

## Matching filters ...

## ... for every fluid

|   |   |  |                            |
|---|---|--|----------------------------|
| <p><b>Spin-on filters</b></p>                   |    | <ul style="list-style-type: none"> <li>• For the filtration of fuels, lube and hydraulic oils</li> <li>• Application: motors, gears, general machinery</li> </ul>  | <p>Page 4<br/>Page 10</p>  |
| <p><b>Filter elements</b></p>                   |      | <ul style="list-style-type: none"> <li>• For the filtration of fuels, lube and hydraulic oils, coolants and paints</li> <li>• Application: motors, gears, general machinery</li> </ul>   | <p>Page 15</p>             |
| <p><b>Elements for EDM</b></p>                  |    | <ul style="list-style-type: none"> <li>• For the filtration of oil and water based dielectrics</li> <li>• Application: wire and cavity-sinking EDM machines</li> </ul>   | <p>Page 21</p>             |
| <p><b>High-pressure filters</b></p>             |      | <ul style="list-style-type: none"> <li>• For the filtration of lube oils and hydraulic fluids</li> <li>• Application: general machinery, hydraulics</li> </ul>   | <p>Page 27</p>             |
| <p><b>In-line filters</b></p>                   |   | <ul style="list-style-type: none"> <li>• For the filtration of fuels, lube oils and hydraulic fluids</li> <li>• Application: motors, machines, plants, automotive hydraulics</li> </ul>  | <p>Page 37</p>             |
| <p><b>Suction filters</b></p>                   |    | <ul style="list-style-type: none"> <li>• For the filtration of lube and hydraulic oils</li> <li>• Application: hydraulic systems, gears</li> </ul>   | <p>Page 51</p>             |
| <p><b>Picolino</b></p>                          |  | <ul style="list-style-type: none"> <li>• For aeration and ventilation</li> <li>• Application: gears, tanks for liquids</li> </ul>  | <p>Page 55</p>             |
| <p><b>Filters for two-way ventilation</b></p>   |    | <ul style="list-style-type: none"> <li>• For aeration and ventilation</li> <li>• Application: gears, tanks for liquids</li> </ul>  | <p>Page 59</p>             |
| <p><b>Gap-type and backflushing filters</b></p> |  | <ul style="list-style-type: none"> <li>• For the filtration of fluids of high and low viscosity, such as water, polyhydric alcohols, isocyanate, cooling lubricants, processing emulsions and alkaline solutions, paints</li> <li>• Application: general machinery, large-size engines, chemical industry, foaming machines, metal-cutting machinery, industrial washing installations, cooling water systems, power stations, etc.</li> </ul> | <p>Page 63<br/>Page 85</p> |

# Configuring the size of filters for liquids

## Fax to:

**FILTERWERK  
MANN+HUMMEL GMBH**  
Geschäftsbereich Industriefilter, Dept. IF-V1  
67323 Speyer, Germany

Copy, fill out and fax  
Fax No. +49 (62 32) 53 – 81 50

Please send us information on a filter for liquids for the following application:

- Use/process: \_\_\_\_\_
- Liquid to be filtered (if known, indicate manufacturer and name): \_\_\_\_\_
- Viscosity at \_\_\_\_ °C: \_\_\_\_\_ • pH: \_\_\_\_\_
- Nominal flow rate: \_\_\_\_\_ • Required service life: \_\_\_\_\_
- Contamination (g/l or g/work piece): \_\_\_\_\_
- Type of contamination: \_\_\_\_\_
- Operating pressure of installation: \_\_\_\_\_ • Max. perm. working pressure: \_\_\_\_\_
- Max. perm. differential pressure: \_\_\_\_\_ • Max. perm. working temperature: \_\_\_\_\_
- Type of impurities: \_\_\_\_\_
- Form of impurities: (i.g. swarf of various forms): \_\_\_\_\_
- Max. perm. particle size on filtered fluid side or filter rating: \_\_\_\_\_
- Optional filter controller from MANN+HUMMEL:  yes  no
- Other: \_\_\_\_\_

Please submit a proposal for the following services:

- |  |   |
|--|---|
| <input type="checkbox"/> Consultation at installation site | <input type="checkbox"/> Test installation                    |
| <input type="checkbox"/> Series of on-site tests           | <input type="checkbox"/> Assembly and start-up                |
| <input type="checkbox"/> Product-oriented training         | <input type="checkbox"/> Inspection and maintenance agreement |

Company \_\_\_\_\_

Name \_\_\_\_\_

Department \_\_\_\_\_

Street \_\_\_\_\_

Postal code/City \_\_\_\_\_

Country \_\_\_\_\_

Telephone \_\_\_\_\_

Fax \_\_\_\_\_

e-mail: \_\_\_\_\_

# 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  $\mu\text{m}$  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

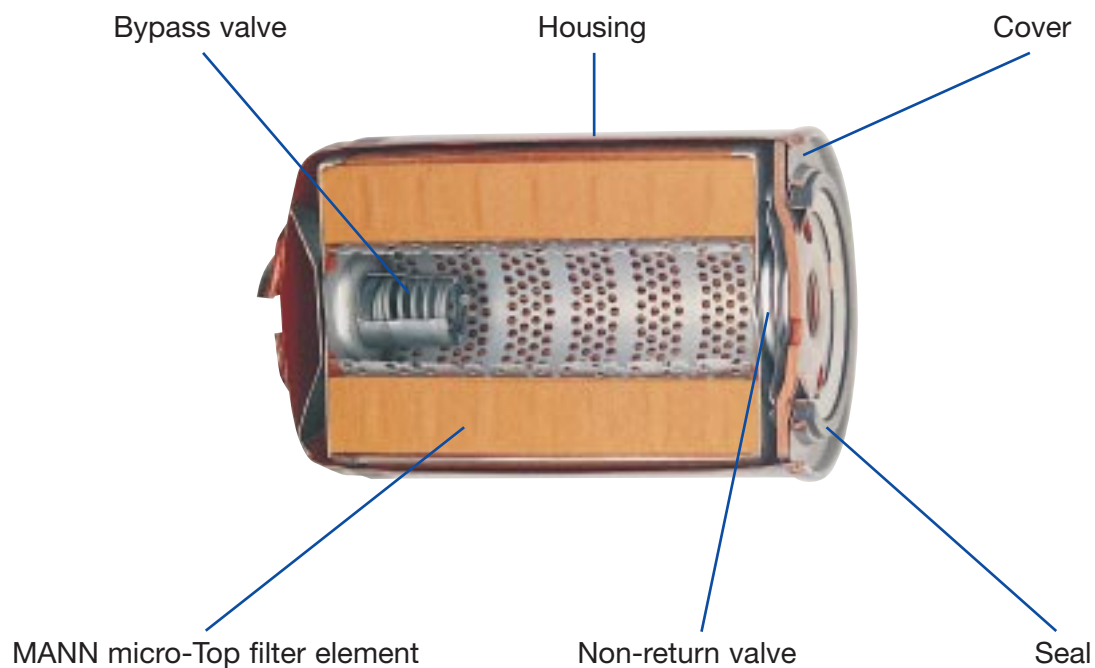
## Maintenance

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 9 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)<br>30 µm 99 % fractional separation efficiency (single pass)<br>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   |

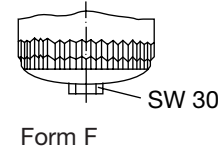
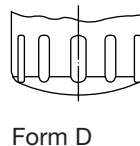
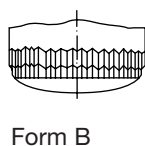
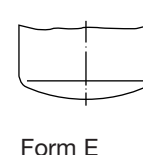
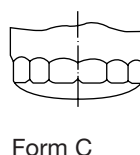
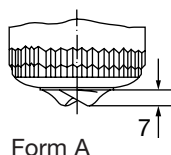
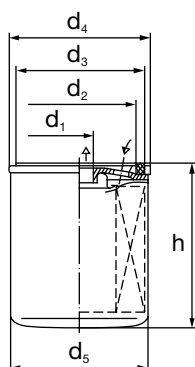
# MANN micro-Top Spin-on filters

## 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 | –                            | –  | 0.2                      | 20  | –                                  |

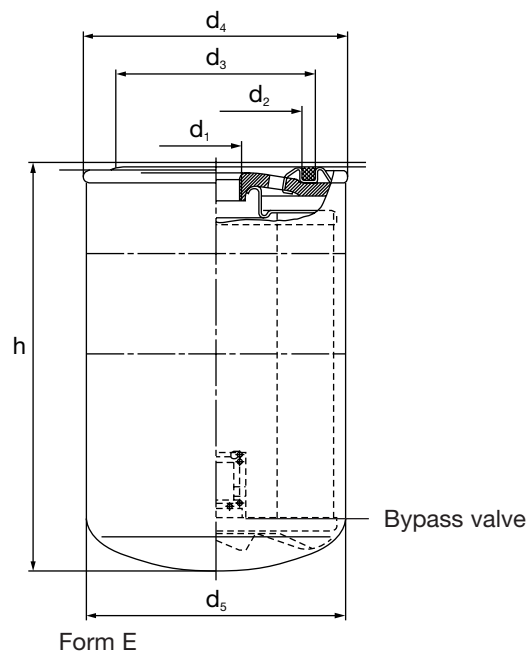
# MANN micro-Top Spin-on filters

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

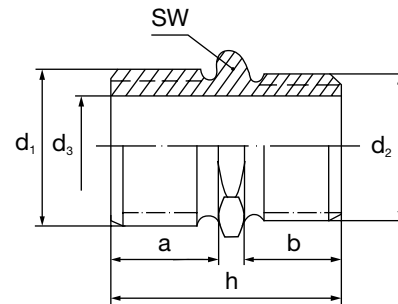
| Part No.  | Form | Nominal flow rate <sup>1)</sup> [l/min] | Dimensions in mm and inches |                |                |                |                |     | Bypass valve [bar] [KPa] |     | Maximum operating pressure [bar] [MPa] |     |
|-----------|------|---|-----------------------------|----------------|----------------|----------------|----------------|-----|--------------------------|-----|--|-----|
|           |      |   | d <sub>1</sub>              | d <sub>2</sub> | d <sub>3</sub> | d <sub>4</sub> | d <sub>5</sub> | h   |                          |     |  |     |
| WD 724/3  | E    | 20                                      | $\frac{3}{4}$ – 16 UNF      | 62             | 71             | 80             | 76             | 140 | 3.5                      | 350 | 35                                     | 3.5 |
| WD 920    | E    | 25                                      | $\frac{3}{4}$ – 16 UNF      | 62             | 71             | 96             | 93             | 97  | 2.5                      | 250 | 25                                     | 2.5 |
| WD 940    | E    | 40                                      | $\frac{3}{4}$ – 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 $\frac{1}{2}$ – 16 UN     | 100            | 111            | 140            | 136            | 177 | –                        | –   | 20                                     | 2.0 |
| WD 13 145 | E    | 180                                     | 1 $\frac{1}{2}$ – 16 UN     | 100            | 111            | 140            | 136            | 302 | 2.5                      | 250 | 20                                     | 2.0 |

<sup>1)</sup> Flow resistance 0.3-0.6 at 36 mm<sup>3</sup>/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.

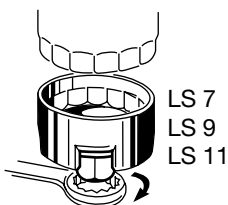


## Dimensions and part numbers

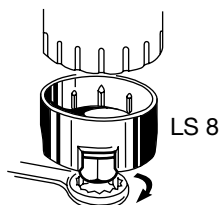
| Part No.      | Dimensions in mm and inches |                |                |      |      |      |    |
|---------------|-----------------------------|----------------|----------------|------|------|------|----|
|               | d <sub>1</sub>              | d <sub>2</sub> | d <sub>3</sub> | a    | b    | h    | SW |
| 21 018 15 331 | M 18x1.5                    | M 18x1.5       | 12             | 10   | 10   | 25   | 24 |
| 21 019 15 111 | $\frac{3}{4}$ – 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 $\frac{1}{8}$ – 16 UN     | M 30x1.5       | 22             | 17.5 | 17.5 | 40   | 32 |
| 21 039 15 101 | 1 $\frac{1}{2}$ – 16 UN     | M 38x1.5       | 30             | 19.5 | 15   | 41   | 46 |

## Removal tool

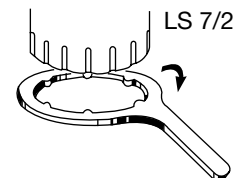
For easy disassembly of the MANN micro-Top Spin-on filters.



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 7) with loosening cam only requires a heavy screwdriver or a round bar, 8 to 10 mm thick, for disassembly.  
Form E (see page 7 and 8) requires the strap-type tool commercially available.



# MANN Fuel filters



## MANN Fuel filters

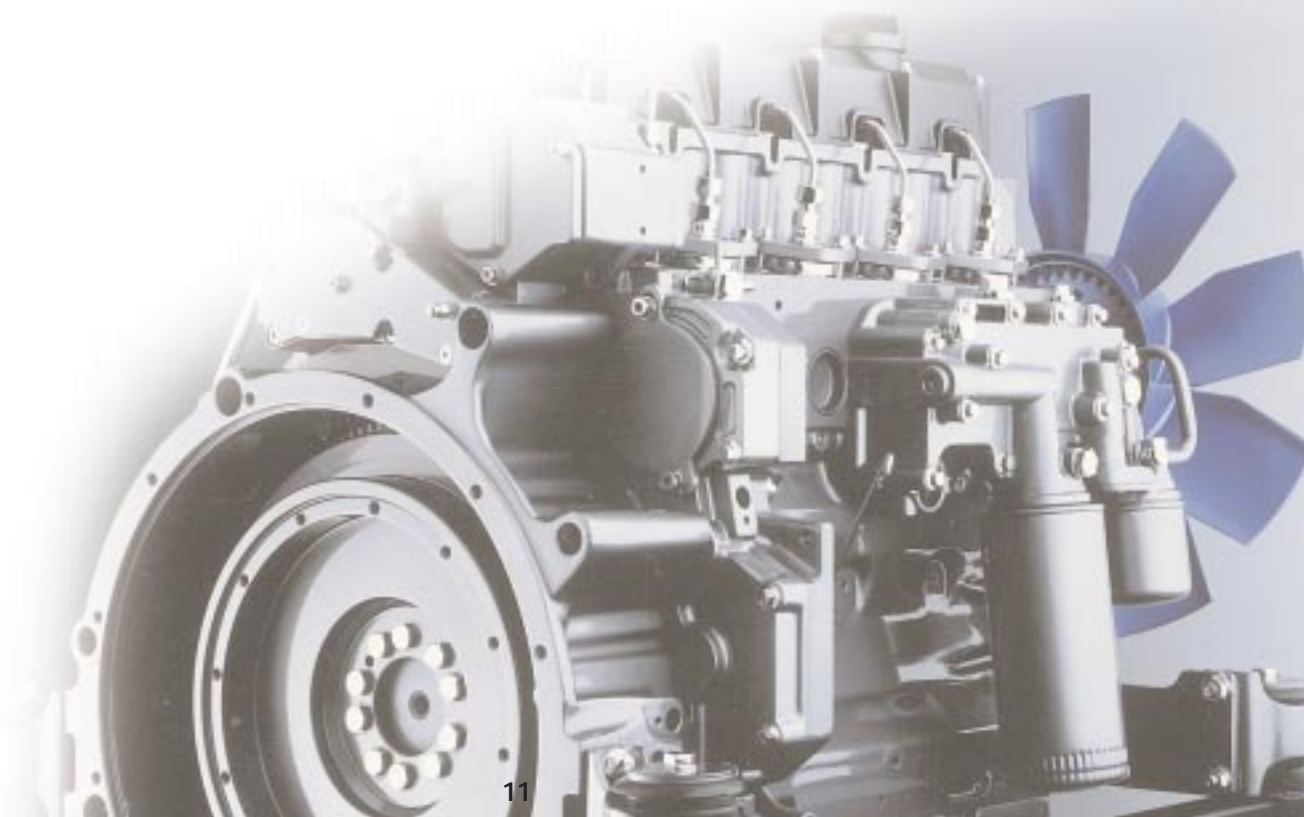
MANN Fuel filters are fine filters used for the elimination of wearing and noxious particles from diesel and gasoline.



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.



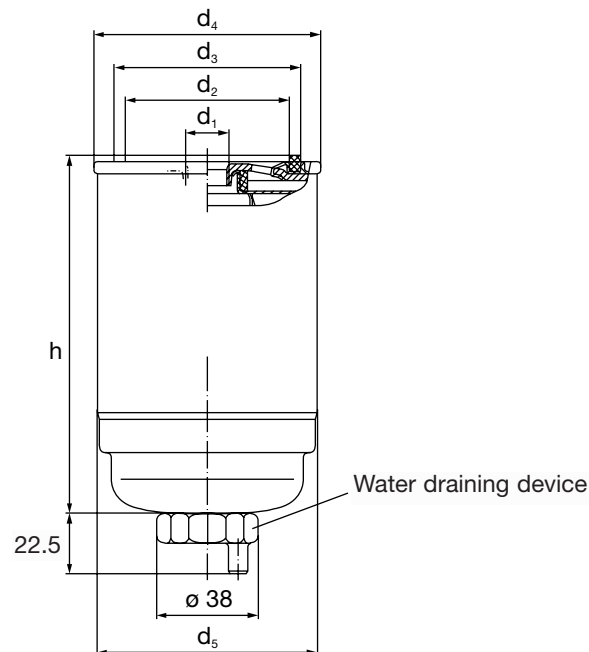
# MANN Fuel filters

## 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  $\mu\text{m}$ .

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 [ $\mu\text{m}$ ] | Nominal flow rate [l/h] | Dimensions in mm and inches |                |                |                |                |     | Maximum operating pressure |       |
|-----------------|-----------------------------------|-------------------------|-----------------------------|----------------|----------------|----------------|----------------|-----|----------------------------|-------|
|                 |                                   |                         | d <sub>1</sub>              | d <sub>2</sub> | d <sub>3</sub> | d <sub>4</sub> | d <sub>5</sub> | h   | [bar]                      | [MPa] |
| <b>WK 842</b>   | 4 – 6                             | 80                      | M 16x1.5                    | 61             | 70             | 84.5           | 81             | 133 | 6                          | 0.6   |
| <b>WK 842/2</b> | 2 – 3                             | 80                      | M 16x1.5                    | 61             | 70             | 84.5           | 81             | 133 | 6                          | 0.6   |
| <b>WK 842/6</b> | 60 (prefilter)                    | 80                      | M 16x1.5                    | 61             | 70             | 84.5           | 81             | 133 | 6                          | 0.6   |

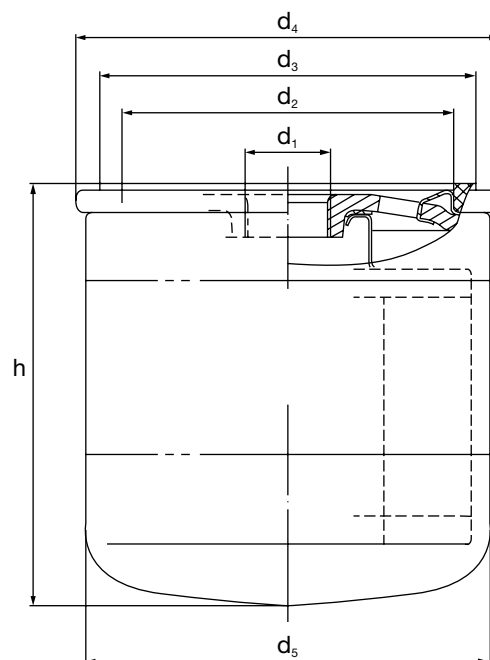
# MANN Fuel filters

## 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  $\mu\text{m}$ .

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 12).



| 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] |
| <b>WK 712/2</b> | 120                     | M 16x1.5                    | 62    | 71    | 80    | 76    | 80  | 6                          | 0.6   |
| <b>WK 731</b>   | 120                     | M 16x1.5                    | 62    | 71    | 80    | 76    | 117 | 6                          | 0.6   |
| <b>WK 731/1</b> | 120                     | M 16x1.5                    | 30    | 38    | 80    | 76    | 115 | 2.5                        | 0.25  |
| <b>WK 712/3</b> | 120                     | M 16x1.5                    | 62    | 71    | 80    | 76    | 80  | 9.5                        | 0.95  |
| <b>WK 723</b>   | 120                     | M 16x1.5                    | 62    | 71    | 80    | 76    | 124 | 9.5                        | 0.95  |
| <b>WK 940/5</b> | 120                     | M 16x1.5                    | 62    | 71    | 96    | 93    | 142 | 6                          | 0.6   |
| <b>WK 962/4</b> | 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).

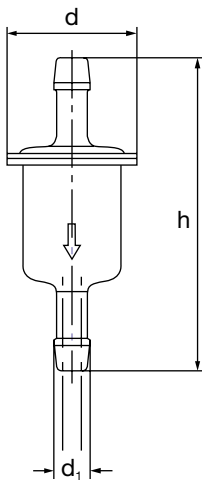


Fig. 1

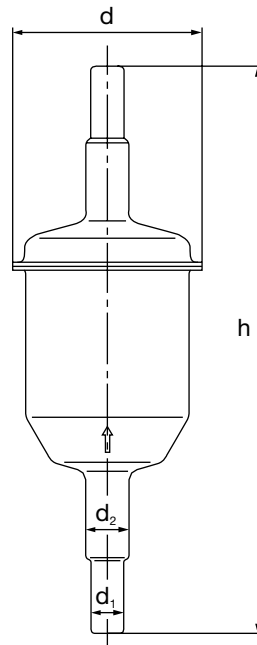


Fig. 2

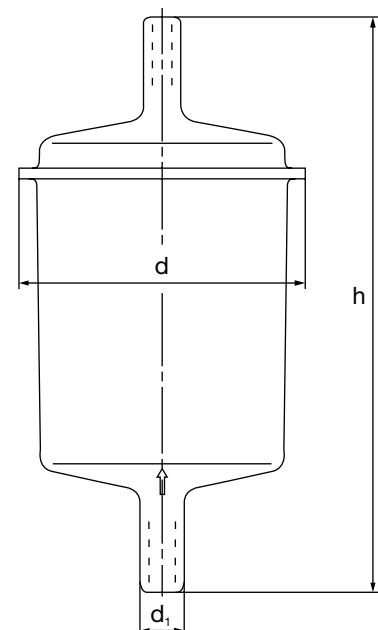


Fig. 3

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

1) right-angled output socket

# MANN micro-Top Filter Elements for filters for liquids

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# 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  $\mu\text{m}$  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.



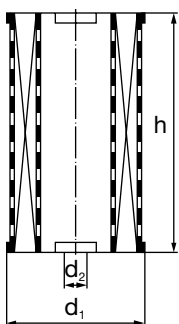
## Operation

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

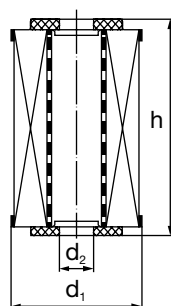
## Maintenance

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.

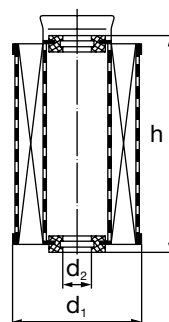
## Types



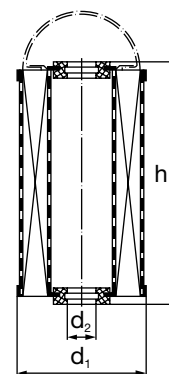
Form A



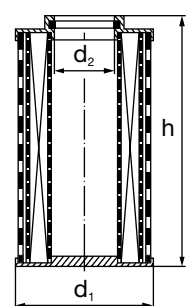
Form B



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<br>(Page<br>16) | Nominal flow<br>rate<br>[l/h] | Dimensions in mm |                              |       | Short designation<br>as per DIN 73 358 |
|-----------------------------------|-----------------------------|----------------------|-------------------------------|------------------|------------------------------|-------|--|
| MANN micro-Top<br>filter elements | MANN Felt filter<br>element |                      |                               | d <sub>1</sub>   | d <sub>2</sub> <sup>1)</sup> | h     |  |
| <b>P 46/1</b>                     | –                           | B                    | 35                            | 40               | 8.5                          | 133   |  |
| <b>P 64</b>                       | –                           | A                    | 15                            | 52               | 12                           | 44    |  |
| <b>P 78</b>                       | –                           | A                    | 37                            | 65               | 14                           | 53    |  |
| <b>P 609</b>                      | –                           | B <sup>5)</sup>      | 30                            | 51               | 8 <sup>3)</sup>              | 68    |  |
| <b>P 707<sup>1)</sup></b>         | BF 707 <sup>1)</sup>        | D <sup>5)</sup>      | 90 <sup>4)</sup>              | 65               | 14 <sup>2)</sup>             | 116   | DIN 73 358 – E 0.5                     |
| <b>P 715<sup>1)</sup></b>         | BF 715 <sup>1)</sup>        | D <sup>5)</sup>      | 65 <sup>4)</sup>              | 65               | 14 <sup>2)</sup>             | 65    | DIN 73 358 – E 0.2                     |
| <b>P 725</b>                      | –                           | A                    | 95                            | 65               | 14                           | 100.5 |  |
| <b>P 810</b>                      | –                           | A                    | 70                            | 70               | 21                           | 84    |  |
| <b>P 811<sup>1)</sup></b>         | BF 811 <sup>1)</sup>        | D <sup>5)</sup>      | 120 <sup>4)</sup>             | 83               | 14 <sup>2)</sup>             | 147   | DIN 73 358 – E 1                       |
| <b>P 824</b>                      | –                           | A                    | 80                            | 72               | 33                           | 89    |  |
| <b>P 825</b>                      | –                           | B <sup>5)</sup>      | 72                            | 77               | 26                           | 100   |  |
| <b>P 833</b>                      | –                           | A                    | 110                           | 72               | 21                           | 125   |  |
| <b>P 921/2</b>                    | –                           | B <sup>5)</sup>      | 120                           | 83               | 26                           | 118   |  |
| <b>P 934</b>                      | –                           | B <sup>6)</sup>      | 150                           | 83               | 10 <sup>3)</sup>             | 167   |  |
| <b>P 1018/1<sup>1)</sup></b>      | BF 1018/1 <sup>1)</sup>     | D                    | 310 <sup>4)</sup>             | 106              | 20 <sup>2)</sup>             | 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<br>(Page 16) | Filling<br>volume<br>[cm <sup>3</sup> ] | Dimensions in mm |                              |     | Short designation<br>as per DIN 71 455 |
|------------------|-------------------|---|------------------|------------------------------|-----|--|
|                  |                   |   | d <sub>1</sub>   | d <sub>2</sub> <sup>1)</sup> | h   |  |
| <b>PF 815</b>    | D                 | 310                                     | 75               | 14                           | 104 |  |
| <b>PF 915</b>    | D                 | 520                                     | 90               | 14                           | 110 |  |
| <b>PF 925</b>    | D                 | 630                                     | 98               | 14                           | 110 | DIN 71 455 – E 1                       |
| <b>PF 1025</b>   | D                 | 1 300                                   | 98               | 14                           | 206 |  |
| <b>PF 1155</b>   | D                 | 950                                     | 110              | 14                           | 125 | DIN 71 455 – E 1.5                     |
| <b>PF 1190</b>   | D                 | 1 600                                   | 110              | 14                           | 202 | DIN 71 455 – E 2.5                     |
| <b>PF 13 140</b> | D                 | 2 300                                   | 130              | 14                           | 202 | DIN 71 455 – E 3.5                     |
| <b>PF 1535</b>   | D                 | 3 800                                   | 150              | 25                           | 250 | DIN 71 455 – E 5                       |
| <b>PF 1552</b>   | D                 | 5 500                                   | 150              | 32                           | 367 | DIN 71 455 – E 8                       |
| <b>PF 19 326</b> | 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<br>(Page 16) | Nominal<br>flow rate<br>[l/min] | Dimensions in mm |                  |       | Short designation<br>as per DIN ISO 7747 |
|----------------------|-------------------|---------------------------------|------------------|------------------|-------|--|
|                      |                   |                                 | d <sub>1</sub>   | d <sub>2</sub>   | h     |  |
| H 53                 | A                 | 5                               | 40               | 12.8             | 64    |  |
| H 53/3 <sup>1)</sup> | A                 | 5                               | 40               | 12.8             | 64    |  |
| H 601                | A                 | 12                              | 59               | 18               | 100.5 |  |
| H 617 <sup>9)</sup>  | A                 | 16                              | 59               | 28.2             | 100.5 |  |
| H 712                | B <sup>5)</sup>   | 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 <sup>7)</sup>   | 22                              | 69               | 33               | 140   |  |
| H 813/1              | B <sup>5)</sup>   | 11                              | 72               | 32               | 87.5  |  |
| H 815                | C                 | 15                              | 76               | 19 <sup>2)</sup> | 107.5 |  |
| H 816                | B <sup>6)</sup>   | 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 <sup>6)</sup>   | 53                              | 90               | 32               | 201   |  |
| H 947/1              | D                 | 47                              | 84               | 23.4             | 196   |  |
| H 960                | A                 | 57                              | 84               | 24.2             | 229   |  |
| H 973                | D <sup>4)</sup>   | 72                              | 90               | 24.4             | 220.2 |  |
| H 1018/2             | B <sup>7)</sup>   | 22                              | 94               | 34               | 78    |  |
| H 1029/1             | B <sup>6)</sup>   | 32                              | 100              | 34               | 101   |  |
| H 1032               | C                 | 27 <sup>3)</sup>                | 100              | 19 <sup>2)</sup> | 126   |  |
| H 1034               | A                 | 40                              | 100              | 30               | 117   | A 100x30x117                             |
| H 1038               | B <sup>5)</sup>   | 35                              | 94               | 34               | 119.5 |  |
| H 1048               | B <sup>7)</sup>   | 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 <sup>3)</sup>                | 100              | 25 <sup>2)</sup> | 204   |  |
| H 1053/2             | B <sup>5)</sup>   | 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 <sup>5)</sup>   | 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 <sup>1)</sup> | A                 | 63                              | 132              | 95               | 163   |  |
| H 1496               | B <sup>5)</sup>   | 85                              | 133              | 88               | 229   |  |
| H 1565/1             | B <sup>7)</sup>   | 68                              | 150              | 88               | 106.5 |  |
| H 10 196             | A                 | 195                             | 100              | 40               | 565   |  |
| H 12 105             | B <sup>5)</sup>   | 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<br>(Page 16) | Nominal<br>flow rate<br>[l/min] | Dimensions in mm |                |       | Short designation<br>as per DIN ISO 7747 |
|--------------------------|-------------------|---------------------------------|------------------|----------------|-------|--|
|                          |                   |                                 | d <sub>1</sub>   | d <sub>2</sub> | h     |  |
| H 12 113                 | A                 | 111                             | 117              | 43             | 229   |  |
| H 12 178                 | B <sup>6)</sup>   | 132                             | 117              | 55             | 336   |  |
| H 12 225                 | B                 | 183                             | 117              | 56             | 462   |  |
| H 12 270                 | B                 | 222                             | 117              | 56             | 559   |  |
| H 13 127/1 <sup>8)</sup> | 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 <sup>7)</sup>   | 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 <sup>1)</sup>   | 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<br>(Page 16) | Nominal<br>flow rate<br>[l/min] | Dimensions in mm |                  |       |
|----------|-------------------|---------------------------------|------------------|------------------|-------|
|          |                   |                                 | d <sub>1</sub>   | d <sub>2</sub>   | h     |
| H 601/4  | A                 | 13                              | 60               | 18               | 100.5 |
| H 615    | C                 | 13                              | 59               | 13 <sup>1)</sup> | 111.5 |
| H 910/2  | C <sup>2)</sup>   | 9                               | 82               | 13 <sup>1)</sup> | 60.5  |
| H 919/7  | C                 | 25                              | 82               | 13 <sup>1)</sup> | 111.5 |

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

2) Without grip.

# MANN micro-Top Filter Elements

for paint filters and high-pressure filters for hydraulic systems

## MANN micro-Top Filter elements for paint filters

| Part No.   | Form<br>(Page 16) | Nominal<br>flow rate | Dimensions in mm |                  |     | Filter fineness<br>µm absolute |
|------------|-------------------|----------------------|------------------|------------------|-----|--------------------------------|
|            |                   |                      | d <sub>1</sub>   | d <sub>2</sub>   | h   |                                |
| H 840      | B <sup>2)</sup>   |                      | 72               | 27               | 251 | 50                             |
| H 845      | B <sup>2)</sup>   |                      | 72               | 27               | 251 | 25                             |
| H 850/4    | B                 |                      | 72               | 27               | 251 | 5                              |
| H 850/5    | B                 |                      | 72               | 27               | 251 | 10                             |
| H 965      | B <sup>2)</sup>   | indicated            | 90               | 27               | 251 | 35                             |
| H 974      | B <sup>2)</sup>   |                      | 90               | 27               | 251 | 25                             |
| H 974/1    | B <sup>2)</sup>   | upon                 | 90               | 27               | 251 | 50                             |
| H 984      | B <sup>2)</sup>   |                      | 90               | 27               | 251 | 10                             |
| H 996      | B <sup>2)</sup>   | request              | 90               | 27               | 251 | 5                              |
| H 15 206/1 | C                 |                      | 150              | 31 <sup>1)</sup> | 364 | 35                             |
| H 15 230/1 | C                 |                      | 150              | 31 <sup>1)</sup> | 364 | 25                             |
| H 15 250/1 | C                 |                      | 150              | 31 <sup>1)</sup> | 364 | 10                             |
| H 18 321   | A                 |                      | 180              | 120              | 366 | 10                             |
| H 18 321/1 | A                 |                      | 180              | 120              | 366 | 25                             |

1) Outer diameter to DIN 2391.

2) With felt gasket.

## MANN micro-Top Filter elements for high-pressure filters for hydraulic systems

| Part No. | Form<br>(Page 16) | Nominal<br>flow rate<br>[l/min] | Dimensions in mm |                |     | Filter fineness<br>µm absolute |
|----------|-------------------|---------------------------------|------------------|----------------|-----|--------------------------------|
|          |                   |                                 | d <sub>1</sub>   | d <sub>2</sub> | h   |                                |
| HD 46    | E                 | 25                              | 40               | 18             | 122 | 25                             |
| HD 46/1  | E                 | 20                              | 40               | 18             | 122 | 3                              |
| HD 46/2  | E                 | 25                              | 40               | 18             | 122 | 10                             |
| HD 46/3  | E                 | 25                              | 40               | 18             | 122 | 10                             |
| HD 65    | E                 | 60                              | 57               | 25             | 71  | 25                             |
| HD 65/1  | E                 | 45                              | 57               | 25             | 71  | 3                              |
| HD 65/2  | E                 | 45                              | 57               | 25             | 71  | 10                             |
| HD 610   | E                 | 100                             | 57               | 25             | 124 | 25                             |
| HD 610/1 | E                 | 70                              | 57               | 25             | 124 | 3                              |
| HD 610/2 | E                 | 70                              | 57               | 25             | 124 | 10                             |
| HD 613   | E                 | 150                             | 57               | 25             | 171 | 25                             |
| HD 613/1 | E                 | 100                             | 57               | 25             | 171 | 3                              |
| HD 613/2 | E                 | 100                             | 57               | 25             | 171 | 10                             |
| HD 938   | E                 | 300                             | 85               | 46             | 200 | 25                             |
| HD 938/1 | E                 | 250                             | 85               | 46             | 200 | 3                              |
| HD 938/2 | E                 | 250                             | 85               | 46             | 200 | 10                             |
| HD 958   | E                 | 450                             | 85               | 46             | 300 | 25                             |
| HD 958/1 | E                 | 350                             | 85               | 46             | 300 | 3                              |
| HD 958/2 | E                 | 350                             | 85               | 46             | 300 | 10                             |

# MANN Elements for EDM machines



Industriefilter



## Highest quality ...

The dielectrics used in cavity-sinking and wire EDM machines must be cleaned of the particles generated during the erosion process. MANN micro-Top filter elements have been used successfully for years for super-fine filtration of dielectrics and de-ionized water. Decades of experience and a close cooperation with leading manufacturers of EDM machinery have resulted in high-quality products with a filter fineness ranging between 3 and 25  $\mu\text{m}$ .



### Design

MANN Filter Elements for EDM machines have a fibre-pack filling or a star-folded paper element. A large filtration surface is achieved by the special star-folding geometry. A highly efficient extraction and a large dirt-holding capacity ensure a long service life. When defining your filtration equipment, please choose element sizes that already exist: this simplifies the spare parts supply and store keeping. For matching filter housings see page 26.

## ... for every EDM machine



### Manufacturer

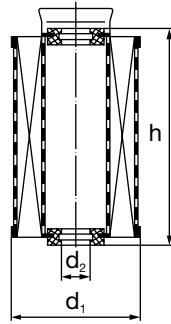
### Matching MANN Filter Element<sup>1)</sup>

|                  |   |
|------------------|---|
| AEG              | H 15 190 n, H 15 135 n, H 15 135 P                            |
| Agema            | H 15 190 n  |
| Agemaspark       | H 1096  |
| Agie             | H 15 190 n, H 15 190/11, H 15 190/16,<br>H 15 475, H 15 475/1 |
| BES              | H 15 190 n  |
| Brother          | H 31 967  |
| Charmilles       | H 15 190 n, H 15 190/14, H 15 190/16                          |
| Deckel           | H 15 190 n, H 15 190/16                                       |
| Exeron           | H 31 967  |
| Fanuc            | H 34 1158/2, H 34 1158/4                                      |
| Hostek           | H 15 190 n, H 15 190/16                                       |
| Hitachi          | H 31 1033/2   |
| Ingersoll-Hansen | H 15 190 n, H 15 190/16                                       |
| Japax            | H 15 190 n, H 15 190/16                                       |
| Jiten            | H 15 190 n, H 15 190/16                                       |
| Makino           | H 26 644/1, H 31 1033   |
| Mitsubishi       | H 31 1033, H 31 967   |
| Multiform        | H 15 190 n, H 15 190/16                                       |
| Nassovia         | H 31 967, H 15 190 n, H 15 190/16                             |
| Sinitron         | H 15 190 n, H 15 190/16                                       |
| Sodick           | H 34 1158/2, H 34 1158/3                                      |
| Seibu-Walter     | H 15 190 n, H 15 190/16                                       |
| Zimmer+Kreim     | H 15 190 n, H 15 190/16                                       |

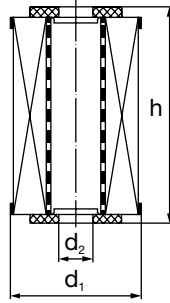
<sup>1)</sup> For the respective dimensions and filter fineness, please refer to the tables on page 24 and 25.



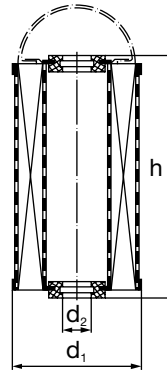
# MANN Elements for erosion machines



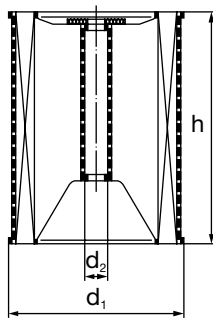
Form A



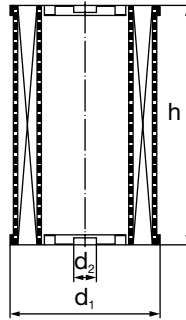
Form B



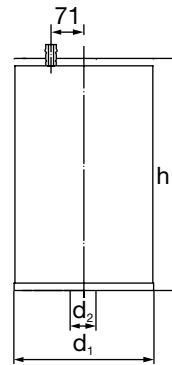
Form C



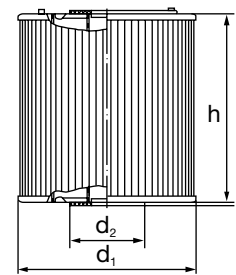
Form D



Form E



Form F



Form G

| Part No.           | Form | Filtering surface [cm <sup>2</sup> ] | Dimensions in mm |                  |     | Filter fineness [µm] | Admission (direction of flow) |
|--------------------|------|--------------------------------------|------------------|------------------|-----|----------------------|-------------------------------|
|                    |      |                                      | d <sub>1</sub>   | d <sub>2</sub>   | h   |                      |                               |
| <b>H 740</b>       | B    | 3 900                                | 62               | 30.5             | 255 | 5 – 8                | outside in/inside out         |
| <b>H 845</b>       | B    | 4 390                                | 72               | 27               | 251 | 10                   | outside in/inside out         |
| <b>H 1053 n</b>    | A    | 6 770                                | 100              | 25               | 204 | 10                   | outside in/inside out         |
| <b>H 1096</b>      | C    | 9 300                                | 100              | 22 <sup>1)</sup> | 202 | 3 – 5                | outside in/inside out         |
| <b>H 15 135 n</b>  | A    | 17 900                               | 150              | 32 <sup>1)</sup> | 252 | 10                   | outside in/inside out         |
| <b>H 15 135 P</b>  | A    | 21 200                               | 150              | 32 <sup>1)</sup> | 252 | 3 – 5                | outside in/inside out         |
| <b>H 15 190</b>    | A    | 20 500                               | 150              | 32 <sup>1)</sup> | 364 | 10                   | outside in/inside out         |
| <b>H 15 190/6</b>  | A    | 27 500                               | 150              | 32 <sup>1)</sup> | 364 | 3 – 5                | outside in/inside out         |
| <b>H 15 190/11</b> | A    | 27 500                               | 150              | 32 <sup>1)</sup> | 364 | 3 – 5                | outside in/inside out         |
| <b>H 15 190/12</b> | A    | 21 600                               | 150              | 32 <sup>1)</sup> | 364 | 25                   | outside in/inside out         |
| <b>H 15 190/14</b> | A    | 27 500                               | 150              | 32 <sup>1)</sup> | 364 | 3 – 5                | outside in/inside out         |
| <b>H 15 475</b>    | A    | 47 000                               | 150              | 32 <sup>1)</sup> | 364 | 3 – 5                | outside in/inside out         |
| <b>H 34 1158/2</b> | D    | 113 200                              | 340              | 45.5             | 450 | 3 – 5                | inside in/outside out         |
| <b>H 34 1158/3</b> | D    | 113 200                              | 340              | 45.5             | 450 | 3 – 5                | inside in/outside out         |
| <b>H 34 1158/4</b> | D    | 145 000                              | 340              | 45.5             | 450 | 3 – 5                | inside in/outside out         |
| <b>H 31 967</b>    | E    | 95 300                               | 302              | 29               | 507 | 3 – 5                | inside in/outside out         |
| <b>H 31 1033</b>   | F    | 99 125                               | 302              | 54               | 503 | 3 – 5                | inside in/outside out         |
| <b>H 31 1033/2</b> | F    | 99 125                               | 302              | 54               | 503 | 3 – 5                | inside in/outside out         |
| <b>H 26 644/1</b>  | G    | 53 700                               | 261              | 46               | 280 | 3 – 5                | outside in/inside out         |
| <b>PF 19 326</b>   | C    | <sup>-2)</sup>                       | 197.5            | 22 <sup>1)</sup> | 378 | 5 – 8                | outside in/inside out         |

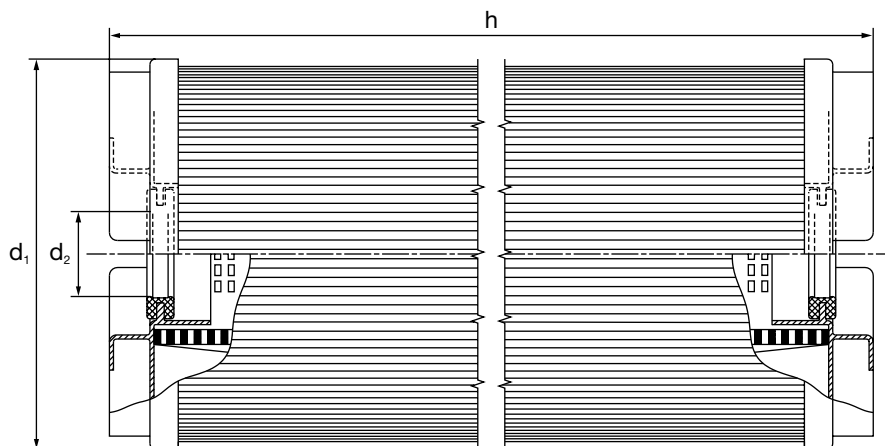
<sup>1)</sup> Outer diameter to DIN 2391.

<sup>2)</sup> Fibre pack element, no surface filter.

## Metal-free elements for EDM machines

Bearing in mind the increasing costs of waste disposal, MANN+HUMMEL and leading manufacturers of EDM machinery have developed a metal-free filter element made of plastics, that can be entirely disposed of in incinerating plants for special refuse.

- for wire and cavity-sinking EDM machines
- free from metal
- corrosion-proof
- long service life
- simple waste removal



| Part No.                       | Filtering surface<br>[cm <sup>2</sup> ] | Dimensions in mm |                  |     | Filter fineness<br>[μm] | Admission<br>(direction of flow) |
|--------------------------------|---|------------------|------------------|-----|-------------------------|----------------------------------|
|                                |   | d <sub>1</sub>   | d <sub>2</sub>   | h   |                         |                                  |
| <b>H 15 190/16</b>             | 30 000                                  | 150              | 32 <sup>1)</sup> | 375 | 3 – 5                   | outside in/inside out            |
| <b>H 15 475/1<sup>2)</sup></b> | 45 320                                  | 150              | 32 <sup>1)</sup> | 375 | 3 – 5                   | outside in/inside out            |

1) Outer diameter to DIN 2391.

2) For cavity-sinking EDM machines only.



# Housings for elements for EDM machines

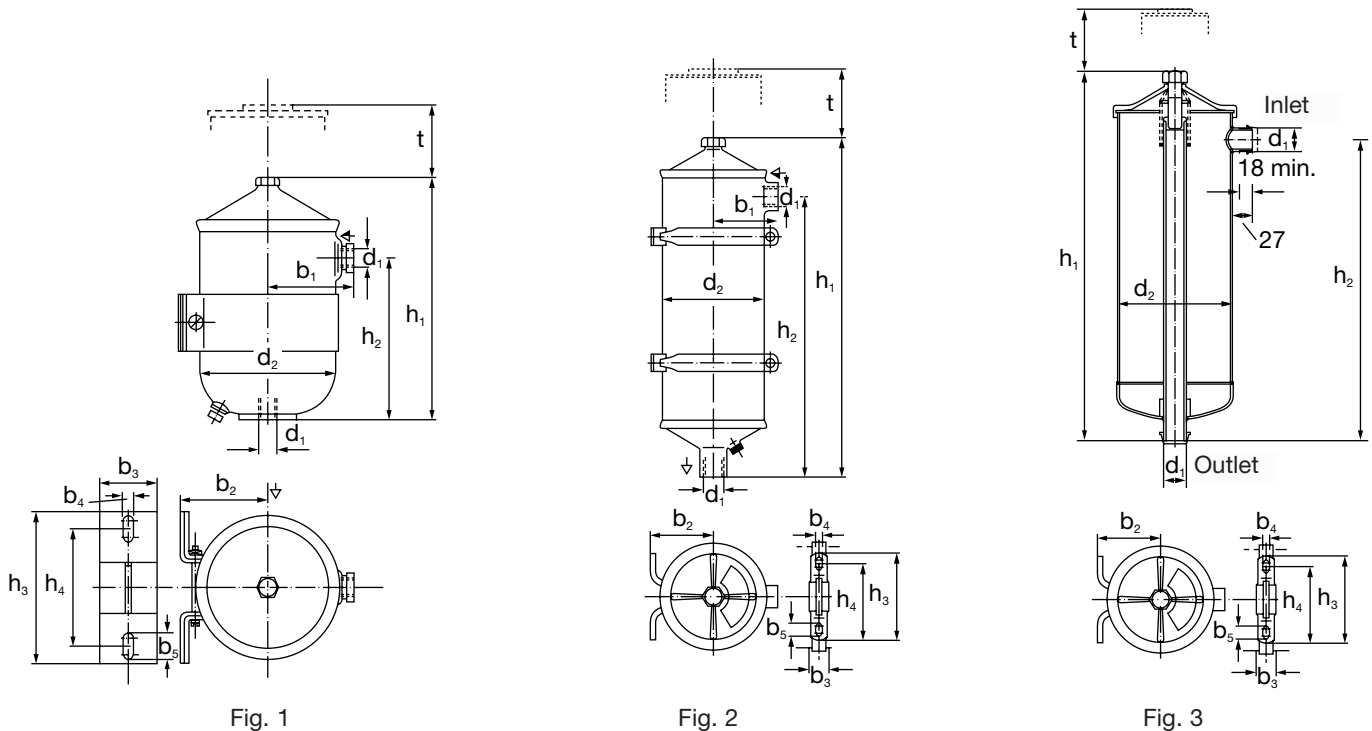


Fig. 1

Fig. 2

Fig. 3

## Part numbers and technical data

| Part No.                    | Fig. | Nominal flow rate <sup>1)</sup> [l/min] | Weight approx. [kg] | Respective MANN micro-Top filter element |
|-----------------------------|------|---|---------------------|--|
| 67 507 75 106 <sup>2)</sup> | 1    | 35                                      | 2.9                 | H 1053 n                                 |
| 67 816 75 103 <sup>2)</sup> | 2    | 70                                      | 6.8                 | H 15 135 Pn                              |
| 67 816 75 106 <sup>2)</sup> | 1    | 80                                      | 6.6                 | H 15 135 n                               |
| 67 825 75 103               | 2    | 75                                      | 9.4                 | H 15 190/6 n                             |
| 67 825 30 871 <sup>3)</sup> | 3    | –                                       | –                   | all H 15 190/... -Types                  |

## Part numbers and dimensions

| Part No.                    | Fig. | Dimensions in mm and inches |                |                |                |                |                |                |                |                |                |                |     |  |
|-----------------------------|------|-----------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----|--|
|                             |      | b <sub>1</sub>              | b <sub>2</sub> | b <sub>3</sub> | b <sub>4</sub> | b <sub>5</sub> | d <sub>1</sub> | d <sub>2</sub> | h <sub>1</sub> | h <sub>2</sub> | h <sub>3</sub> | h <sub>4</sub> | t   |  |
| 67 507 75 106 <sup>2)</sup> | 1    | 75                          | 75             | 30             | 9              | 23             | M 22x1.5       | 117            | 285            | 212            | 132            | 102            | 180 |  |
| 67 816 75 103 <sup>2)</sup> | 1    | 110                         | 100            | 30             | 10             | 20             | G 1            | 165            | 398            | 250            | 140            | 105            | 202 |  |
| 67 816 75 106 <sup>2)</sup> | 1    | 110                         | 100            | 30             | 10             | 20             | G 1            | 163            | 398            | 250            | 140            | 105            | 202 |  |
| 67 825 75 103               | 2    | 104                         | 100            | 25             | 10             | 20             | G 1            | 163            | 552            | 456            | 140            | 105            | 322 |  |
| 67 825 30 871 <sup>3)</sup> | 3    | 104                         | 100            | 25             | 10             | 20             | G 1            | 163            | 510            | 430            | 140            | 105            | 322 |  |

1) The flow rates are valid for oil- and water-based dielectrics.

2) Housing supplied with two brackets.

3) Housing for wire EDM machines is made of stainless steel. Please order brackets separately.

# MANN High-pressure filters



Industriefilter



# MANN High-pressure filters



## Application

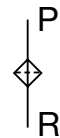
MANN High-pressure filters as per DIN 24550 are used primarily for the filtration of lube oils and hydraulic fluids in engines and installations. A special version in star-pleated strainer design is available for the filtration of polyurethane components (see page 34 to 36).

## Design

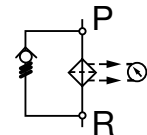
A high-pressure filter consists of a filter housing, a filter head with two threads for connection and a replaceable MANN micro-Top filter element from the HD range. The dirt-retaining capacity of this element is particularly high due to the large filtering surface. The design and the pleat support of the filter element allow for pressures ranging from 10 to 180 bar (1 MPa to 18 MPa), tested to DIN ISO 2941.

Versions available:

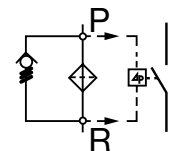
Without bypass valve  
without service indicator



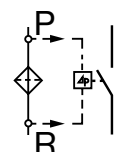
With bypass valve  
and service indicator



With bypass valve  
and service switch



Without bypass valve  
with service switch



The service indicator or switch and the bypass valve are combined to signal the need for maintenance before the bypass valve opens.

# MANN High-pressure filters

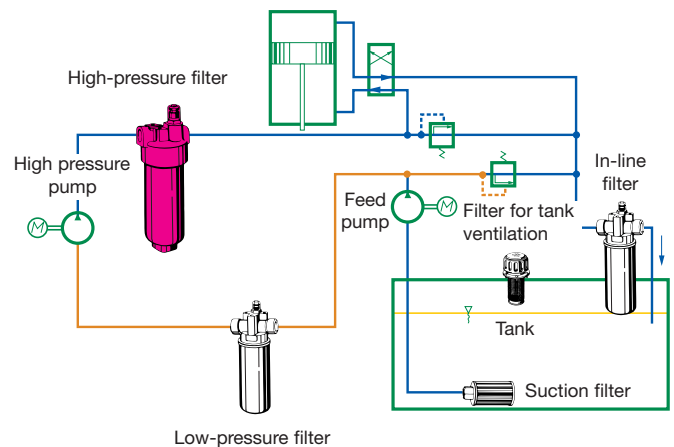
## Operation

MANN High-pressure filters are used as full-flow filters, i.e. they must be installed in the circuit in a way ensuring that all the liquid to be cleaned passes through the filter every time it circulates.

## Assembly and Maintenance

The filter is installed in the pipeline using the connection threads (see dimension table for the threads). Attention must be paid to the direction of flow, indicated on the threads by arrows. Maintenance is limited to the replacement of the MANN micro-Top filter element.

## MANN Filters in hydraulic circuits



## Technical data

| Filter element | Performance data as per ISO 4572<br>at a differential pressure of 5 bar (500 KPa)<br>(differential pressure stability) |
|----------------|--|
| HD ... / 1     | $\beta_6 \geq 75$  |
| HD ... / 2     | $\beta_{10} \geq 75$ ( $\Delta p$ 15 bar/1.5 MPa)  |
| HD ... / 3     | $\beta_{10} \geq 75$ ( $\Delta p$ 60 bar/6.0 MPa)  |
| HD ...         | $\beta_{25} \geq 75$   |

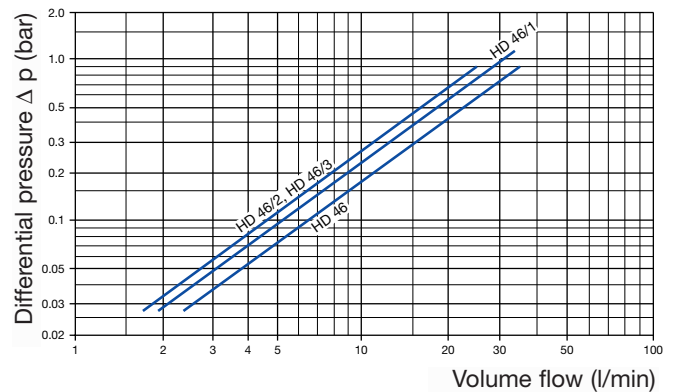
|                        |  |
|------------------------|--|
| Filter fineness:       | $\beta_6$ to $\beta_{25} \geq 75$  |
| Nominal flow rate:     | 20 to 125 l/min  |
| Operating pressure:    | 200/400 bar (20/40 MPa)  |
| Operating temperature: | -25 °C to +120 °C  |
| Material:              | Filter head made of cast iron with spheroidal graphite<br>Filter can made of steel               |
| Bypass valve:          | Opening pressure: 7 bar (700 KPa)  |
| Service indicator:     | Indication through red signal ring at a differential pressure of 5 bar (500 KPa)                 |
| Service switch:        | Switching at a differential pressure of 5 bar (500 KPa)<br>Electrical connections see page 49/50 |

# MANN High-pressure filters

## Nominal pressure 200 bar (20 MPa)

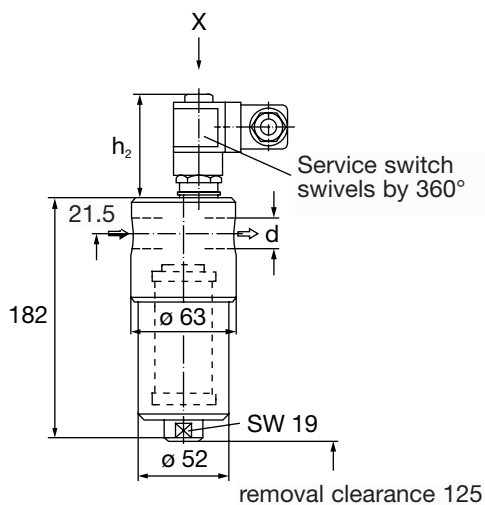
### Characteristics

Flow resistance as per ISO 3968 at  
32 mm<sup>2</sup>/sec.

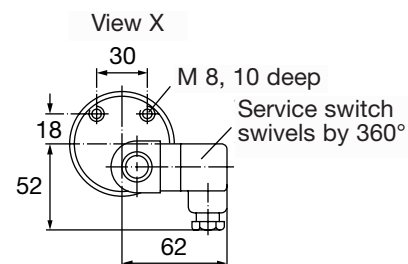


### Dimensions and part numbers

- Filter size 0.2 l
- Weight: approx. 2 kg



Dimensions filter housing  
with service switch



Filter housing with  
service switch

| Part No.<br>for complete filter | Nominal<br>flow rate<br>[l/min] | MANN<br>micro-Top<br>filter element<br>(see page 24) | Dimensions in mm<br>and inches |                | Service<br>indication <sup>1)</sup> | Collapse-/burst<br>pressure<br>[bar] [MPa] |   |
|---------------------------------|---------------------------------|--|--------------------------------|----------------|-------------------------------------|--|---|
|                                 |                                 |  | d                              | h <sub>2</sub> |                                     |  |   |
| <b>67 201 62 106</b>            | 25                              | HD 46  | M 18x1.5                       | 13             | V                                   | 10   | 1 |
| <b>67 201 62 101</b>            | 25                              | HD 46/2  | M 18x1.5                       | 13             | V                                   | 10   | 1 |
| <b>67 201 62 126</b>            | 20                              | HD 46/1  | G 3/8                          | 63             | S                                   | 60   | 6 |
| <b>67 201 62 116</b>            | 25                              | HD 46/3  | G 3/8                          | 63             | S                                   | 60   | 6 |

<sup>1)</sup> V = Bypass valve (opening pressure: 7 bar)

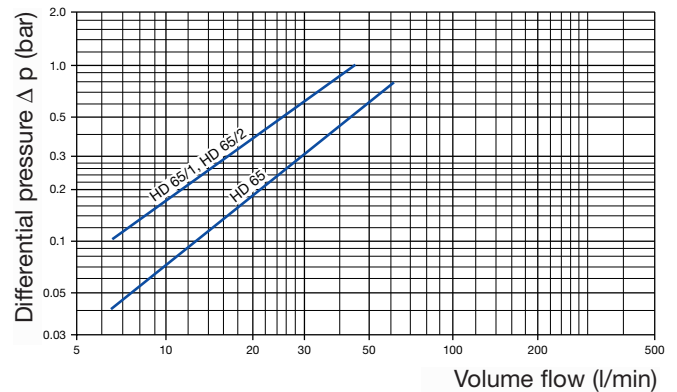
S = Service switch make/break contact (convertible)

# MANN High-pressure filters

## Nominal pressure 400 bar (40 MPa)

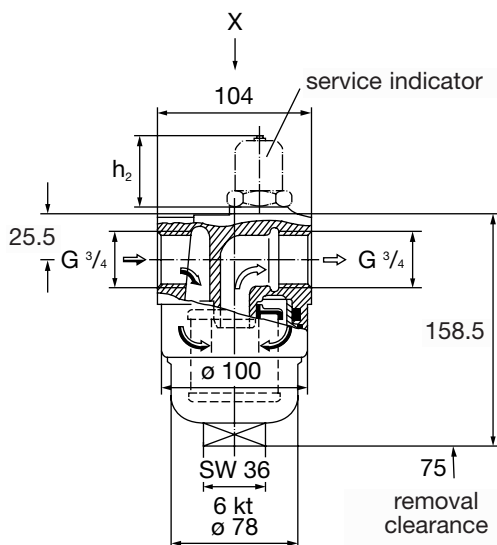
### Characteristics

Flow resistance as per ISO 3968 at  
32 mm<sup>2</sup>/sec.

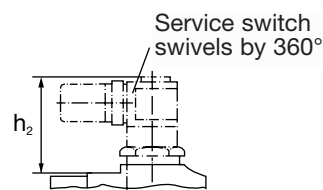


### Dimensions and part numbers

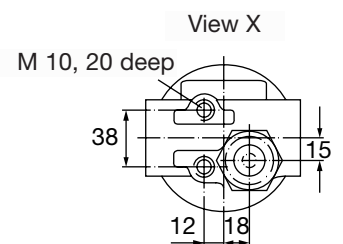
- Filter size 0.2 l
- Weight: approx. 4.9 kg



Dimensions filter housing



Height  
service switch



Filter housing with  
service switch

| Part No.<br>for complete filter | Nominal<br>flow rate<br>[l/min] | MANN<br>micro-Top<br>filter element<br>(see page 24) | h <sub>2</sub><br>[mm] | Service<br>indication <sup>1)</sup> | Collapse-/burst<br>pressure<br>[bar] [MPa] |
|---------------------------------|---------------------------------|--|------------------------|-------------------------------------|--|
| 67 300 62 156                   | 63                              | HD 65  | 11.5                   | –                                   | 45 4.5                                     |
| 67 300 62 166                   | 63                              | HD 65  | 53.5                   | A and V                             | 45 4.5                                     |
| 67 300 62 176                   | 63                              | HD 65  | 70.5                   | S and V                             | 45 4.5                                     |
| 67 300 62 202                   | 45                              | HD 65/2  | 11.5                   | –                                   | 15 1.5                                     |
| 67 300 62 212                   | 45                              | HD 65/2  | 53.5                   | A and V                             | 15 1.5                                     |
| 67 300 62 222                   | 45                              | HD 65/2  | 70.5                   | S and V                             | 15 1.5                                     |
| 67 300 62 180                   | 35                              | HD 65/1  | 70.5                   | S                                   | 180 18                                     |

<sup>1)</sup> A = Service indicator

V = Bypass valve (opening pressure: 7 bar)

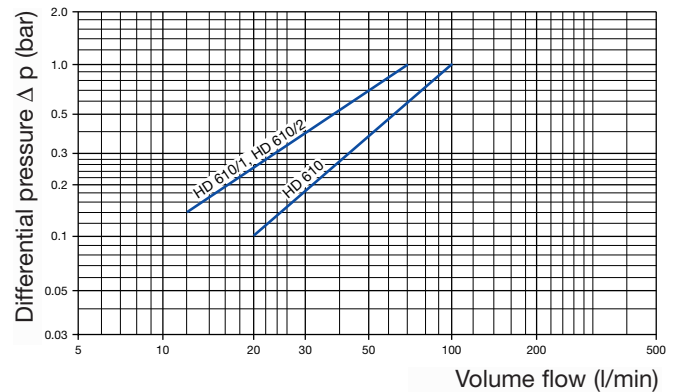
S = Service switch make/break contact (convertible)

# MANN High-pressure filters

## Nominal pressure 400 bar (40 MPa)

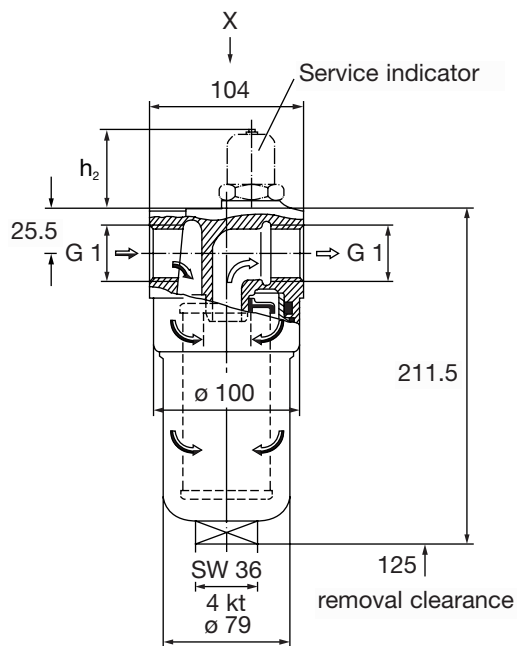
### Characteristics

Flow resistance as per ISO 3968 at 32 mm<sup>2</sup>/sec.

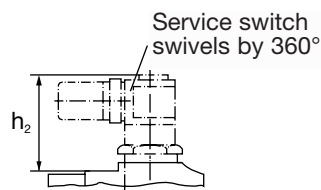


### Dimensions and part numbers

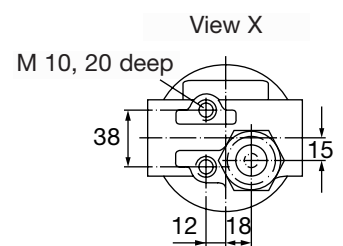
- Filter size 0.4 l
- Weight: approx. 5.6 kg



Dimensions filter housing



Height service switch



Filter housing with service switch

| Part No.<br>for complete filter | Nominal<br>flow rate<br>[l/min] | MANN<br>micro-Top<br>filter element<br>(see page 24) | h <sub>2</sub><br>[mm] | Service<br>indication <sup>1)</sup> | Collapse-/burst<br>pressure<br>[bar] [MPa] |
|---------------------------------|---------------------------------|--|------------------------|-------------------------------------|--|
| 67 301 62 186                   | 100                             | HD 610   | 11.5                   | –                                   | 45 4.5                                     |
| 67 301 62 196                   | 100                             | HD 610   | 53.5                   | A and V                             | 45 4.5                                     |
| 67 301 62 206                   | 100                             | HD 610   | 70.5                   | S and V                             | 45 4.5                                     |
| 67 301 62 222                   | 70                              | HD 610/2   | 11.5                   | –                                   | 15 1.5                                     |
| 67 301 62 232                   | 70                              | HD 610/2   | 53.5                   | A and V                             | 15 1.5                                     |
| 67 301 62 242                   | 70                              | HD 610/2   | 70.5                   | S and V                             | 15 1.5                                     |
| 67 301 62 210                   | 50                              | HD 610/1   | 70.5                   | S                                   | 180 18                                     |

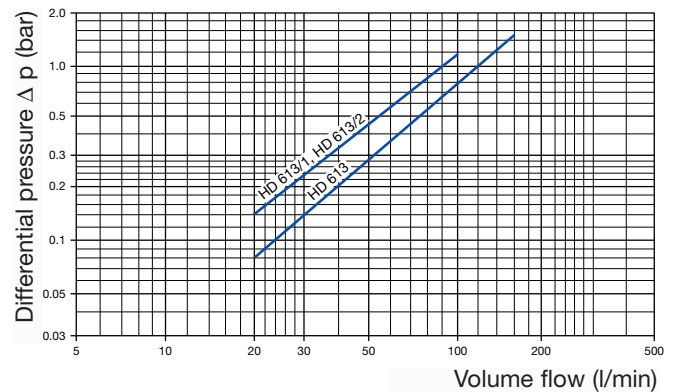
1) A = Service indicator  
V = Bypass valve (opening pressure: 7 bar)  
S = Service switch make/break contact (convertible)

# MANN High-pressure filters

## Nominal pressure 400 bar (40 MPa)

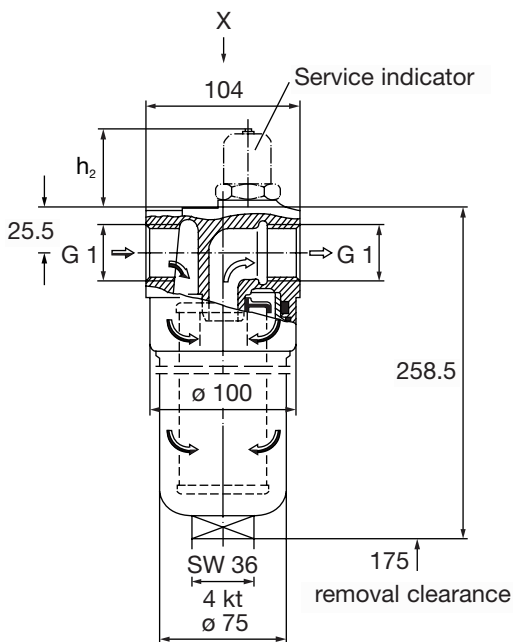
### Characteristics

Flow resistance as per ISO 3968 at 32 mm<sup>2</sup>/sec.

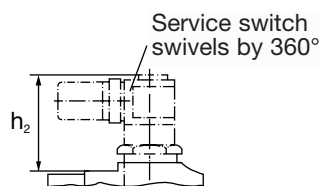


### Dimensions and part numbers

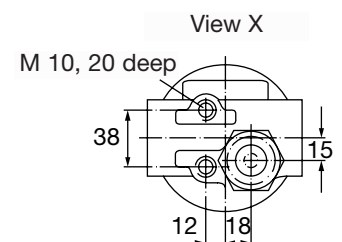
- Filter size 0.6 l
- Weight: approx. 6.3 kg



Dimensions filter housing



Height service switch



Filter housing with service switch

| Part No.<br>for complete filter | Nominal<br>flow rate<br>[l/min] | MANN<br>micro-Top<br>filter element<br>(see page 24) | h <sub>2</sub><br>[mm] | Service<br>indication <sup>1)</sup> | Collapse-/burst<br>pressure<br>[bar] [MPa] |
|---------------------------------|---------------------------------|--|------------------------|-------------------------------------|--|
| 67 302 62 146                   | 125                             | HD 613   | 11.5                   | –                                   | 45 4.5                                     |
| 67 302 62 156                   | 125                             | HD 613   | 53.5                   | A and V                             | 45 4.5                                     |
| 67 302 62 166                   | 125                             | HD 613   | 70.5                   | S and V                             | 45 4.5                                     |
| 67 302 62 192                   | 85                              | HD 613/2   | 11.5                   | –                                   | 15 1.5                                     |
| 67 302 62 202                   | 85                              | HD 613/2   | 53.5                   | A and V                             | 15 1.5                                     |
| 67 302 62 212                   | 85                              | HD 613/2   | 70.5                   | S and V                             | 15 1.5                                     |
| 67 302 62 170                   | 60                              | HD 613/1   | 70.5                   | S                                   | 180 18                                     |

1) A = Service indicator  
V = Bypass valve (opening pressure: 7 bar)  
S = Service switch make/break contact (convertible)



## High-pressure filters with star-pleated strainer inserts

For the filtration of polyurethane components

These high pressure filters are used primarily for the filtration of polyurethane components. The filter housings are the same as on page 30 to 33. To meet the requirements of reaction injection moulding machines MANN+HUMMEL has developed special filter elements. Please send us the fax on page 3. We would like to help you determining the optimal filter for your special application.



### Technical data

|   |  |
|---|--|
| Filter fineness:  | 25 to 200 µm   |
| Nominal flow rate:  | 25 to 175 l/min  |
| Operating pressure:                                       | maximum 400 bar (40 MPa)   |
| Operating temperature:                                    | -25 °C to +120 °C  |
| Material:   | Filter head: cast iron with spheroidal graphite<br>Filter can: steel |
| Filter element: collapse-/burst pressure as per ISO 2941: | max. 45 bar (4.5 MPa)  |

# High-pressure filters with star-pleated strainer inserts

## Nominal pressure 400 bar (40 MPa)

### Type 300

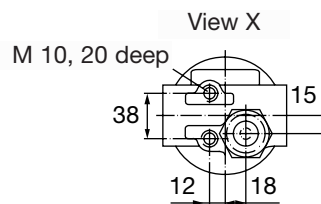
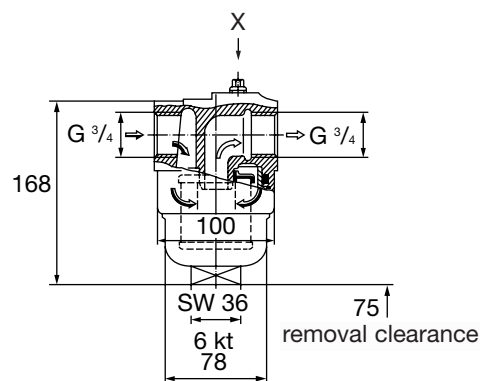
| Housing             |        |                      |
|---------------------|--------|----------------------|
| Part No.<br>Housing | Volume | Material<br>Head/Can |
| 62 300 30 931       | 0.2 l  | GGG/St-painted       |
| 62 300 30 935       | 0.2 l  | GGG/St-chem. nickled |

| Suitable star-pleated strainer inserts |                            |                         |   |
|--|----------------------------|-------------------------|---|
| Part No.<br>inserts                    | Mesh <sup>2)</sup><br>[mm] | Material of<br>strainer | Nominal<br>flow rate <sup>1)</sup><br>[l/min] |
| 62 301 50 692                          | 0.03                       | St                      | 25  |
| 62 301 50 695                          | 0.03                       | VA                      | 25  |
| 62 301 52 692                          | 0.06                       | St                      | 40  |
| 62 301 52 695                          | 0.06                       | VA                      | 40  |
| 62 301 53 692                          | 0.1                        | St                      | 50  |
| 62 301 53 695                          | 0.1                        | VA                      | 50  |
| 62 301 55 692                          | 0.2                        | St                      | 100   |
| 62 301 55 695                          | 0.2                        | VA                      | 100   |

1) Flow rates apply to liquids with a viscosity of 100 mm<sup>2</sup>/sec. (cSt) at a flow resistance of 0.2 bar (20 KPa).

2) Other mesh sizes upon request.

- Filter size 0.2 l
- Filtering surface: 540 cm<sup>2</sup>
- Weight: approx. 4.9 kg



### Type 302

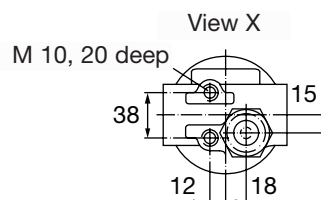
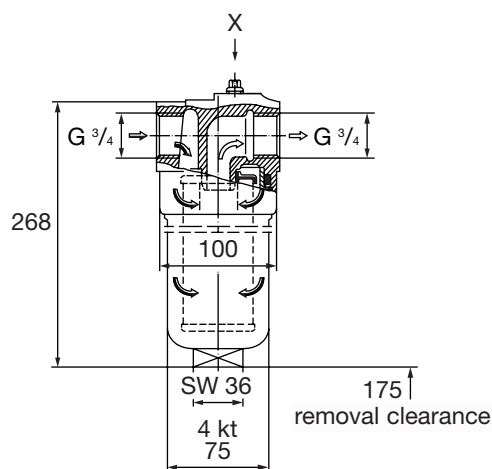
| Housing             |        |                      |
|---------------------|--------|----------------------|
| Part No.<br>Housing | Volume | Material<br>Head/Can |
| 62 302 30 991       | 0.6 l  | GGG/St-painted       |
| 62 302 30 995       | 0.6 l  | GGG/St-chem. nickled |

| Suitable star-pleated strainer inserts |                            |                         |   |
|--|----------------------------|-------------------------|---|
| Part No.<br>inserts                    | Mesh <sup>2)</sup><br>[mm] | Material of<br>strainer | Nominal<br>flow rate <sup>1)</sup><br>[l/min] |
| 62 302 50 132                          | 0.03                       | St                      | 35  |
| 62 302 50 135                          | 0.03                       | VA                      | 35  |
| 62 302 52 132                          | 0.06                       | St                      | 55  |
| 62 302 52 135                          | 0.06                       | VA                      | 55  |
| 62 302 53 132                          | 0.1                        | St                      | 60  |
| 62 302 53 135                          | 0.1                        | VA                      | 60  |
| 62 302 55 132                          | 0.2                        | St                      | 120   |
| 62 302 55 135                          | 0.2                        | VA                      | 120   |

1) Flow rates apply to liquids with a viscosity of 100 mm<sup>2</sup>/sec. (cSt) at a flow resistance of 0.2 bar (20 KPa).

2) Other mesh sizes upon request.

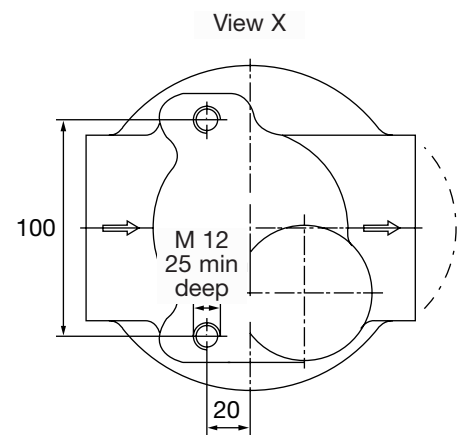
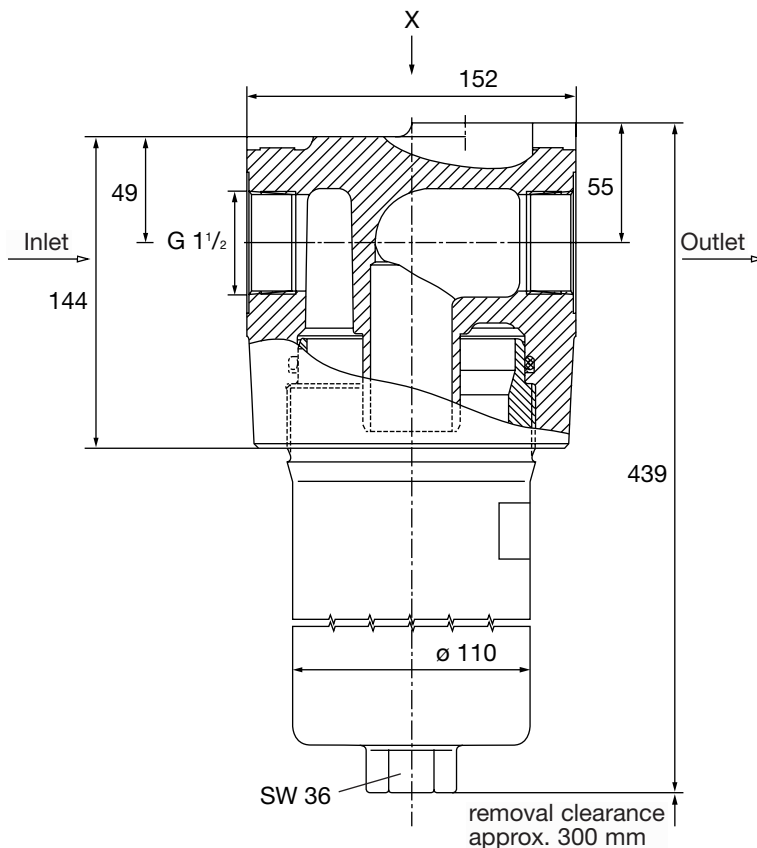
- Filter size 0.6 l
- Filtering surface: 1 520 cm<sup>2</sup>
- Weight: approx. 6.3 kg



# High-pressure filters with star-pleated strainer inserts

Nominal pressure 400 bar (40 MPa)

- Filter size 2.4 l
- Filtering surface: 5 500 cm<sup>2</sup>



## Type 506

| Housing              |        |                       |
|----------------------|--------|-----------------------|
| Part No. Housing     | Volume | Material Head/Can     |
| <b>62 506 30 991</b> | 2.4 l  | GGG/St-painted        |
| <b>62 506 30 995</b> | 2.4 l  | GGG/St-chem. nickeled |

| Suitable star-pleated strainer inserts |                         |                      |   |
|--|-------------------------|----------------------|---|
| Part No. inserts                       | Mesh <sup>2)</sup> [mm] | Material of strainer | Nominal flow rate <sup>1)</sup> [l/min] |
| <b>62 506 52 105</b>                   | 0.06                    | VA                   | 150                                     |
| <b>62 506 53 105</b>                   | 0.1                     | VA                   | 175                                     |

<sup>1)</sup> Flow rates apply to liquids with a viscosity of 100 mm<sup>2</sup>/sec. (cSt) at a flow resistance of 0.2 bar (20 KPa).

<sup>2)</sup> Other mesh sizes upon request.

## Example:

We look for a corrosion-free filter for a flow rate of 50 l/min (at 100 mm<sup>2</sup>/s), filter fineness 60 µm.

Part No. Housing: **62 302 30 995**  
chem. nickeled, see page 35

Part No. Insert: **62 302 52 135**  
Strainer VA, see page 35



# MANN In-line filters



Industriefilter



## 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  $\mu\text{m}$  range.

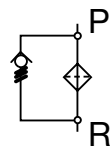


### Design

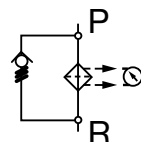
The filters consist of a filter head with two threads, mounting holes and a MANN micro-Top Spin-on filter

Versions available:

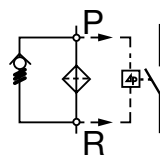
- with bypass valve, without service indicator



- with bypass valve and service indicator



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



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

### 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.

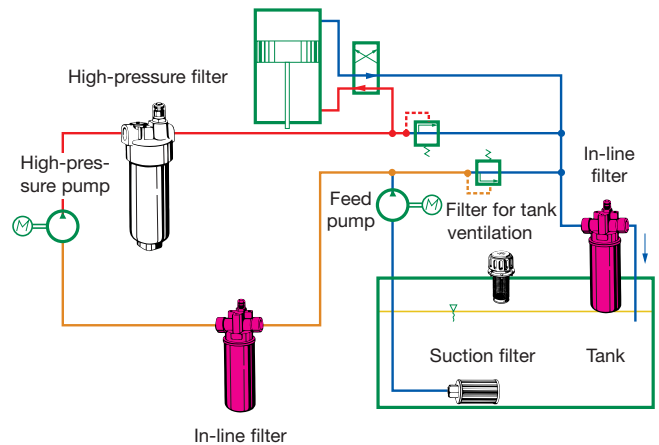
Deposit of dirt particles on the paper element causes the flow resistance to increase. When a certain differential pressure has been reached (e.g. upon cold start or when the filter element is clogged), a bypass valve in the filter opens, ensuring sufficient and constant lubrication.

## ... for full and return flow

### Assembly and maintenance

The filters are installed in pipelines (refer to dimension table for threads). Attention must be paid to the flow direction, indicated on the threads by arrows. Maintenance is limited to the replacement of the clogged spin-on can: A service indicator or switch signals that a service is necessary. The MANN removal tool on page 9 helps in loosening the filter.

### MANN In-line filters in hydraulic circuits



### Technical data

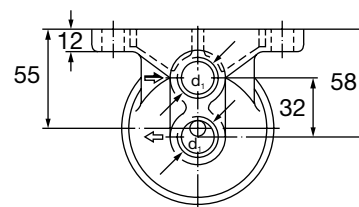
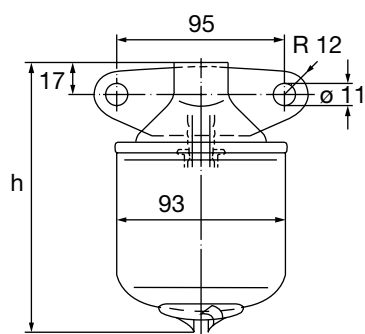
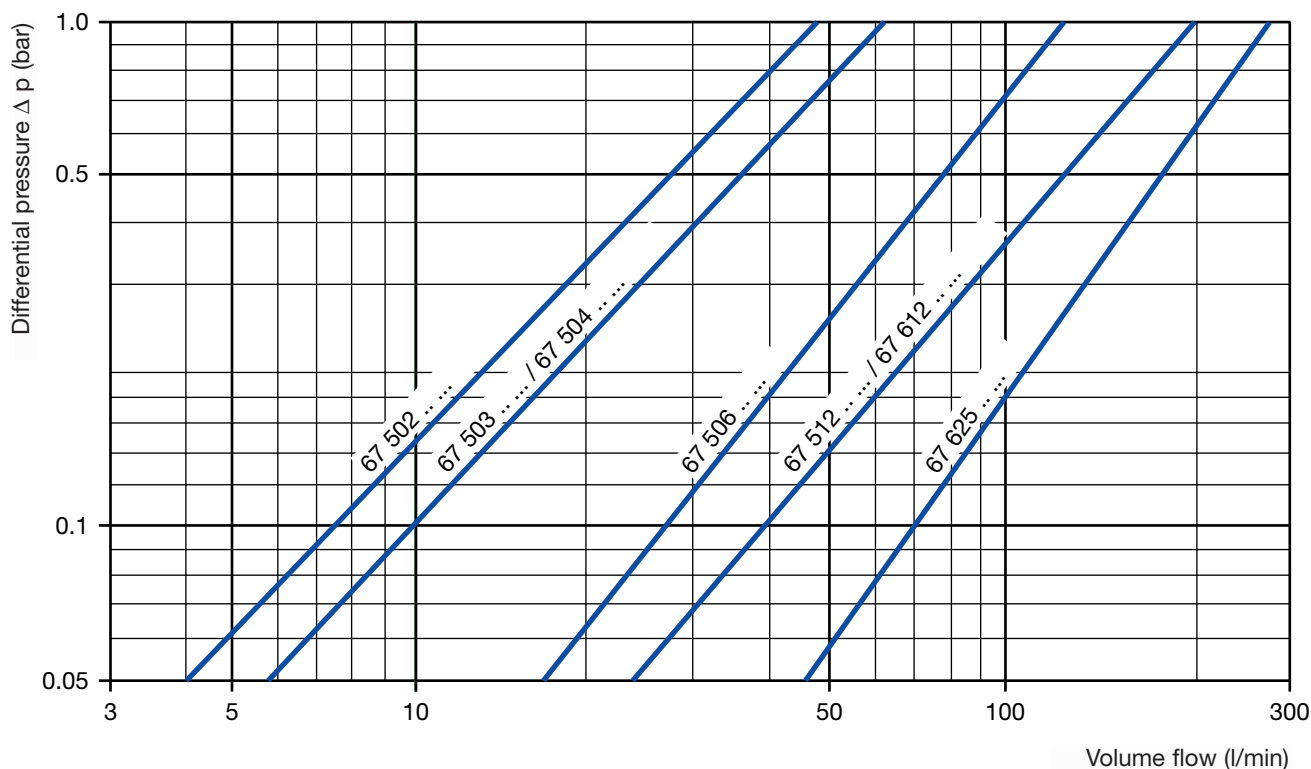
|                        |  |
|------------------------|--|
| Filter fineness:       | 12 $\mu\text{m}$ 50 % fractional separation efficiency (single pass)<br>30 $\mu\text{m}$ 99 % fractional separation efficiency (single pass)<br>Other filter fineness upon request |
| Nominal flow rate:     | 25 to 540 l/min  |
| Operating pressure:    | 14; 20; 25 or 35 bar (1.4; 2; 2.5 or 3.5 MPa)<br>For non-automotive applications, observe the regulations on the construction of pressure vessels                                  |
| Operating temperature: | Max. 120 °C  |
| Material:              | Filter head made of cast aluminium   |
| Bypass valve:          | Opens at differential pressures of 2.5 or 3.5 bar (250 or 350 KPa) with our without non-return valve   |
| Service indicator:     | Indication through red signal ring at a differential pressure of 1.8 bar (180 KPa)   |
| Service switch:        | Switching at differential pressure of 1.8 bar (180 KPa)<br>Electrical connections see page 49/50   |

# MANN In-line filters

Nominal pressure 14 bar (1.4 MPa)

## Characteristics

Flow resistance as per ISO 3968 at  
36 mm<sup>2</sup>/sec.



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

<sup>1)</sup> Flow rate values are only valid for liquids with 36 mm<sup>2</sup>/sec and flow resistance according to the above diagram.

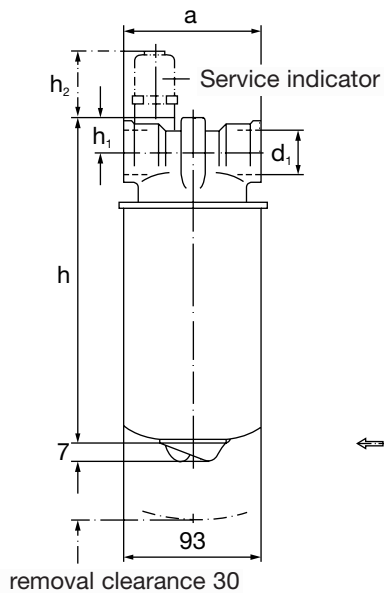


Fig. 1

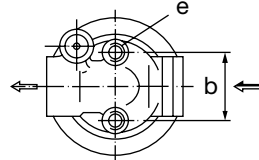


Fig. 2

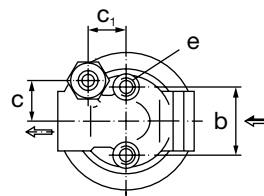
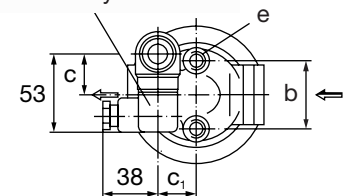
Service switch  
swivels by 360°

Fig. 3

| Part No.                    | Fig. | Spin-on filter | Dimensions in mm and inches |      |      |                |                              |      |     |                |                |            | Service indication | Weight approx. [kg] |
|-----------------------------|------|----------------|-----------------------------|------|------|----------------|------------------------------|------|-----|----------------|----------------|------------|--------------------|---------------------|
|                             |      |                | a                           | b    | c    | c <sub>1</sub> | d <sub>1</sub> <sup>1)</sup> | e    | h   | h <sub>1</sub> | h <sub>2</sub> |            |                    |                     |
| Nominal flow rate: 25 l/min |      |                |                             |      |      |                |                              |      |     |                |                |            |                    |                     |
| <b>67 502 62 256</b>        | 1    | W 920          | 90                          | 40   | –    | –              | G 1/2                        | M 8, | 147 | 22             | –              | –          | 1.2                |                     |
| <b>67 502 62 236</b>        | 2    | W 920          | 90                          | 40   | 21.5 | 24             | G 1/2                        | 16   | 147 | 22             | 46             | optical    | 1.2                |                     |
| <b>67 502 62 226</b>        | 3    | W 920          | 90                          | 40   | 21.5 | 24             | G 1/2                        | deep | 147 | 22             | 62             | electrical | 1.3                |                     |
| Nominal flow rate: 40 l/min |      |                |                             |      |      |                |                              |      |     |                |                |            |                    |                     |
| <b>67 503 62 306</b>        | 1    | W 940          | 90                          | 40   | –    | –              | G 1/2                        | M 8, | 194 | 22             | –              | –          | 1.2                |                     |
| <b>67 503 62 276</b>        | 2    | W 940          | 90                          | 40   | 21.5 | 24             | G 1/2                        | 16   | 194 | 22             | 46             | optical    | 1.2                |                     |
| <b>67 503 62 266</b>        | 3    | W 940          | 90                          | 40   | 21.5 | 24             | G 1/2                        | deep | 194 | 22             | 62             | electrical | 1.3                |                     |
| Nominal flow rate: 70 l/min |      |                |                             |      |      |                |                              |      |     |                |                |            |                    |                     |
| <b>67 506 62 706</b>        | 1    | W 962/2        | 95                          | 47.5 | –    | –              | G 1                          | M 8, | 269 | 25             | –              | –          | 1.6                |                     |
| <b>67 506 62 666</b>        | 2    | W 962/2        | 95                          | 47.5 | 28.5 | 26             | G 1                          | 16   | 269 | 25             | 46             | optical    | 1.6                |                     |
| <b>67 506 62 676</b>        | 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 mm<sup>2</sup>/sec and flow resistance according to the diagram on page 40.



# MANN In-line filters

## Nominal pressure 14 bar (1.4 MPa)

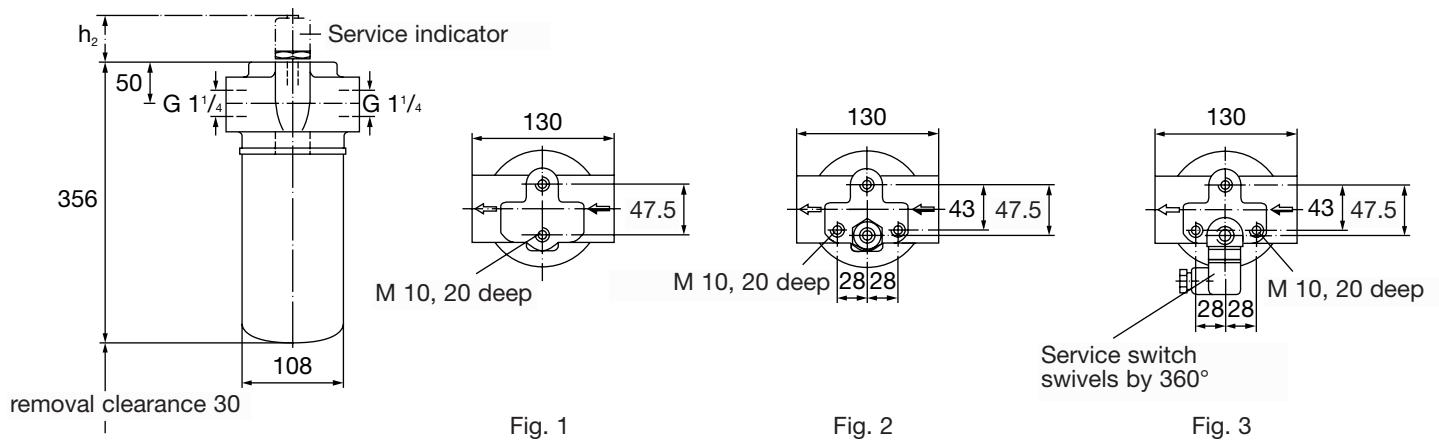


Fig. 1

Fig. 2

Fig. 3

| Part No.      | Fig. | Nominal flow rate [l/min] <sup>1)</sup> | Spin-on filter | h <sub>2</sub> [mm] | Service indication | Weight approx. [kg] |
|---------------|------|---|----------------|---------------------|--------------------|---------------------|
| 67 612 62 146 | 1    | 120                                     | W 11 102       | –                   | –                  | 4.1                 |
| 67 612 62 176 | 2    | 120                                     | W 11 102       | 46                  | optical            | 4.2                 |
| 67 612 62 166 | 3    | 120                                     | W 11 102       | 62                  | electrical         | 5.2                 |

1) Flow rate values are only valid for liquids with 36 mm<sup>2</sup>/sec and flow resistance according to the diagram on page 40.

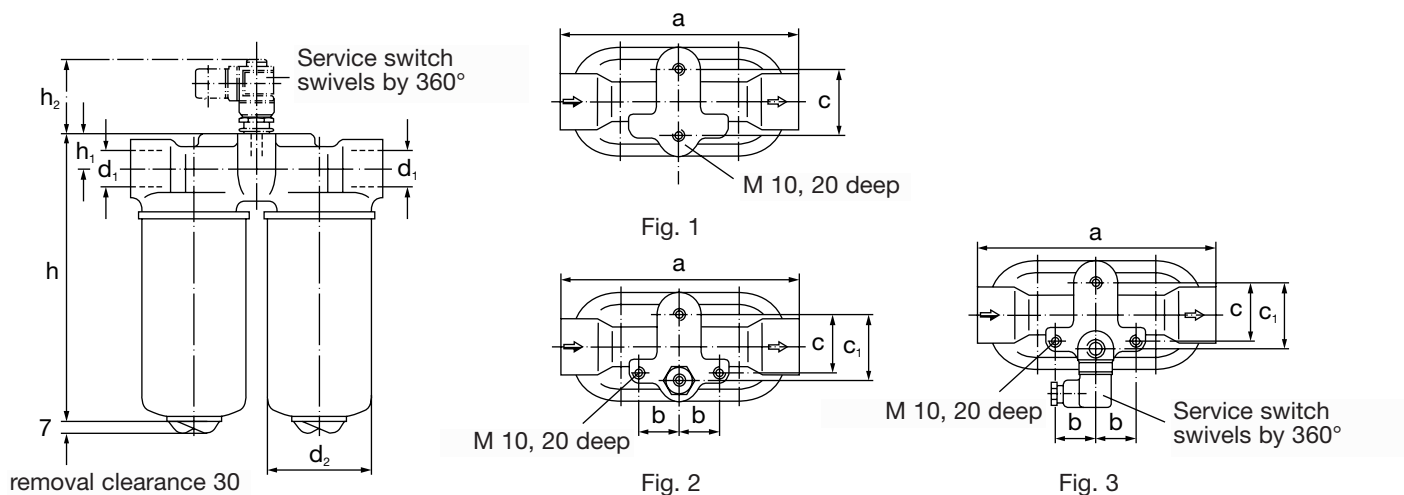


Fig. 1

Fig. 2

Fig. 3

| Part No.                    | Fig. | Nom. flow rate [l/min] <sup>3)</sup> | Spin-on filter | Dimensions in mm and inches |    |      |                |                              |                |     |                | Service indication | Weight approx. [kg] |                |
|-----------------------------|------|--------------------------------------|----------------|-----------------------------|----|------|----------------|------------------------------|----------------|-----|----------------|--------------------|---------------------|----------------|
|                             |      |                                      |                | a                           | b  | c    | c <sub>1</sub> | d <sub>1</sub> <sup>2)</sup> | d <sub>2</sub> | h   | h <sub>1</sub> |                    |                     | h <sub>2</sub> |
| 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 <sup>1)</sup> | 1    | 180                                  | 2x W 11 102    | 270                         | –  | 70   | –              | G 1 1/2                      | 108            | 337 | 35             | –                  | –                   | 4.6            |
| 67 625 62 116 <sup>1)</sup> | 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 <sup>1)</sup> | 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 mm<sup>2</sup>/sec and flow resistance according to the diagram on page 40.

# 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 mm<sup>2</sup>/sec.

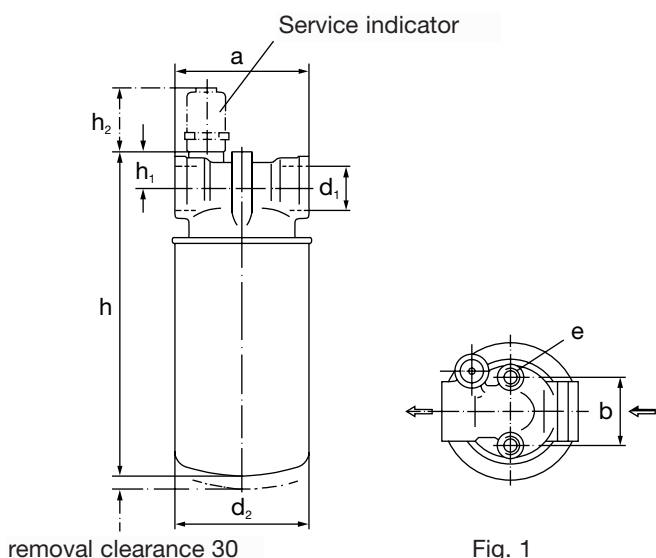
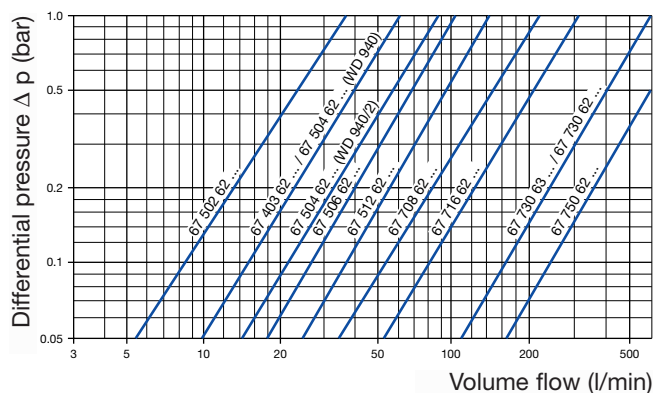


Fig. 1

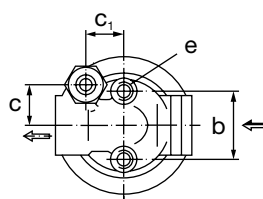


Fig. 2

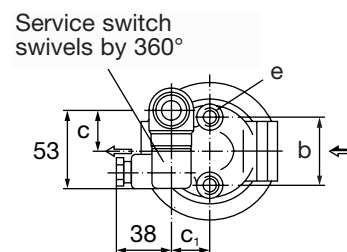


Fig. 3

| Part No.                            | Fig. | Nominal flow rate [l/min] <sup>3)</sup> | Spin-on filter | Dimensions in mm and inches |      |      |                |                              |                |               |               |                |                | Service indication | Weight approx. [kg] |      |  |
|-------------------------------------|------|---|----------------|-----------------------------|------|------|----------------|------------------------------|----------------|---------------|---------------|----------------|----------------|--------------------|---------------------|------|--|
|                                     |      |   |                | a                           | b    | c    | c <sub>1</sub> | d <sub>1</sub> <sup>1)</sup> | d <sub>2</sub> | e             | h             | h <sub>1</sub> | h <sub>2</sub> |                    |                     |      |  |
| 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                          | 47.5 | 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 <sup>2)</sup>         | 1    | 95                                      | WD 1374        | 135                         | 56   | -    | -              | G 1 1/4                      | 136            | M 10, 20 deep |               | 246            | 28             | -                  | -                   | 3.0  |  |
| 67 708 62 156 <sup>2)</sup>         | 2    | 95                                      | WD 1374        | 135                         | 56   | 30   | 26             | G 1 1/4                      | 136            |               |               | 246            | 28             | 46                 | optical             | 3.1  |  |
| 67 708 62 166 <sup>2)</sup>         | 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 mm<sup>2</sup>/sec and flow resistance according to the above diagram.

# MANN In-line filters

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

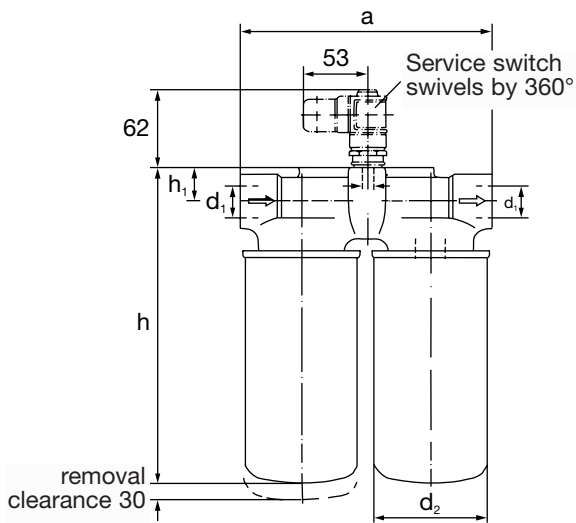


Fig. 1

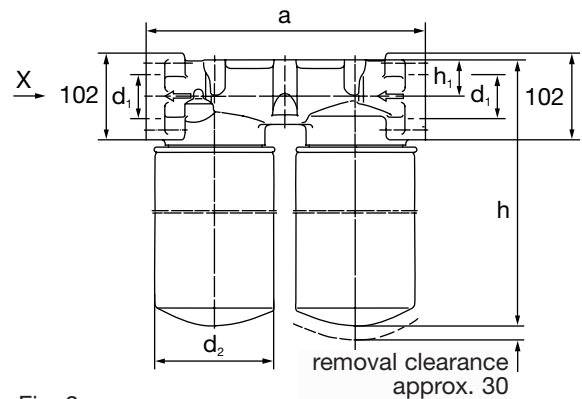


Fig. 2

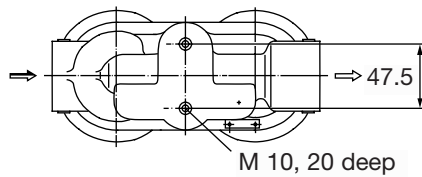


Fig. 1.1

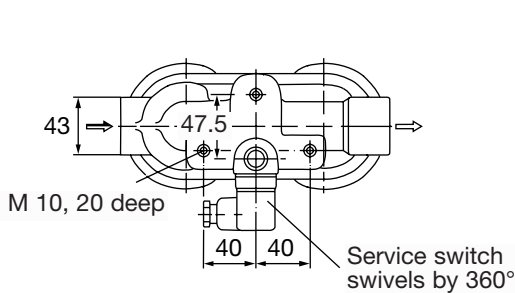
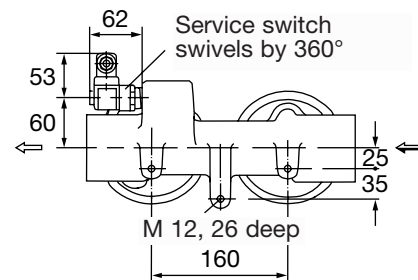
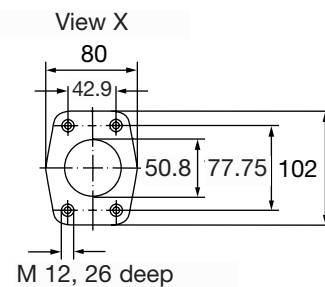


Fig. 1.2



| Part No.      | Fig. | Nominal flow rate [l/min] <sup>3)</sup> | Spin-on filter | Dimensions in mm and inches |                              |                |     |                | Operating pressure [bar] [MPa] |     | Service indication | Weight approx. [kg] |
|---------------|------|---|----------------|-----------------------------|------------------------------|----------------|-----|----------------|--------------------------------|-----|--------------------|---------------------|
|               |      |   |                | a                           | d <sub>1</sub> <sup>2)</sup> | d <sub>2</sub> | h   | h <sub>1</sub> |                                |     |                    |                     |
| 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 <sup>1)</sup>            | 136            | 402 | 42             | 20                             | 2   | –                  | 6.8                 |
| 67 730 63 116 | 2    | 360                                     | 2 x WD 13 145  | 320                         | SAE <sup>1)</sup>            | 136            | 402 | 42             | 20                             | 2   | optical            | 6.9                 |
| 67 730 63 106 | 2    | 360                                     | 2 x WD 13 145  | 320                         | SAE <sup>1)</sup>            | 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 mm<sup>2</sup>/sec and flow resistance according to the diagram on page 43.

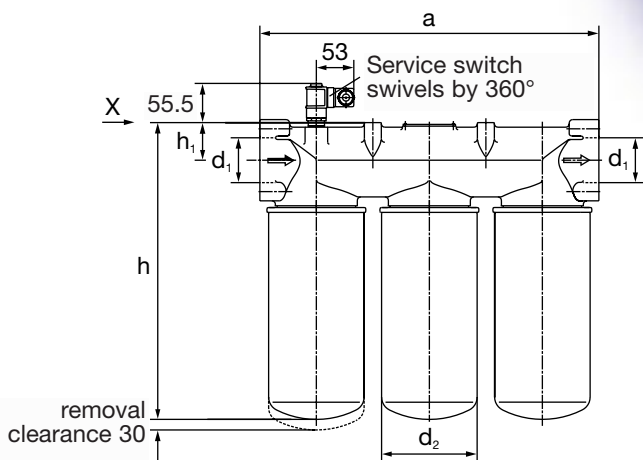
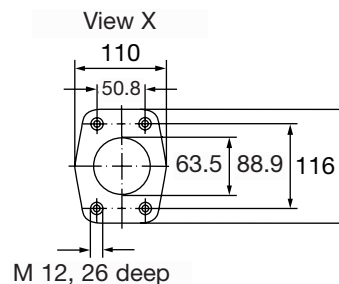
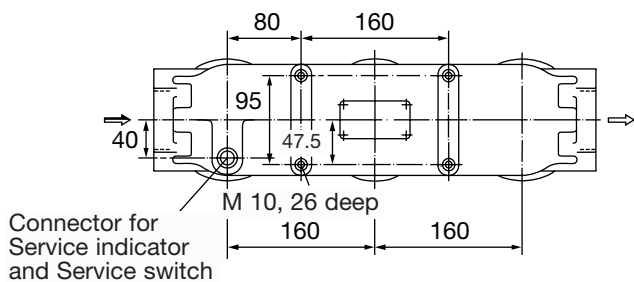


Fig. 1



| Part No.      | Fig. | Nominal flow rate [l/min] <sup>1)</sup> | Spin-on filter | Dimensions in mm |                |                |       |                | Operating pressure [bar] [MPa] |   | Service indication | Weight approx. [kg] |
|---------------|------|---|----------------|------------------|----------------|----------------|-------|----------------|--------------------------------|---|--------------------|---------------------|
|               |      |   |                | a                | d <sub>1</sub> | d <sub>2</sub> | h     | h <sub>1</sub> |                                |   |                    |                     |
| 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 mm<sup>2</sup>/sec and flow resistance according to the diagram on page 43.

# 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 mm<sup>2</sup>/sec.

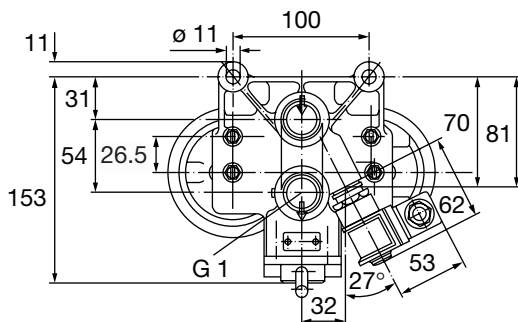
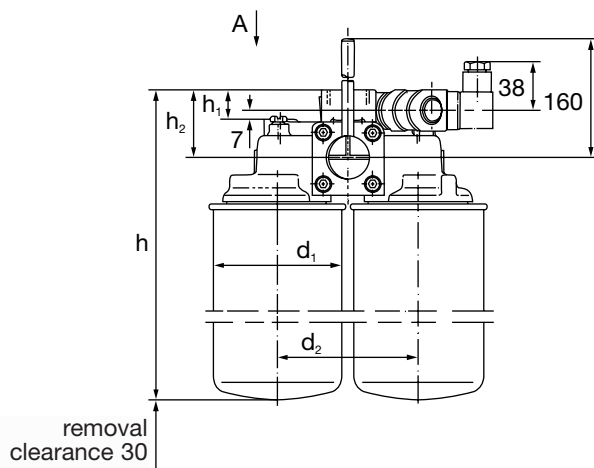
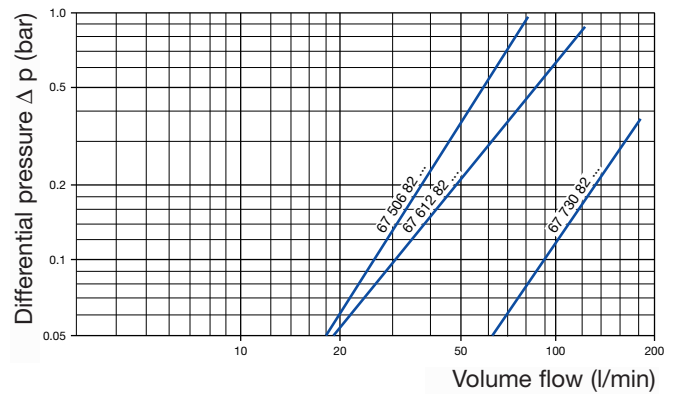


Fig. 1

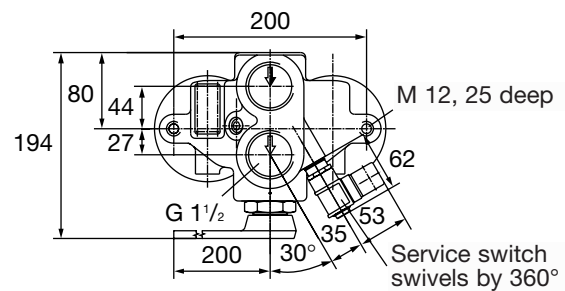


Fig. 2

| Part No.                    | Fig. | Nominal flow rate <sup>2)</sup> [l/min] | Spin-on filter             | Dimensions in mm |                |     |                |                | Operating pressure |       | Service indication | Weight approx. [kg] |
|-----------------------------|------|---|----------------------------|------------------|----------------|-----|----------------|----------------|--------------------|-------|--------------------|---------------------|
|                             |      |   |                            | d <sub>1</sub>   | d <sub>2</sub> | h   | h <sub>1</sub> | h <sub>2</sub> | [bar]              | [MPa] |                    |                     |
| 67 506 82 176 <sup>3)</sup> | 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    | 120                                     | 2 x W 11 102 <sup>1)</sup> | 108              | 130            | 373 | 53             | 71             | 10                 | 1     | –                  | 7.3                 |
| 67 612 82 146               | 2    | 120                                     | 2 x W 11 102 <sup>1)</sup> | 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 mm<sup>2</sup>/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.

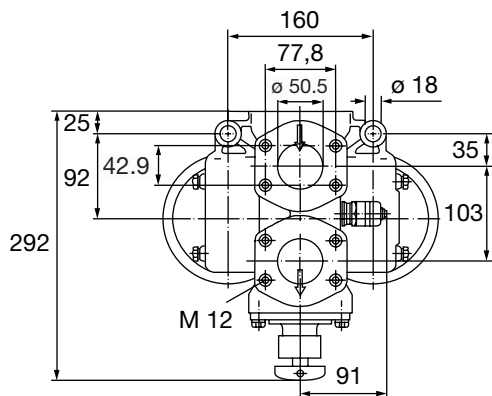
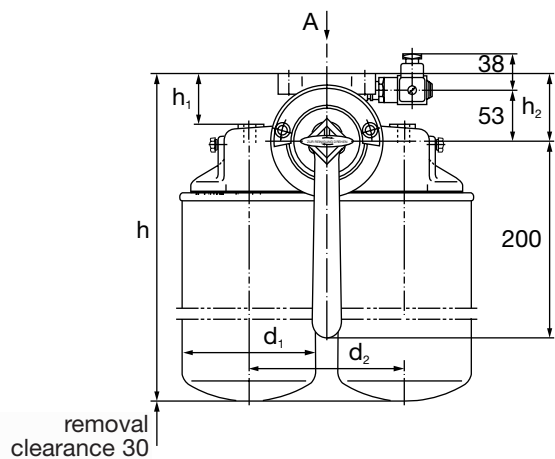


Fig. 1

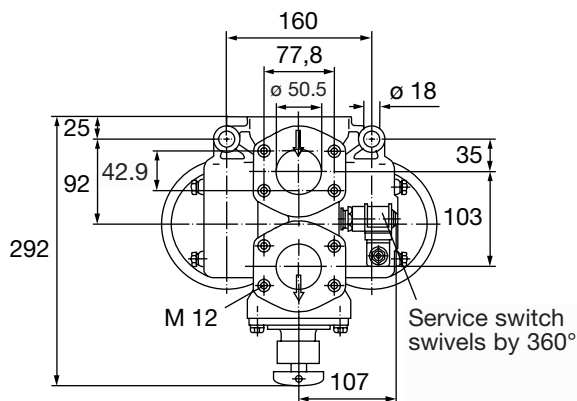


Fig. 2

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

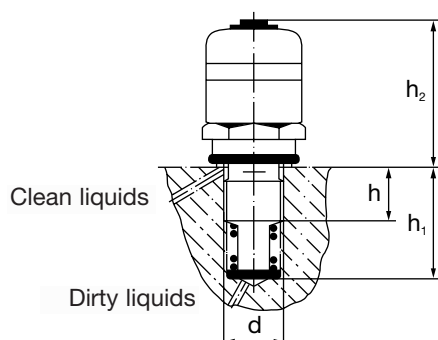
1) Available upon request: 1 counterflange (with 4 screws and 4 spring washers), Part N° 22 078 21 101.

2) The flow rates indicated apply to liquids with a viscosity of 36 mm<sup>2</sup>/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 <sub>1</sub> | h <sub>2</sub> | [bar]              | [MPa] | [bar]              | [KPa] |
| <b>59 020 79 202</b> | M 18x1.5         | 22 | 36             | 46             | 25                 | 2.5   | 1.8                | 180   |
| <b>59 020 79 212</b> | M 10x1           | 16 | –              | 44             | 25                 | 2.5   | 1.8                | 180   |
| <b>59 020 79 315</b> | M 24x2           | 19 | 44.5           | 44             | 400                | 40    | 5                  | 500   |

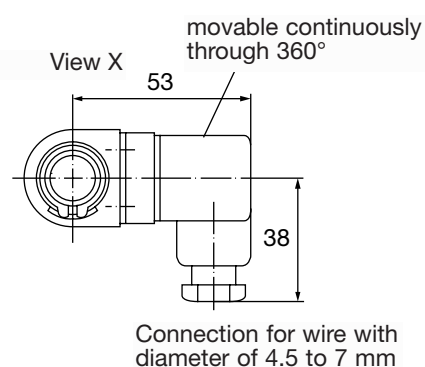
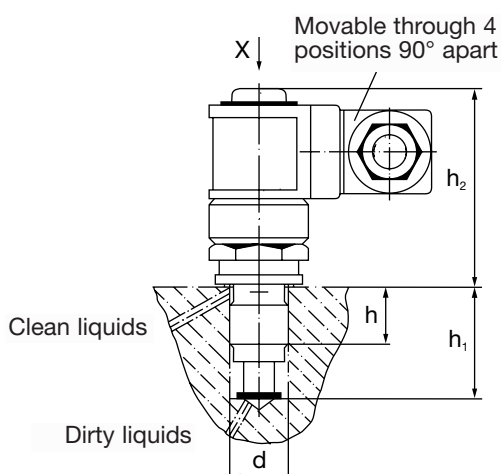
# MANN Service indicators

## 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 <sub>1</sub> | h <sub>2</sub> | [bar]              | [MPa] | [bar]              | [KPa] |
| <b>59 010 79 202</b>              | M 18x1.5         | 22  | 36             | 62.5           | 25                 | 2.5   | 1.8                | 180   |
| <b>59 010 79 305</b>              | M 24x2           | 19  | 59.5           | 61             | 400                | 40    | 5                  | 500   |
| <b>59 010 79 315<sup>1)</sup></b> | M 24x2           | 19  | 57.5           | 61             | 400                | 40    | 5                  | 500   |
| <b>59 010 79 405</b>              | M 18x1.5         | 7.5 | 30             | 62.5           | 220                | 17.5  | 5                  | 500   |

1) With opening pressure for bypass valve of  $7 \pm 0.9$  bar.



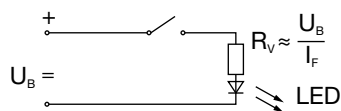
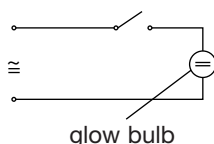
# Service switches

## For In-line and high-pressure filters

### Recommendations for electrical installation of service switches

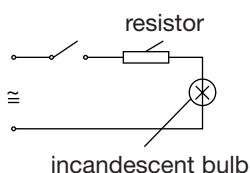
Each service switch is equipped with a high-quality relay (reed contact). In order to ensure trouble-free operation, observe the following:

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  
 $I_f =$  approx. 15 to 20 mA

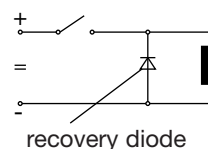
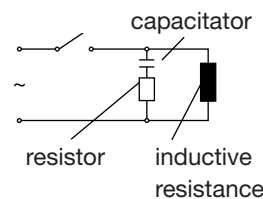
2. Incandescent bulbs require a very high switch-on current compared to their operating current. Therefore, select the bulb and a series resistor in such a way that the switch's maximum rating (refer to plaque on unit) is not exceeded when it is turned on. We recommend selecting the series resistor in 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



Industriefilter



## 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.

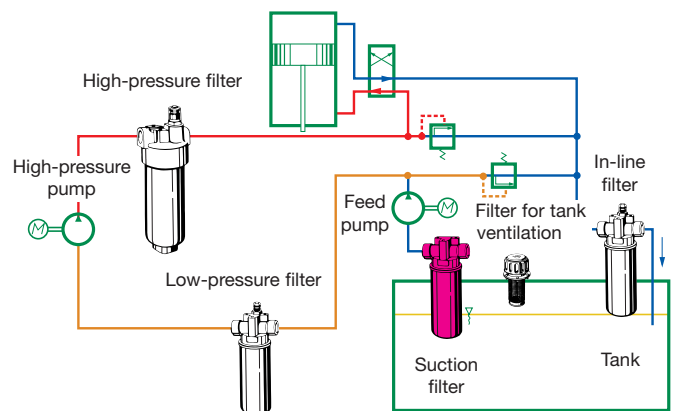
### Technical data

|                                     |   |
|-------------------------------------|---|
| Filter fineness:                    | 12 $\mu\text{m}$ 50% fractional separation efficiency (single pass)<br>30 $\mu\text{m}$ 99% fractional separation efficiency (single pass)<br>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 $-0.5 \pm 0.2$ bar ( $-50 \pm 20$ KPa)<br>Breaking voltage max. 42 V $\cong$<br>Inrush current: 1 A<br>Rupturing capacity: max. 12 W<br>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.

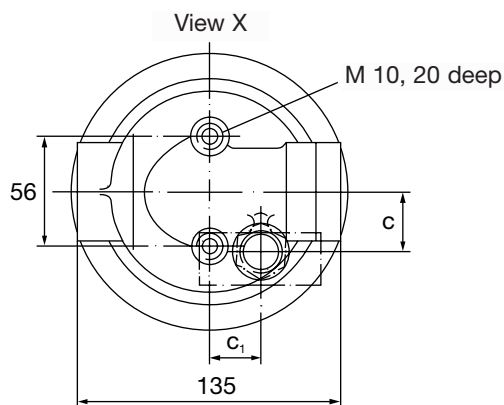
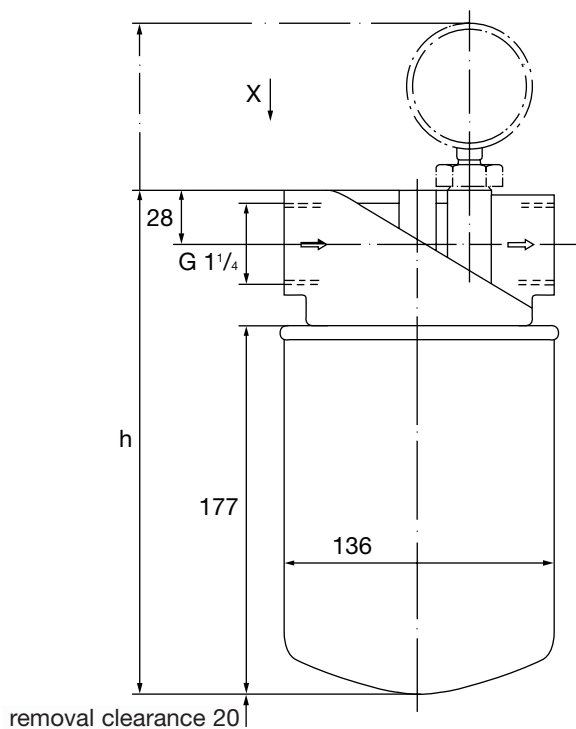
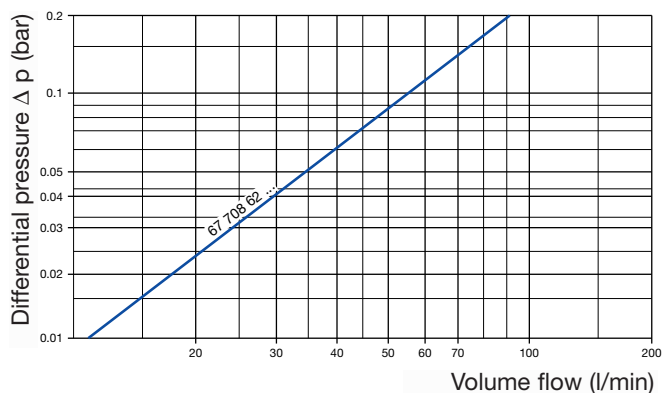
### MANN Filters in hydraulic circuits



# ... for in-line installation

## Characteristics

Flow resistance as per ISO 3968 at 36 mm<sup>2</sup>/sec.

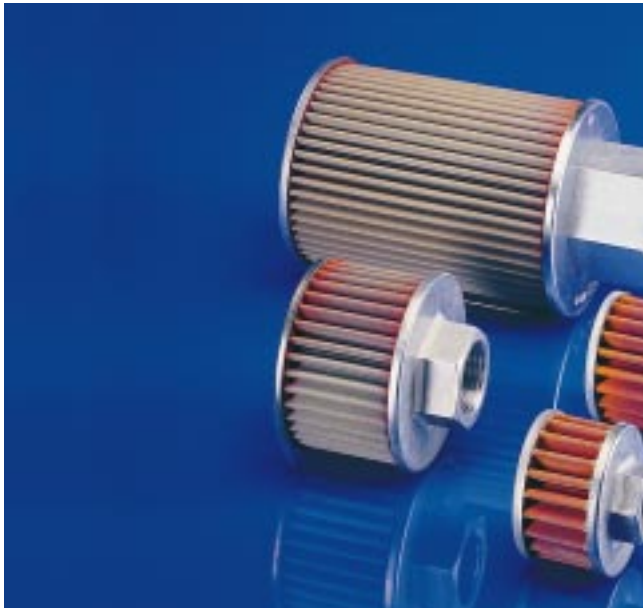


| Part No.<br>Complete filter | Nominal<br>flow rate<br>[l/min] | Spin-on<br>filter      | Dimensions in mm |                |     | Service<br>indicator |
|-----------------------------|---------------------------------|------------------------|------------------|----------------|-----|----------------------|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

<sup>1)</sup> 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



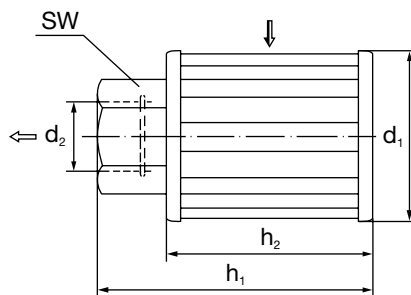
MANN Star-pleated strainer filters are used primarily for suction operation in hydraulic tanks.

### Assembly and maintenance

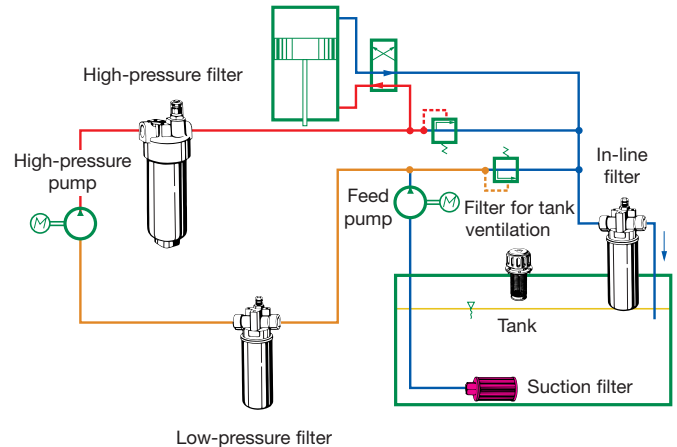
The filter is screwed directly onto the suction socket of the feed pump or a similar suction pipe. The filter maintenance is carried out latest when an oil change becomes necessary.

### Technical data

- Filter fineness: 100  $\mu\text{m}$   
(other fineness upon request)
- Strainer web: Phosphor bronze



### MANN Filters in hydraulic circuits



| Part No.      | Nominal flow rate [l/min] <sup>1)</sup> | Filtering surface [cm <sup>2</sup> ] | Dimensions in mm and inches |                |                |                |    | Weight approx. [kg] |
|---------------|---|--------------------------------------|-----------------------------|----------------|----------------|----------------|----|---------------------|
|               |   |                                      | d <sub>1</sub>              | d <sub>2</sub> | h <sub>1</sub> | h <sub>2</sub> | 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                |

<sup>1)</sup> Flow rates apply to liquids with a viscosity of 36 mm<sup>2</sup>/sec. (cSt) at a flow resistance < 0.1 bar (10 KPa).

# MANN Picolino



Industriefilter



## Compact air cleaners for high requirements

**NEW**

MANN Picolino. The new series of compact air cleaners made of plastic.

### Application areas

- For two-way ventilation of gearboxes and tanks for liquids (also available with pressure regulation)
- As a silencer cleaner for applications where low noise is a requirement

### Technical data

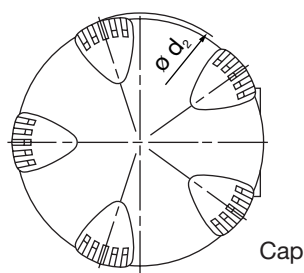
- Nominal flow rate: 0.15 to 3.2 m<sup>2</sup>/min
- Material: impact-resistant polyamide for temperatures from -20 °C to +120 °C

### Your advantages in a glance

- Economic
- Short delivery time
- Short manufacturing time for cleaners with your logo
- Free of metal
- Easy to recycle
- Easy to service and assemble



# Picolino intake air filter (with two-way ventilation)



Cap

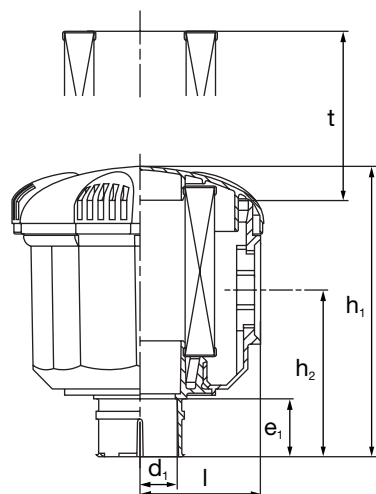
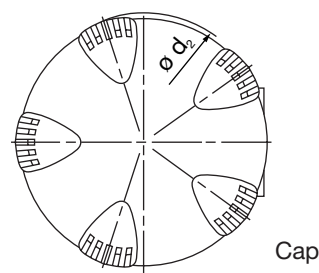


Fig. 1



Cap

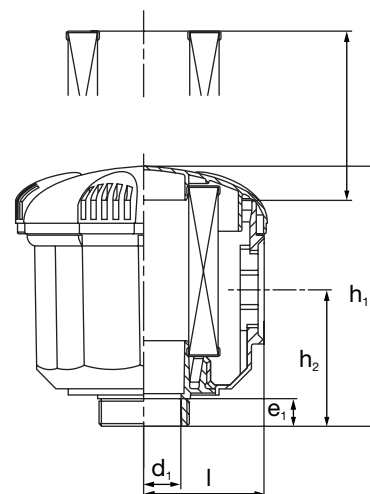


Fig. 2

| Part No.      | Fig. | Nominal flow rate [m <sup>3</sup> /min] <sup>1)</sup> | Dimensions in mm and inches |                |                |                |                |    |     | Replacement MANN micro-Top filter element | Clamp (not included in extent of supply) <sup>3)</sup> |
|---------------|------|---|-----------------------------|----------------|----------------|----------------|----------------|----|-----|---|--|
|               |      |   | d <sub>1</sub>              | d <sub>2</sub> | e <sub>1</sub> | h <sub>1</sub> | h <sub>2</sub> | l  | t   |   |  |
| 44 010 72 996 | 2    | 0.15  | G 1/2 <sup>4)</sup>         | 58             | 14             | 61             | 34             | 27 | 30  | C 410                                     | –  |
| 44 010 72 997 | 2    | 0.15  | G 3/8 <sup>4)</sup>         | 58             | 11             | 61             | 34             | 27 | 30  | C 410                                     | –  |
| 44 010 72 999 | 2    | 0.2   | M 18x1.5 <sup>2)</sup>      | 58             | 10             | 61             | 34             | 27 | 30  | C 410                                     | –  |
| 44 010 77 999 | 1    | 0.25  | 35                          | 58             | 23             | 73             | 64             | 27 | 30  | C 410                                     | 02 018 01 192  |
| 44 020 72 996 | 2    | 0.2   | G 1/2 <sup>4)</sup>         | 68             | 14             | 62             | 34             | 31 | 30  | C 420                                     | –  |
| 44 020 72 997 | 2    | 0.2   | G 3/8 <sup>4)</sup>         | 68             | 11             | 62             | 34             | 31 | 30  | C 420                                     | –  |
| 44 020 72 999 | 2    | 0.25  | M 18x1.5 <sup>2)</sup>      | 68             | 10             | 62             | 34             | 31 | 30  | C 420                                     | –  |
| 44 020 77 999 | 1    | 0.3   | 35                          | 68             | 23             | 74             | 46             | 31 | 30  | C 420                                     | 02 018 01 192  |
| 44 030 72 999 | 2    | 0.7   | G 3/4 <sup>4)</sup>         | 102            | 15             | 94             | 45             | 48 | 68  | C 630                                     | –  |
| 44 030 77 997 | 1    | 1.4   | 40                          | 102            | 25             | 116            | 67             | 48 | 68  | C 630                                     | 02 018 01 194  |
| 44 030 77 998 | 1    | 1.2   | 30                          | 102            | 23             | 116            | 67             | 48 | 68  | C 630                                     | 02 018 01 192  |
| 44 030 77 999 | 1    | 0.6   | 20                          | 102            | 23             | 116            | 67             | 48 | 68  | C 630                                     | 02 018 01 190  |
| 44 040 72 999 | 2    | 2.0   | G 1 1/4 <sup>4)</sup>       | 145            | 19             | 131            | 71             | 69 | 79  | C 1140                                    | –  |
| 44 040 77 996 | 1    | 3.0   | 71                          | 145            | 25             | 136            | 76             | 69 | 79  | C 1140                                    | 02 018 01 196  |
| 44 040 77 997 | 1    | 3.0   | 60                          | 145            | 25             | 136            | 76             | 69 | 79  | C 1140                                    | 02 018 01 195  |
| 44 040 77 998 | 1    | 2.7   | 52                          | 145            | 25             | 136            | 76             | 69 | 79  | C 1140                                    | 02 018 01 194  |
| 44 040 77 999 | 1    | 2.0   | 40                          | 145            | 25             | 136            | 76             | 69 | 79  | C 1140                                    | 02 018 01 194  |
| 44 050 72 999 | 2    | 2.2   | G 1 1/4 <sup>4)</sup>       | 181            | 19             | 188            | 112            | 86 | 135 | C 1250                                    | –  |
| 44 050 77 996 | 1    | 3.2   | 71                          | 181            | 25             | 193            | 117            | 86 | 135 | C 1250                                    | 02 018 01 196  |
| 44 050 77 997 | 1    | 3.2   | 60                          | 181            | 25             | 193            | 117            | 86 | 135 | C 1250                                    | 02 018 01 195  |
| 44 050 77 998 | 1    | 3.0   | 52                          | 181            | 25             | 193            | 117            | 86 | 135 | C 1250                                    | 02 018 01 194  |
| 44 050 77 999 | 1    | 2.2   | 40                          | 181            | 25             | 193            | 117            | 86 | 135 | C 1250                                    | 02 018 01 194  |

1) Nominal flow rate relating to 15 mbar flow resistance. Flow rate value dependant on the cross-section of the clean air adapter.

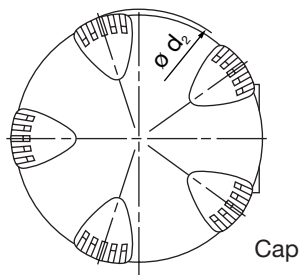
2) Male thread.

3) On request filter supplied with fitted clamp strap.

4) Female thread.



# Picolino filter silencer



Cap

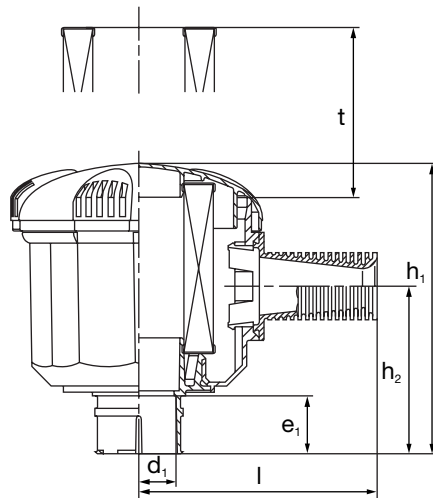
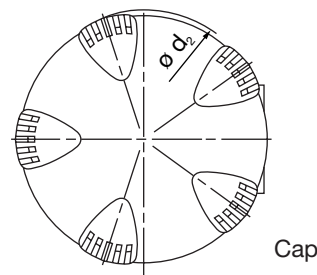


Fig. 1



Cap

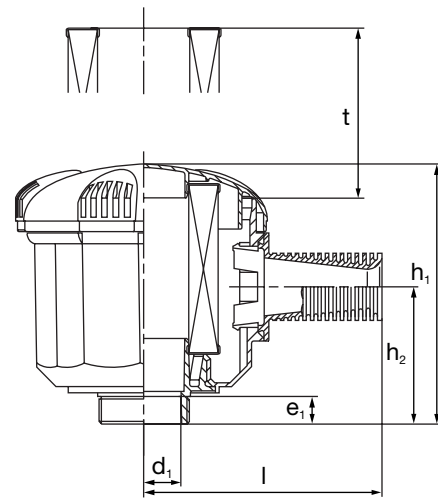


Fig. 2

| Part No.      | Fig. | Nominal flow rate [m <sup>3</sup> /min] <sup>1)</sup> | Dimensions in mm and inches |                |                |                |                |                |     |     | Replacement MANN micro-Top filter element | Clamp (not included in extent of supply) <sup>3)</sup> |
|---------------|------|---|-----------------------------|----------------|----------------|----------------|----------------|----------------|-----|-----|---|--|
|               |      |   | d <sub>1</sub>              | d <sub>2</sub> | e <sub>1</sub> | e <sub>2</sub> | h <sub>1</sub> | h <sub>2</sub> | l   | t   |   |  |
| 44 010 82 996 | 2    | 0.15  | G 1/2 <sup>4)</sup>         | 58             | 14             | 29             | 61             | 34             | 56  | 30  | C 410                                     | –  |
| 44 010 82 997 | 2    | 0.15  | G 3/8 <sup>4)</sup>         | 58             | 11             | 29             | 61             | 34             | 56  | 30  | C 410                                     | –  |
| 44 010 82 999 | 2    | 0.15  | M 18x1.5 <sup>2)</sup>      | 58             | 10             | 29             | 61             | 34             | 56  | 30  | C 410                                     | –  |
| 44 010 87 999 | 1    | 0.16  | 35                          | 58             | 23             | 29             | 73             | 46             | 56  | 30  | C 410                                     | 02 018 01 192  |
| 44 020 82 996 | 2    | 0.2   | G 1/2 <sup>4)</sup>         | 68             | 14             | 29             | 62             | 34             | 60  | 30  | C 420                                     | –  |
| 44 020 82 997 | 2    | 0.2   | G 3/8 <sup>4)</sup>         | 68             | 11             | 29             | 62             | 34             | 60  | 30  | C 420                                     | –  |
| 44 020 82 999 | 2    | 0.15  | M 18x1.5 <sup>2)</sup>      | 68             | 10             | 29             | 62             | 34             | 60  | 30  | C 420                                     | –  |
| 44 020 87 999 | 1    | 0.18  | 35                          | 68             | 23             | 29             | 74             | 46             | 60  | 30  | C 420                                     | 02 018 01 192  |
| 44 030 82 999 | 2    | 0.6   | G 3/4 <sup>4)</sup>         | 102            | 15             | 47             | 94             | 45             | 95  | 68  | C 630                                     | –  |
| 44 030 87 997 | 1    | 0.9   | 40                          | 102            | 25             | 47             | 116            | 67             | 95  | 68  | C 630                                     | 02 018 01 194  |
| 44 030 87 998 | 1    | 0.7   | 30                          | 102            | 23             | 47             | 116            | 67             | 95  | 68  | C 630                                     | 02 018 01 192  |
| 44 030 87 999 | 1    | 0.6   | 20                          | 102            | 23             | 47             | 116            | 67             | 95  | 68  | C 630                                     | 02 018 01 190  |
| 44 040 82 999 | 2    | 1.8   | G 1 1/4 <sup>4)</sup>       | 145            | 19             | 55             | 131            | 71             | 79  | 79  | C 1140                                    | –  |
| 44 040 87 996 | 1    | 2.0   | 71                          | 145            | 25             | 55             | 136            | 76             | 79  | 79  | C 1140                                    | 02 018 01 196  |
| 44 040 87 997 | 1    | 2.2   | 60                          | 145            | 25             | 53             | 136            | 76             | 116 | 79  | C 1140                                    | 02 018 01 195  |
| 44 040 87 998 | 1    | 1.9   | 52                          | 145            | 25             | 53             | 136            | 76             | 116 | 79  | C 1140                                    | 02 018 01 194  |
| 44 040 87 999 | 1    | 1.5   | 40                          | 145            | 25             | 53             | 136            | 76             | 116 | 79  | C 1140                                    | 02 018 01 194  |
| 44 050 82 999 | 2    | 2.8   | G 1 1/4 <sup>4)</sup>       | 181            | 19             | 55             | 188            | 112            | 133 | 135 | C 1250                                    | –  |
| 44 050 87 996 | 1    | 3.0   | 71                          | 181            | 25             | 55             | 193            | 117            | 133 | 135 | C 1250                                    | 02 018 01 196  |
| 44 050 87 997 | 1    | 3.0   | 60                          | 181            | 25             | 59             | 193            | 117            | 133 | 135 | C 1250                                    | 02 018 01 195  |
| 44 050 87 998 | 1    | 2.6   | 52                          | 181            | 25             | 59             | 193            | 117            | 133 | 135 | C 1250                                    | 02 018 01 194  |
| 44 050 87 999 | 1    | 2.0   | 40                          | 181            | 25             | 59             | 193            | 117            | 133 | 135 | C 1250                                    | 02 018 01 194  |

1) Nominal flow rate relating to 15 mbar flow resistance. Flow rate value dependant on the cross-section of the clean air adapter.

2) Male thread.

3) On request filter supplied with fitted clamp strap.

4) Female thread.



# MANN Filters for two-way ventilation in hydraulic systems



## 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 61). 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.

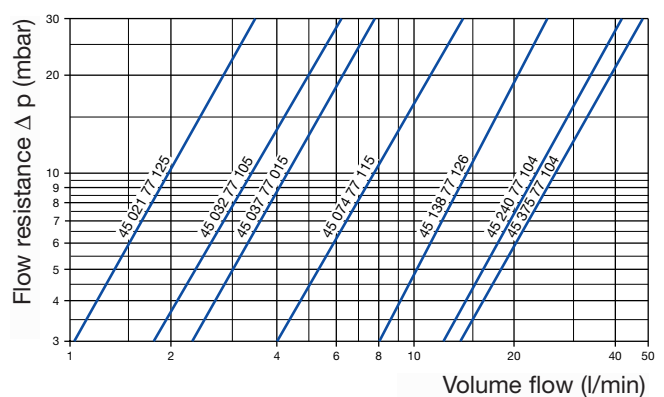
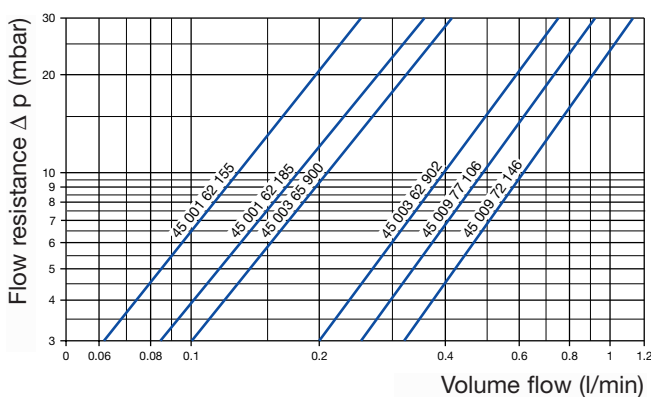


### Maintenance

Fig. 1, 2 and 4 (Page 61): On maintenance, the complete filter is replaced by a new one.

Fig. 3 (Page 61): The MANN micro-Top filter element is replaced after the hood has been removed.

### Characteristics



## ... for hydraulic systems

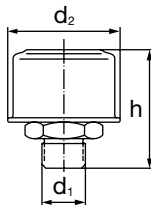


Fig. 1

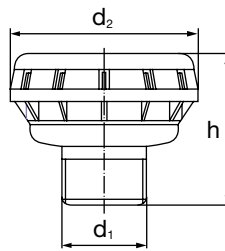


Fig. 2

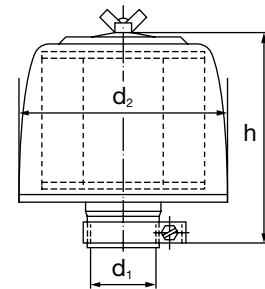


Fig. 3

| Part No.      | Fig. | Nominal flow rate [m³/min] | Dimensions in mm and inches |                |      | Weight approx. [kg] | Respective MANN micro-Top filter element |
|---------------|------|----------------------------|-----------------------------|----------------|------|---------------------|--|
|               |      |                            | d <sub>1</sub>              | d <sub>2</sub> | 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 ¾                         | 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 [m³/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.

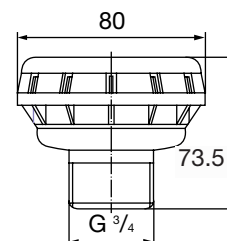


Fig. 4

# 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.

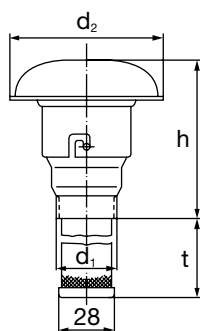


Fig. 1

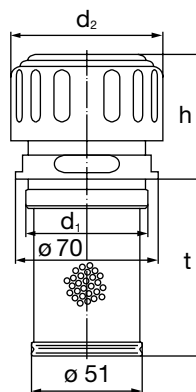


Fig. 2

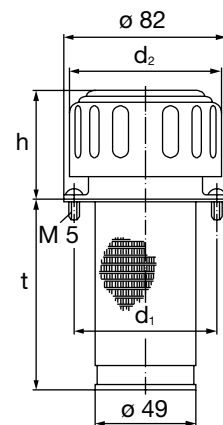


Fig. 3

| Part No.                    | Fig. | Nominal flow rate [m <sup>3</sup> /min <sup>1</sup> ] | Dimensions in mm and inches |                |    |     | Weight approx. [kg] |
|-----------------------------|------|---|-----------------------------|----------------|----|-----|---------------------|
|                             |      |   | d <sub>1</sub>              | d <sub>2</sub> | 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 <sup>2)</sup> | 3    | 0.7   | 71.5                        | 77             | 54 | 96  | 0.4                 |

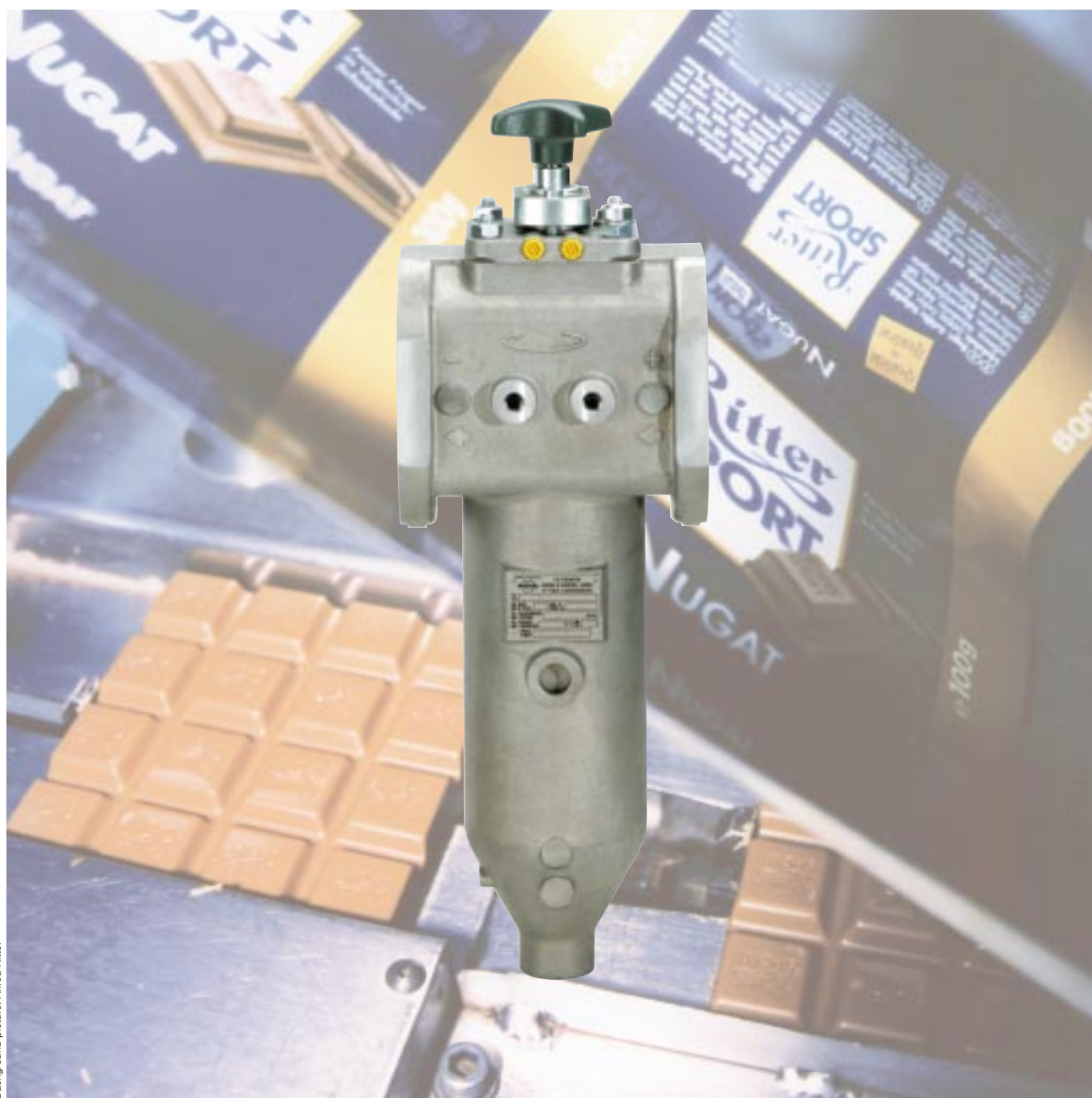
<sup>1)</sup> Given a flow resistance of  $\Delta p = 10$  mbar (1 KPa).

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

# MANN Gap-type filters



Industriefilter



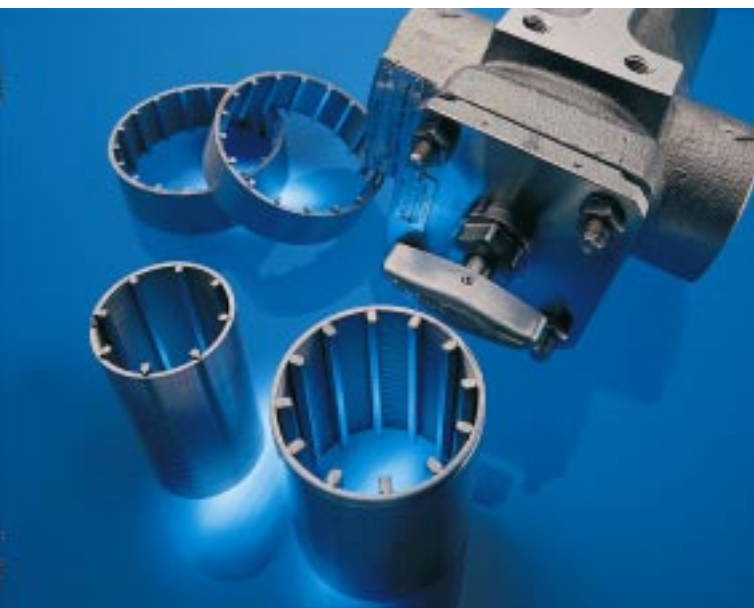
Background picture: Alfred Ritter

## MANN Gap-type filters

Plate gap-type, wire gap-type and gap-type tube filters are particularly suitable for the filtration of heavily contaminated fluids of high and low viscosity, such as fuels, lube oils, paints, polyhydric alcohols, isocyanate, cooling lubricants, etc. They are used in almost every industrial branch for numerous applications, such as:

- steam and hydraulic engines
- pumps
- hydraulic systems
- machine tools
- gears
- medium to large-size internal-combustion engines
- food industry
- cleaning of water and fluids in the pharmaceutical processing industry, etc.

MANN gap-type filters can be cleaned during service; they offer simple maintenance and particularly long service life. All the gap-type filters work without chemicals, i.e. they have no harmful impact on the environment.



Gap-type filters are used in full and return flows. The fluid passes through the filter inserts from the outside to the inside.

The filter rating is determined by the gap width. MANN gap-type filters can also be combined with MANN in-line filters (paper filters serving as highly efficient fine filters) to make multi-stage filters. You can find in-line filters from page 37 onwards.

Heatable gap-type filters for special applications are also available, as well as electronic controllers for automatic operation.

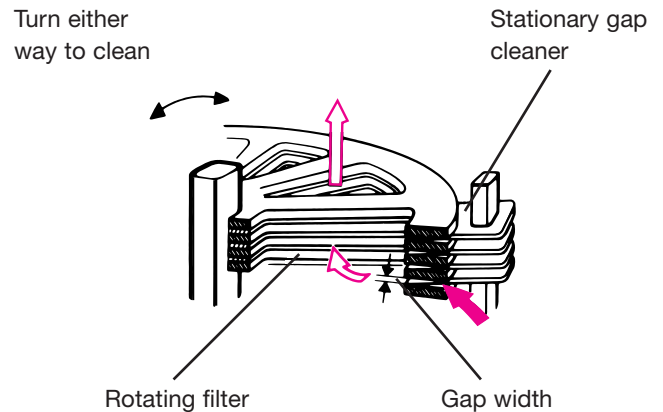
The filter housings can be made of carbon steel, grey cast iron, cast aluminium or nickel chromium steel. Special models can be supplied on request.

Fill out and fax us the form on page 3: We will configure the filter best suited to your requirements.

## MANN Gap-type filters

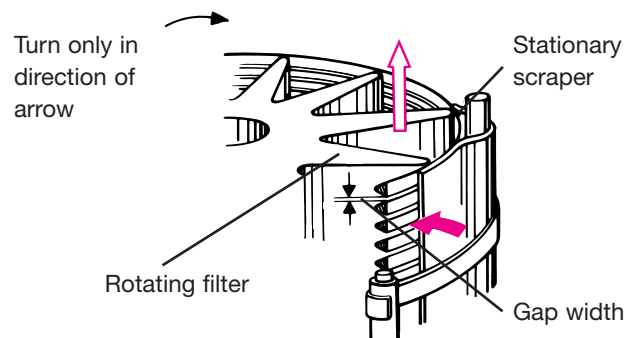
### MANN Plate Gap-type filters for gap width $\geq 0.1$ mm

The plate gap-type filter insert consists of steel discs which are piled up on a central pin. The gap width between the discs is determined by spacers between the discs. A stationary gap cleaner runs through every gap. As the fluid flows between the discs, the dirt particles are deposited on the surface and in the gaps. By turning the filter insert with the handle, the dirt gathers on the row of gap cleaners and falls into the sludge collection chamber where it is discharged by opening a ball valve.



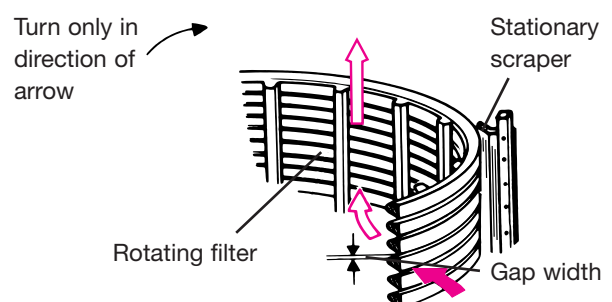
### MANN Wire Gap-type filters for gap width $\geq 0.03$ mm

The wire gap-type filter insert consists of a non-rusting, high tensile steel wire wound in a spiral around an aluminium frame. The exact position of the steel wire on the frame provides for equal gaps. As the liquid to be filtered flows through the filter insert the dirt particles are deposited in the gaps. By turning the filter insert with the handle, the dirt is removed by a stationary scraper and then falls down into the sludge collection chamber where it is discharged by opening a ball valve.



### MANN Gap-type Tube filter for gap width $\geq 0.03$ mm

The gap-type tube filter insert consists of a wire wound around longitudinal rods welded together at every crossing point. The longitudinal rods and wire are made of non-rusting, high tensile steel. The exact position of the steel wire on the longitudinal rods provide for equal gaps. As the liquid to be filtered flows through the filter insert the dirt particles are deposited in the gaps. By turning the filter insert with the handle, the dirt is removed by a stationary scraper and then falls

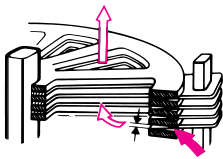
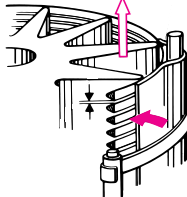
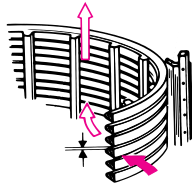


down into the sludge collection chamber where it is discharged by opening a ball valve.



# MANN Gap-type filters

## Applications and technical data

|   | <br><b>Plate gap-type filter</b> | <br><b>Wire gap-type filter</b> | <br><b>Gap-type tube filter</b> |
|---|---|---|--|
| Particular suitable for                         | highly viscous fluids   | fuels and lubricants  | aqueous and/or abrasive fluids   |
| Main range of application (industrial branches) | reaction injection moulding machines  | aggregates (gears, engines, etc.)   | industrial installations   |
| Gap width                                       | 100 to 800 µm   | 30 to 500 µm  | 30 to 2 000 µm   |
| Nominal flow rate at 1-10 mm <sup>2</sup> /s    | up to 45 m <sup>3</sup> /h  | up to 45 m <sup>3</sup> /h  | up to 800 m <sup>3</sup> /h  |
| Material of housing                             | Al, grey cast iron, SS  | Al, grey cast iron, SS  | Al, grey cast iron, SS   |
| Material of filter inlet                        | Al, grey cast iron, SS  | Al, grey cast iron, SS  | Al, grey cast iron, SS   |
| Operating pressure <sup>1)</sup>                | 10 to 40 bar (1 to 4 MPa)   | 10 to 40 bar (1 to 4 MPa)   | 10 to 40 bar (1 to 4 MPa)  |
| Working temperature <sup>1)</sup>               | 120 °C  | 120 °C  | 120 °C   |
| Operation                                       | manual or electric <sup>2)</sup>  | manual or electric <sup>2)</sup>  | manual or electric <sup>2)</sup>   |
| Sludge outlet                                   | yes   | yes   | yes  |
| Connections                                     | metric thread, pipe thread and flange   |   |  |
| Controller and monitoring                       | optional  | optional  | optional   |

<sup>1)</sup> Higher upon request.

<sup>2)</sup> Explosion-protection upon request.

# MANN Plate gap-type filters

Nominal pressure 10/40 bar (1.0/4.0 MPa)

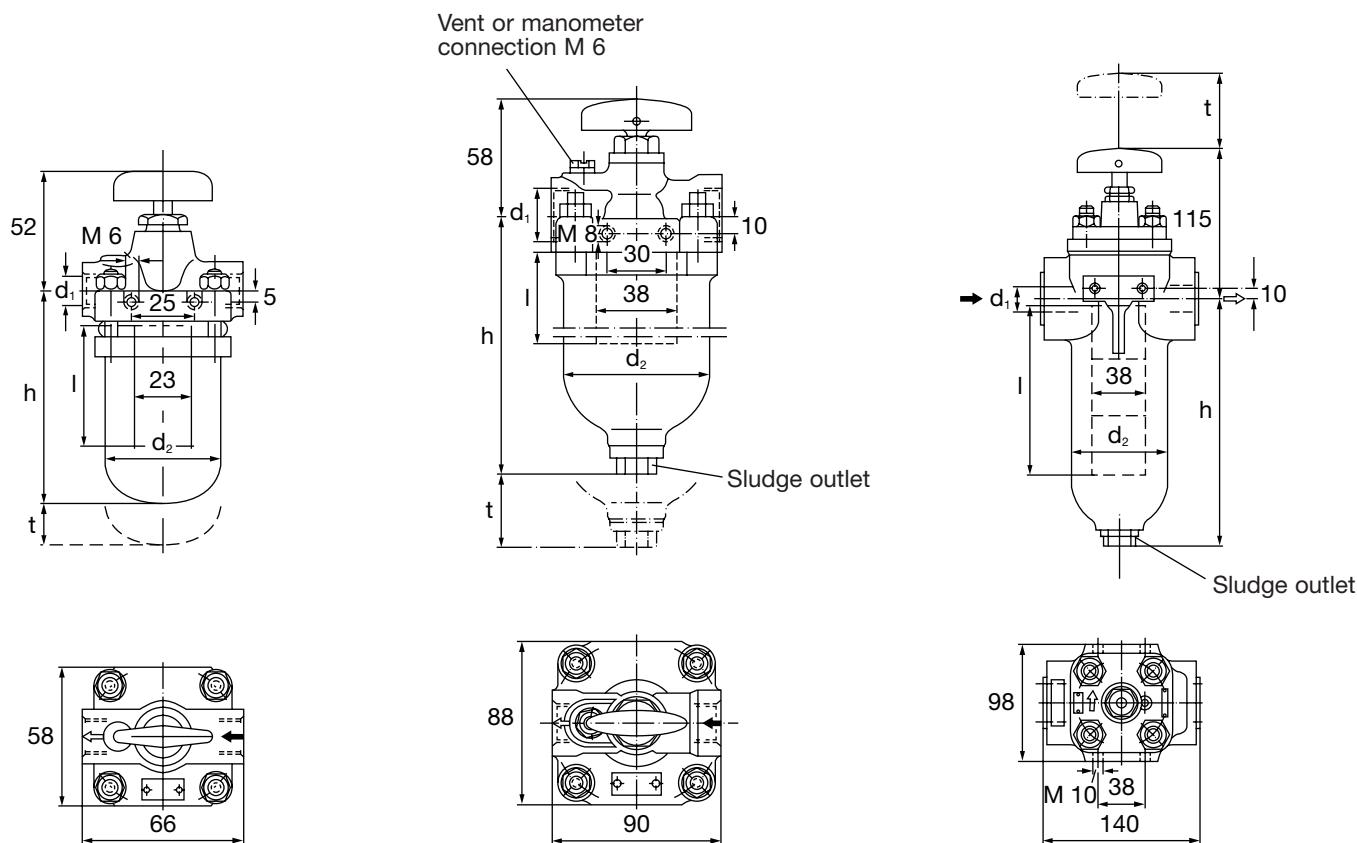


Fig. 1 Filter bowl removable from the bottom

Fig. 2 Filter bowl removable from the bottom

Fig. 3 Filter insert removable from the top

## Dimensions and Part Numbers

| Part No.      | Fig. | Gap width   |                 | Dimensions in mm and inches |                |     |     |     | Max. working pressure |       | Weight approx. [kg] |
|---------------|------|---|-----------------|-----------------------------|----------------|-----|-----|-----|-----------------------|-------|---------------------|
|               |      | 0.1 mm<br>x = 3<br>Nom. flow rate <sup>1)</sup> [l/h] | 0.2 mm<br>x = 5 | d <sub>1</sub>              | d <sub>2</sub> | h   | l   | t   | [bar]                 | [MPa] |                     |
| 51 207 6x 021 | 1    | 900   | –               | M 14x1.5                    | 47             | 125 | 70  | 85  | 10                    | 1     | 0.9                 |
| 51 305 6x 041 | 2    | 1 400   | 3 500           | M 22x1.5                    | 77             | 142 | 50  | 90  | 40                    | 4     | 2.4                 |
| 51 305 6x 051 | 2    | 1 400   | 3 500           | G 1/2                       | 77             | 142 | 50  | 90  | 40                    | 4     | 2.4                 |
| 51 305 6x 061 | 2    | 1 400   | 4 000           | G 3/4                       | 77             | 142 | 50  | 90  | 40                    | 4     | 2.4                 |
| 51 310 6x 041 | 2    | 2 600   | 3 500           | M 22x1.5                    | 77             | 192 | 95  | 140 | 40                    | 4     | 2.8                 |
| 51 310 6x 051 | 2    | 2 600   | 3 500           | G 1/2                       | 77             | 192 | 95  | 140 | 40                    | 4     | 2.8                 |
| 51 310 6x 061 | 2    | 2 600   | 4 500           | G 3/4                       | 77             | 192 | 95  | 140 | 40                    | 4     | 2.8                 |
| 51 310 7x 101 | 3    | 2 600   | 5 000           | G 1                         | 78             | 180 | 95  | 180 | 10                    | 1     | 5.8                 |
| 51 318 7x 101 | 3    | 5 000   | 5 000           | G 1                         | 78             | 295 | 180 | 280 | 10                    | 1     | 8                   |

<sup>1)</sup> The flow rates indicated apply to liquids with a viscosity of 72 mm<sup>2</sup>/s (cSt) given a flow resistance ( $\Delta p$ ) of 0.2 to 0.3 bar (20 to 30 KPa). For aqueous fluids or when a higher flow resistance is permissible, the indicated flow data may be exceeded.

Other gap widths as well as special non-rusting plate gap-type filters upon request.

# MANN Plate gap-type filters

Nominal pressure 16/40 (1.6/4.0 MPa)

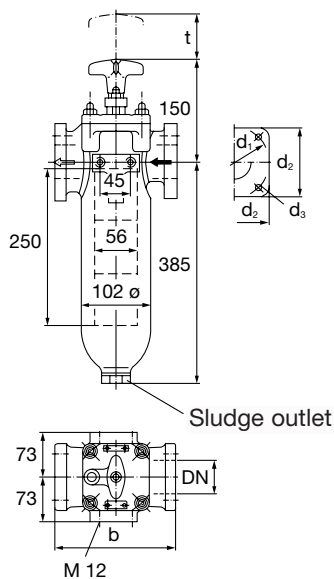


Fig. 1

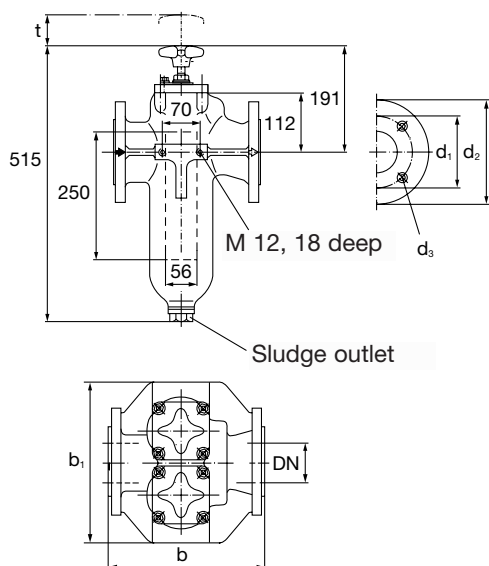


Fig. 2

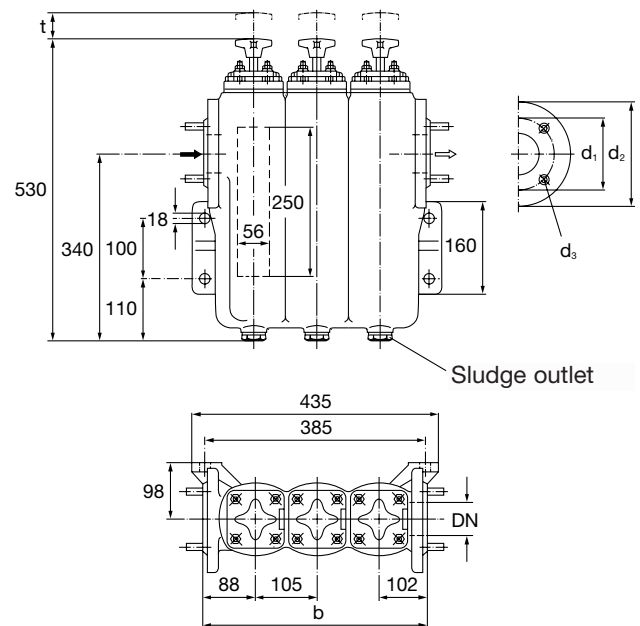


Fig. 3

## Dimensions and Part Numbers

| Part No.             | Fig. | Gap width                          |                 | Dimensions in mm |                |                |                |     |    | Max. working pressure |       | Weight approx. [kg] |
|----------------------|------|------------------------------------|-----------------|------------------|----------------|----------------|----------------|-----|----|-----------------------|-------|---------------------|
|                      |      | 0.1 mm<br>x = 3                    | 0.2 mm<br>x = 5 | b                | d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | t   | DN | [bar]                 | [MPa] |                     |
|                      |      | Nom. flow rate <sup>1)</sup> [l/h] |                 |                  |                |                |                |     |    |                       |       |                     |
| <b>51 525 7x 101</b> | 1    | 12 000                             | 15 000          | 180              | 110            | 110            | M 14           | 390 | 50 | 40                    | 4     | 19.5                |
| <b>55 550 7x 251</b> | 2    | 24 000                             | 30 000          | 290              | 145            | 220            | 18             | 390 | 65 | 16                    | 1.6   | 42                  |
| <b>55 575 7x 221</b> | 3    | 36 000                             | 45 000          | 400              | 145            | 185            | M 16           | 390 | 65 | 16                    | 1.6   | 68                  |

1) The flow rates indicated apply to liquids with a viscosity of 72 mm<sup>2</sup>/s (cSt) given a flow resistance ( $\Delta p$ ) of 0.2 to 0.3 bar (20 to 30 KPa). For aqueous fluids or when a higher flow resistance is permissible, the indicated flow data may be exceeded.

Other gap widths as well as special non-rusting plate gap-type filters upon request.

# MANN Wire gap-type and gap-type tube filters

Nominal pressure 40 bar (4.0 MPa)

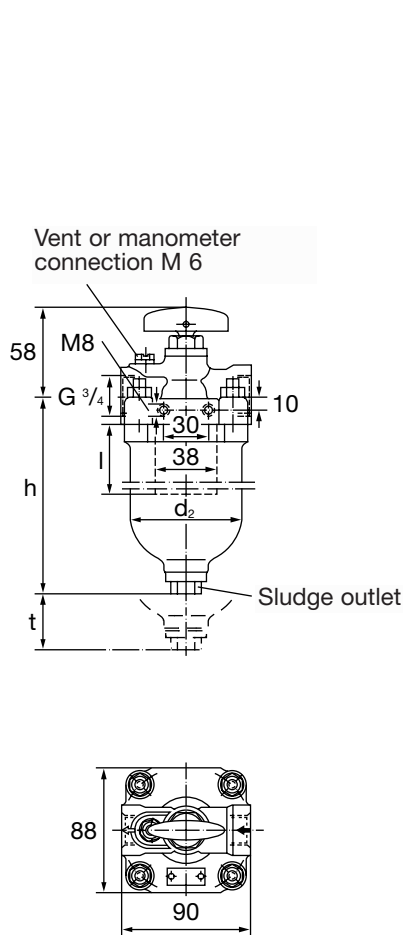


Fig. 1 Filter bowl removable from the bottom

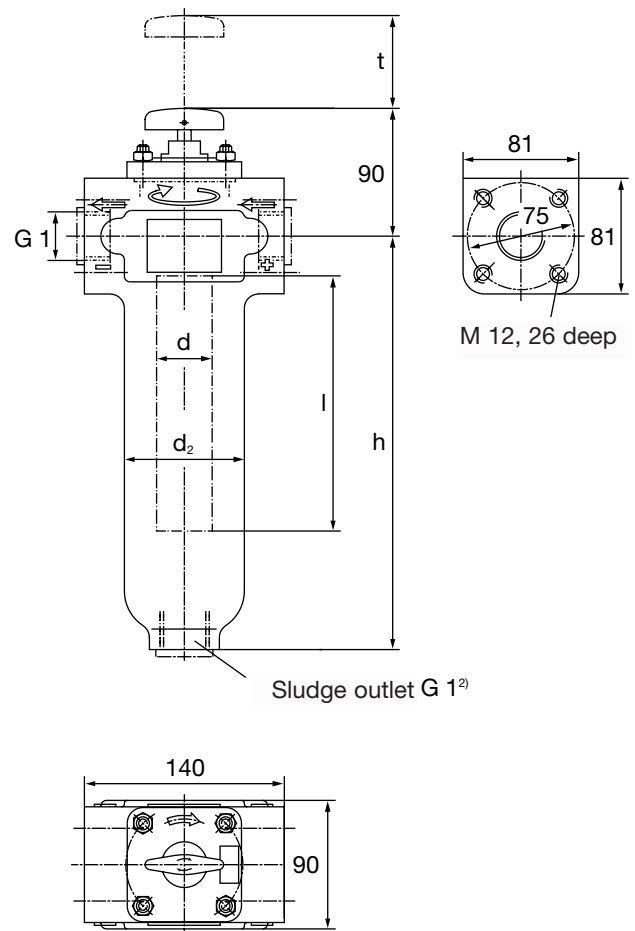


Fig. 2 Filter insert removable from the top

## Dimensions and Part No.

Max. operating pressure: 40 bar (4 MPa)

| Part No.                     | Fig. | Gap width        |                  |                 |                 | Dimensions in mm |                |       |     |     | Weight approx. [kg] |
|------------------------------|------|------------------|------------------|-----------------|-----------------|------------------|----------------|-------|-----|-----|---------------------|
|                              |      | 0.03 mm<br>x = 0 | 0.05 mm<br>x = 1 | 0.1 mm<br>x = 3 | 0.2 mm<br>x = 5 | d                | d <sub>2</sub> | h     | l   | t   |                     |
| <b>Wire gap-type filters</b> |      |                  |                  |                 |                 |                  |                |       |     |     |                     |
| 53 410 6x 061                | 1    | 1 100            | 2 000            | 3 000           | 3 500           | 42               | 77             | 195   | 95  | 140 | 2.2                 |
| 53 418 7x 101                | 2    | 2 100            | 3 900            | 5 000           | 5 000           | 42               | 84             | 289.5 | 165 | 260 | 4                   |
| <b>Gap-type tube filters</b> |      |                  |                  |                 |                 |                  |                |       |     |     |                     |
| 54 310 6x 061                | 1    | –                | 1 100            | 2 000           | 3 000           | 38               | 77             | 195   | 100 | 140 | 2.2                 |
| 54 310 7x 164                | 2    | –                | 1 100            | 2 000           | 3 000           | 38               | 84             | 180   | 100 | 200 | 3.2                 |
| 54 318 7x 104                | 2    | –                | 1 900            | 3 500           | 5 000           | 38               | 84             | 289.5 | 180 | 280 | 4.0                 |

1) The flow rates indicated apply to liquids with a viscosity of 72 mm<sup>2</sup>/s (cSt) given a flow resistance ( $\Delta p$ ) of 0.2 to 0.3 bar (20 to 30 KPa).  
For aqueous fluids or when a higher flow resistance is permissible, the indicated flow data may be exceeded.

2) Drain plug G1 (DIN 910), Part No. 01 436 16 000 and sealing ring Part No. 01 901 01 033, optional.

Other gap widths as well as special non-rusting plate gap-type filters upon request.

# MANN Gap-type tube filters

Nominal pressure 10/40 bar (1.0/4.0 MPa)

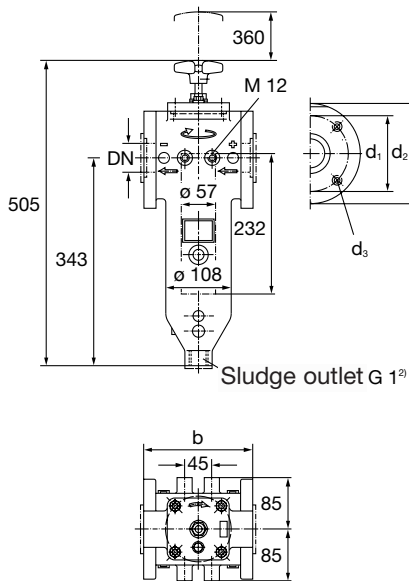


Fig. 1

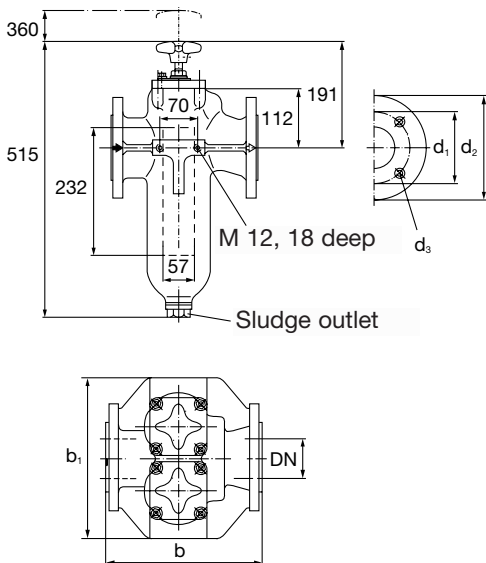


Fig. 2

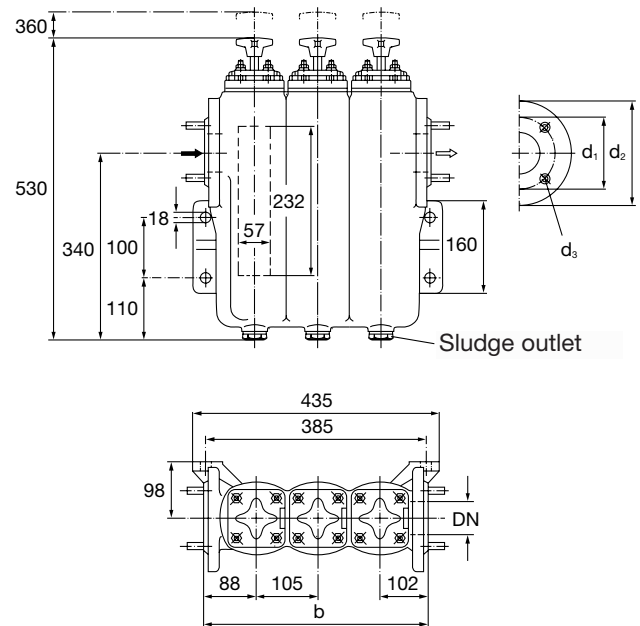
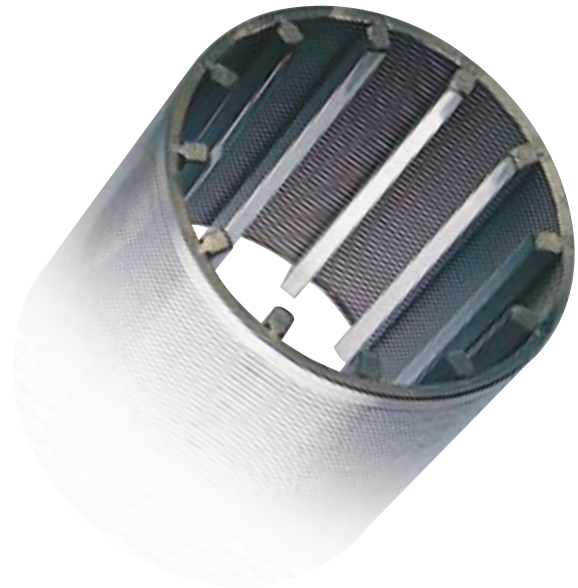


Fig. 3

## Dimensions and Part Numbers

| Part No.      | Fig. | Gap width        |                 |                 | Dimensions in mm |                |                |                |                |    | Max. working pressure [bar] [MPa] | Weight approx. [kg] |    |
|---------------|------|------------------|-----------------|-----------------|------------------|----------------|----------------|----------------|----------------|----|-----------------------------------|---------------------|----|
|               |      | 0.05 mm<br>x = 1 | 0.1 mm<br>x = 3 | 0.2 mm<br>x = 5 | b                | b <sub>1</sub> | d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | DN |                                   |                     |    |
| 54 524 7x 101 | 1    | 4 000            | 10 000          | 15 000          | 180              | –              | 125            | 165            | M 16           | 50 | 40                                | 4                   | 10 |
| 54 548 7x 101 | 2    | 8 000            | 20 000          | 30 000          | 270              | 265            | 145            | 185            | 18             | 65 | 10                                | 1                   | 40 |
| 54 572 7x 101 | 3    | 12 000           | 30 000          | 45 000          | 400              | –              | 145            | 185            | M 16           | 65 | 10                                | 1                   | 65 |

1) The flow rates indicated apply to liquids with a viscosity of 72 mm<sup>2</sup>/s (cSt) given a flow resistance ( $\Delta p$ ) of 0.2 to 0.3 bar (20 to 30 KPa).  
For aqueous fluids or when a higher flow resistance is permissible, the indicated flow data may be exceeded.

2) Drain plug G1 (DIN 910), Part No. 01 436 16 000 and sealing ring Part No. 01 901 01 033, optional.

Other gap widths as well as special non-rusting plate gap-type filters upon request.

# MANN Plate gap-type filter inserts

Nominal pressure 10/40 bar (1.0/4.0 MPa)

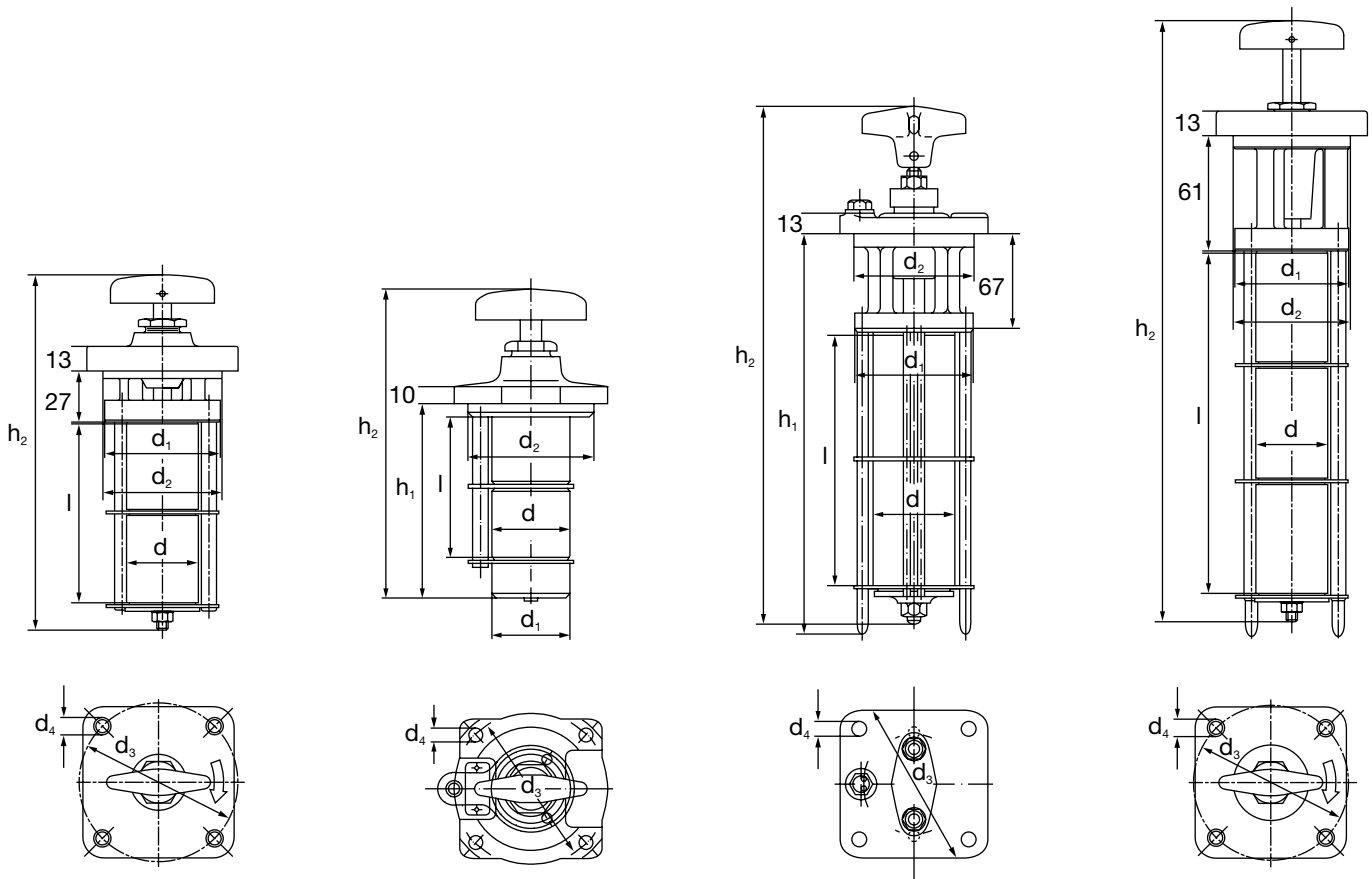


Fig. 1 Discharge on top

Fig. 2 Discharge at bottom

Fig. 3 Discharge on top

Fig. 4 Discharge on top

## Dimensions and Part Numbers

Max. working pressure: 10 bar (1 MPa)

40 bar (4 MPa) for filters 51 525 5x 121

| Part No.      | Fig. | Gap width                          |                 | Dimensions in mm |                |                |                |                |                |                |     | Weight approx. [kg] |
|---------------|------|------------------------------------|-----------------|------------------|----------------|----------------|----------------|----------------|----------------|----------------|-----|---------------------|
|               |      | 0.1 mm<br>x = 3                    | 0.2 mm<br>x = 5 | d                | d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | d <sub>4</sub> | h <sub>1</sub> | h <sub>2</sub> | l   |                     |
|               |      | Nom. flow rate <sup>1)</sup> [l/h] |                 |                  |                |                |                |                |                |                |     |                     |
| 51 305 5x 051 | 1    | 1 400                              | 4 000           | 38               | 62             | 63             | 84             | 9              | 92             | 143            | 50  | 1.0                 |
| 51 310 5x 051 | 1    | 2 600                              | 5 000           | 38               | 62             | 63             | 84             | 9              | 137            | 188            | 95  | 1.3                 |
| 51 310 5x 061 | 4    | 2 600                              | 5 000           | 38               | 61             | 62             | 82             | 8.5            | 172            | 233            | 95  | 1.3                 |
| 51 315 5x 051 | 1    | 4 000                              | 5 000           | 38               | 62             | 63             | 84             | 9              | 192            | 243            | 142 | 1.7                 |
| 51 318 5x 061 | 4    | 5 000                              | 5 000           | 38               | 61             | 62             | 82             | 8.5            | 257            | 318            | 180 | 1.9                 |
| 52 204 5x 025 | 2    | 510                                | –               | 23               | 25             | 45             | 60             | 6.6            | 52             | 105            | 32  | 0.3                 |
| 52 207 5x 021 | 2    | 900                                | –               | 23               | 25             | 45             | 60             | 6.6            | 90             | 140            | 70  | 0.4                 |
| 52 305 5x 021 | 2    | 1 400                              | 5 000           | 38               | 38             | 61             | 76             | 6.6            | 77             | 130            | 50  | 0.9                 |
| 52 310 5x 021 | 2    | 2 600                              | 5 000           | 38               | 38             | 61             | 76             | 6.6            | 121            | 176            | 95  | 1.3                 |
| 52 315 5x 021 | 2    | 4 000                              | 5 000           | 38               | 38             | 61             | 76             | 6.6            | 177            | 230            | 142 | 1.6                 |
| 51 525 5x 121 | 3    | 12 000                             | 15 000          | 56               | 82.5           | 82.5           | 108            | 11             | 352            | 432            | 250 | 5.4                 |

1) The flow rates indicated apply to liquids with a viscosity of 72 mm<sup>2</sup>/s (cSt) given a flow resistance ( $\Delta p$ ) of 0.05 to 0.15 bar (5 to 15 kPa). For aqueous fluids or when a higher flow resistance is permissible, the indicated flow data may be exceeded.

Other gap widths as well as special non-rusting plate gap-type filters upon request.

# Wire Gap-type / Gap-type tube filter inserts

Nominal pressure 40 bar (4.0 MPa)

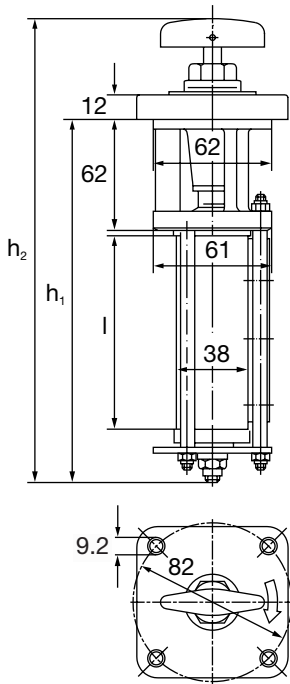


Fig. 1 Discharge on top

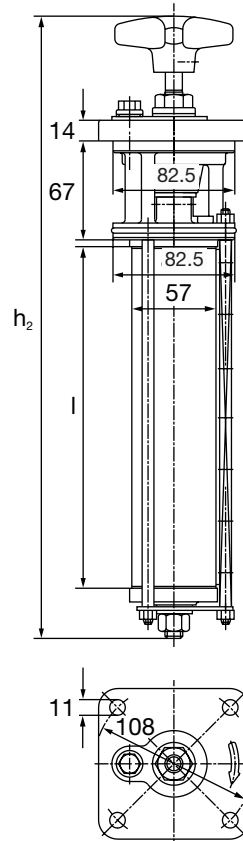


Fig. 2 Discharge on top



## Dimensions and Part Numbers

Max. working pressure: 40 bar (4 MPa)

| Part No.                            | Fig. | Gap width        |                  |                 |                 | Dimensions in mm |                |     | Weight approx. [kg] |
|-------------------------------------|------|------------------|------------------|-----------------|-----------------|------------------|----------------|-----|---------------------|
|                                     |      | 0.03 mm<br>x = 0 | 0.05 mm<br>x = 1 | 0.1 mm<br>x = 3 | 0.2 mm<br>x = 5 | h <sub>1</sub>   | h <sub>2</sub> | l   |                     |
| <b>Wire gap-type filter inserts</b> |      |                  |                  |                 |                 |                  |                |     |                     |
| 53 417 5x 121                       | 1    | 2 100            | 3 900            | 5 000           | 5 000           | 245              | 305            | 165 | 1.5                 |
| 53 524 5x 041                       | 2    | 3 400            | 6 300            | 13 500          | 15 000          | 326              | 420            | 234 | 4.8                 |
| <b>Gap-type tube filter inserts</b> |      |                  |                  |                 |                 |                  |                |     |                     |
| 54 310 5x 141                       | 1    | 600              | 1 100            | 2 000           | 3 000           | 192              | 242            | 100 | 1.2                 |
| 54 318 5x 101                       | 1    | 900              | 1 900            | 3 500           | 5 000           | 272              | 322            | 180 | 1.5                 |
| 54 524 5x 041                       | 2    | 2 100            | 4 000            | 13 000          | 15 000          | 326              | 420            | 232 | 4.8                 |

1) The flow rates indicated apply to liquids with a viscosity of 72 mm<sup>2</sup>/s (cSt) given a flow resistance ( $\Delta p$ ) of 0.05 to 0.15 bar (5 to 15 KPa). When contamination is not too heavy and a higher flow resistance is permissible, the indicated flow data may be exceeded.

Other gap widths as well as special non-rusting gap-type tube filter inserts upon request.

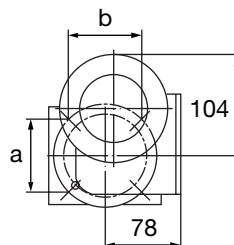
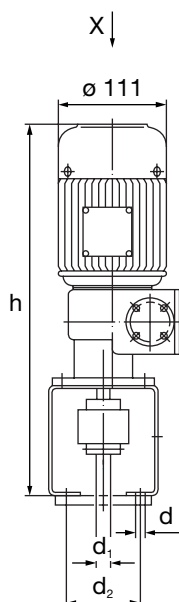
# Electrical drives for MANN Gap-type filters

## For automatic filter cleaning during operation

Electrical drives increase the efficiency of the gap-type filters by automatically triggering the cleaning of the inserts at a preset frequency. The service life of the filter is prolonged. Upon request, MANN gap-type filters can be supplied with controllers and pressure transmitters. Refer to pages 74 and 75 for the MANN service indicators and switches.

### Technical data

|                         | Geared motor      |                           |
|-------------------------|-------------------|---------------------------|
|                         | Standard          | with explosion protection |
| Voltage 50 Hz           | 210-240/365-420 V |                           |
| Voltage 60 Hz           | 255-290/440-500 V | –                         |
| Frequency               | 50/60 Hz          | 50 Hz                     |
| Speed                   | 1.84/2.2 1/min    | 1.84 1/min                |
| Power                   | 0.06 KW           | 0.09 KW                   |
| Current consumption     | 0.55/0.33 A       | 0.7/0.4 A                 |
| Enclosure               | IP 55             | IP 55                     |
| Insulation class        | F                 | F                         |
| Explosion protection    |                   | EEX EII T4                |
| Varnish                 | RAL 7031          | RAL 7031                  |
| Special characteristics |                   | with protection roof      |



### Dimensions and Part Numbers

| Geared motor standard Part No. | Geared motor with explosion protection | Used on filter  | Dimensions in mm |                |                |      |      |     |
|--------------------------------|--|-----------------|------------------|----------------|----------------|------|------|-----|
|                                |  |                 | h                | d <sub>1</sub> | d <sub>2</sub> | a    | b    | d   |
| <b>59 420 70 321</b>           | <b>59 420 70 322</b>                   | 51 525 7x ...   | 379              | 16             | ∅ 108          | 76.4 | 76.4 | 11  |
|                                |  | 54 524 7x ...   |                  |                |                |      |      |     |
|                                |  | 54 548 7x ...   |                  |                |                |      |      |     |
|                                |  | 54 572 7x ...   |                  |                |                |      |      |     |
|                                |  | 55 550 7x ...   |                  |                |                |      |      |     |
| 55 575 7x ...                  | 401 <sup>1)</sup>                      | 16              | ∅ 108            | 76.4           | 76.4           | 11   |      |     |
| <b>59 420 70 301</b>           | <b>59 420 70 302</b>                   | 51 3 . . 6x ... | 379              | 9.5            | ∅ 92           | 65   | 65   | 9.3 |
|                                |  | 53 4 . . 6x ... |                  |                |                |      |      |     |
|                                |  | 54 3 . . 6x ... |                  |                |                |      |      |     |
| <b>59 420 70 331</b>           | <b>59 420 70 332</b>                   | 51 3 . . 7x ... | 369              | 9.5            | ∅ 82           | 58   | 58   | 9   |
|                                |  | 53 4 . . 7x ... |                  |                |                |      |      |     |
|                                |  | 54 3 . . 7x ... |                  |                |                |      |      |     |

<sup>1)</sup> Dimensions of a geared motor with explosion protection.

Further models with other voltage, frequency and enclosure upon request.



## Differential pressure gauges and service switches ...

### Manometer (variable)

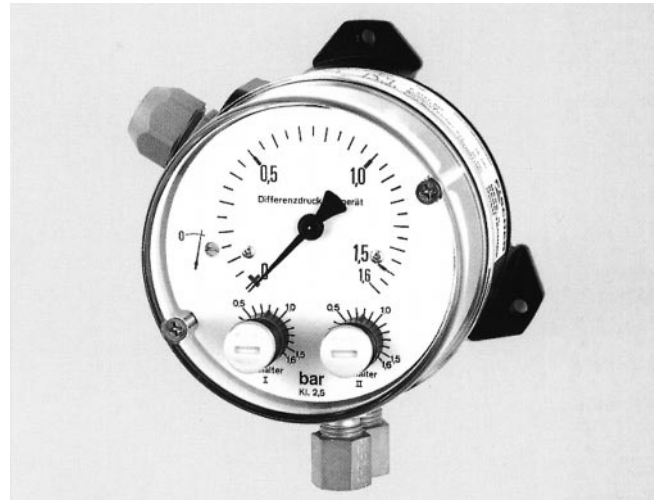
Combination display and switching device for overpressure, low pressure and differential pressure.

The service switch is especially defined by:

- High repetitive accuracy of the switch points
- Long lifetime
- High security against overload

### Technical data

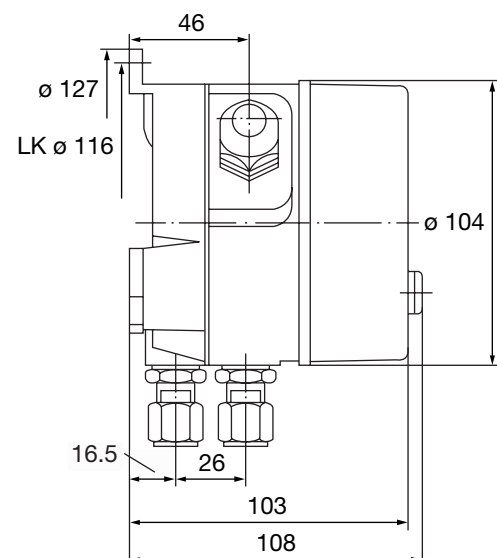
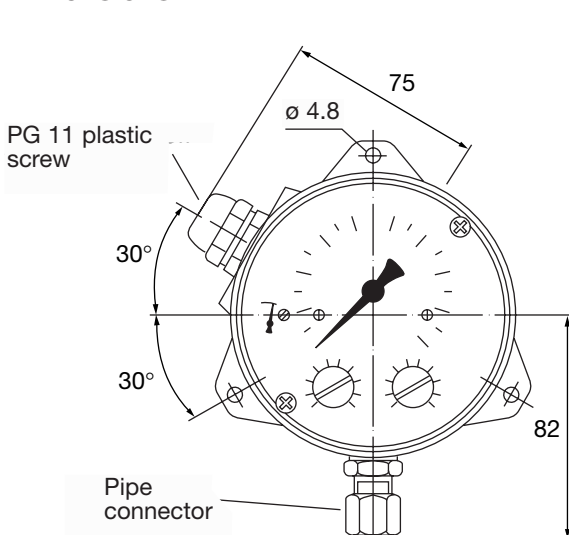
- Measuring range : 0...400 mbar to 0...25 bar
- Nominal pressure of the measuring system: 25 bar
- Allowed ambient temperature range: -10 °C to +70 °C
- Allowed medium temperature: 70 °C
- Protection class: IP 54 accord. DIN 40 050
- Installation position: flexible
- Pressure chamber material: aluminium, aluminium with HARD COAT surface protection or nickel chromium steel 1.4305
- Measuring membrane material: NBR or Viton, depending on the application
- Compressed air connections: G 1/4 inch internal thread
- Electrical connections: permanently wired numbered cable



### Switch points

- Contact output: one or two micro switches, 1-way switch
- Switch point setting: standard value scale externally adjustable, smallest adjustable value approx. 5% of upper limit of effective range
- Switching hysteresis: approx. 2.5%
- $U \sim \text{max.} = 250 \text{ V AC}$ ,  $I \text{ max.} = 5 \text{ A}$ ,  $P \text{ max.} = 250 \text{ VA}$   
 $U = \text{max.} = 30 \text{ V DC}$ ,  $I \text{ max.} = 0.4 \text{ A}$ ,  $P \text{ max.} = 10 \text{ W}$

### Dimensions



Order no.: 26 000 91 891

## ... for gap-type filters

### Service switch (variable)

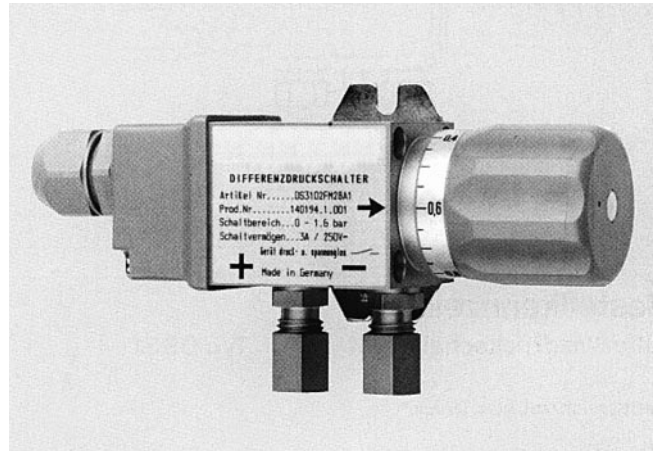
The differential pressure switch device is appropriate for all neutral mediums such as water for industrial use, water for heating systems, neutral gases, oils, etc.. Two-step control is possible via a steplessly settable switch point between 10 and 100% of the pressure range.

The service switch is especially defined by:

- High repetitive accuracy of the switch points
- Long lifetime
- High security against overload

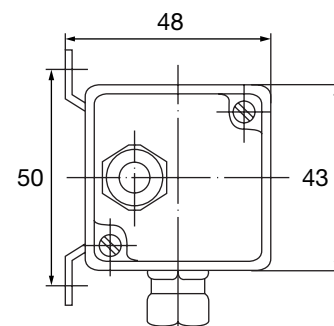
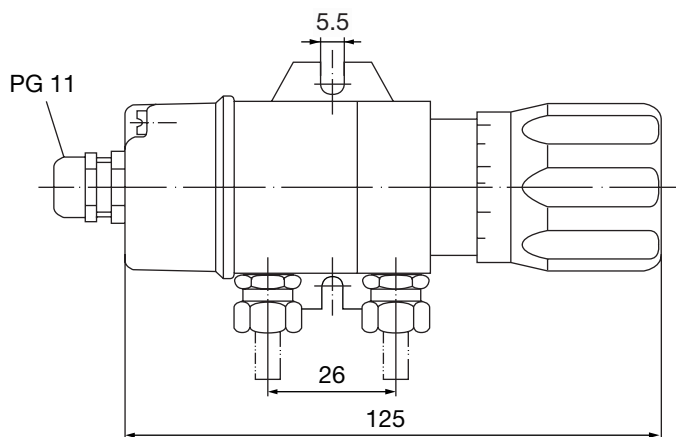
### Technical data

- Measuring range : 0...4 bar
- Max. static operating pressure: 16 bar
- Max. allowed ambient temperature : +80 °C
- Allowed medium temperature: +80 °C
- Pressure chamber material: brass
- Membrane material: NBR or Viton, depending on the application



- Compressed air connections: G 1/8 inch internal thread
- Electrical connections: permanently wired numbered cable
- Switching point: steplessly settable for 10 to 100% of pressure range

### Dimensions



Order no.: 02 150 02 405

# MANN AutoFluid

## Automatic backflushing filter

MANN+HUMMEL

Industriefilter



## Clever, efficient, economical

The filtration of products and process fluids often demands the highest requirements from a filter system. The perfect and effective solution for these requirements defines the process reliability, the product quality and the running costs for the customer.

The new backflushable MANN AutoFluid sets new standards in the field of filtration of liquids regarding the filter efficiency and economy. And this is not the only reason why reputable companies such as VW and BASF successfully use it. MANN AutoFluid has proved itself with many varied applications and works precisely and reliably in continuous operation. In practice MANN AutoFluid has shown that in terms of efficiency and economy it is the superior solution compared to conventional automatic filters or non-automatic filter systems.



### MANN AutoFluid is suitable for use in the following fields ...

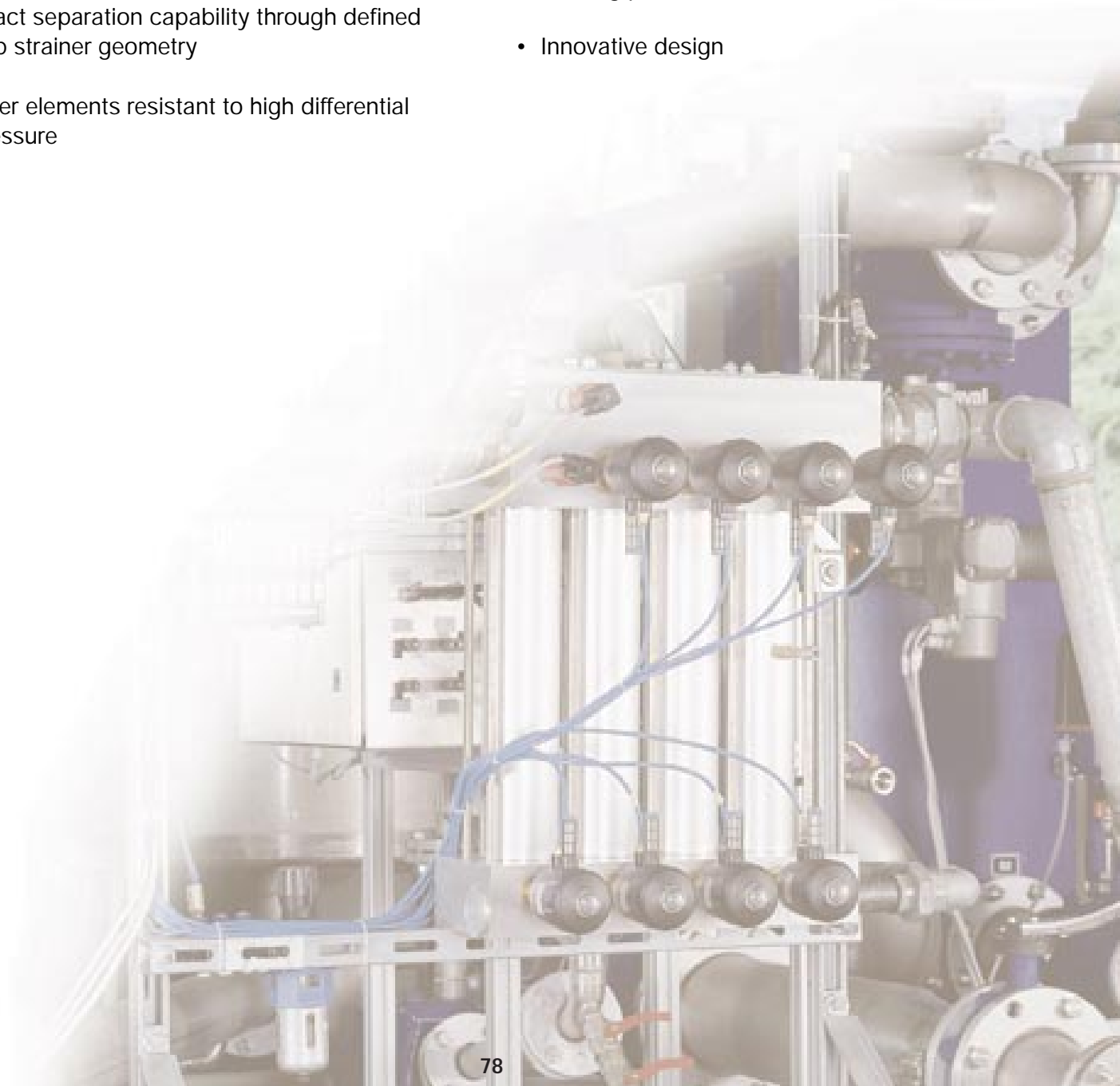
- The paints industry
- The automobile industry
- Municipal authorities
- Chemicals
- The food industry
- Machine tooling
- Pharmaceuticals
- The cosmetics industry
- Environmental technology
- Metalworking industries
- The paper industry
- The oil industry
- Power stations

### ... for the filtration of:

- Paints
- Inks
- Cutting lubricants
- Cooling water
- Water for industrial use
- Waste water
- Grease and wax
- Highly viscous materials such as creams, pastes
- Cleaning agents
- Mineral, synthetic and natural oils
- Fuel

## MANN AutoFluid – a system with many advantages

- Considerable reduction of running costs compared with other filter solutions
- Special valve control enables quick cleaning operations with minimal backflushing quantities and pressure loss
- Fully automatic operation
- Ideal adaptation to the application in question is possible
- Long service life
- Exact separation capability through defined gap strainer geometry
- Filter elements resistant to high differential pressure
- „Easy-to-clean“ characteristics enable an especially compact design with a comparably smaller filter surface area
- Robust and low-wear system
- Simple and quick servicing without special tools or special knowledge
- Easy to use operation of the control unit which is included in the scope of delivery
- Variable and easy integration of the filter in existing production lines
- Innovative design



## High performance and ...

In the field, the MANN AutoFluid is not only gaining market share in classic applications for automatic filters. It is also increasingly making its presence felt in areas such as surface treatment technology or with paints, where bag, strainer, or layer filters are still often chosen to be the filter solution.

The extent of the success enjoyed by the MANN AutoFluid can best be seen through examples of satisfied customers:

### **Filtration of coolants on engine test benches**

At a large world-famous car producer the MANN AutoFluid is used to filter water-glycol mixtures on engine test benches. To filter the coolants three MANN AutoFluid units are connected in parallel. In continuous operation it has proved itself against automatic filters from the competition to be the filter solution with the highest performance. Due to the good results, MANN AutoFluid has become the recommended solution for similar applications within this company.

### **Filtration of dispersion paints**

Today, bag filters represent the common solution used for the filtration of highly viscous water-based dispersion paints. After a short time however, the viscoelasticity of the dispersion paints often causes the filter to block and therefore demands frequent manual work and regular changing of the filter bag.

An important European producer of dispersion paints therefore opted for the MANN AutoFluid with different gap widths.

The fully automatic operation of the filters – with an almost total lack of maintenance – allows for considerable savings in comparison to bag filters.

### **Filtration of wire enamels**

Expensive disk filters with a deep-bed filtration effect are frequently used in the production process for wire enamels. Handling the toxic wire enamels when replacing the disks is a problem. Therefore, a leading producer of paints replaced their existing filter solution with a MANN AutoFluid with a very small gap width. Thanks to the continuous filtration offered by the MANN AutoFluid the cost intensive handling encountered during servicing is now a thing of the past.

### **Filtration of elements for household waxes**

A large producer of chemicals was using bag filters with a very small filter fineness to filter chemical components for the waxes. Frequent bag changes and difficult handling persuaded the customer to switch over to the MANN AutoFluid after a successful trial period. It was also possible in this application to considerably reduce the running costs, while achieving the same filtration result.

## ... convincing from the start

### Operation and control

The MANN AutoFluid functions fully automatically.

The micro-processor computerised control specially designed for the MANN AutoFluid can be operated using the 4 key operating panel and the two line LCD in an easy way without any programming knowledge.

The control unit checks the function of the pressure transmitter, monitors the set pressure values and times and creates error messages if critical operating conditions arise. It thereby protects the devices and machines located downstream in the production line.



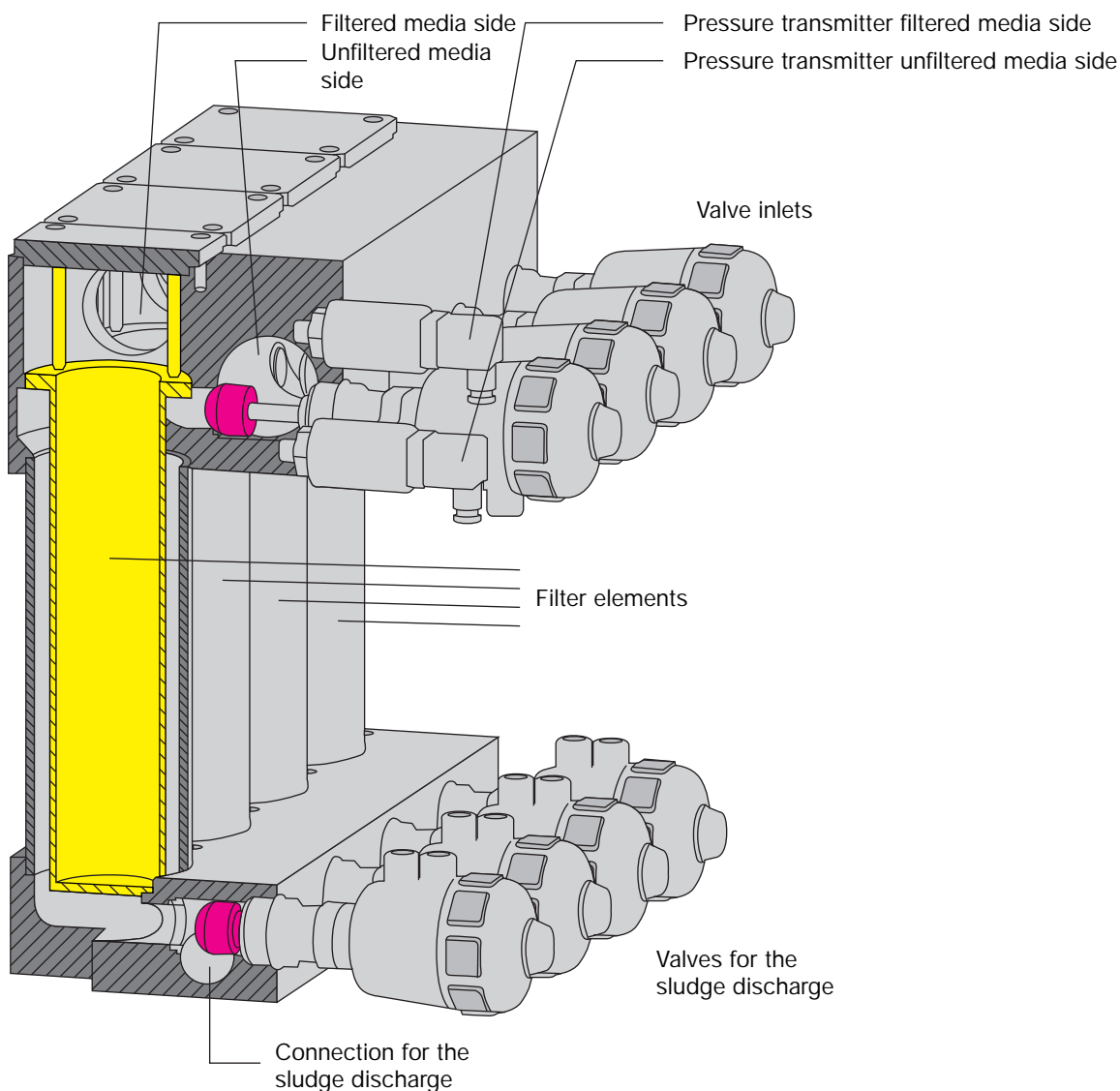
The ability to select between several backflushing programs means that efficient cleaning with a minimum backflushing volume and long service life can be achieved.

All parameters on the MANN AutoFluid can be individually set in order to adapt to the respective operating conditions and requirements regarding the concentration, type, form and density of the dirt and the fractional distribution and viscosity of the medium to be filtered.

# Integration of ...

## Design

The MANN AutoFluid is a multi-chamber back-flushing filter with four filter elements which serve to offer ideal backflushing characteristics. Depending on the requirements of the application, the housing is available in aluminium or stainless steel. A control unit specially designed for the AutoFluid monitors the pre-set differential pressure, manages the valves according to the operating parameters and controls the back-flushing process which cleans the filter element.

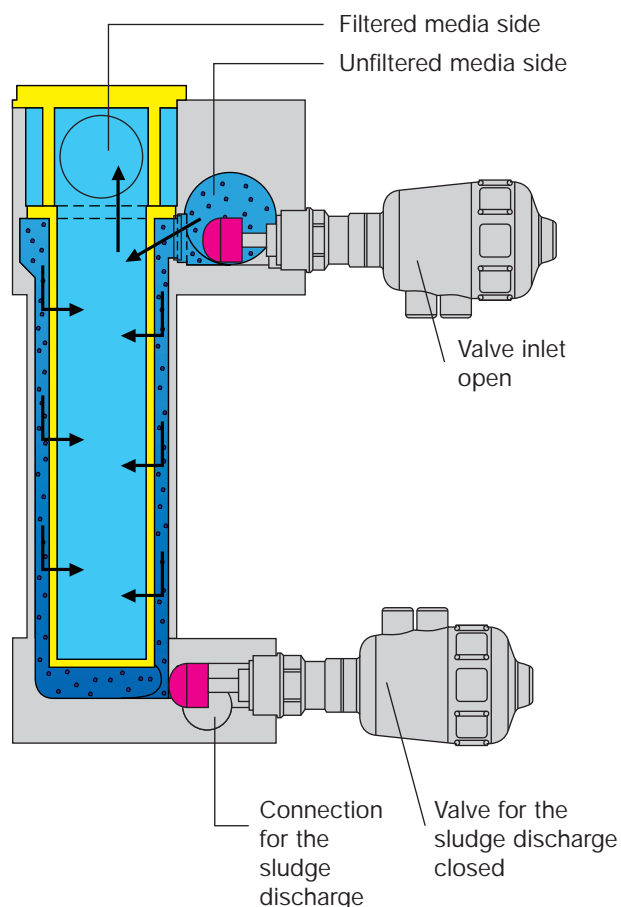




## ... design and functionality

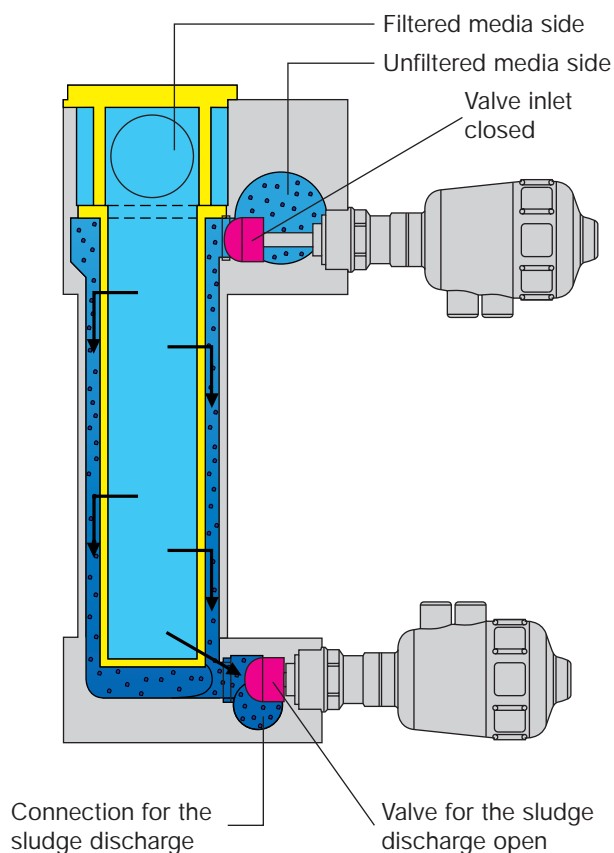
### Filtration

The medium to be cleaned flows in from the unfiltered media side into the housing and flows through the filter elements from the outside to the inside. The coarse dirt particles held back either form a sediment in the lower part of the housing or a deposit on the surface of the filter elements. The cleaned medium flows through to the filtered media side and out of the filter.



### Backflushing

The dirt particles filtered out lead to an increase in the differential pressure. When the pre-set differential pressure is reached, all four filter elements are backflushed one after the other without stopping the operation of the whole system. During this cleaning process the inlet in the respective element is closed and the sludge discharge valve is opened. As a result the filter element is cleaned. After the cleaning of the first element has taken place, the other three filter elements are backflushed one after the other. When the backflushing cycle has ended the differential pressure in the filter has returned to its initial value.



## Specifications



|  |  |
|--|--|
| <b>Gap width</b>   | 10 µm, 20 µm, 30 µm, 50 µm, 75 µm, 100 µm<br>(other gap widths on request)   |
| <b>Volumetric flow</b><br>(Example: water, gap width 30 µm, 25 °C)   | 75 m <sup>3</sup> /h at 0.5 bar initial differential pressure<br>100 m <sup>3</sup> /h at 0.85 bar initial differential pressure |
| <b>Connections</b>   | G 3" (unfiltered media side and filtered media side)<br>G 1,5" (sludge discharge)  |
| <b>Dimensions in mm</b><br>(Height x Width x Length)   | 780 x 550 x 440  |
| <b>Backflushing</b>  | Integrated   |
| <b>Sludge discharge</b>  | Integrated   |
| <b>Operating pressure</b>  | 10 bar   |
| <b>Differential pressure monitoring</b>  | Integrated, can be set   |
| <b>Pressure on the unfiltered media side</b>   | P1 = 1.5 - 10 bar  |
| <b>Permissible operating temperature</b>   | 80 °C (120 °C on request)  |
| <b>Materials</b>   | Aluminium (coated material on request), stainless steel  |
| <b>Pneumatic connections</b>   | G 1/4, 6 ±1 bar  |
| <b>Mains power connection</b>  | 230/110 V AC 50/60 Hz  |
| <b>Control</b>   | Integrated MANN+HUMMEL micro-computer control  |
| <b>Backflushing medium</b>   | The medium which is being filtered   |
| <b>Backflushing control</b>  | Dependent on time or differential pressure   |
| <b>Version for explosive atmospheres</b>   | Optional   |
| <b>Possibility of remote diagnosis, monitoring and parameterisation carried out by MANN+HUMMEL service technicians</b> | On request   |

## Excellent Service

Our customers at MANN+HUMMEL find competent contact partners for their filtration requirements. It is not by chance that MANN+HUMMEL has been a world leader for more than six decades in the field of filtration of liquids and air in the most varied of applications and processes. In our international sales and service network our customers find experienced MANN+HUMMEL filter specialists, wherever they are in the world. After a thorough analysis of the application operating conditions we offer our customers a tailor-made filter system. Along with the intensive training for service and

maintenance personnel, we provide a comprehensive range of services:

- On-site installation and commissioning
- Recycling of AutoFluid filter elements
- Preventative maintenance carried out by service technicians on a service contract basis
- Service technicians available on call

**Talk to us – with MANN+HUMMEL as your filter partner you will make the right choice.**



# MANN Profluid

## Automatic backflushing filter



Industriefilter



Background picture: Krupp Hoesch

# MANN Profluid

## A Filter system for numerous applications

When it comes to the filtration of oils, processing emulsions and suds or the preparation of cooling and process waters, MANN Profluid is the solution. Well-known suppliers of industrial cleaning installations, companies from the chemical and food industries, general machinery as well as tool manufacturers rely on the patented backflushing filter.

### Modular filter system

The Profluid system features outstanding performances in many areas, such as

- Filtration fineness
- Nominal flow rate
- Working pressure
- Resistance of the components to various agents and
- Temperature stability.

They can be adapted individually to any application. MANN+HUMMEL's filtration expertise is at your disposal: Consult our engineers to select the system that is best suited to your installation. Please fill out and fax us the form on page 3.



*Gap-type tube*

### The advantages of MANN Profluid

- Consistent quality level of the parts to be cleaned.
- The agents can be used for a longer period so that operating and disposal costs are reduced.
- The maintenance intervals are increased considerably.
- MANN Profluid has a much simpler design than comparable filters with multi-chamber systems.
- Effective backflushing with a low backflush rate.
- Impurities collected in the filter are removed at individually adjustable intervals without interrupting the process.
- Reliable and continuous operation even with very different dirt particles.

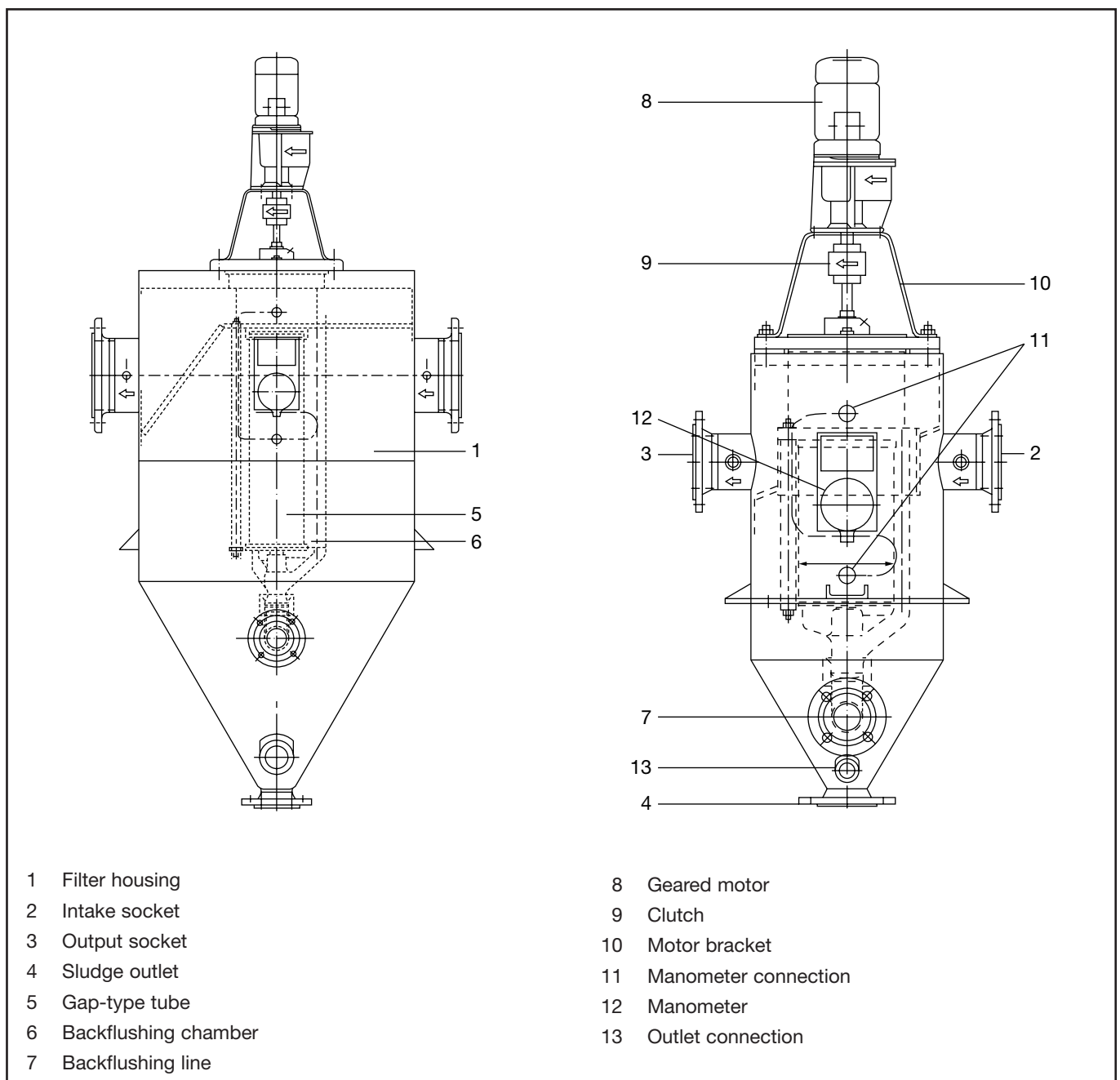
# Automatic backflushing filter

## Dirt scraping and simultaneous backflushing

### Design

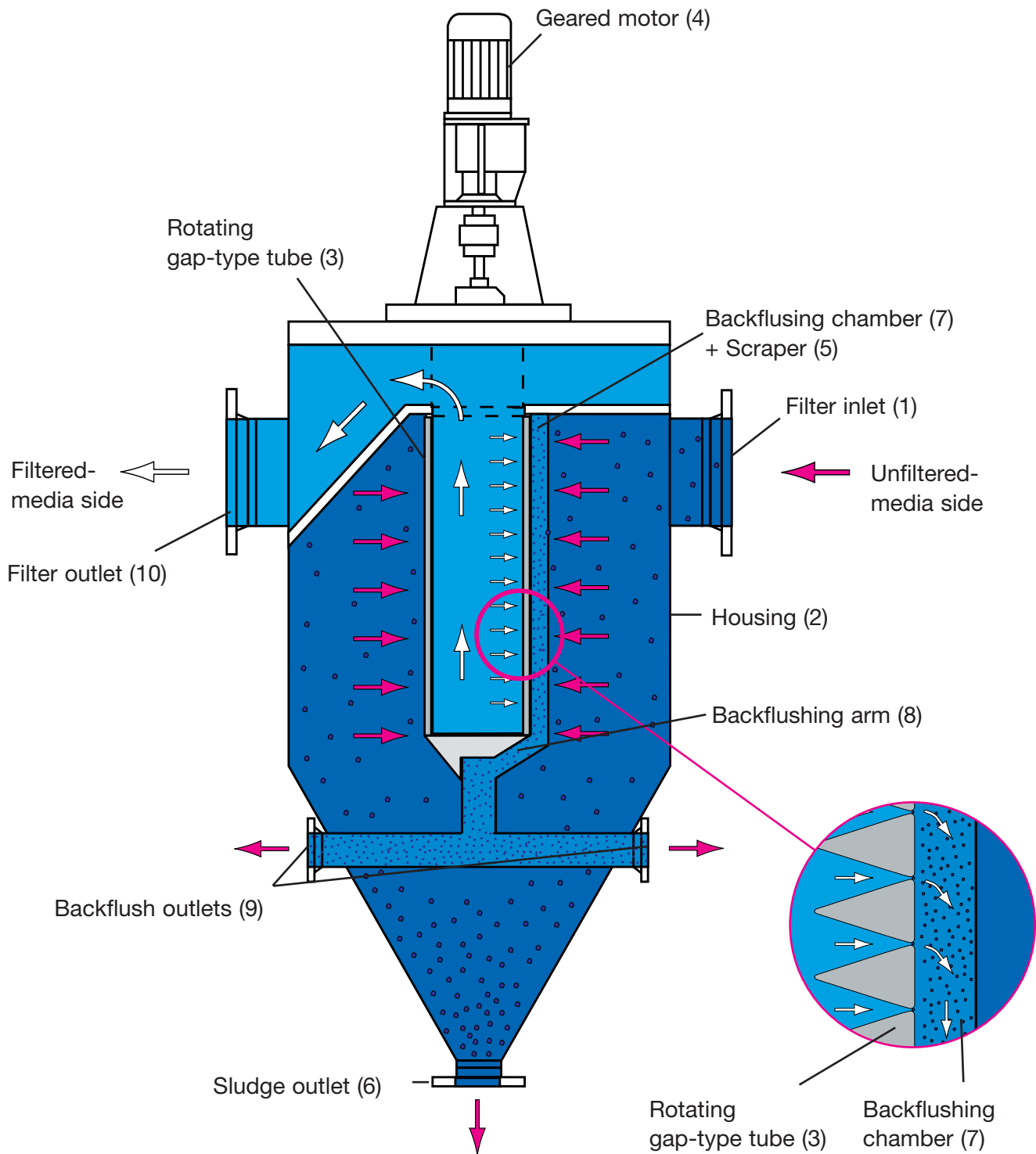
The Profluid backflushing system consists of a housing, a filter element, electro-pneumatic ball valves and a controller. The filter element is a gap-type tube. The agent to be cleaned flows through it, from the outside to the inside. Impurities larger than the gaps are filtered out

and either sink to the housing bottom or, form a filter cake that is removed by the scraper plate through the rotation of the filter element. The scraping of the gap-type tube can occur during operation, triggered by differential pressure or time control.



# Cleaning and backflushing ...

## Mode of operation



## ... without interrupting the operation

### Cleaning

The medium to be cleaned flows into the housing (2) via the filter inlet (1) and passes through the gap-type tube (3) from the outside to the inside. All impurities in the medium which are larger than the gap width are retained on the surface of the tube. The coarse dirt particles either sink to the lower part of the housing or form a filter cake on the exterior surface of the tube.

### Dirt scraping

Driven by a geared motor (4), the gap-type tube rotates along a stationary scraper plate (5) that removes the filter cake. It then sinks to the bottom of the housing and is discharged when necessary via the sludge outlet (6). To simplify the disposal of the solid particles filtered out, a drying valve can be installed.

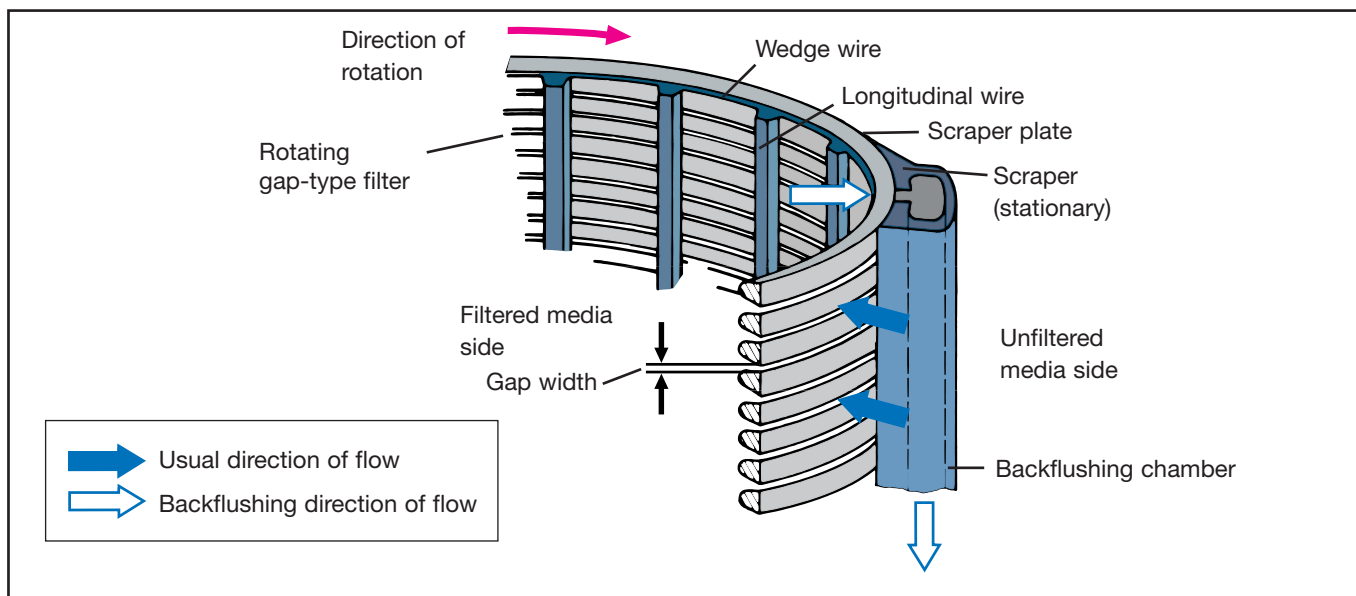
### Backflushing (cleaning the gaps of the filter element)

Particles from a certain size up cannot be removed by the scraper. On conventional gap-type tube filters, they deposit in the gaps and - under certain operation conditions - quickly clog the filter.

Near size particles can be eliminated from the gap type tube through the use of a backflushing chamber (7). The whole length of the tube is flushed: When the backflushing line is opened, the medium flows into the unpressurized backflushing chamber in opposite direction to normal, and is drained towards the outside. The backflushing procedure is submitted to specific parameters, such as operation hours, time pulse and increase of the differential pressure.

Operating pressure and set backflush volume influence decisively the efficiency of backflushing.

**The combined action of dirt scraping and backflushing, a patented procedure, ensure quality cleaning without interrupting the production.**



Backflushing



# MANN Profluid

## Technical data and maintenance

Depending on the nominal flow rate, the gap width and the media contamination, Profluid can be supplied as single or up to quadruple filter. Profluid backflushing systems can be installed in series or in parallel. All types are provided with a removable element. Geared motors with 230/400 V, 50/60 Hz and IP 56/65 protection are standard supply. Other voltages, frequencies and protections are available upon request.



### Maintenance

Maintenance work on our filter systems should be performed by our technical service personnel or by service engineers from your company that have been trained by us.

Please ask for details.

Call us at +49 (62 32) 319 – 483 or  
send a fax to +49 (62 32) 319 – 370

### Technical data

|                                    |  |
|------------------------------------|--|
| Gap width:                         | 30 to 200 µm   |
| Nominal flow rate:                 | up to 800 m <sup>3</sup> /h                              |
| Connections:                       | DN 50 to DN 300  |
| Backflushing:                      | integrated   |
| Backflushing volume:               | 5-10% of nominal flow rate                               |
| Sludge outlet:                     | integrated   |
| Working pressure:                  | 10 to 40 bar (1.0 to 4.0 MPa)                            |
| Differential pressure control:     | integrated   |
| Permissible operation temperature: | up to 200 °C   |
| Materials:                         | Aluminium, nodular graphite iron, steel, stainless steel |
| Cleaning:                          | by control pulses, electrical drive                      |
| Control:                           | available optionally                                     |
| Applications:                      | cleaning of all type of low-viscosity media              |

# MANN Profluid

## Nominal pressure up to 40 bar (4.0 MPa)

Filter with removable inlet and geared motor (230/400 V, 50/60 Hz, enclosure IP 54/65).  
Moduls with other voltage, frequency and enclosure upon request.

Please send us the questionnaire on page 3, we would like to help you determining the right filter system.

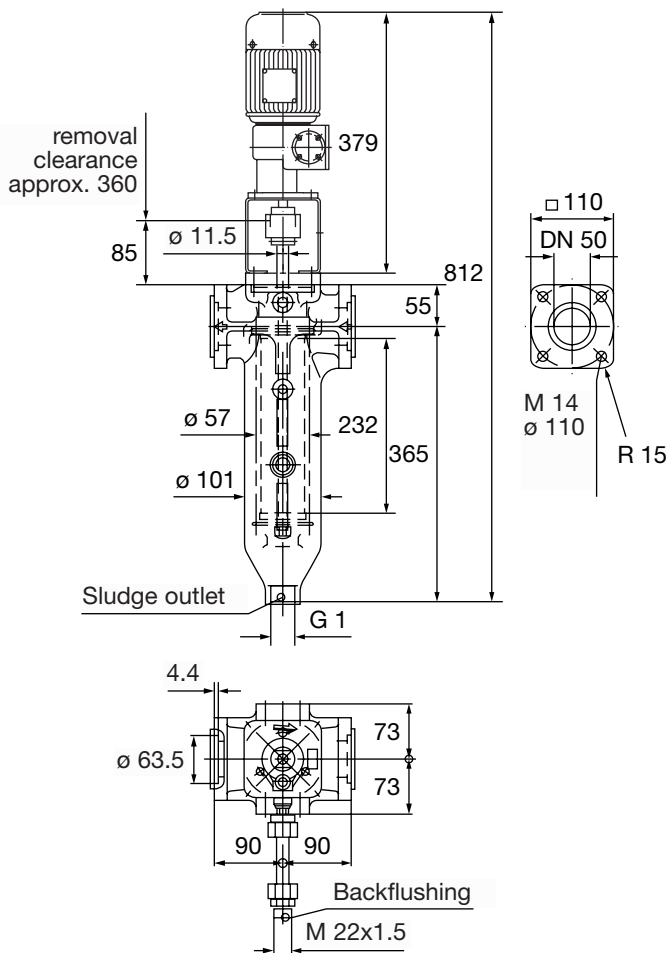


Fig. 1

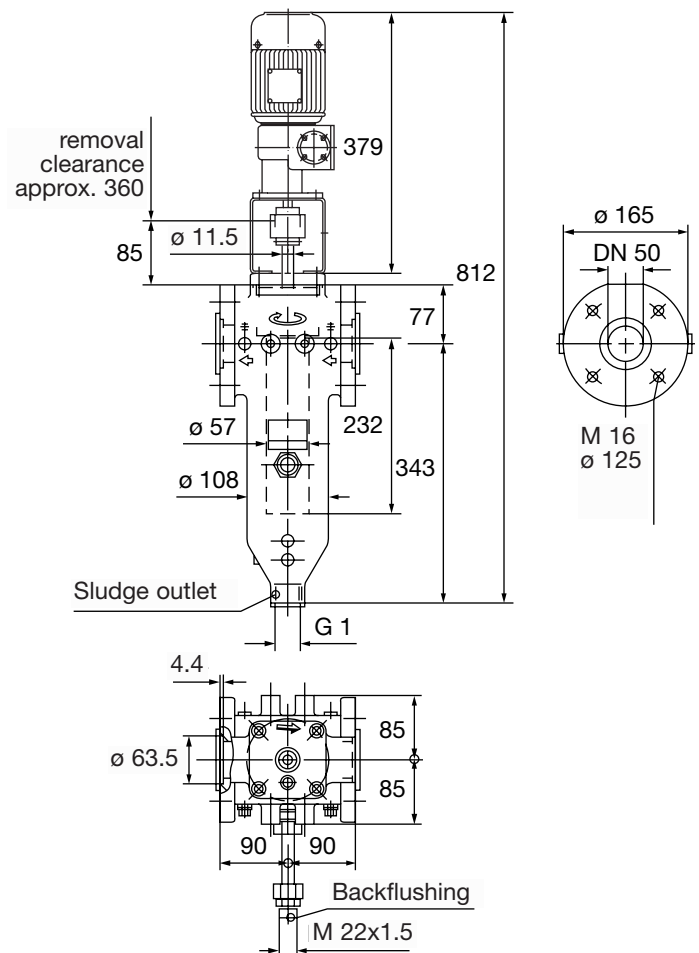


Fig. 2

### Part Numbers

| Part No.             | Fig. | Gap width         |                   |                   |                   |                   |                   | Material Housing | Weight approx. [kg] |
|----------------------|------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------|---------------------|
|                      |      | 0.030 mm<br>x = 0 | 0.050 mm<br>x = 1 | 0.075 mm<br>x = 2 | 0.100 mm<br>x = 3 | 0.150 mm<br>x = 4 | 0.200 mm<br>x = 5 |                  |                     |
| <b>54 524 8x 262</b> | 2    | 2.5               | 4                 | 7                 | 10                | 13                | 15                | Al nickled       | 16                  |
| <b>54 524 7x 263</b> | 1    | 2.5               | 4                 | 7                 | 10                | 13                | 15                | GGG-40           | 24                  |
| <b>54 524 7x 264</b> | 2    | 2.5               | 4                 | 7                 | 10                | 13                | 15                | Al               | 16                  |

<sup>1)</sup> e flow rates indicated apply to liquids with a viscosity of 72 mm<sup>2</sup>/s (cSt) given a flow resistance ( $\Delta p$ ) of 0.4 bar.

# MANN Profluid

Nominal pressure up to 12/40 bar (1.2/4.0 MPa)

Please send us the questionnaire on page 3, we would like to help you determining the right filter system.

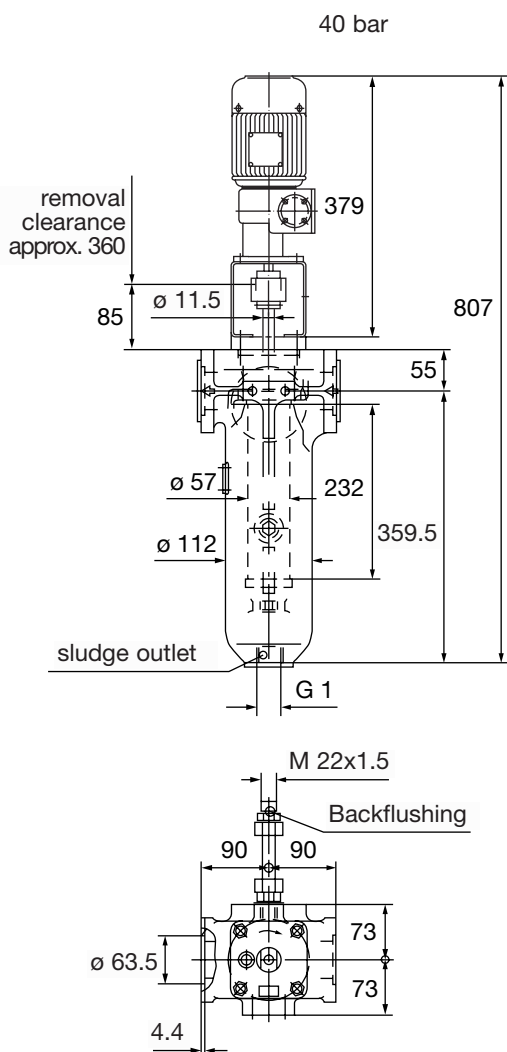


Fig. 1

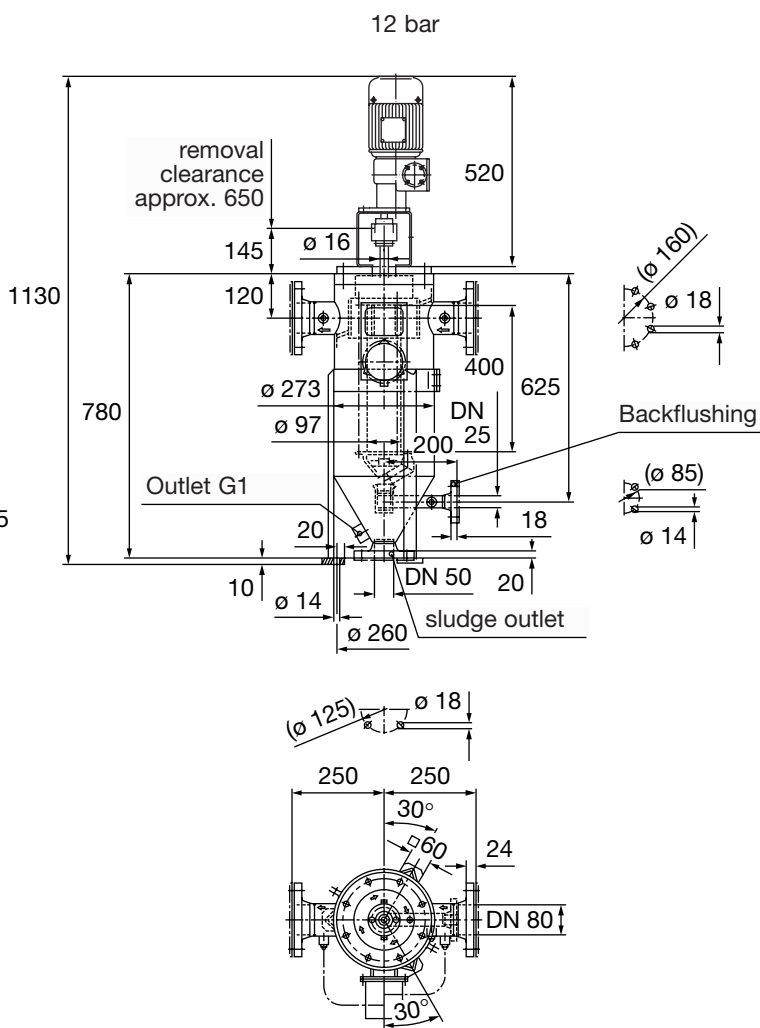


Fig. 2

## Part Numbers

| Part No.      | Fig. | Gap width         |                   |                   |                   |                   |                   | Material Housing | Weight approx. [kg] |
|---------------|------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------|---------------------|
|               |      | 0.030 mm<br>x = 0 | 0.050 mm<br>x = 1 | 0.075 mm<br>x = 2 | 0.100 mm<br>x = 3 | 0.150 mm<br>x = 4 | 0.200 mm<br>x = 5 |                  |                     |
| 54 524 8x 265 | 1    | 2.5               | 4                 | 7                 | 10                | 13                | 15                | 1.4581           | 28                  |
| 54 740 8x 175 | 2    | 15                | 20                | 25                | 30                | 40                | 45                | 1.4571           | 102                 |

1) The flow rates indicated apply to liquids with a viscosity of 72 mm<sup>2</sup>/s (cSt) given a flow resistance (Δp) of 0.4 bar.

# MANN Profluid

## Nominal pressure up to 12 bar (1.2 MPa)

Filter with removable inlet and geared motor (230/400 V, 50/60 Hz, enclosure IP 54/65).  
Moduls with other voltage, frequency and enclosure upon request.  
Especially when using high gap widths inlets without backflushing can be installed. Other gap widths, welded, corrosion- and acid-resistant filters are available upon request.

Please send us the questionnaire on page 3, we would like to help you determining the right filter system.

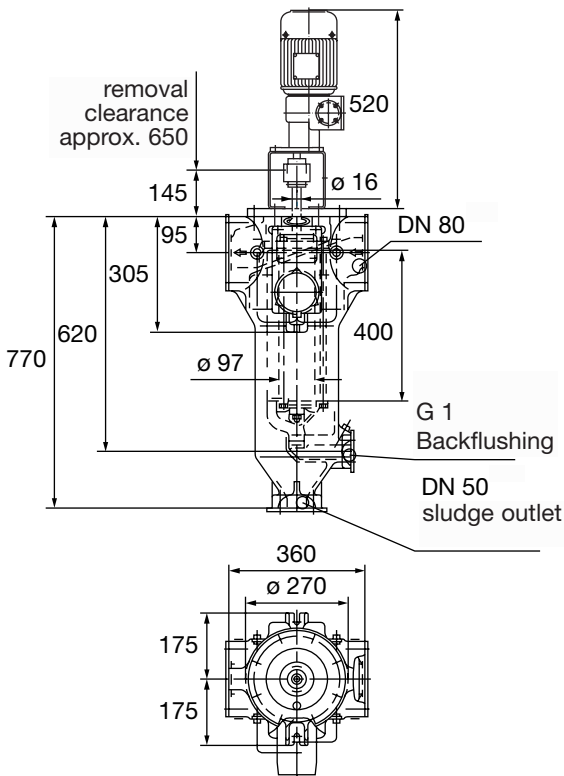


Fig. 1

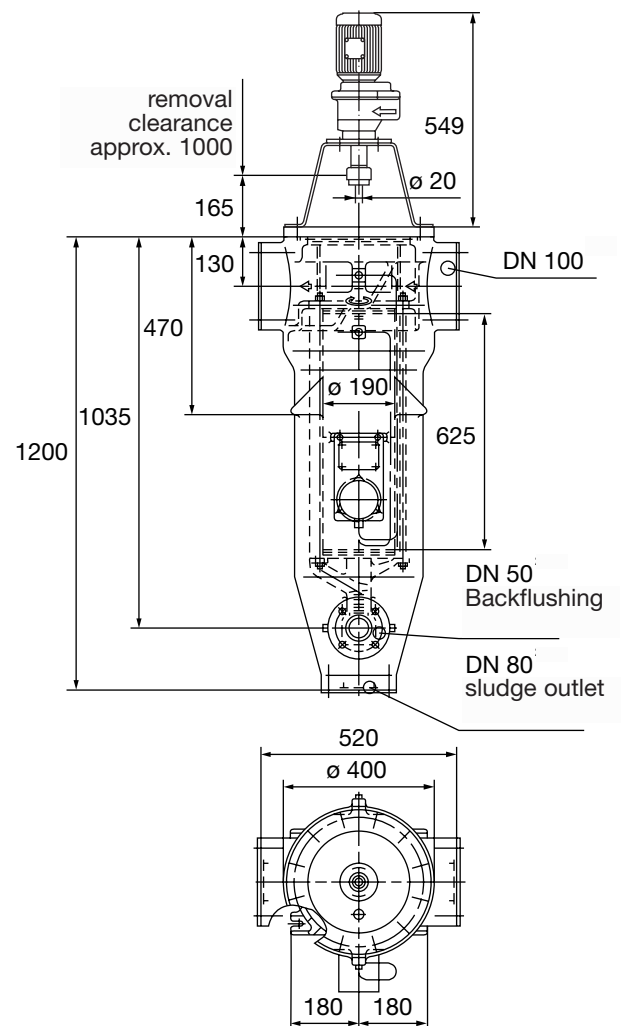


Fig. 2

### Part Numbers

| Part. No.     | Fig. | Gap width   |                   |                   |                   |                   |                   | Material Housing | Weight approx. [kg] |
|---------------|------|---|-------------------|-------------------|-------------------|-------------------|-------------------|------------------|---------------------|
|               |      | 0.030 mm<br>x = 0                                   | 0.050 mm<br>x = 1 | 0.075 mm<br>x = 2 | 0.100 mm<br>x = 3 | 0.150 mm<br>x = 4 | 0.200 mm<br>x = 5 |                  |                     |
|               |      | Nominal flow rate <sup>1)</sup> [m <sup>3</sup> /h] |                   |                   |                   |                   |                   |                  |                     |
| 54 740 8x 162 | 1    | 15  | 20                | 25                | 30                | 40                | 45                | Al nickled       | 100                 |
| 54 740 8x 164 | 1    | 15  | 20                | 25                | 30                | 40                | 45                | Al               | 100                 |
| 54 964 8x 382 | 2    | 50  | 70                | 80                | 100               | 100               | 100               | Al nickled       | 180                 |
| 54 964 8x 384 | 2    | 50  | 70                | 80                | 100               | 100               | 100               | Al               | 180                 |

<sup>1)</sup> The flow rates indicated apply to liquids with a viscosity of 72 mm<sup>2</sup>/s (cSt) given a flow resistance ( $\Delta p$ ) of 0.4 bar.

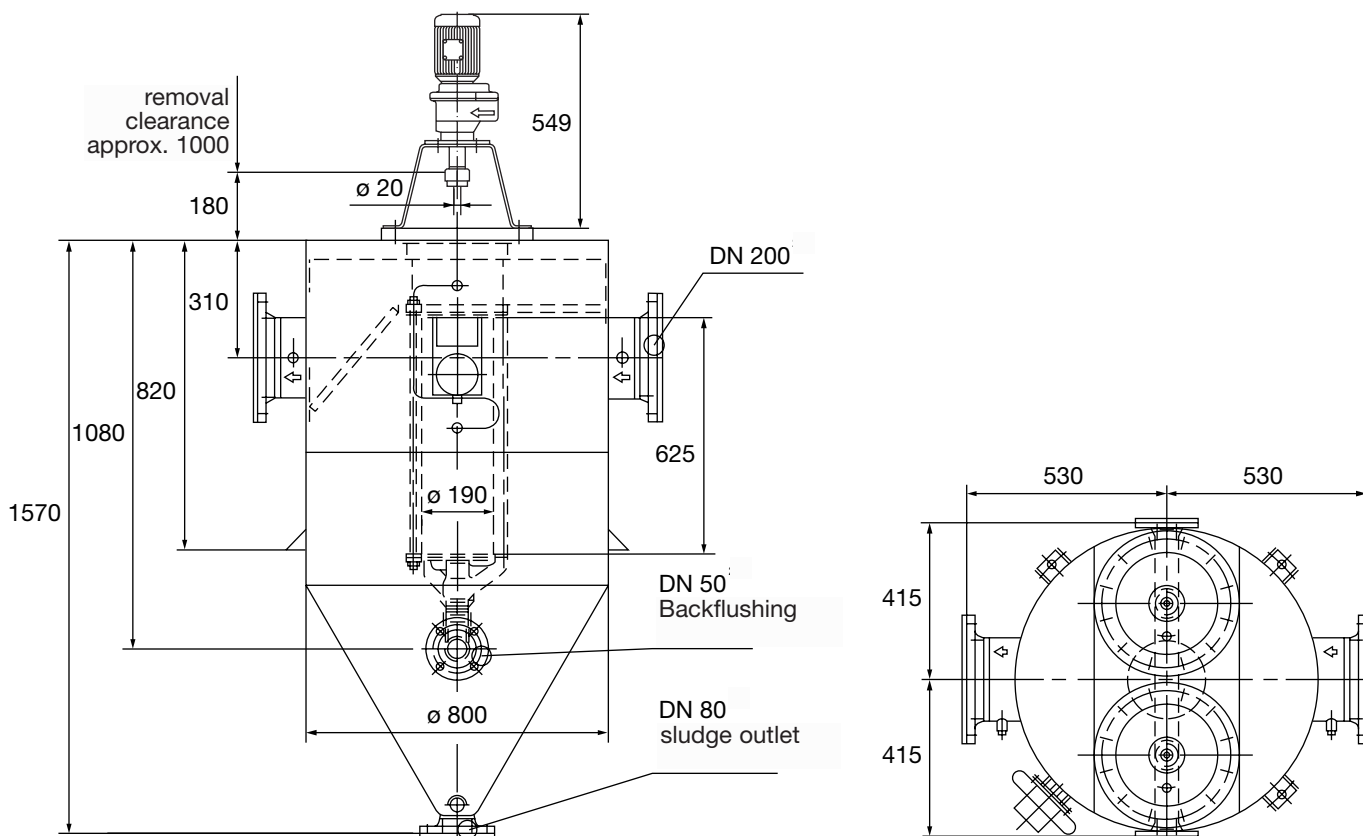
# MANN Profluid

## Nominal pressure up to 10 bar (1.0 MPa)

Double filter with removable inlets and geared motors (230/400 V, 50/60 Hz, enclosure IP 54/65). Moduls with other voltage, frequency and enclosure upon request.

Especially when using high gap widths inlets without backflushing can be installed. Other gap widths, welded, corrosion- and acid-resistant filters are available upon request.

Please send us the questionnaire on page 3, we would like to help you determining the right filter system.



### Part Numbers

| Part No.             | Gap width |          |          |          |          | Material Housing | Weight approx. [kg] |
|----------------------|-----------|----------|----------|----------|----------|------------------|---------------------|
|                      | 0.050 mm  | 0.075 mm | 0.100 mm | 0.150 mm | 0.200 mm |                  |                     |
| <b>95 499 28 ...</b> | 150       | 180      | 200      | 220      | 250      | St               | 700                 |

1) The flow rates indicated apply to liquids with a viscosity of 72 mm<sup>2</sup>/s (cSt) given a flow resistance ( $\Delta p$ ) of 0.4 bar.

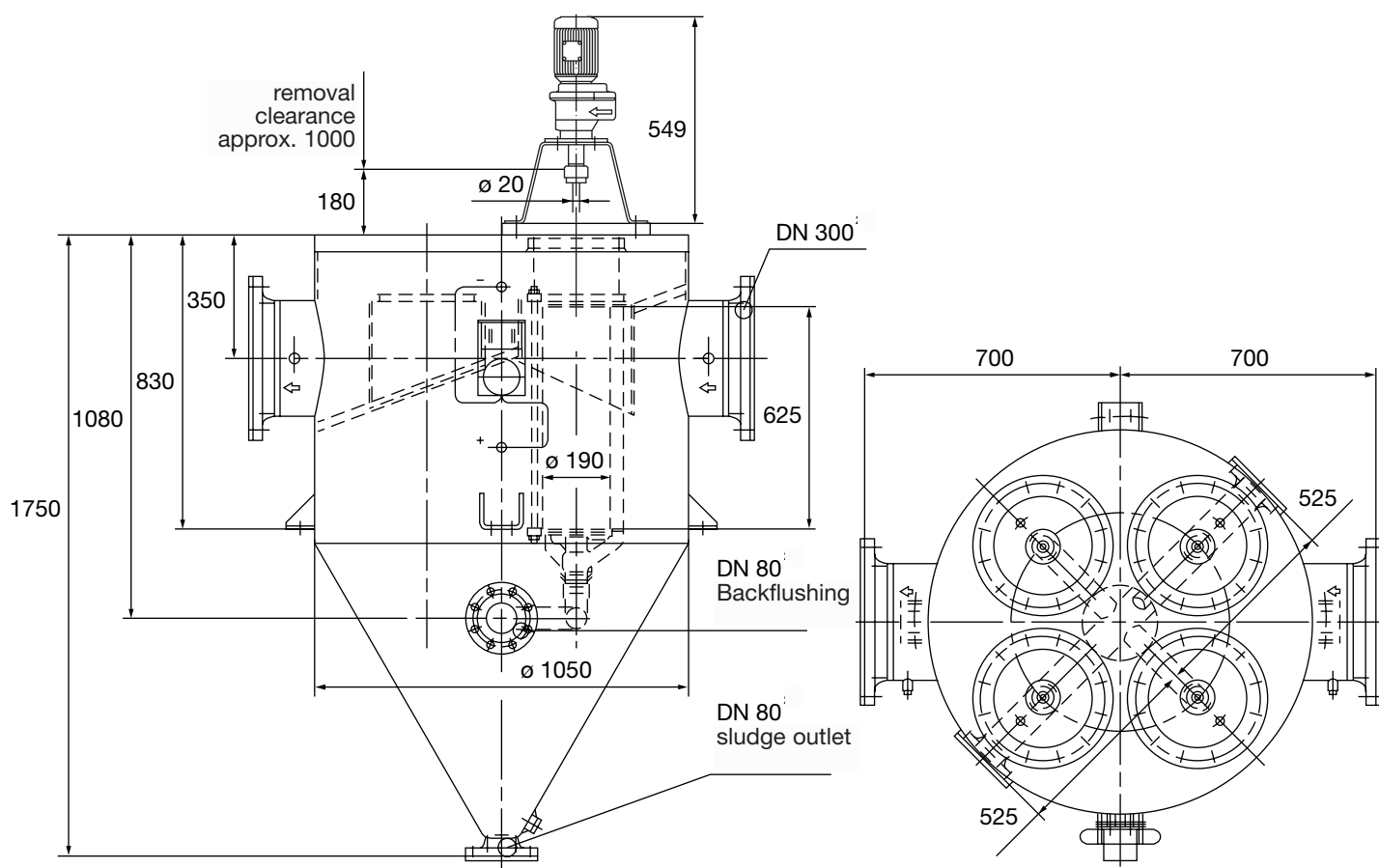
# MANN Profluid

## Nominal pressure up to 10 bar (1.0 MPa)

Quadruple filter with removable inlets and geared motors (230/400 V, 50/60 Hz, enclosure IP 54/65). Moduls with other voltage, frequency and enclosure upon request.

Especially when using high gap widths inlets without backflushing can be installed. Other gap widths, welded, corrosion- and acid-resistant filters are available upon request.

Please send us the questionnaire on page 3, we would like to help you determining the right filter system.



### Part Numbers

| Part No.      | Gap width |          |          |          |          | Material Housing | Weight approx. [kg] |
|---------------|-----------|----------|----------|----------|----------|------------------|---------------------|
|               | 0.050 mm  | 0.075 mm | 0.100 mm | 0.150 mm | 0.200 mm |                  |                     |
| 95 499 48 ... | 300       | 360      | 400      | 440      | 500      | St               | 1 500               |

1) The flow rates indicated apply to liquids with a viscosity of 72 mm<sup>2</sup>/s (cSt) given a flow resistance ( $\Delta p$ ) of 0.4 bar.

## Filters for liquids for a multitude of industrial applications

Modern high performance vehicles, machines, aggregates and engines call for efficient filters and components. In the present catalogue you can take a look through our range of filters.

Our customers use MANN filters for a variety of industrial applications, e.g.:

- Machines for the construction industry
- EDM, electrical discharge machining
- Compressors
- Agricultural machinery
- Construction equipment
- Engine construction
- The construction of commercial vehicles and vehicles designed for special purposes, etc.

Therefore, it is quite usual for MANN+HUMMEL to develop special customised solutions.

### Contact in your area

Production sites and sales offices in a number of European locations as well as in Asia, the USA, and South America enable on-site clarification of all technical questions. And also one of our representatives is sure to be located near you so that we are always within reach.



## Quality does not happen by chance

To be able to guarantee a consistently high quality in production, we check the following properties of our filter elements according to prescribed standards:

- Maximum permissible differential pressure (collapse or burst strength) to DIN ISO 2941
- Acceptable product quality (absence of leaks in bubble test) to DIN ISO 2942
- Compatibility with working fluids (storage) to DIN ISO 2943
- Test on end discs (pressure test) to DIN ISO 3723
- Fatigue strength confining flow (pulsation testing) to DIN ISO 3724
- Flow resistance (pressure loss - volume flow characteristics) to ISO 3968
- Extraction efficiency and service life (multipass procedure) to ISO 4572



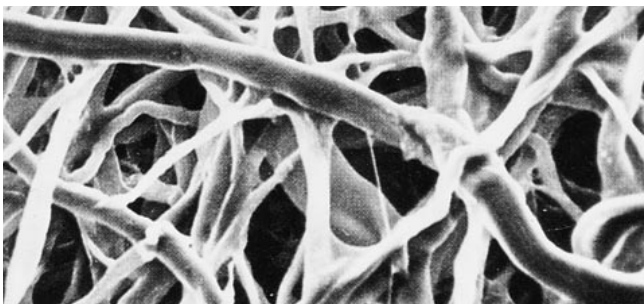


## Reliable filtration ...

MANN filters for liquids perform a function which, through often unnoticed, is in fact indispensable. They keep away damaging impurities from engines and aggregates and prevent early engine wear. The basic material for the fine filter medium in the MANN filter elements is the special technically prepared paper which has an exactly defined composition. Special applications also use other mediums such as, for example, synthetic fabric.

### Filter paper

MANN+HUMMEL only uses special technically prepared paper which has to fulfil the highest quality requirements in the stages of production, processing, and finally the installation. The structure of the fibres and pores as well as the filter fineness are exactly defined. With these filter papers only 10% of the paper volume is actually made of fibres. The remaining 90% consist of many equally large in-between spaces (paper pores), which guarantee a high degree of dirt separation and a high dirt holding capacity, and therefore a long service life.

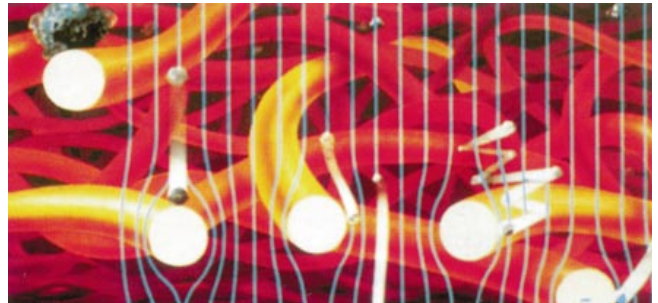


*Filter paper under the microscope*

Such filter papers are able to hold back particles far smaller than 1 micron (1/1000 mm). Due to the structure of the paper, which has a broken up inflow side surface and a smooth surface on the outflow side, dirt holding capacity is increased and also the amount of filter surface area available in the filter element is larger.

The basic material we get from our supplier only becomes highly effective filter paper after a

special processing treatment based on MANN+HUMMEL know-how.



*Graphic representation of a cross-section of a filter paper*

### Impregnating

In order to ensure sufficient stability against mechanical, thermal and climatic influences and resistance to fuels, nearly all our filter papers are impregnated. Modern synthetic resins in a soluble state perfuse – either as an aqueous, alcohol based or acetone solution – the filter paper. The resins cover the fibres of the filter papers and »knot« them together at the crossing points. Using a specific heat treatment condensation of the resins is achieved and thereby the final characteristics of the paper. It is important that impregnated and thermally hardened papers do not change their critical characteristics – volume of pores, size of pores, and structure of fibres – in relation to their basic structure. The main task of impregnation is to increase the stability of the filter paper for its use in the field.

### Geometry of the pleats

Even before the impregnated paper finally stiffens during hardening, it is formed and pleated. The fact that before hardening impregnated filter paper acts thermoplastically at temperatures between 20 and 100 °C, i.e. the outside form can be created easily and this form remains after hardening. In order to guarantee the effectiveness of the whole filter paper surface and to increase the service life under the mechanical influences of the engine operation caused by

## ... thanks to high quality filtering media

pulsation and vibrations, raised parts acting as special distance holders are pressed into the paper. Also serving as distance holders are so-called creases, whereby one paper pleat is folded all the way along.

The combination of the distance holder and optimised pleat geometry make it possible to achieve a large filter surface within a relatively small space. The filter elements can be adapted to almost any housing design giving flexibility. Since there is no possibility of »packeting« of the filter pleats (i.e. when the pleats are pressed together), all the filter surface is active.

### Advantages of the special paper

- Consistent pore distribution guarantees high dirt separation at low pressure resistance levels
- Reliable function during the whole operation time
- Damaging dirt particles with dimensions of a few thousandths of a millimetre are reliably filtered
- Unimpaired function at high temperatures
- Highly developed pleat geometry allows large filter surface areas in small spaces
- Long service intervals thanks to large dirt holding capacity
- Raised surfaces and creases make the filter fully effective
- Operational reliability even in extreme conditions
- Not sensitive to mechanical, climatic or thermal influences

### Highest quality for your safety

The development and production of suitable filter mediums is of the greatest importance for a product with high quality standards. Therefore the way leading up to series production is long, hard, dusty, and at times icy. Many trials, tests and studies have to convince us that a filter is reliable and will fulfil its task. All materials and product developments are thoroughly tested in modern test benches in our laboratories.

On top of the tests carried out in laboratories and in measuring and testing rooms, we also test our products at the site where the future application will take place. Ambient temperatures with either extreme coldness or extreme heat may be found where our customers use the aggregates and are natural test conditions. On-site testing with permanent field checking together with research work contributes indispensably towards an optimum product design. And this means you can always depend on filters which have our brand name!



## Configuring the size ...

The main job of a filter for liquids is to protect lube oil, hydraulic and cooling systems from wear. But filters used in industrial processes increasingly contribute to the fulfillment of environmental regulations, for example the MANN Profluid, used for the preparation of cooling lubricants.

The criteria to be considered when selecting a filter for liquids are the following:

- Flow rate
- Viscosity
- Type and quantity of dirt
- Filter fineness
- Operating temperature
- Operating pressure
- Expected service life
- Permissible differential pressure
- Operating and maintenance conditions on site

Simply fill out and send us the form on page 3. We would like to help you find the right filter configuration.

### Service life

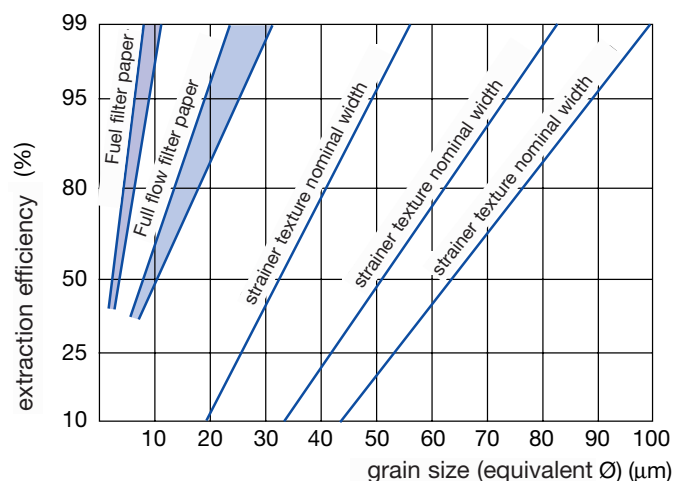
The service life can be defined as the time during which the filter is in operation before a given increase in air-flow resistance occurs, as a result of the dirt deposit on the filter. When the permissible differential pressure is reached, maintenance is necessary. The connection between pressure increase and dirt-retaining capacity is usually not known in practice, since it depends on the type of dirt and the specific operating conditions. Ask our sales engineers for more information. Characteristic is the progressive increase in differential pressure over the duration of operation. Larger filtering surface and a more coarse filter element prolong service life considerably.

Bearing in mind the strong economical impact of filter service life, MANN+HUMMEL recommends to give preference to a filter only as fine as necessary.

Required filter fineness and achievable service life are experimental values determined during practice. Many factors can influence them and this is the reason why a theoretical predetermination is only partly possible.

### Filter fineness (extraction efficiency)

The filter media and the resulting filter fineness depend either on the size of the particles that pass through the filter or extraction probability for the various particle sizes.



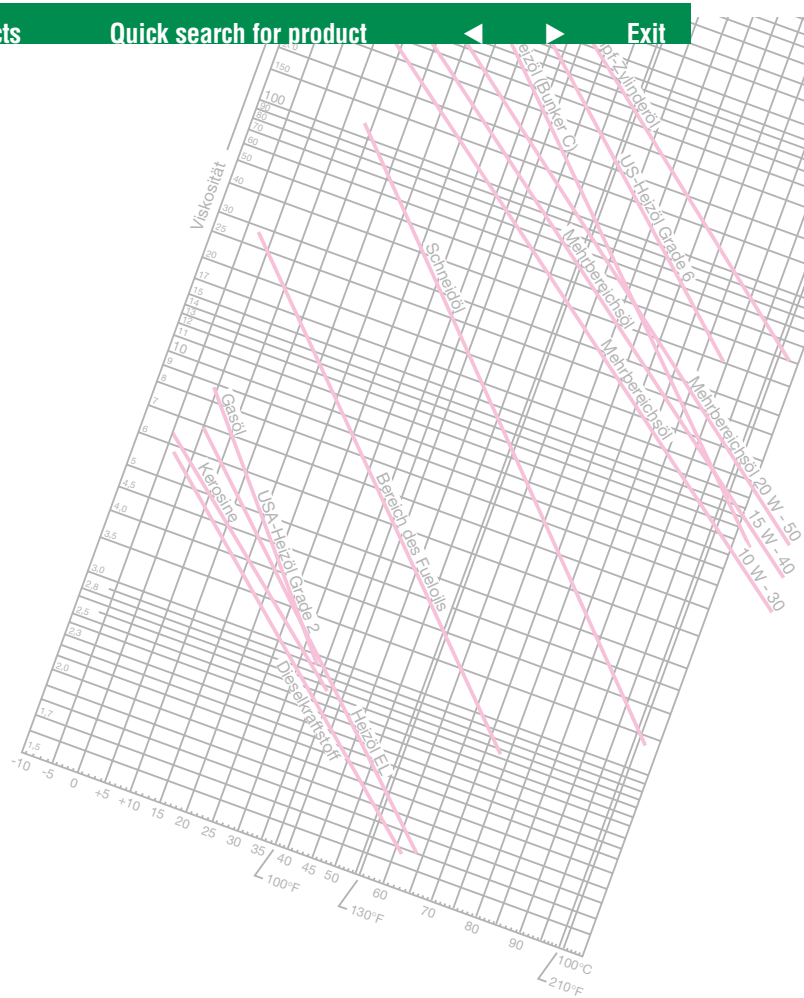
## ... of filters for liquids

### Flow rate and flow resistance

Generally, the flow resistance in pipe systems provided with filters can be determined only approximately, because of their varying cross sections. As more dirt is retained by the filter, the flow resistance increases.

To be able to make comparable statements when viscosity data is not available, mineral oil with a kinematic viscosity of  $72 \text{ mm}^2/\text{s}$  is used as a point of reference. For the volume flow indicated in the tables, the resulting flow resistance (differential pressure) is of about 0.2 bar (20 KPa), provided that no details have been provided.

In the filter element the flow patterns run mainly in the laminar zone, i.e. volume flow, resp. flow resistance change exponentially in relation to the kinematic viscosity.



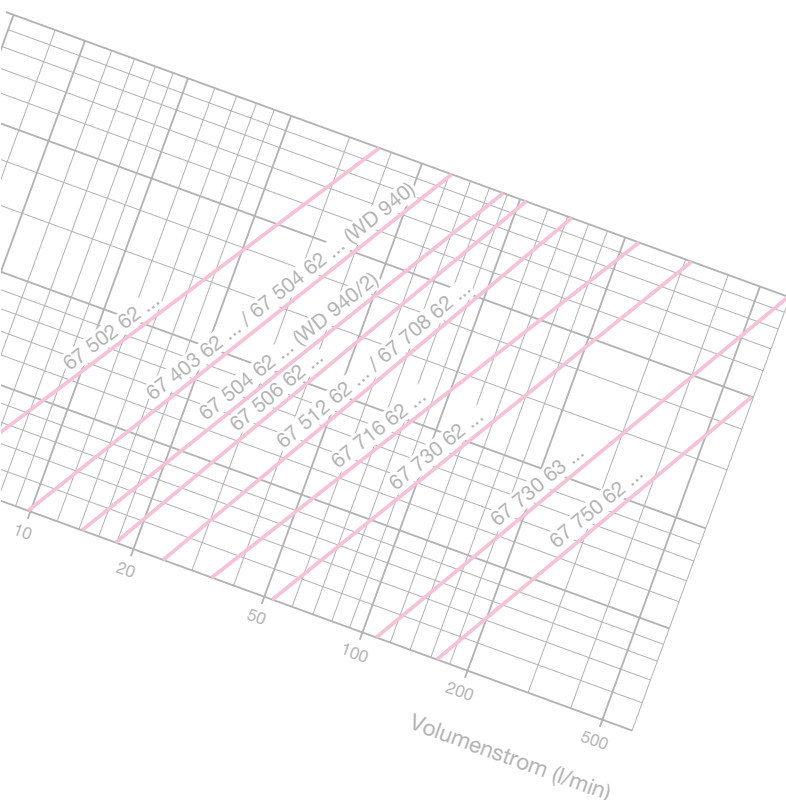
If the filter housing is taken into consideration, a turbulent flow or a mixed flow can occur. In the turbulent area, the flow resistance is largely proportional to the square of the velocity and the viscosity plays a subordinate role.

### Nominal flow rate

The nominal flow rate of a filter for liquids is closely connected with the geometrical filter calculation data (connection nominal diameter, filter fineness) and the physical properties of the liquid to be filtered (viscosity, spissitude). As a rule, the pump capacity determines the required nominal flow rate of the filter. You will find the nominal flow rate of MANN filters in the respective charts.

### Configuration support from our engineers

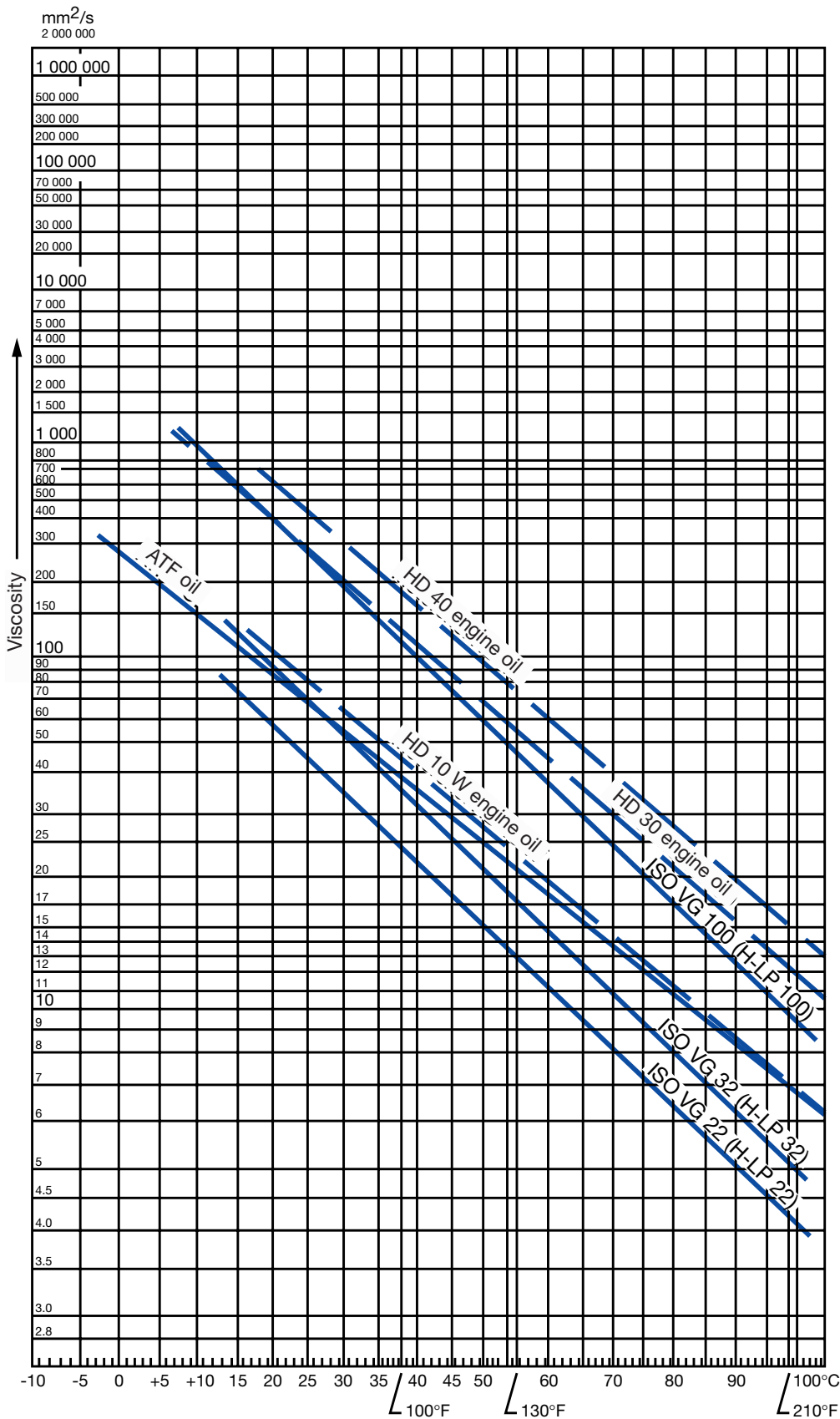
Our engineers would like to assist you in determining the filter required for your application. Just fill out and fax us the form on page 3.



# Viscosity/temperature chart

## Examples of commercial, single-grade engine oils, hydraulic and ATF oils

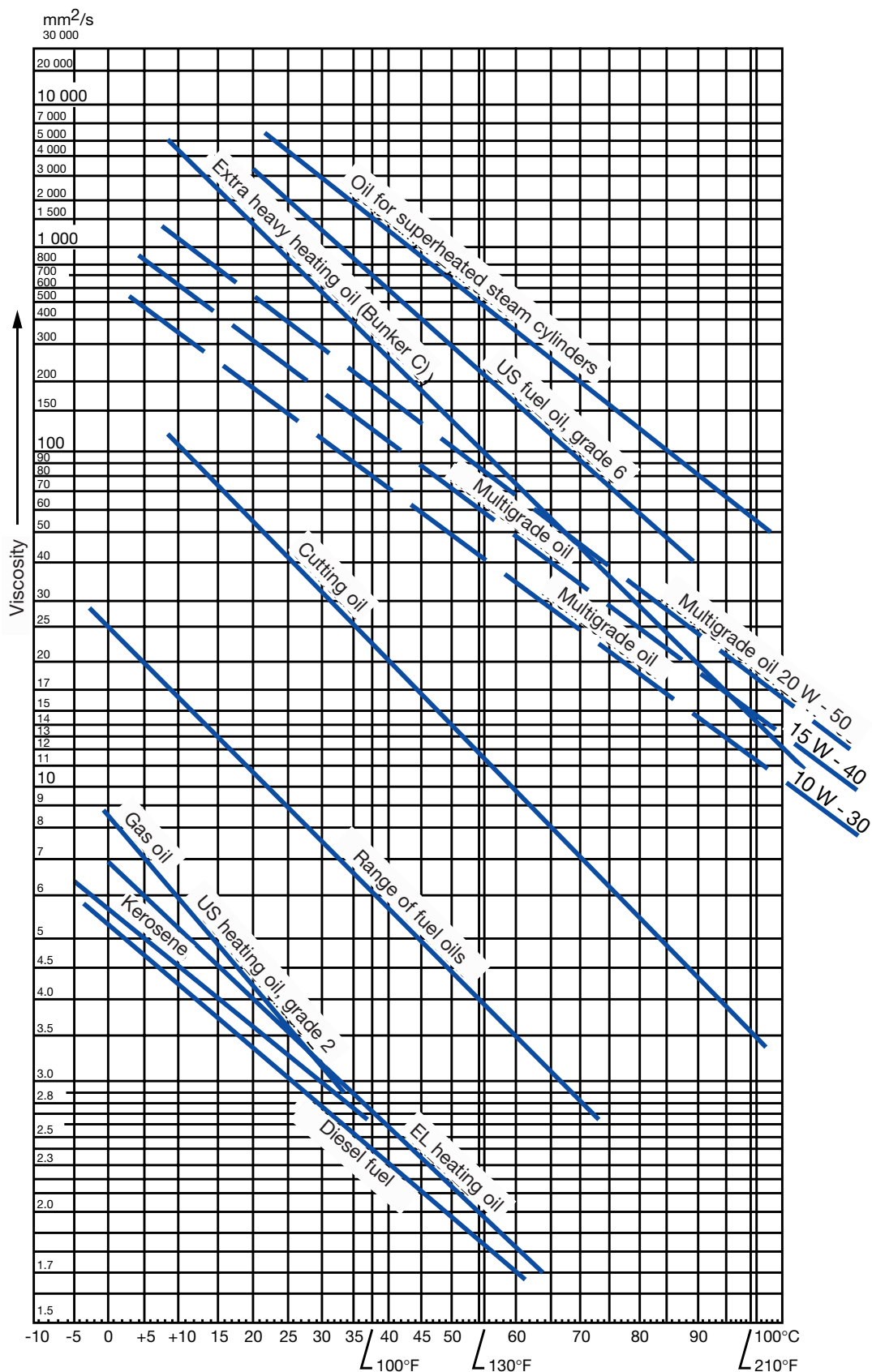
(Characteristic curves for motor oils are shown in broken lines for ease of identification.)



# Viscosity/temperature chart

## Examples of commercial, multi-grade engine oils, cutting and heating oils

(Characteristic curves for motor oils are shown in broken lines for ease of identification.)



# Glossary

## Definition of expressions used in filter engineering

**Backflushing filter** – Filter where cleaning is achieved without taking out the filter element by reversing the flow direction.

**Burst pressure** [bar, KPa] – Smallest differential pressure which can cause damage to the filter or a filter component due to the pressure load.

**Differential pressure** [bar, mbar, KPa] – Flow resistance is one of the causes of differential pressure. By definition it is the difference in pressure between two measured points, e.g. the crude side and the clean side of the filter.

**Dirt capacity** [g] – Dirt capacity of a filter or filter element is established under laboratory conditions and is the mass of the dirt added to the filter up to the defined end of the test.

**Dirt load** – Quantity of dirt the filter is designed to handle.

**Extraction efficiency** [%] – Relationship between the dirt extracted in the filter and the dirt going into the filter.

**Filter fineness** – General term describing the pore size, gap and mesh width, etc.

**Filter medium** – Material used to carry out the filtration.

**Flow resistance** [bar, mbar, KPa] – Resistance in the filter working against the flow of the medium to be filtered.

**Fractional extraction efficiency** [%] – extraction efficiency for a particular particle size.

**Gap-type filter** – Filter which extracts impurities using a filter element with a defined gap width, e.g. through layered plates or discs, or wound wires.

**In-line filter** – For filter installation in pipes or hoses.

**Medium** – (see Filter medium)

**Micro-top** – MANN+HUMMEL brand name for filter elements.

**Nominal flow rate** [l/min., m<sup>3</sup>/h] - a defined → volume flow.

**Nominal pressure** [bar, mbar, KPa] - Pressure which the filter is designed to operate with. This information can be included in the filter description.

**Opening pressure** [bar, KPa] - Differential pressure when opening the bypass valve, characterised by a defined → volume flow.

**Pressure loss** [bar, mbar, KPa] - Persistent loss in pressure resulting from a reduction of the flow energy caused by the filter or the filter element.

**Profluid** - MANN+HUMMEL brand name for an automatic → backflushing filter.

**Spin-on filter** - Filter which is removed with its filter element in one piece during service and replaced.

**Viscosity** - Dynamic viscosity is a measure of the resistance of the medium to be filtered. Kinematic viscosity is the relationship between the dynamic viscosity of the medium to its density.

**Volume flow** [l/min., m<sup>3</sup>/h] - Volume which flows through a filter in a time unit.

## 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 <sup>3</sup> /min | = | 35.3140 | cfm |
| 1 m <sup>3</sup> /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 <sup>3</sup>   | = | 1000 litres      | = | 35.31 ft. <sup>3</sup> | = | 61020 inch <sup>3</sup> |
| 1 ft. <sup>3</sup> | = | 28.32 litres     | = | 0.02832 m <sup>3</sup> | = | 1728 inch <sup>3</sup>  |
| 1 litre            | = | 0.2642 US gallon | = | 0.2201 Engl. gallon    |   |                         |
| 1 US gallon        | = | 3.785 litres     | = | 231 inch <sup>3</sup>  |   |                         |
| 1 Engl. gallon     | = | 4.544 litres     | = | 277 inch <sup>3</sup>  |   |                         |

### 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 <sub>2</sub> O |
| 10 mbar                | = | 1 KPa      | = | 0.145 psi  | = | 4.015 IN. H <sub>2</sub> O |
| 10 psi                 | = | 68.95 KPa  | = | 0.6895 bar | = | 27.68 IN. H <sub>2</sub> O |
| 1 IN. H <sub>2</sub> O | = | 0.2491 KPa | = | 2.491 mbar | = | 0.03613 psi                |