 0.4
W 719/4	C	20	3/4 - 16 UNF	62	71	80	76	123	0.12	12	2.5	250	-
W 920	A	25	3/4 - 16 UNF	62	71	96	93	95	0.12	12	2.5	250	B 0.5
W 920/7	B	25	3/4 - 16 UNF	62	71	96	93	95	0.12	12	1.2	120	-
W 930	A	25	3/4 - 16 UNF	62	71	96	93	114	0.12	12	2.5	250	B 0.6
W 940	A	40	3/4 - 16 UNF	62	71	96	93	142	0.12	12	2.5	250	B 0.8
W 940/1	B	40	3/4 - 16 UNF	62	71	96	93	142	0.12	12	1.2	120	-
W 940/13	F	40	3/4 - 16 UNF	62	71	96	93	142	0.12	12	2.5	250	-
W 940/18	B	40	1 - 12 UNF	62	71	96	93	142	0.12	12	2.5	250	A 0.8x1
W 950	B	45	1 - 12 UNF	62	71	96	93	170	0.12	12	2.5	250	A 1
W 950/1	B	45	1 - 12 UNF	62	71	96	93	170	0.12	12	1.2	120	-
W 962	B	70	1 - 12 UNF	62	71	96	93	210	0.12	12	2.5	250	A 1.2
W 962/2	A	70	1 - 12 UNF	62	71	96	93	210	0.12	12	2.5	250	B 1.2
W 1130	C	30	3/4 - 16 UNF	62	71	110	108	115	0.12	12	1.0	100	-
W 1140	C	45	3/4 - 16 UNF	62	71	110	108	135	0.12	12	1.2	120	-
W 1170	C	70	1 - 12 UNF	62	71	110	108	227	0.12	12	1.2	120	-
W 11 102	C	100	1 1/8 - 16 UN	93	104	110	108	260	0.12	12	2.5	250	-
W 1374/2	E	85	G 1 1/4	100	111	140	136	177	-	-	-	-	-
W 1374/4	E	85	1 1/2 - 16 UN - 2 B	100	111	140	136	177	-	-	-	-	-

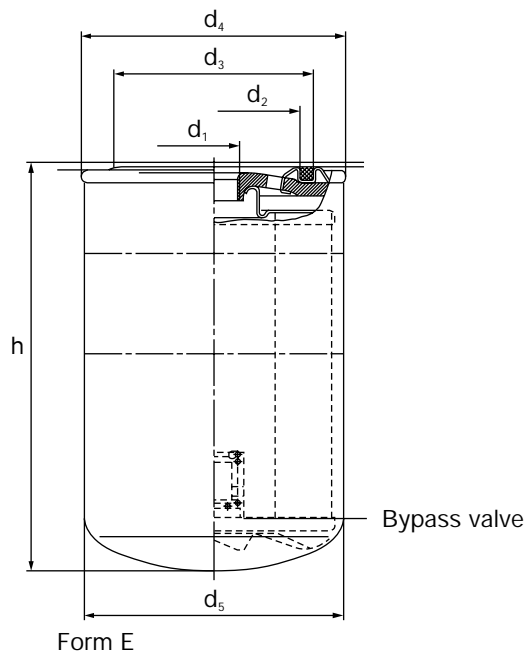
MANN micro-Top Spin-on filters

Nominal pressure 35/25/20 bar (3.5/2.5/2.0 MPa)



Spin-on filters for this pressure range are used primarily for the filtration of hydraulic oils in compliance with DIN 51 524 and DIN 51 525. Applications for other liquids upon request.

- Opening pressure of bypass: 0.8 to 2.5 bar (80 to 350 KPa).



Filter mounting: unified thread in inches

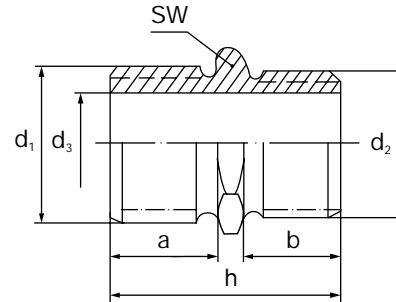
Part No.	Form	Nominal flow rate ¹⁾ [l/min]	Dimensions in mm and inches						Bypass valve		Maximum operating pressure	
			d ₁	d ₂	d ₃	d ₄	d ₅	h	[bar]	[KPa]	[bar]	[MPa]
WD 724/3	E	20	3/4 – 16 UNF	62	71	80	76	140	3.5	350	35	3.5
WD 920	E	25	3/4 – 16 UNF	62	71	96	93	97	2.5	250	25	2.5
WD 940	E	40	3/4 – 16 UNF	62	71	96	93	144	2.5	250	25	2.5
WD 940/2	E	35	1 – 12 UNF	62	71	96	93	144	2.5	250	25	2.5
WD 950	E	40	1 – 12 UNF	62	71	96	93	172	2.5	250	25	2.5
WD 950/2	E	50	1 – 12 UNF	62.5	72.5	98	96	170	3.5	350	25	2.5
WD 962	E	70	1 – 12 UNF	62	71	96	93	212	2.5	250	25	2.5
WD 1374	E	95	1 1/2 – 16 UN	100	111	140	136	177	–	–	–	–
WD 13 145	E	180	1 1/2 – 16 UN	100	111	140	136	302	2.5	250	20	2.0

¹⁾ Flow resistance 0.3-0.6 at 36 mm²/sec.

Accessories for MANN micro-Top Spin-on filters

Double union

When the mounting plate is provided with a female thread, a double union is required for the assembly of the filter.

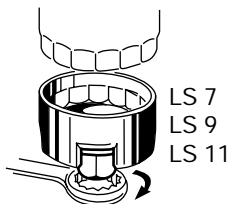


Dimensions and part numbers

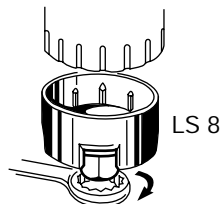
Part No.	Dimensions in mm and inches						
	d ₁	d ₂	d ₃	a	b	h	SW
21 018 15 331	M 18x1,5	M 18x1.5	12	10	10	25	24
21 019 15 111	³ / ₄ – 16 UNF	M 18x1.5	13	17	14.5	35.5	24
21 025 15 101	1 – 12 UNF	M 24x1.5	18	17	15.5	37	27
21 030 15 251	1 ¹ / ₈ – 16 UN	M 30x1.5	22	17.5	17.5	40	32
21 039 15 101	1 ¹ / ₂ – 16 UN	M 38x1.5	30	19.5	15	41	46

Removal tool

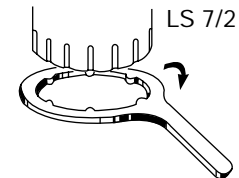
For easy disassembly of the MANN micro-Top Spin-on filters.



Form B
Form C



Form D



Form D

Mann micro-Top Spin-on Filters	W 7 ...		W 8 ...	W 9 ...	W 11 ...
Filter form	C	D	D	B	C
Suiting MANN removal tool	LS 7	LS 7/2	LS 8	LS 9	LS 11

Form A (see page 10) with loosening cam only requires a heavy screwdriver or a round bar, 8 to 10 mm thick, for disassembly.

Form E (see page 10 and 11) requires the strap-type tool commercially available.



MANN Fuel filters

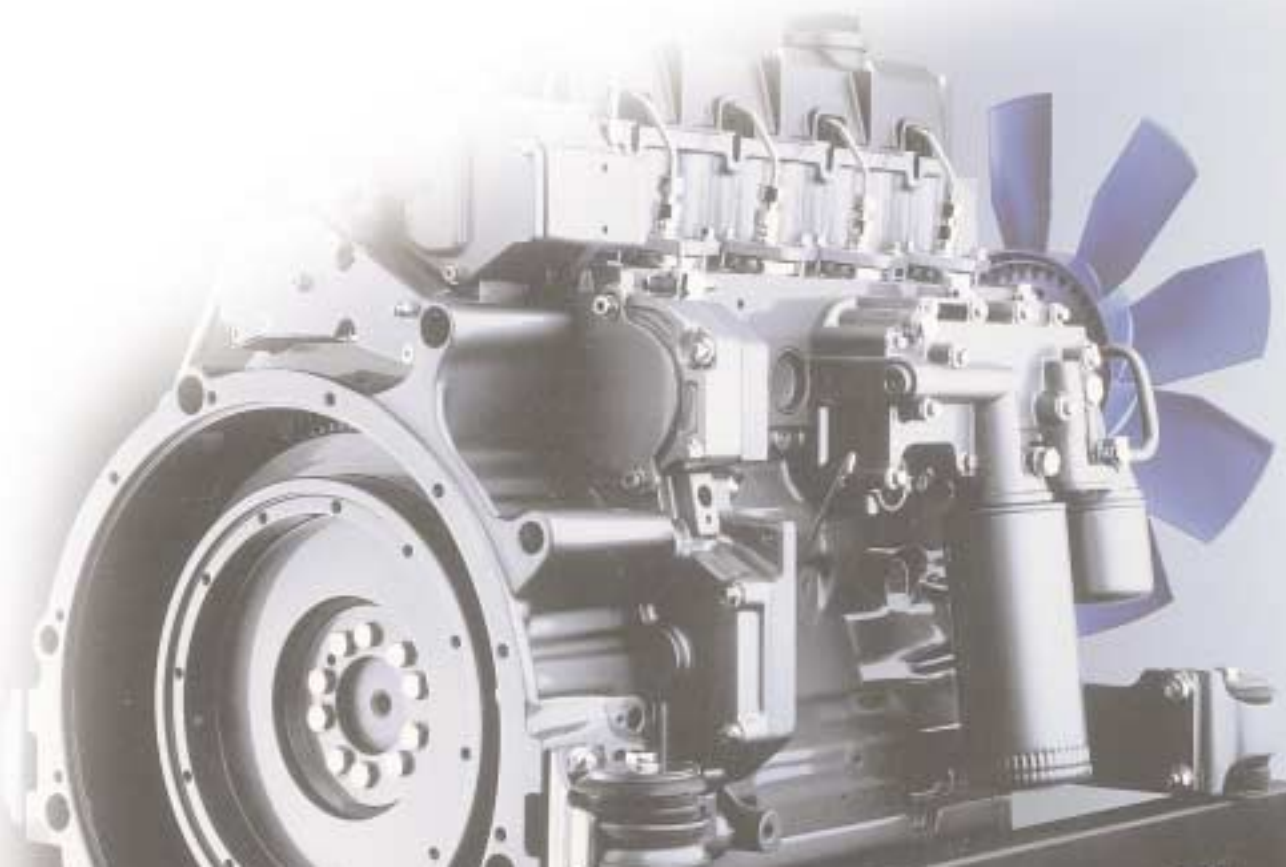
MANN Fuel filters are fine filters used for the elimination of wearing and noxious particles from diesel and gasoline.



Injection pumps and nozzles of diesel engines, injection systems of gasoline injection systems and carburettor installations are protected from impurities and wear most efficiently when equipped with the appropriate and ideally specified MANN fuel filter.

MANN+HUMMEL supplies spin-on filters both with or without water trap and drain as well as filters for in-line installation.

Spin-on filters are screwed on a matching connection on engines or on a separate filter head. Small-sized units can be installed in flexible pipes without extra fastening.



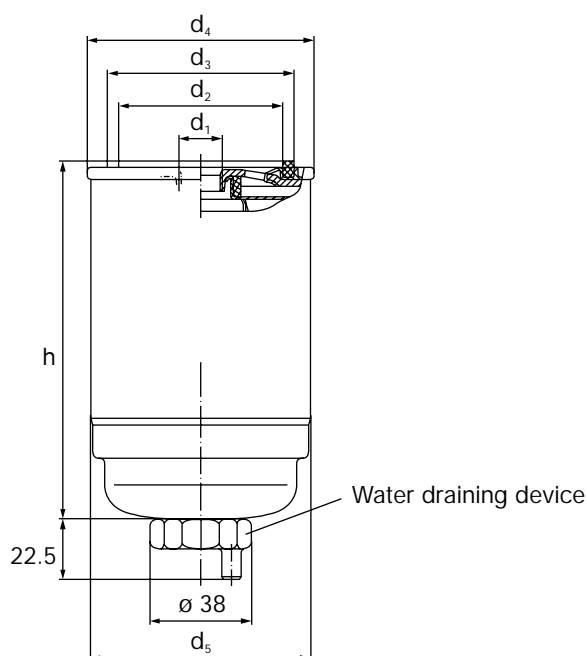
MANN Fuel filters

for distributor pumps of diesel engines

Small to medium-sized diesel engines, such as those found in agricultural and commercial vehicles, are commonly equipped with distributor-type fuel-injection pumps.

MANN Fuel filters for distributor pumps and solenoid-controlled injection systems are always provided with water traps and draining devices. The usual filter solution in this case is the spin-on filter with a fineness between 2-6 μm .

The actual filter element of the spin-on filter is fixed in the metal housing. The central connection thread serving as output for the cleaned fuel is located in the filter cover, near the intake openings and the filter seal. Usually, 4 intake openings are arranged concentrically between the central connection and the filter seal.



Part No.	Filter fineness [μm]	Nominal flow rate [l/h]	Dimensions in mm and inches						Maximum operating pressure	
			d ₁	d ₂	d ₃	d ₄	d ₅	h	[bar]	[MPa]
WK 842	4 – 6	80	M 16x1.5	61	70	84.5	81	133	6	0.6
WK 842/2	2 – 3	80	M 16x1.5	61	70	84.5	81	133	6	0.6
WK 842/6	60 (prefilter)	80	M 16x1.5	61	70	84.5	81	133	6	0.6

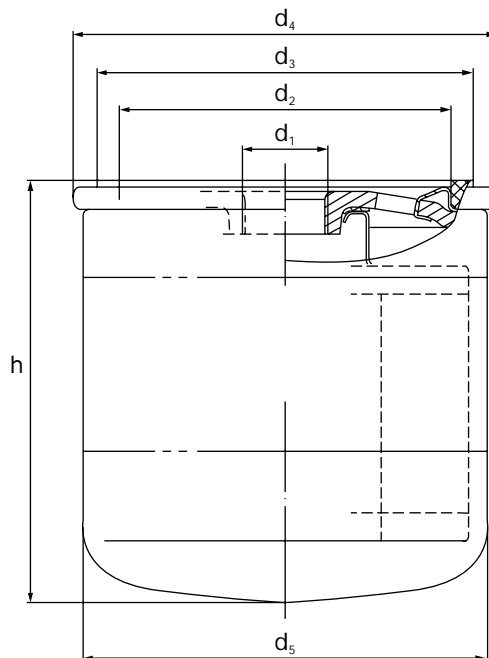
MANN Fuel filters

for in-line pumps of diesel engines

In-line pumps are utilised mainly in medium and large-size diesel engines for commercial vehicles.

For this type of pump, MANN+HUMMEL recommends fuel filters without water draining device. The average filter fineness ranges between 8 to 10 μm .

The design of these filters is comparable to that of the spin-on filters equipped with water drainage, as used on injection installations with distributor pumps (see page 15).



Part No.	Nominal flow rate [l/h]	Dimensions in mm and inches						Maximum operating pressure	
		d_1	d_2	d_3	d_4	d_5	h	[bar]	[MPa]
WK 712/2	120	M 16x1.5	62	71	80	76	80	6	0.6
WK 731	120	M 16x1.5	62	71	80	76	117	6	0.6
WK 731/1	120	M 16x1.5	30	38	80	76	115	2.5	0.25
WK 712/3	120	M 16x1.5	62	71	80	76	80	9.5	0.95
WK 723	120	M 16x1.5	62	71	80	76	124	9.5	0.95
WK 940/5	120	M 16x1.5	62	71	96	93	142	6	0.6
WK 962/4	200	M 16x1.5	62	71	96	93	210	2.5	0.25

MANN Fuel filters

for installation in flexible lines

Specially designed filters are available for installation in hoses and flexible lines.

Small filters made of transparent synthetic material can be used in carburettor engines, as well as for the filtration of diesel fuel and heating oil, provided the filter fineness requirements are less demanding. They allow relatively high flow rates though their size is moderate.

Larger in-line filters with metal housing and filter media meeting high standards of fineness can be supplied upon request (used for example to protect injection aggregates on gasoline and injection engines).

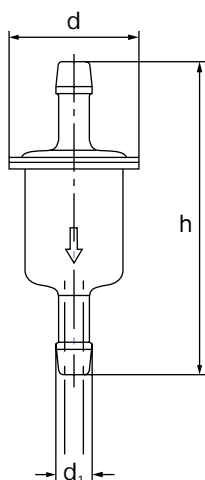


Fig. 1

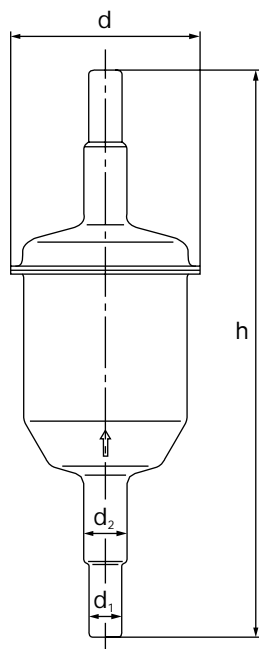


Fig. 2

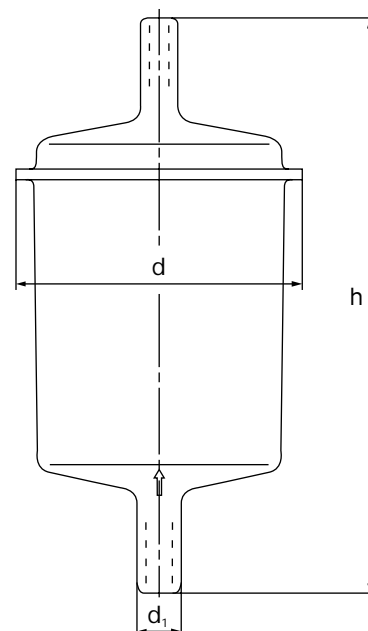
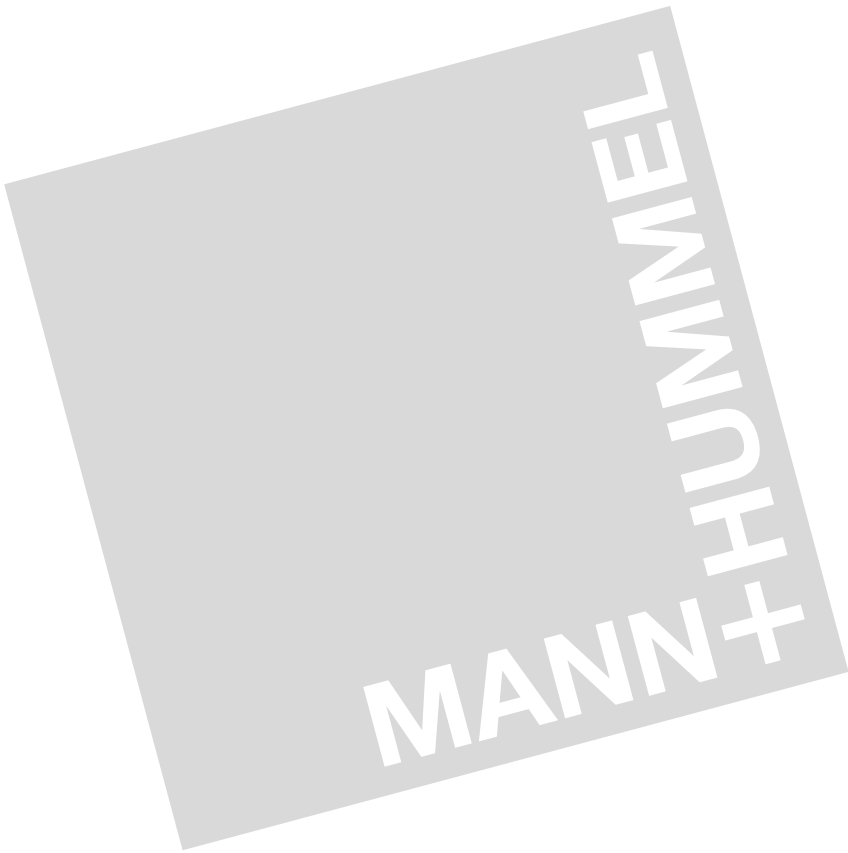


Fig. 3

Part No.	Fig.	for installation in lines		Dimensions in mm		Mesh width or filter paper
		d ₁	d ₂	d	h	
WK 21	1	6-mm		21	50	50 µm
WK 21/2	1	6-mm		21	50	136 µm
WK 31/2	2	6- and 8-mm		35	104	Filter paper element
WK 31/4	2	8-mm		37	104	200 µm
WK 31/5 ¹⁾	2	8-mm ¹⁾		37	105	200 µm
WK 32	2	6- and 8-mm		37	142	Filter paper element
WK 43/1	3	8-mm		59	108	Filter paper element

1) right-angled output socket



MANN micro-Top Filter Elements for filters for liquids



MANN micro-Top Filter Elements

MANN micro-Top filter elements are fine filters for engine and hydraulic oils, fuels, coolants and paints.

The filter fineness is in the μm range.

The MANN micro-Top filter elements are distinguished by following features:

- High and constant filtration efficiency
- High dirt-retention capacity of the paper filter elements due to the large filtering surface and the optimal paper structure.
- The specially embossed paper ensures lasting efficiency of the whole filter surface over the entire operating time.
- Resistance to water, coolants, fuels, oils and other hydrocarbons up to temperatures of $140\text{ }^{\circ}\text{C}$ thanks to the special impregnation.
- Various types as per DIN- or ISO-specifications.
- Available in more than 100 countries.



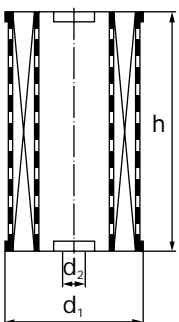
Operation

The flow of liquid to be filtered passes the filter from the outside to the inside. Exception: Filter elements for steering hydraulic systems.

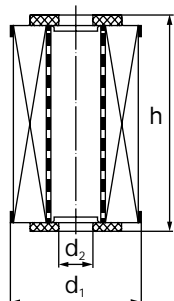
Maintenance

The maintenance frequency is usually prescribed by the engine or installation manufacturer. Servicing is limited to the replacement of the MANN micro-Top filter elements.

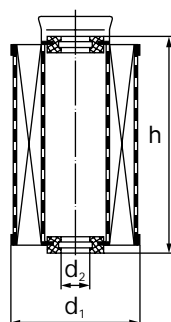
Types



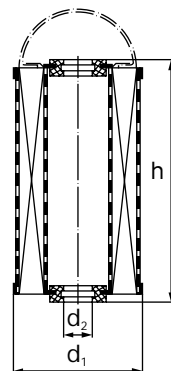
Form A



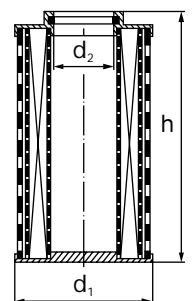
Form B



Form C



Form D



Form E

MANN micro-Top Filter Elements

for fuel filters and partial-flow oil filters

MANN micro-Top Filter elements and MANN felt filter elements for fuel filters

Part No.		Form (Page 20)	Nominal flow rate [l/h]	Dimensions in mm			Short designation as per DIN 73 358
MANN micro-Top filter elements	MANN Felt filter element			d ₁	d ₂ ¹⁾	h	
P 46/1	–	B	35	40	8,5	133	
P 64	–	A	15	52	12	44	
P 78	–	A	37	65	14	53	
P 609	–	B ⁵⁾	30	51	8 ³⁾	68	
P 707¹⁾	BF 707 ¹⁾	D ⁵⁾	90 ⁴⁾	65	14 ²⁾	116	DIN 73 358 – E 0.5
P 715¹⁾	BF 715 ¹⁾	D ⁵⁾	65 ⁴⁾	65	14 ²⁾	65	DIN 73 358 – E 0.2
P 725	–	A	95	65	14	100,5	
P 810	–	A	70	70	21	84	
P 811¹⁾	BF 811 ¹⁾	D ⁵⁾	120 ⁴⁾	83	14 ²⁾	147	DIN 73 358 – E 1
P 824	–	A	80	72	33	89	
P 825	–	B ⁵⁾	72	77	26	100	
P 833	–	A	110	72	21	125	
P 921/2	–	B ⁵⁾	120	83	26	118	
P 934	–	B ⁶⁾	150	83	10 ³⁾	167	
P 1018/1¹⁾	BF 1018/1 ¹⁾	D	310 ⁴⁾	106	20 ²⁾	171,5	DIN 73 358 – E 2

1) Interchangeable in filters to DIN 73 358, 73 359 and 73 360. For this reason, the dimensions indicated are those of the largest element.

2) Seal diameter for pipes to DIN 2391 or similar bolt.

3) Nominal diameter for bolt.

4) Flow rate with 1 m gradient (when new, to DIN 73 358).

5) With felt gasket.

6) With cork insert.

MANN micro-Top Filter elements (fiber pack) for oil filters in partial flow

Part No.	Form (Page 20)	Filling volume [cm ³]	Dimensions in mm			Short designation as per DIN 71 455
			d ₁	d ₂ ¹⁾	h	
PF 815	D	310	75	14	104	
PF 915	D	520	90	14	110	
PF 925	D	630	98	14	110	DIN 71 455 – E 1
PF 1025	D	1 300	98	14	206	
PF 1155	D	950	110	14	125	DIN 71 455 – E 1.5
PF 1190	D	1 600	110	14	202	DIN 71 455 – E 2.5
PF 13 140	D	2 300	130	14	202	DIN 71 455 – E 3.5
PF 1535	D	3 800	150	25	250	DIN 71 455 – E 5
PF 1552	D	5 500	150	32	367	DIN 71 455 – E 8
PF 19 326	D	10 100	197.5	22	378	

1) Seal diameter for pipes to DIN 2391 or similar bolt.

MANN micro-Top Filter Elements

Star-pleated paper elements for full-flow oil filters

MANN micro-Top Filter elements for full-flow oil filters

Part No.	Form (Page 20)	Nominal flow rate [l/min]	Dimensions in mm			Short designation as per DIN ISO 7747
			d ₁	d ₂	h	
H 53	A	5	40	12.8	64	
H 53/3 ¹⁾	A	5	40	12.8	64	
H 601	A	12	59	18	100.5	
H 617 ⁹⁾	A	16	59	28.2	100.5	
H 712	B ⁵⁾	23	70	33	156.5	
H 715/1	B	13	70	20	109	
H 720	A	19	70	26	117	A 70x26x117
H 729	A	22	70	26	165	A 70x26x165
H 804	B ⁷⁾	22	69	33	140	
H 813/1	B ⁵⁾	11	72	32	87.5	
H 815	C	15	76	19 ²⁾	107.5	
H 816	B ⁶⁾	18	72	32	108.5	
H 820/3	A	20	72	21	117	
H 827/1	B	25	72	33	154	
H 829	A	28	72	26	165	
H 928/1	A	30	87	20	117	
H 932/2	A	30	84	24.2	134	
H 943	A	46	84	24.2	196	
H 943/2	B ⁶⁾	53	90	32	201	
H 947/1	D	47	84	23.4	196	
H 960	A	57	84	24.2	229	
H 973	D ⁴⁾	72	90	24.4	220.2	
H 1018/2	B ⁷⁾	22	94	34	78	
H 1029/1	B ⁶⁾	32	100	34	101	
H 1032	C	27 ³⁾	100	19 ²⁾	126	
H 1034	A	40	100	30	117	A 100x30x117
H 1038	B ⁵⁾	35	94	34	119.5	
H 1048	B ⁷⁾	50	100	26	151	
H 1050/1	A	57	100	30	165	A 100x30x165
H 1050/2	B	50	99	30	182	
H 1053	C	61 ³⁾	100	25 ²⁾	204	
H 1053/2	B ⁵⁾	49	92	49	179.5	
H 1060	A	68	100	30	196	A 100x30x196
H 1072	A	82	100	30	234	A 100x30x234
H 1072/11	B ⁵⁾	82	100	40.5	236.5	
H 1075/1	B	72	92	50	262	
H 1081	A	82	100	40	234	A 100x40x234
H 1258	A	63	117	73	165	
H 1263/1	B	60	117	56	138	
H 1290/1	B	75	118	59	165	
H 1465 ¹⁾	A	63	132	95	163	
H 1496	B ⁵⁾	85	133	88	229	
H 1565/1	B ⁷⁾	68	150	88	106.5	
H 10 196	A	195	100	40	565	
H 12 105	B ⁵⁾	100	114	36	232	
H 12 107	A	95	117	56	196	
H 12 107/1	A	81	117	56	196	
H 12 110/1	B	88	117	56	227.5	

MANN micro-Top Filter Elements

for full-flow oil filters and filters for steering hydraulic systems

MANN micro-Top Filter elements for full-flow oil filters (continued)

Part No.	Form (Page 20)	Nominal flow rate [l/min]	Dimensions in mm			Short designation as per DIN ISO 7747
			d ₁	d ₂	h	
H 12 113	A	111	117	43	229	
H 12 178	B ⁶⁾	132	117	55	336	
H 12 225	B	183	117	56	462	
H 12 270	B	222	117	56	559	
H 13 127/1 ⁸⁾	A	104	128	14.5	210.5	
H 15 111/2	A	98	150	88	165	
H 15 134	A	143	150	88	196	A 152x88x196
H 15 134/1	B ⁷⁾	143	150	88	211	
H 15 135	C	80	150	31.5	252	
H 15 190	C	80	150	31.5	364	
H 15 190/6	C	80	150	31	364	
H 15 190/11	C	80	150	31	364	
H 15 222/2	A	200	150	88	330	
H 15 263 ¹⁾	B	262	150	88	425	
H 15 395	B	392	150	88	631	
H 15 432	B	355	150	88	597	
H 15 475	C	80	150	31	364	
H 15 490	A	525	150	88	722	
H 15 490/2	B	525	150	88	733	
H 18 265	A	227	170	115	363	
H 18 300	A	303	170	115	484	
H 20 211	B	175	194	118	183	
H 20 440	B	363	194	118	366	
H 25 669	A	663	242	132	366	

1) Flow from the inside to the outside.

2) Seal diameter for pipes to DIN 2391 or similar bolt.

3) Flow rate related to discharge cross section.

4) Without clip.

5) With cardboard end cap as gasket.

6) With felt gasket.

7) With cork gasket.

8) See project drawing.

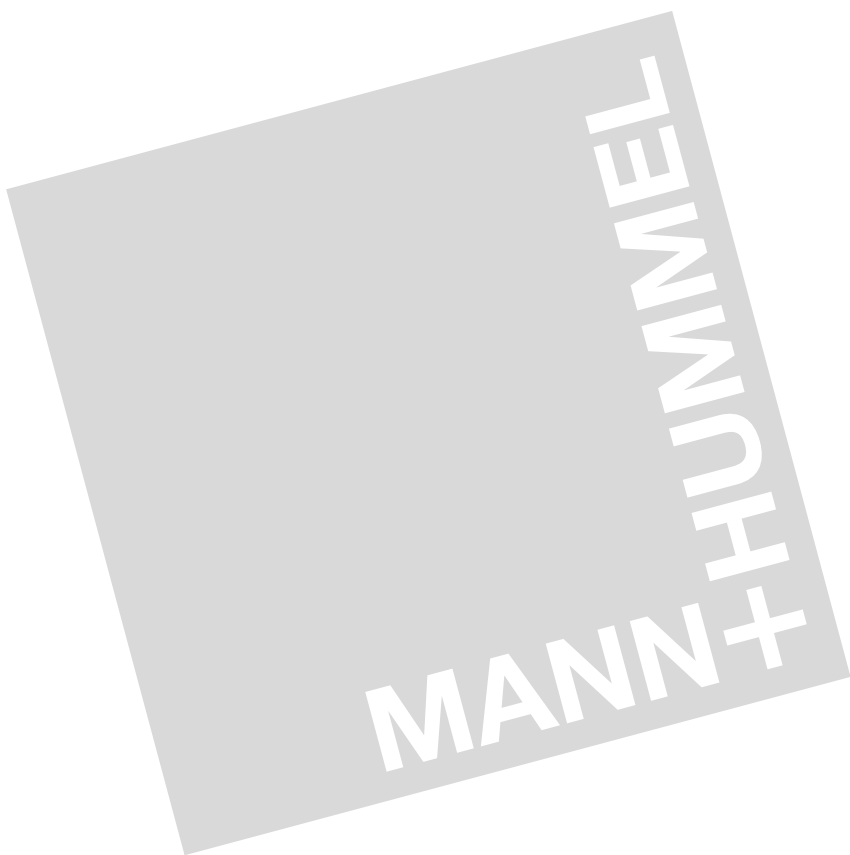
9) With bypass valve.

MANN micro-Top Filter elements for filters for steering hydraulic systems

Part No.	Form (Page 20)	Nominal flow rate [l/min]	Dimensions in mm		
			d ₁	d ₂	h
H 601/4	A	13	60	18	100.5
H 615	C	13	59	13 ¹⁾	111.5
H 910/2	C ²⁾	9	82	13 ¹⁾	60.5
H 919/7	C	25	82	13 ¹⁾	111.5

1) Seal diameter for pipes to DIN 2391 or similar bolt.

2) Without grip.



MANN In-line filters



MANN In-line filters ...

MANN In-line Filters are fine filters used mainly in hydraulic systems for the filtration of motor and gearbox oils and in lube-oil circuits in the general machine construction. The fineness of the MANN micro-Top filter elements (star-pleated paper) is in the μm range.

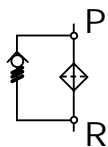


Design

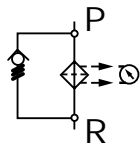
The filters consist of a filter head with two threads, mounting holes and a MANN micro-Top Spin-on filter

Versions available:

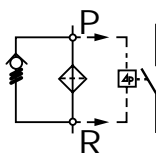
- with bypass valve, without service indicator



- with bypass valve and service indicator



- with bypass valve and service switch (make /break contact, convertible)



Operation

MANN In-line filters are mainly used as full-flow filters. All the liquid to be cleaned passes through every time it circulates. The filters can also be used for return flow.

Deposit of dirt particles on the paper element causes the flow resistance to increase. When a certain differential pressure has been reached (e.g. upon cold start or when the filter element is clogged), a bypass valve in the filter opens, ensuring sufficient and constant lubrication.

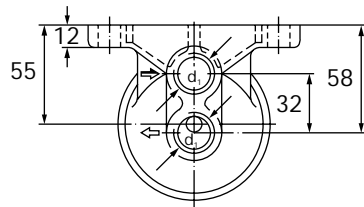
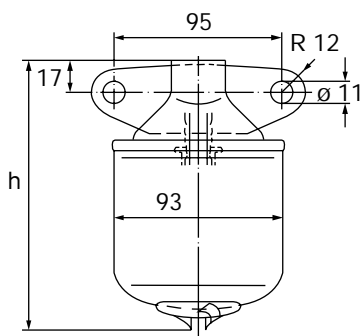
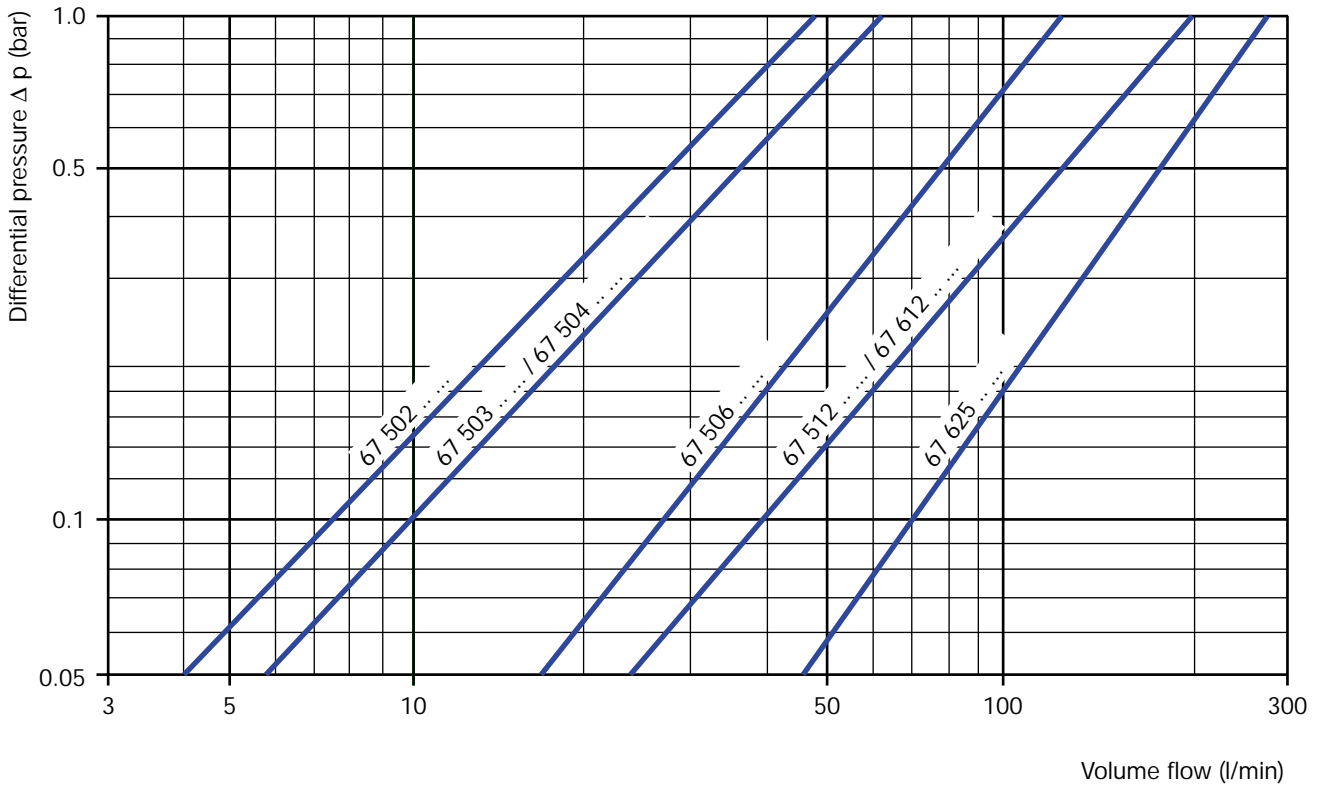
Service indicators or switches and bypass valves are combined to signal the need for filter service before the bypass valve opens.

MANN In-line filters

Nominal pressure 14 bar (1.4 MPa)

Characteristics

Flow resistance as per ISO 3968 at 36 mm²/sec.



Part No.	Nominal flow rate [l/min] ¹⁾	Spin-on filter	Dimensions in mm and inches		Weight approx. [kg]
			d ₁	h	
67 502 62 026	25	W 920	M 20x1.5	145	0.72
67 503 62 026	40	W 940	M 20x1.5	192	0.83
67 502 62 106	25	W 920	G 1/2	145	0.72
67 504 62 126	40	W 940	G 1/2	192	0.81

¹⁾ Flow rate values are only valid for liquids with 36 mm²/sec and flow resistance according to the above diagram.

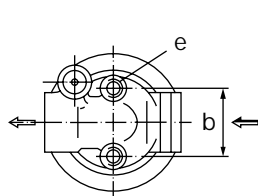
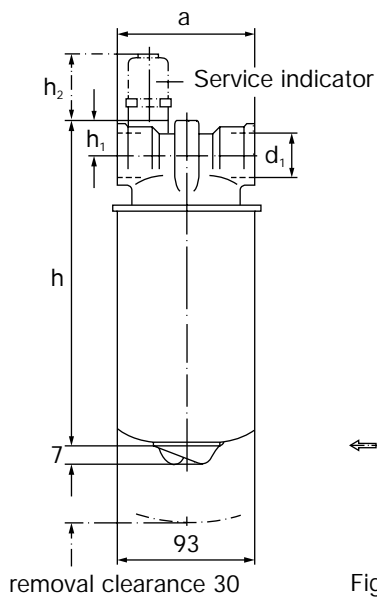


Fig. 1

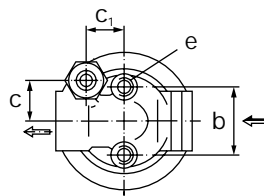


Fig. 2

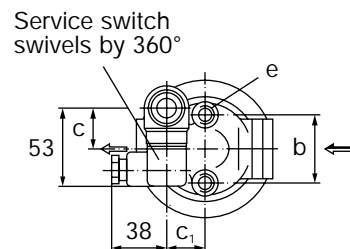


Fig. 3

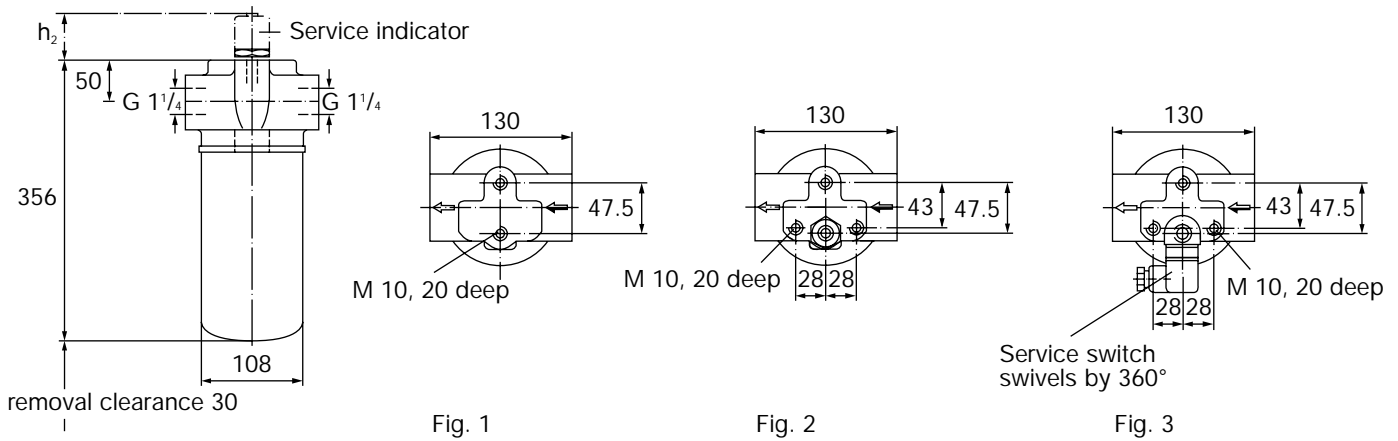
Part No.	Fig.	Spin-on filter	Dimensions in mm and inches									Service indication	Weight approx. [kg]
			a	b	c	c ₁	d ₁ ¹⁾	e	h	h ₁	h ₂		
Nominal flow rate: 40 l/min ¹⁾													
67 502 62 256	1	W 920	90	40	–	–	G 1/2	M 8,	147	22	–	–	1.2
67 502 62 236	2	W 920	90	40	21.5	24	G 1/2	16	147	22	46	optical	1.2
67 502 62 226	3	W 920	90	40	21.5	24	G 1/2	deep	147	22	62	electrical	1.3
Nominal flow rate: 40 l/min ²⁾													
67 503 62 306	1	W 940	90	40	–	–	G 1/2	M 8,	194	22	–	–	1.2
67 503 62 276	2	W 940	90	40	21.5	24	G 1/2	16	194	22	46	optical	1.2
67 503 62 266	3	W 940	90	40	21.5	24	G 1/2	deep	194	22	62	electrical	1.3
Nominal flow rate: 70 l/min ²⁾													
67 506 62 706	1	W 962/2	95	47,5	–	–	G 1	M 10,	269	25	–	–	1.6
67 506 62 666	2	W 962/2	95	47,5	28.5	26	G 1	20	269	25	46	optical	1.6
67 506 62 676	3	W 962/2	95	47,5	28.5	26	G 1	deep	269	25	62	electrical	1.7

1) Other threads upon request.

2) Flow rate values are only valid for liquids with 36 mm²/sec and flow resistance according to the diagram on page 28.

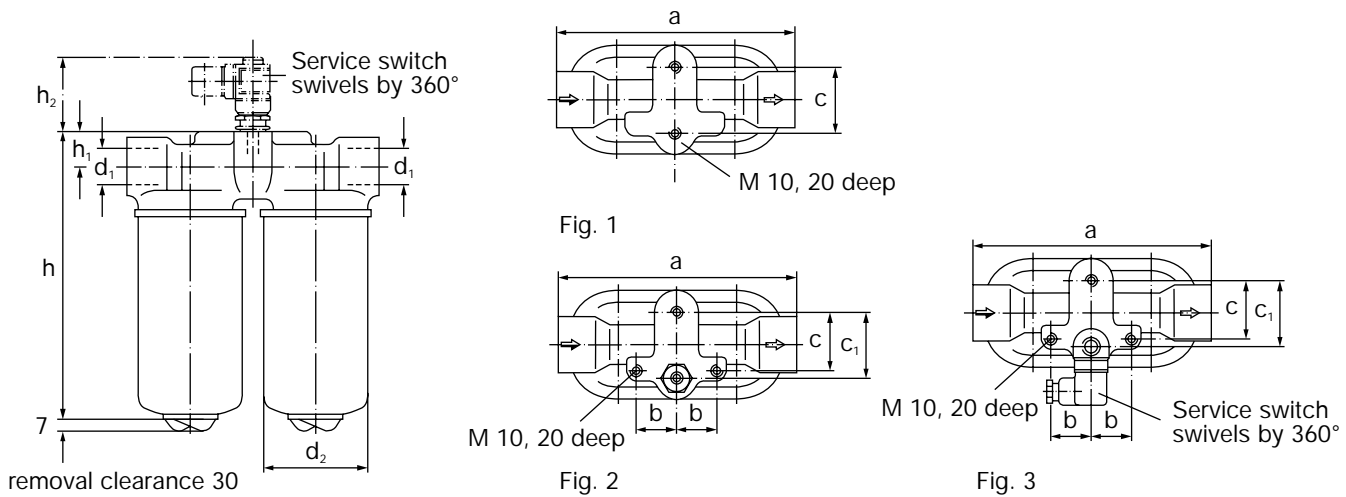
MANN In-line filters

Nominal pressure 14 bar (1.4 MPa)



Part No.	Fig.	Nominal flow rate [l/min] ¹⁾	Spin-on filter	h ₂ [mm]	Service indication	Weight approx. [kg]
67 612 62 146	1	100	W 11 102	–	–	4.1
67 612 62 176	2	100	W 11 102	46	optical	4.2
67 612 62 166	3	100	W 11 102	62	electrical	5.2

1) Flow rate values are only valid for liquids with 36 mm²/sec and flow resistance according to the diagram on page 28.



Part No.	Fig.	Nom. flow rate [l/min] ³⁾	Spin-on filter	Dimensions in mm and inches								Service indication	Weight approx. [kg]	
				a	b	c	c ₁	d ₁ ²⁾	d ₂	h	h ₁			h ₂
67 512 62 106	1	120	2x W 962/2	200	–	47,5	–	G 1	93	275	30	–	–	2.8
67 512 62 136	2	120	2x W 962/2	200	40	43	47.5	G 1	93	275	30	46	optical	2.8
67 512 62 126	3	120	2x W 962/2	200	40	43	47.5	G 1	93	275	30	62	electrical	4.2
67 625 62 106 ¹⁾	1	180	2x W 11 102	270	–	70	–	G 1 1/2	108	337	35	–	–	4.6
67 625 62 116 ¹⁾	2	180	2x W 11 102	270	45	65	70	G 1 1/2	108	337	35	46	optical	4.8
67 625 62 126 ¹⁾	3	180	2x W 11 102	270	45	65	70	G 1 1/2	108	337	35	62	electrical	4.7

1) Filters supplied without release cam.

2) Other threads upon request.

3) Flow rate values are only valid for liquids with 36 mm²/sec and flow resistance according to the diagram on page 28.

MANN In-line filters

Nominal pressure 35/25/20 bar (3.5/2.5/2.0 MPa)

Characteristics

Flow resistance as per ISO 3968 at 36 mm²/sec.

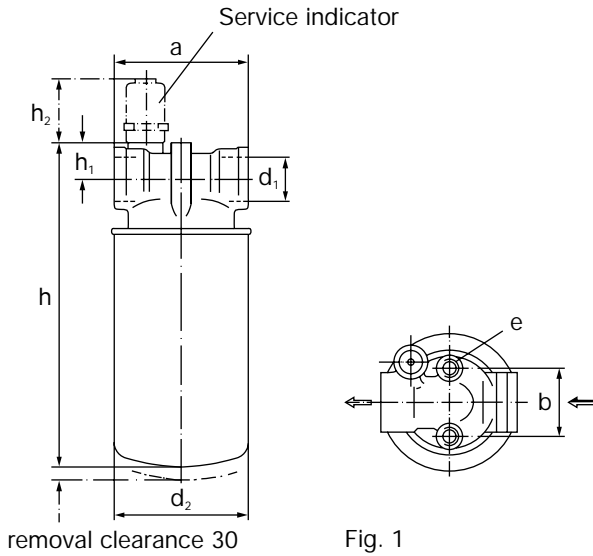


Fig. 1

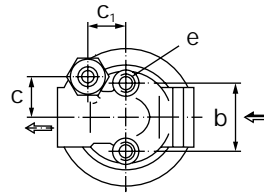
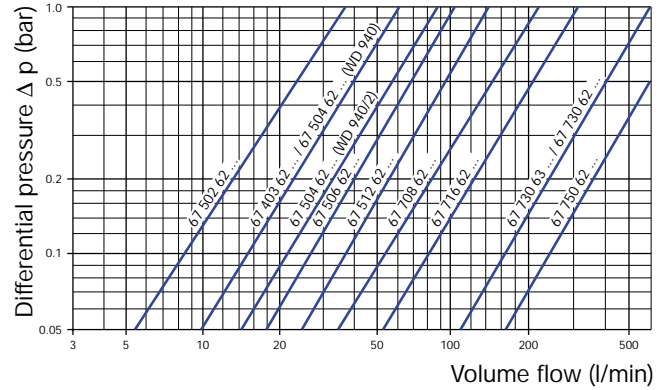


Fig. 2

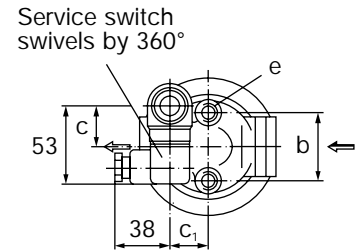


Fig. 3

Part No.	Fig.	Nominal flow rate [l/min] ³⁾	Spin-on filter	Dimensions in mm and inches										Service indication	Weight approx. [kg]		
				a	b	c	c ₁	d ₁ ¹⁾	d ₂	e	h	h ₁	h ₂				
Operating pressure 35 bar (3.5 MPa)																	
67 403 62 246	1	20	WD 724/3	90	40	-	-	G 1/2	76	M 8, 16 deep	192	22	-	-	0.9		
Operating pressure 25 bar (2.5 MPa)																	
67 502 62 246	1	25	WD 920	90	40	-	-	G 1/2	93		149	22	-	-	0.73		
67 502 62 216	2	25	WD 920	90	40	21.5	24	G 1/2	93		149	22	46	optical	0.83		
67 502 62 206	3	25	WD 920	90	40	21.5	24	G 1/2	93		149	22	62	electric.	0.83		
67 504 62 436	1	40	WD 940	90	40	-	-	G 1/2	93		196	22	-	-	1.3		
67 504 62 456	2	40	WD 940	90	40	21.5	24	G 1/2	93		196	22	46	optical	1.4		
67 504 62 446	3	40	WD 940	90	40	21.5	24	G 1/2	93		196	22	62	electric.	1.4		
67 504 62 426	1	35	WD 940/2	95	47.5	-	-	G 1	93		M 10, 20 deep	203	25	-	-	0.87	
67 504 62 416	2	35	WD 940/2	95	47.5	28.5	26	G 1	93			203	25	46	optical	0.97	
67 504 62 406	3	35	WD 940/2	95	47.5	28.5	26	G 1	93	203		25	62	electric.	0.97		
67 506 62 756	1	70	WD 962	95	47.5	-	-	G 3/4	93	271		25	-	-	2.7		
67 506 62 696	1	70	WD 962	95	47.5	-	-	G1	93	271		25	-	-	2.7		
67 506 62 656	2	70	WD 962	95	47.5	28.5	26	G1	93	271		25	46	optical	2.8		
67 506 62 646	3	70	WD 962	95	47.5	28.5	26	G1	93	271		25	62	electric.	2.8		
Operating pressure 20 bar (2.0 MPa)																	
67 708 62 146 ²⁾	1	95	WD 1374	135	56	-	-	G 1 1/4	136	M 10, 20 deep		246	28	-	-	3.0	
67 708 62 156 ²⁾	2	95	WD 1374	135	56	30	26	G 1 1/4	136			246	28	46	optical	3.1	
67 708 62 166 ²⁾	3	95	WD 1374	135	56	30	26	G 1 1/4	136		246	28	62	electric.	3.1		
67 716 62 216	1	180	WD 13 145	135	56	-	-	G 1 1/4	136		371	28	-	-	3.4		
67 716 62 226	2	180	WD 13 145	135	56	30	26	G 1 1/4	136		371	28	46	optical	3.5		
67 716 62 236	3	180	WD 13 145	135	56	30	26	G 1 1/4	136		371	28	62	electric.	3.5		

1) Other threads upon request.

2) Without bypass valve.

3) Flow rate values are only valid for liquids with 36 mm²/sec and flow resistance according to the above diagram.

MANN In-line filters

Nominal pressure 25/20 bar (2.5/2.0 MPa)

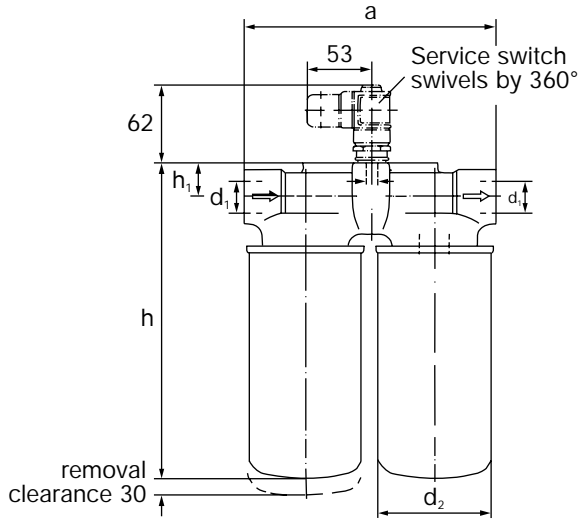


Fig. 1

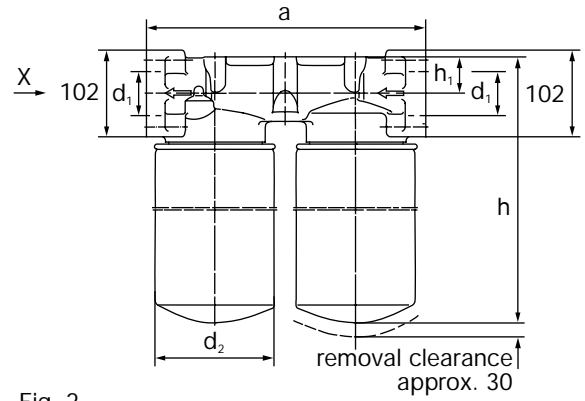


Fig. 2

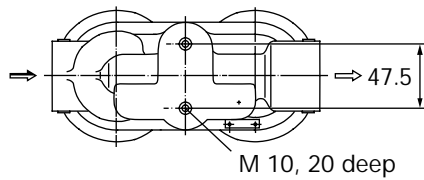


Fig. 1.1

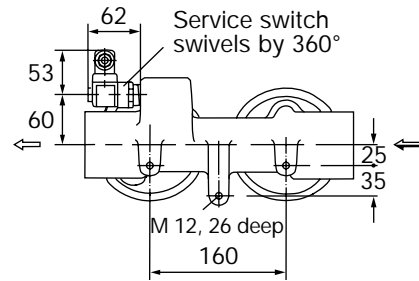
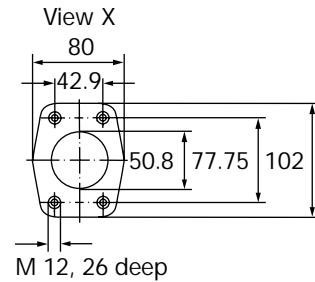
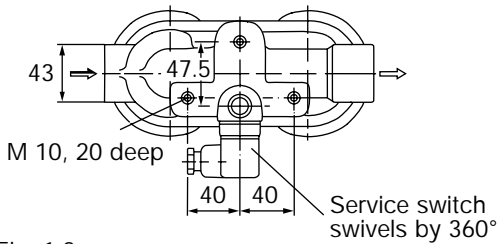


Fig. 1.2



Part No.	Fig.	Nominal flow rate [l/min] ³⁾	Spin-on filter	Dimensions in mm and inches					Operating pressure [bar] [MPa]		Service indication	Weight approx. [kg]
				a	d ₁ ²⁾	d ₂	h	h ₁				
67 512 62 156	1.1	120	2 x WD 962	200	G 1	93	277	30	25	2.5	-	4.1
67 512 62 166	1.2	120	2 x WD 962	200	G 1	93	277	30	25	2.5	optical	4.2
67 512 62 176	1.2	120	2 x WD 962	200	G 1	93	277	30	25	2.5	electrical	4.2
67 730 63 126	2	360	2 x WD 13 145	320	SAE ¹⁾	136	402	42	20	2	-	6.8
67 730 63 116	2	360	2 x WD 13 145	320	SAE ¹⁾	136	402	42	20	2	optical	6.9
67 730 63 106	2	360	2 x WD 13 145	320	SAE ¹⁾	136	402	42	20	2	electrical	6.9
67 730 62 296	2	360	2 x WD 13 145	320	G 2	136	402	42	20	2	-	6.8
67 730 62 266	2	360	2 x WD 13 145	320	G 2	136	402	42	20	2	optical	6.9
67 730 62 256	2	360	2 x WD 13 145	320	G 2	136	402	42	20	2	electrical	6.9

1) Available upon request: 1 counterflange (with 4 screws and 4 spring washers), Part No. 22 078 21 101.

2) Other threads upon request.

3) Flow rate values are only valid for liquids with 36 mm²/sec and flow resistance according to the diagram on page 31.

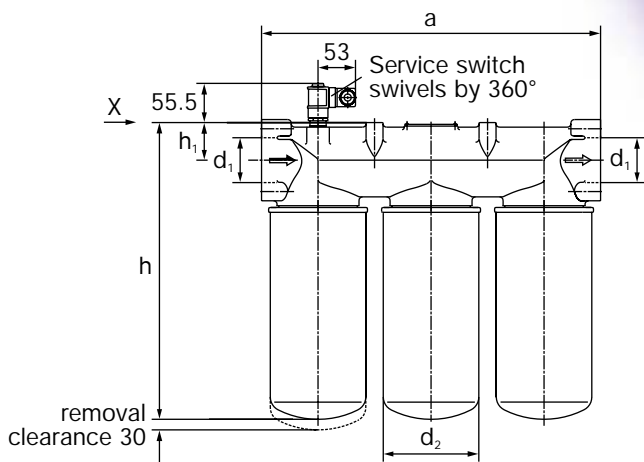
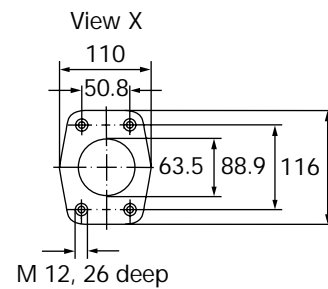
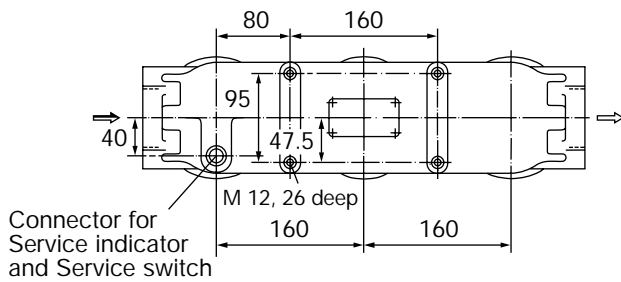


Fig. 1



Part No.	Fig.	Nominal flow rate [l/min] ¹⁾	Spin-on filter	Dimensions in mm					Operating pressure [bar] [MPa]		Service indication	Weight approx. [kg]
				a	d ₁	d ₂	h	h ₁				
67 750 62 106	1	540	3 x WD 13 145	480	SAE	136	424.5	53.5	20	2	-	10.2
67 750 62 116	1	540	3 x WD 13 145	480	SAE	136	424.5	53.5	20	2	optical	10.2
67 750 62 126	1	540	3 x WD 13 145	480	SAE	136	424.5	53.5	20	2	electrical	10.2

1) Flow rate values are only valid for liquids with 36 mm²/sec and flow resistance according to the diagram on page 31.

MANN In-line filters, selectable duplex

Nominal pressure 25/20/10 bar (2.5/2.0/1.0 MPa)

Switching filter halves allows maintenance of the filter without turning off the unit.

Characteristics

Flow resistance as per ISO 3968 at 36 mm²/sec.

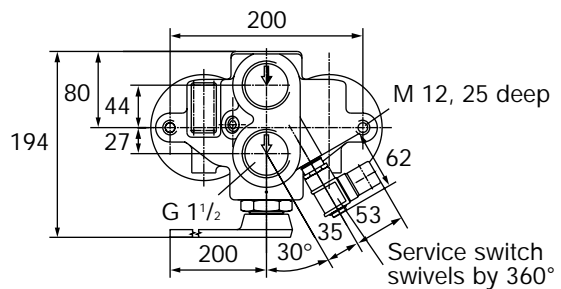
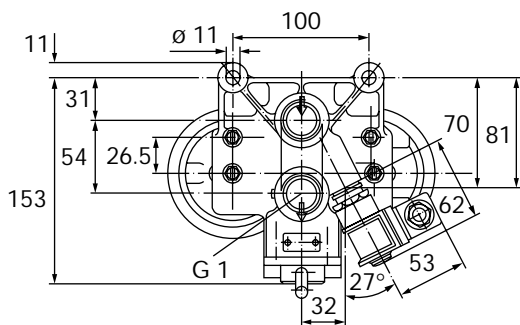
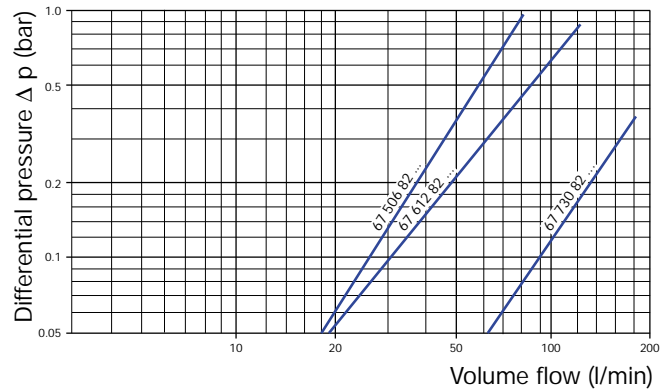
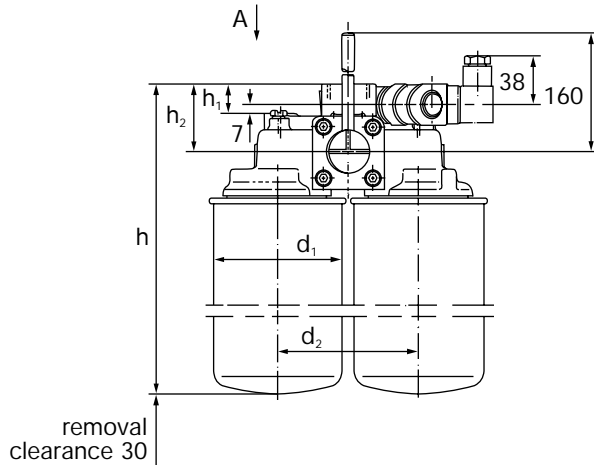


Fig. 1

Fig. 2

Part No.	Fig.	Nominal flow rate ²⁾ [l/min]	Spin-on filter	Dimensions in mm					Operating pressure [bar] [MPa]	Service indication	Weight approx. [kg]
				d ₁	d ₂	h	h ₁	h ₂			
67 506 82 176 ³⁾	1	80	2 x WD 962	93	102	294	22	50	25 2.5	-	4.3
67 506 82 166	1	80	2 x WD 962	93	102	294	22	50	25 2.5	optical	4.4
67 506 82 136	1	80	2 x WD 962	93	102	294	22	50	25 2.5	electrical	4.4
67 612 82 116	2	100	2 x W 11 102 ¹⁾	108	130	373	53	71	10 1	-	7.3
67 612 82 146	2	100	2 x W 11 102 ¹⁾	108	130	373	53	71	10 1	electrical	7.3

1) With non-return valve.

2) The flow rates indicated apply to liquids with a viscosity of 36 mm²/sec. (cSt) given a flow resistance of 0.4 to 0.6 bar (40 to 60 kPa). Nominal flow rate of a filter half.

3) Selector lever SW 24, Part No. 02 086 01 024.

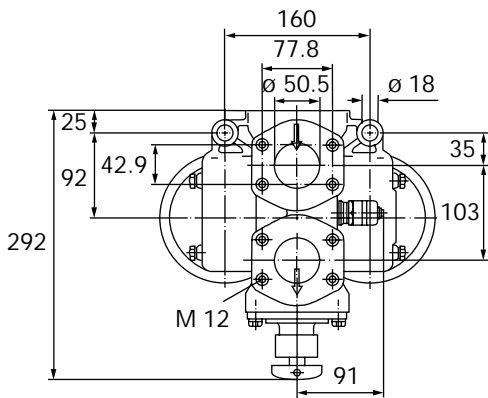
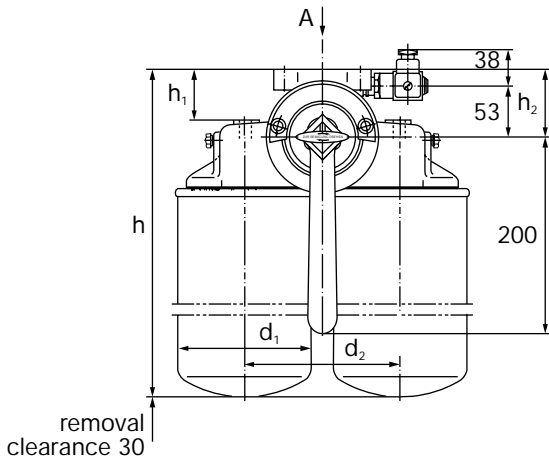


Fig. 1

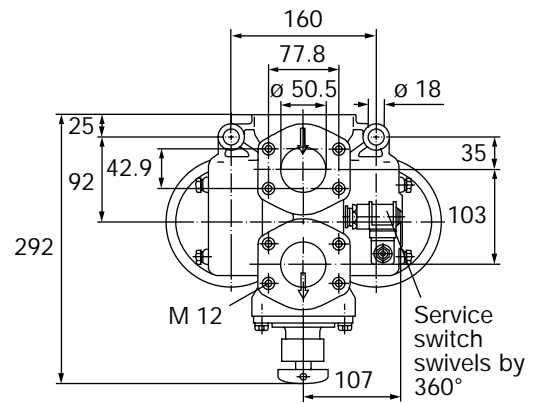


Fig. 2

Part No.	Fig.	Nominal flow rate ²⁾ [l/min]	Spin-on filter	Dimensions in mm					Operating pressure [bar] [MPa]	Service indication	Weight approx. [kg]
				d ₁	d ₂	h	h ₁	h ₂			
67 730 82 106 ¹⁾	1	180	2 x WD 13 145	136	160	424	52	70	20 2	-	9.7
67 730 82 126 ¹⁾	1	180	2 x WD 13 145	136	160	424	52	70	20 2	optical	9.8
67 730 82 116 ¹⁾	2	180	2 x WD 13 145	136	160	424	52	70	20 2	electrical	9.8

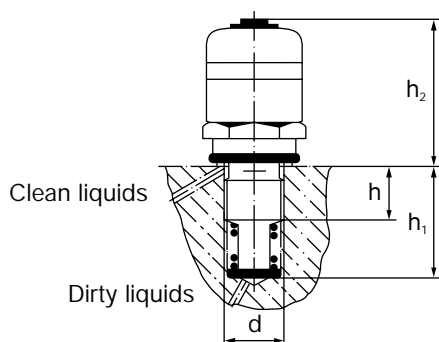
¹⁾ Available upon request: 1 counterflange (with 4 screws and 4 spring washers), Part N° 22 078 21 101.

²⁾ The flow rates indicated apply to liquids with a viscosity of 36 mm²/sec. (cSt) given a flow resistance of 0.4 to 0.6 bar (40 to 60 KPa).
Nominal flow rate of a filter half.

MANN Service indicators

For In-line and high-pressure filters

MANN Service indicators signal that the filter element is clogged and needs servicing. A red signal appears in the display window. Permissible operating temperature: 120 °C.



Part No.	Dimensions in mm				Operating pressure		Switching pressure	
	d	h	h ₁	h ₂	[bar]	[MPa]	[bar]	[KPa]
59 020 79 202	M 18x1.5	22	36	46	25	2.5	1.8	180
59 020 79 212	M 10x1	16	–	44	25	2.5	1.8	180
59 020 79 315	M 24x2	19	44.5	44	400	40	5	500

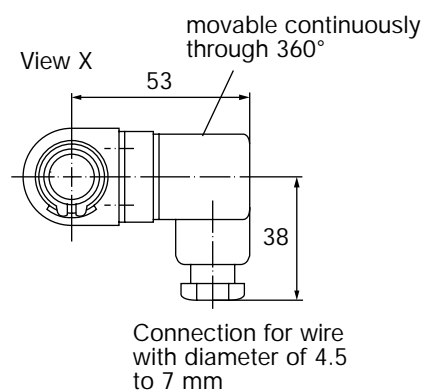
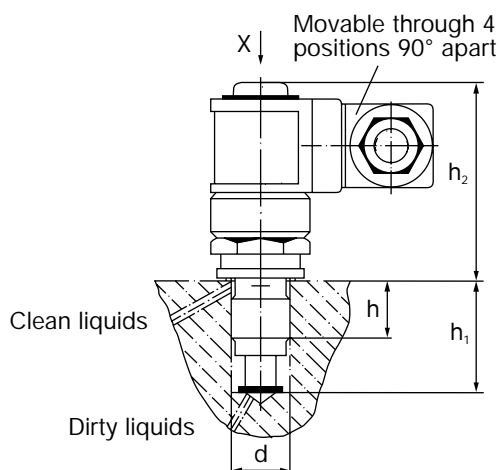
MANN Service indicators

For In-line and high-pressure filters



When the time has come for service, the solenoid switch activates a signal device (e.g. pilot lamp or buzzer) or a switch-off device.

- Operating temperature: max. 120 °C
- Switch type: make/break contact
- Breaking voltage: max. 220 V
- Rupturing capacity: max. 12 W/18 VA
- Inrush current: max. 0.8 A
- Protection: IP 65 protective insulation



Part No.	Dimensions in mm				Operating pressure		Switching pressure	
	d	h	h ₁	h ₂	[bar]	[MPa]	[bar]	[KPa]
59 010 79 202	M 18x1.5	22	36	62.5	25	2.5	1.8	180
59 010 79 305	M 24x2	19	59.5	61	400	40	5	500
59 010 79 315 ¹⁾	M 24x2	19	44.5	61	400	40	5	500
59 010 79 405	M 18x1.5	7.5	44.5	62.5	220	17.5	5	500

1) With opening pressure for bypass valve of 7 ± 0.9 bar.

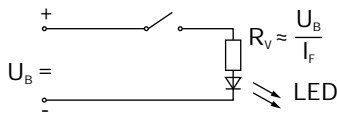
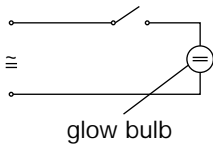
Service switches

For In-line and high-pressure filters

Recommendations for electrical installation of service switches

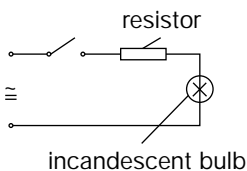
Each service switch is equipped with a high-quality relay (reed contact). In order to ensure trouble-free operation, observe the following:

1. We recommend using a low voltage neon-glow bulb or LED for electric/optical display. Both can be switched on and off directly without spark arrestors.



Specify R_v such that $I_f = \text{approx. } 15 \text{ to } 20 \text{ mA}$

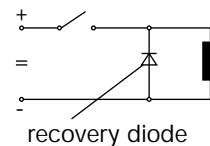
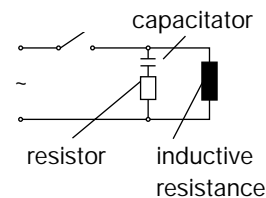
2. Incandescent bulbs require a very high switch-on current compared to their operating current. Therefore, select the bulb and a series resistor in such a way that the switch's maximum rating (refer to plaque on unit) is not exceeded when it is turned on. We recommend selecting the series resistor in such a way that the current reaching the switch is still under the switch's peak switch-on current level before counting the incandescent bulb. That protects it completely against overload; it does mean, however, that the bulb receives only undervoltage.



3. By switching inductive loads, current peaks may be induced that might destroy the service switch. Therefore, if using alternating current, install an RC combination parallel to the relay or protection coil; if using DC, install a recovery diode (such as a 1 N 4007 diode) parallel to the inductivity in the reverse direction.

By dimensioning the sparkarresting devices, observe any guidelines issued by the manufacturer of the protection coil or relay.

In neither case is it permissible to exceed the switch's maximum rating (refer to plaque on unit).



MANN Suction filters



Background picture: Deutz Fahr Agrartechnik

MANN Suction filters ...



MANN Suction filters are used primarily in hydraulic circuits.

Design and operation

The filters consist of a filter head with two threads, mounting holes and a MANN micro-Top spin-on filter.

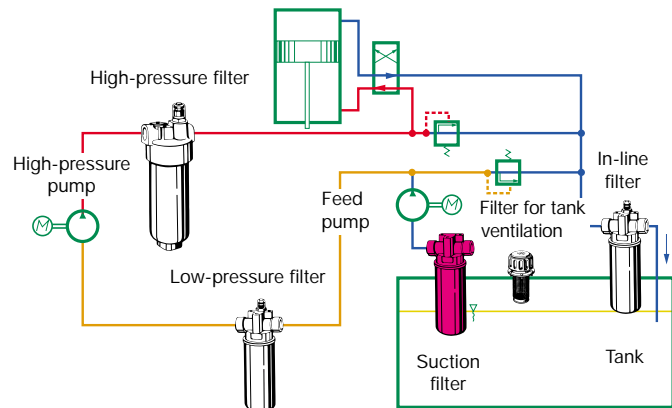
Technical data

Filter fineness:	12 µm 50% fractional separation efficiency (single pass) 30 µm 99% fractional separation efficiency (single pass) Other filter fineness upon request
Nominal flow rate:	60 l/min
Version with bypass valve available	
Operating pressure:	-0.8 bar (-80 KPa)
Operating temperature:	max. 120 °C
Material:	Filter head made of cast aluminium
Service indicator:	Indication range: -1/+0.6 bar
Service switch:	Switching at a differential pressure of -0.5 ± 0.2 bar (-50 ± 20 KPa) Breaking voltage max. 42 V \cong Inrush current: 1 A Rupturing capacity: max. 12 W Switch type: make contact

Assembly and maintenance

The in-line suction filters are installed in pipelines (see dimension table for threads). The maintenance is limited to the replacement of the clogged filter. The necessity of servicing can be indicated by means of a pressure measuring device or service switch.

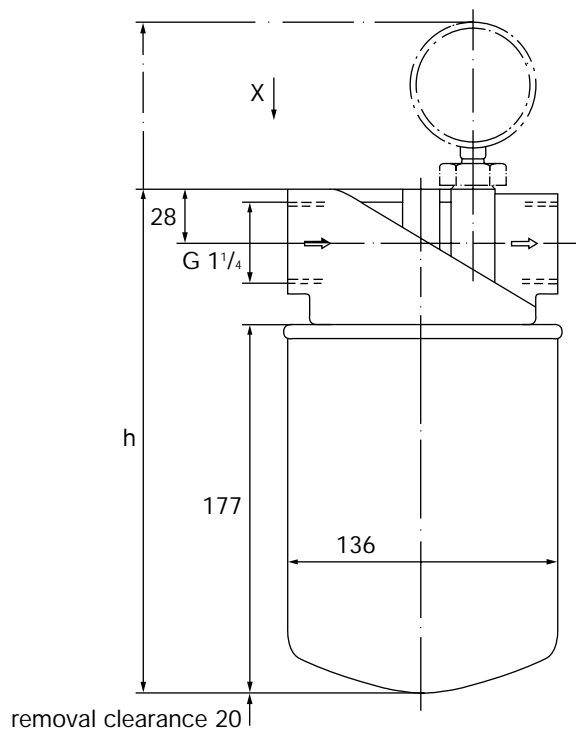
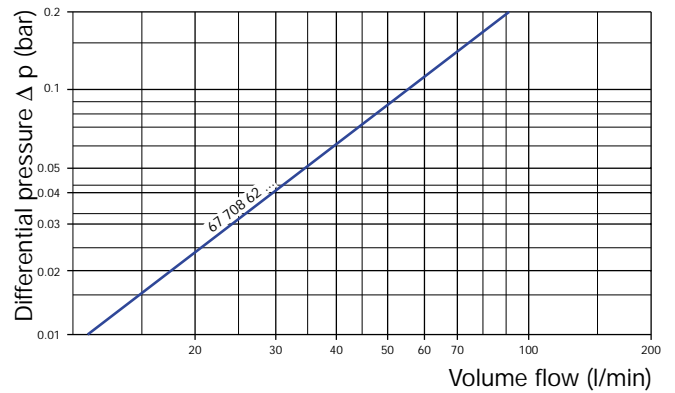
MANN Filters in hydraulic circuits



... for in-line installation

Characteristics

Flow resistance as per ISO 3968 at 36 mm²/sec.

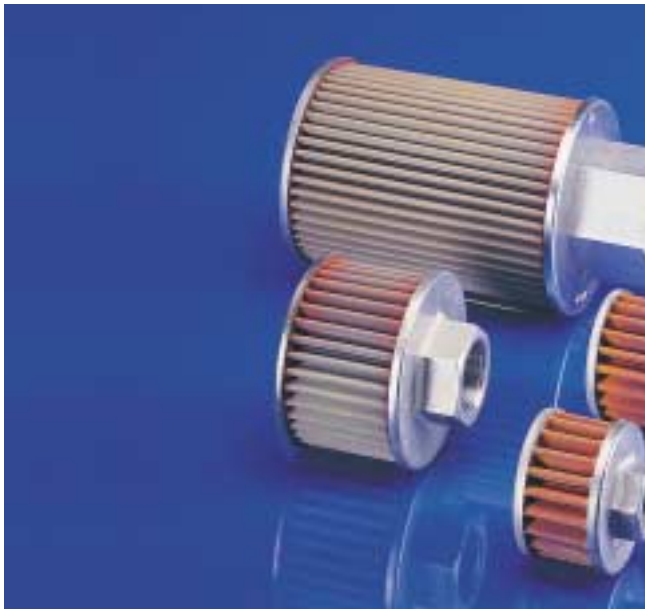


Part No. Complete filter	Nominal flow rate [l/min]	Spin-on filter	Dimensions in mm			Service indicator
			c	c ₁	h	
67 708 62 186	60	W 1374/2	-	-	246	-
67 708 62 206	60	W 1374/2	30	26	336	optical
67 708 62 266	60	W 1374/2	30	26	330	electrical
67 708 62 276	60	W 1374/4 ¹⁾	-	-	246	-
67 708 62 286	60	W 1374/4 ¹⁾	30	26	336	optical

¹⁾ Spin-on filter with bypass valve, opening pressure 0.2 + 0.15 bar (20 + 15 KPa).
Other threads upon request.

MANN Suction filters

Star-pleated strainer design



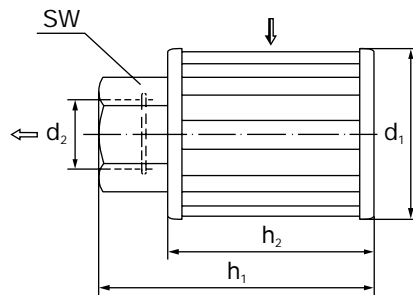
MANN Star-pleated strainer filters are used primarily for suction operation in hydraulic tanks.

Assembly and maintenance

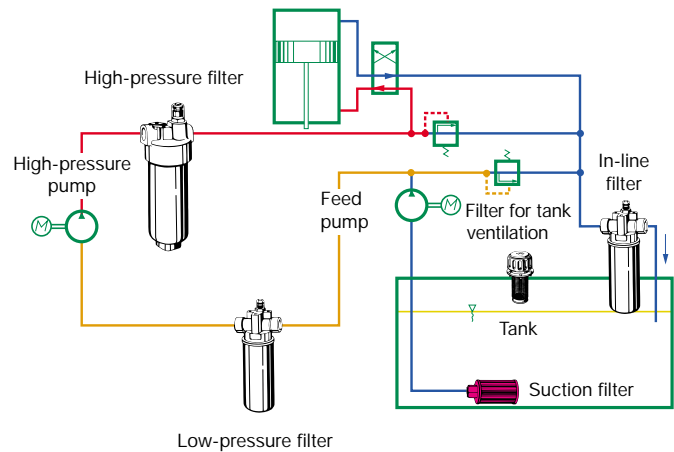
The filter is screwed directly onto the suction socket of the feed pump or a similar suction pipe. The filter maintenance is carried out latest when an oil change becomes necessary.

Technical data

- Filter fineness: 100 μm
(other fineness upon request)
- Strainer web: Phosphor bronze



MANN Filters in hydraulic circuits



Part No.	Nominal flow rate [l/min] ¹⁾	Filtering surface [cm ²]	Dimensions in mm and inches					Weight approx. [kg]
			d ₁	d ₂	h ₁	h ₂	SW	
62 300 53 551	20	170	61	G 1/2	55	42	27	0.15
62 300 53 571	30	310	61	G 1/2	84	71	27	0.20
62 300 53 541	30	310	61	G 3/4	87	70.5	36	0.25
62 500 53 411	45	460	87	G 1	85	63.5	41	0.50
62 501 53 281	60	650	87	G 1	105	84	41	0.70
62 501 53 291	80	900	87	G 1	155	134	41	0.75
62 602 53 251	120	1 400	110	G 1 1/2	165	120	60	1.10
62 602 53 261	150	1 800	110	G 1 1/2	205	160	60	1.20

¹⁾ Flow rates apply to liquids with a viscosity of 36 mm²/sec. (cSt) at a flow resistance < 0.1 bar (10 KPa).

MANN Filters for two-way ventilation in hydraulic systems



Background picture: Linde

MANN Pico air filters ...

MANN Pico air filters are single-stage air filters used mainly for the two-way ventilation of liquid tanks.

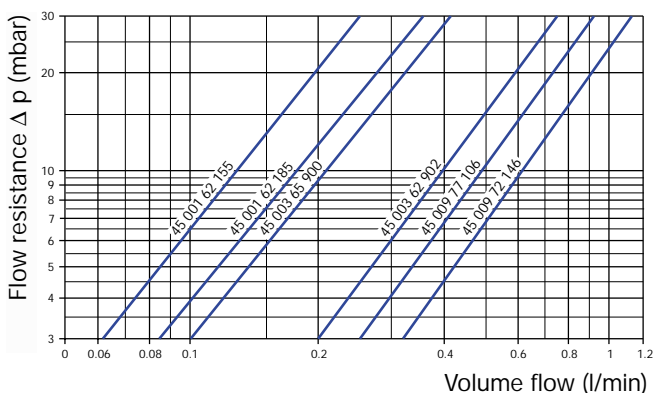
Design

The filtration is ensured by a MANN micro-Top filter element. The MANN Pico air filter can be supplied with integrated pressure control valve (see fig. 4 on page 45). Provided that the configuration is correct, air exchange in the tank will be almost completely avoided and air carrying oil will not escape.

Assembly

The filters must be installed in an area of the tank where the dust level is low. To ensure perfect operation, position them vertically ($\pm 15^\circ$ variation). Fasten them with a clamping socket, plug or bayonet type cap, flanged or threaded connection.

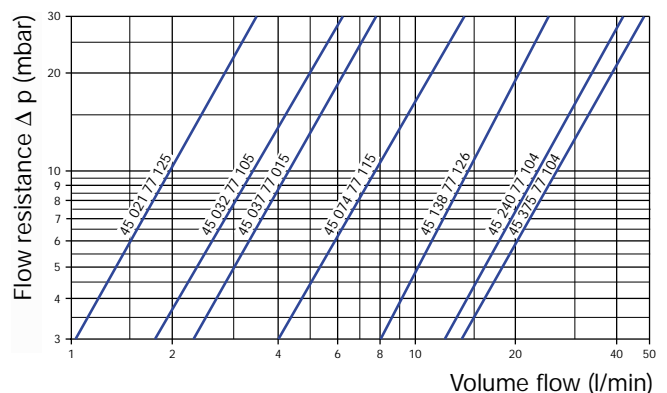
Characteristics



Maintenance

Fig. 1, 2 and 4 (Page 45): On maintenance, the complete filter is replaced by a new one.

Fig. 3 (Page 45): The MANN micro-Top filter element is replaced after the hood has been removed.



... for hydraulic systems

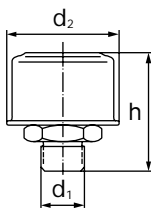


Fig. 1

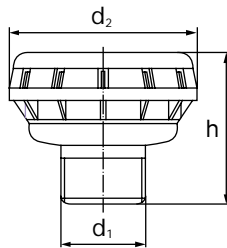


Fig. 2

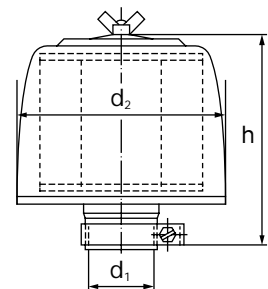


Fig. 3

Part No.	Fig.	Nominal flow rate [m ³ /min]	Dimensions in mm and inches			Weight approx. [kg]	Respective MANN micro-Top filter element
			d ₁	d ₂	h		
45 001 62 155	1	–	M 14x1.5	45	47	0.05	- ¹⁾
45 001 62 185	1	–	M 18x1.5	45	47	0.08	- ¹⁾
45 003 65 900	2	–	35	80	65	0.06	- ¹⁾
45 003 62 902	2	–	G 3/4	80	73.5	0.08	- ¹⁾
45 009 72 146	3	0.5	M 26x1.5	98	110	0.3	C 75/4
45 009 77 106	3	0.5	20	98	110	0.3	C 75/4
45 021 77 125	3	2.0	40	132	120	0.5	C 1112
45 032 77 105	3	3.5	52	132	152	0.65	C 1132
45 037 77 015	3	4.5	60	170	175	1.1	C 1337
45 074 77 115	3	8.0	80	208	185	1.3	C 1574
45 138 77 126	3	15.0	100	283	200	7.0	C 21 138/1
45 240 77 104	3	23.0	140	318	302	9.0	C 26 240
45 375 77 104	3	32.0	180	396	285	11.0	C 30 375

¹⁾ On maintenance, the complete filter is replaced by a new one.

MANN Pico air filters with pressure control valve

Part No.	Nominal flow rate [m ³ /min]	Opening pressure [bar] [KPa]	Weight approx. [kg]
45 003 62 900	0.2	0.85 85	0.1
45 003 62 901	0.2	0.35 35	0.1

On maintenance, the complete filter is replaced by a new one.

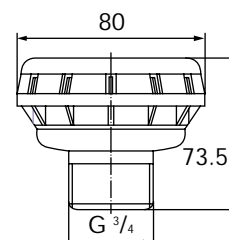


Fig. 4

Filters for two-way ventilation with intake strainer

MANN Filters for two-way ventilation are used in liquid tanks for pressure compensation.

Design

Vent filter and intake strainer are combined. The filter element is either a foam insert, star-folded paper or oil-wetted steel net.

Assembly and maintenance

The filters must be installed in an area of the tank where the dust level is low. They may be fastened by a clamping socket, plug or bayonet type cap, flanged or threaded connection. They can be cleaned when they become noticeably dirty.

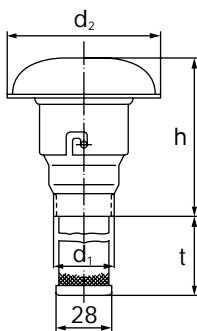


Fig. 1

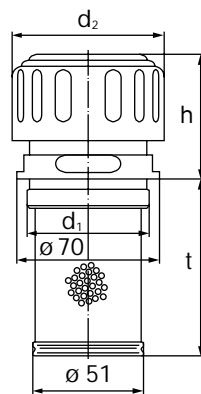


Fig. 2

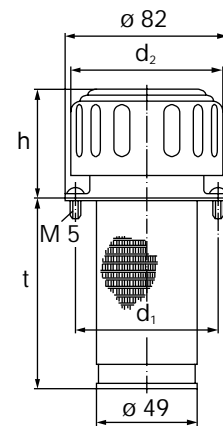


Fig. 3

Part No.	Fig.	Nominal flow rate [m ³ /min ¹⁾]	Dimensions in mm and inches				Weight approx. [kg]
			d ₁	d ₂	h	t	
41 004 62 142	1	0.4	M 33x1.5	76	78	100	0.25
41 004 62 232	1	0.4	G 1 B	76	78	95	0.25
43 010 62 100	2	0.7	G 2	77	64	88	0.4
43 010 63 100 ²⁾	3	0.7	71.5	77	54	96	0.4

1) Given a flow resistance of $\Delta p = 10$ mbar (1 KPa).

2) 6 self-tapping screws (for holes of 4.5 mm diameter) to fasten the filter and a seal are included as standard.

Conversion factors

$$400 \text{ KW} \times 1,341 = 536,4 \text{ HP}$$

Temperature

°F	=	(°C x 9/5) + 32
°C	=	(°F - 32) x 5/9

Power

HP	=	KW x 1.341
KW	=	HP x 0.746

Flow rates

1 litre/min	=	0.0353	cfm
1 m ³ /min	=	35.3140	cfm
1 m ³ /h	=	0.5886	cfm
1 Engl. gallon/min	=	0.1605	cfm

Length

1 m	=	1000 mm	=	39.38 inch	=	3.281 ft.
1 inch	=	25.4 mm	=	0.0254 m	=	0.08333 ft.
1 ft.	=	304.8 mm	=	0.3048 m	=	12 inch

Volume

1 m ³	=	1000 litres	=	35.31 ft. ³	=	61020 inch ³
1 ft. ³	=	28.32 litres	=	0.02832 m ³	=	1728 inch ³
1 litre	=	0.2642 US gallon	=	0.2201 Engl. gallon		
1 US gallon	=	3.785 litres	=	231 inch ³		
1 Engl. gallon	=	4.544 litres	=	277 inch ³		

Weight

1 kg	=	2.205 lb	=	35.27 Oz
1 lb	=	0.4536 kg	=	16 Oz
1 Oz	=	0.02835 kg	=	0.0625 lb

Pressure

1 bar	=	100 KPa	=	14,5 psi	=	401.5 IN. H ₂ O
10 mbar	=	1 KPa	=	0.145 psi	=	4.015 IN. H ₂ O
10 psi	=	68.95 KPa	=	0.6895 bar	=	27.68 IN. H ₂ O
1 IN. H ₂ O	=	0.2491 KPa	=	2.491 mbar	=	0.03613 psi

The MANN+HUMMEL Group

The MANN+HUMMEL group operates worldwide with 9100 employees at 38 company locations around the world. The company develops, produces and distributes highly developed automotive components such as air cleaner systems and intake systems, liquid filter systems and cabin filters as well as filter elements for the servicing and repair of vehicles. Products manufactured also include industrial filters, filter systems and material handling devices for use in the fields of mechanical engineering, process technology and industrial production. MANN+HUMMEL customers operate in many fields with the emphasis on series production in the automobile industry.

Automotive OEM Division

Air Filter Systems Business Unit

- Air filters and air cleaner systems
- Air conduction (unfiltered and filtered air, supercharger lines)
- Components, e.g. mufflers, control valves, design covers
- Crankcase ventilation systems

Intake Manifold Systems Business Unit

- Intake manifold modules and systems, components for spin and tumble control
- Engine components, e.g. fuel supply rails, secondary turbochargers, cylinder head covers
- Liquid containers for braking and steering oils, windscreen washer systems, headlight cleaning systems
- Complex plastic parts

Liquid Filter Systems Business Unit

- Liquid filter systems in plastic and metal
- Components, e.g. oil pumps, integrated oil-water heat exchangers
- Oil pans, valves
- Oil centrifuges in metal and plastic

Filter elements and Systems for Industry and Trade Division

Filters Business Unit

- Filter elements for air and liquids
- Cabin filters for particle filtration and gas absorption, combination filters
- Air-drying boxes
- Cooling-water filters
- Spin-on oil filters and fuel filters
- Elements for oil-aerosol separators

Industrial Filters Business Unit

- Air and liquid filters for industrial engines, construction and agricultural machinery, compressors
- Air-oil separators for compressed air systems
- Process filters for mechanical engineering and process technology
- Cabin filters

Industrial Systems and Components Division

ProTec Business Unit

- Systems and equipment for material handling and materials processing in the plastic, rubber, recycling and chemical industries

Hydromation Business Unit

- Systems and equipment for the filtration of machining liquids in mechanical production
- Chip handling systems and chip transport systems