

# Water Absorbing Filter Elements



## EXAPOR® AQUA

### Quick and efficient dewatering of hydraulic and lubrication oils

Water in hydraulic and lubrication oils may have the following causes:

- Radiator leakage
- Environment humidity
- Spray-water
- Fresh oil

Already small quantities of free water in oil can lead to acidification. Corrosion of surfaces at components can be the result. Due to free water the oil characteristics changes, e.g. decreased load-carrying capacity, reduced temperature resistance. In order to avoid economic damage, the oil must be protected against free water or existing water must be withdrawn as fast as possible.

Large water quantities can be withdrawn by oil change, flushing of the system with dewatering units. On systems with hygroscopic (materials that absorb water are described as hygroscopic) oils or with permanent water entry through seals (e.g. hydraulic excavator used in water constructions) ARGO-HYTOS off-line filters and filter units with EXAPOR® AQUA filter elements can be installed permanent in the system, in order to withdraw water. To withdraw remaining water quantities, e.g. after new filling, the ARGO-HYTOS EXAPOR® AQUA elements in portable off-line filter units also can be used during operation of the system.

EXAPOR® AQUA filter elements are applicable in different ARGO-HYTOS filter units. Depending on the operating situation the water absorption amounts to approx. 1300 ml/element. The combination of water-



Filling unit  
FA 016



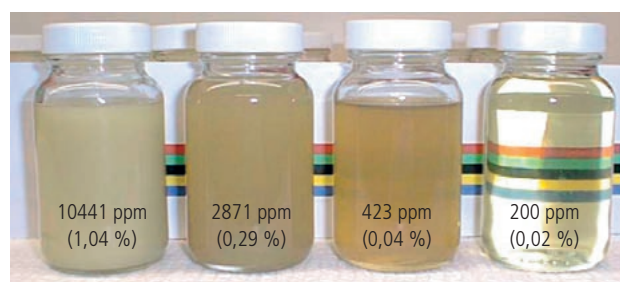
Oil service unit  
UM / UMP 045

absorbing filter layers with micro-filter material in the EXAPOR® AQUA also permits the use in hydraulic and lubrication systems with high requirements to the oil cleanliness.

Simply the cooled down oil sample can be judged optically. As long as a turbidity is visible in the cooled down oil, the water content will be unacceptably high. If the cooled down oil sample appears clear, the water content usually lies in the permissible range. An exact measurement of the water content is made by an oil sample analysis in the laboratory (e.g. water content regulation after the Karl Fischer method in accordance with DIN 51777).



EXAPOR® AQUA filter elements



Oil samples with varying water content

EXAPOR® AQUA Filter element	Water capacity per element at $v = 30 \text{ mm}^2/\text{s}$	Filter fineness	Dirt-holding capacity (values in g test dust ISO MTD according to ISO 16889)	Applicable in ARGO-HYTOS filter units
<b>Y7.1220-05</b>	350 ml	8E-A $\beta_{8(c)} \geq 200$	64 g	FA 016, FNA 008, FNA 016, FAPC 016 (with filter element size V7.1220)
<b>Y7.1560-05</b>	1300 ml	8E-A $\beta_{8(c)} \geq 200$	240 g	UM 045, UMP 045, FNA 045



### We produce fluid power solutions

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## Oil Service Units

### Cleanline portable

#### FA 016/FAPC 016

- Easy filling and cleaning
- Compact design, comfortable handling
- High filtration efficiency
- Option: with Oil Cleanliness Monitor



**Oil service – simple, quick and compact**



## **Cleanline portable**

With the Cleanline portable hydraulic or lubricating systems can be easily filled or cleaned in off-line filtration.

### **Compact design and comfortable handling**

The compact design allows easy access to the oil tank. Cleanline portable comes ready to connect, with hose packages. The suction hose and the pressure hose can be wound around the hose fixtures. Residual oil from the hoses is collected in the oil pan. The ultra-fine elements can be quickly changed without special auxiliary tools.

### **Protection of components through ultra-fine filtration**

The EXAPOR® ultra-fine elements are the heart of the ARGO-HYTOS filter units Cleanline portable. High separation efficiency guarantees excellent cleanliness levels and thereby highest protection of components. The high dirt holding capacity of the EXAPOR® ultra-fine elements allow economic operation of the Cleanline portable.



## Cleanline portable with OPCom

### 2 in 1: Cleanline portable with Oil Cleanliness Monitor OPCom

The Cleanline portable can be equipped with a Oil Cleanliness Monitor. The ARGO-HYTOS OPCom permanently monitors the current cleanliness class during the cleaning or filling process.

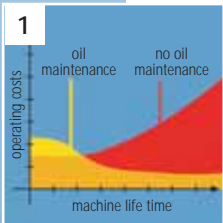
When monitoring the cleanliness class a ball valve is used to select "upstream" (before filter, e.g. when cleaning filled oil) or "downstream" (behind filter, e.g. when filling systems). The display area allows a choice of particle sizes: 4, 6, 14 or 21  $\mu\text{m}$ . The display shows the classification number of the selected particle size, as specified by ISO 4406:1999.

The OPCom can be reconfigured with a PALM Organizer or alternatively via a PC with an infrared interface. The data can be transmitted to the computer via the RS232 interface so that the progression can be visualized and followed graphically or in table form.

## Easy Transport

For easy transportation for FA 016 and FAPC 016 the trolley can be hooked onto the standing unit. Also, trouble-free transportation is possible for long distances.

# Advantages at a glance



## 1. Economical

Efficiency through ARGO-HYTOS Fluid Management systems. After just a short time your investments will be amortized due to longer service intervals and increase of machine availability.



## 2. Portable in any position

Thanks to the compact design the Cleanline portable can be easily carried and also be used in difficult zones of hydraulic systems. Hoses and electric cables can be fixed at the service unit. The Cleanline portable can be operated and transported in both up-right and horizontal positions.



## 3. User-friendly filter element change

Optimal operator handling has been a key feature in the development of Cleanline portable. No extra tools are needed to open the housing and the filter element can be pulled out through the hang-in technique.



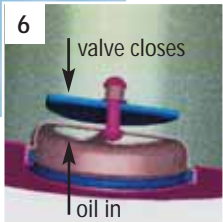
## 4. Quality in detail

The EXAPOR® ultra-fine element is the heart of the Cleanline portable. High separation efficiency and dirt holding capacities guarantee maximum cleanliness levels and service intervals in line with practical needs.



## 5. Controlled cleaning by Oil Cleanliness Monitor OPCom

The Cleanline portable can be optionally equipped with the ARGO-HYTOS Oil Cleanliness Monitor OPCom which allows to monitor the oil cleanliness during the cleaning or filling process. The current cleanliness classes are indicated on the display or can be transferred by the provided infrared- or RS232-interface.



## 6. Maintenance-free filter housing thanks to a clever filter element technique

On the bottom of the from inside to outside flown through filter elements there is a dirt retention valve. If the filter element is pulled out of the filter housing with the cover, the dirt retention valve will close. Sedimented dirt is removed from the housing with the filter element.

# Characteristics

### Hydraulic connection

Hoses:  
Suction hose NG 20, length 1,8 m, with suction strainer 300 µm,  
Ø ca. 49 mm pressure hose NG 20, length 2 m, pressure or  
supply lance Ø ca. 20 mm (extensions on request)

### Electrical connection / Electric motor

Electric motor, air cooled fan type  
Cable: length 2,5 m  
Electro motor types: 1~ 110 V / 50...60 Hz  
1~ 230 V / 50...60 Hz  
Protection type IP 55  
Electro motor type 24 V DC  
Protection type IP 54

See selection chart

### Tank capacity

ca. 2,4 l

### Pump design

Internal gear pump

### Operating and transportation position

Upright or horizontal

### Hydraulic fluids

Mineral oil and biodegradable fluids  
(see info service sheet 00.20).  
Other fluids on request.

### Temperature range of fluids

0 °C...+60 °C (also see fluid viscosity range).

### Ambient temperature range

0 °C...+50 °C

### Accessories

#### Water-absorbing filter elements EXAPOR® Aqua

These can be used for short-term water absorption in  
all standard units. (please inquire)

### Trolley

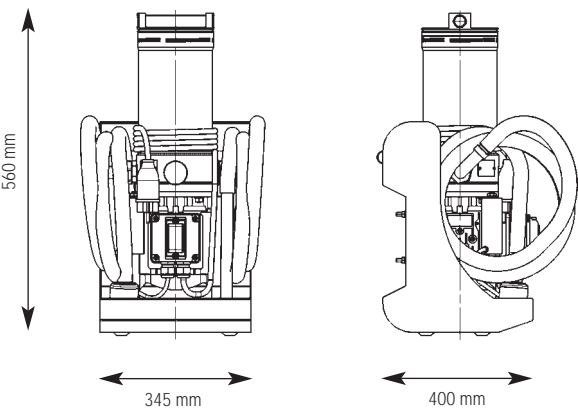
Easy transportation for long transport ways.

### Viscosity range

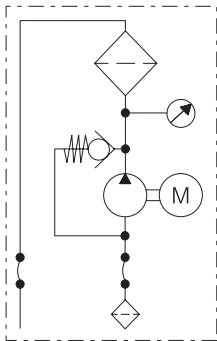
Type	Continuous operation min.	Continuous operation max.	Short-term operation max.
FA 016-1100	15 mm²/s	250 mm²/s	400 mm²/s
FA 016-1110	15 mm²/s	200 mm²/s	400 mm²/s
FA 016-1300	15 mm²/s	250 mm²/s	400 mm²/s
FA 016-1600	15 mm²/s	250 mm²/s	400 mm²/s
FA 016-1150	15 mm²/s	100 mm²/s	200 mm²/s
FAPC 016-1100	15 mm²/s	150 mm²/s	150 mm²/s*

\* An exact measurement of the oil cleanliness class is only possible within a  
viscosity range from 15 mm²/s to 150 mm²/s

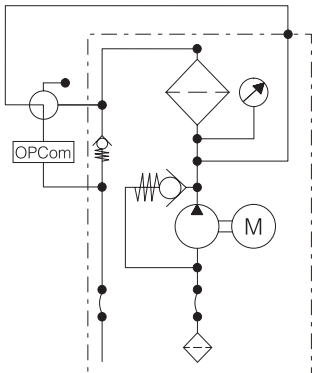
# Dimensions



Symbol 1



Symbol 2



# Description

## Cleaning speed

The cleaning speed depends on the efficiency of the filter elements ( $\beta \times (c)$ ), the nominal volume flow ( $Q_{\text{nominal}}$ ) and the oil volume ( $V_{\text{actual}}$ ).

In graph D1-D2 the cleaning speeds are shown in relation to the filter fineness (cleanliness information according to ISO 4406:1999). The values are recorded by laboratory methods and they may be influenced by environmental conditions (such as continuous additional introduction of dirt on running systems, high water content, etc.).

All characteristic curves (see graphs D1-D2) relate to a **reference oil volume of 180 l** and a **nominal volume flow of 15 l/min**.

The following formula should be used to convert to the actual oil volume:

$$t_{\text{actual}} = \frac{V_{\text{actual}} \cdot \Delta t}{12 \cdot Q_{\text{nominal}}}$$

$t_{\text{actual}}$  = actual cleaning speed

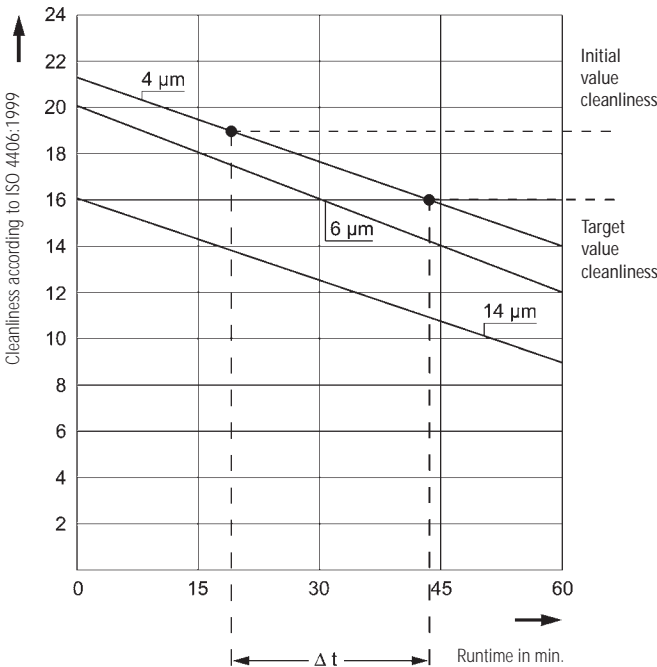
$\Delta t$  = cleaning speed for oil volume of 180 l

$V_{\text{actual}}$  = volume of oil to be cleaned

$Q_{\text{nominal}}$  = nominal volume flow, see selection chart

For monitoring purposes we recommend the PODS *Pro* (Portable Oil Diagnostic System) particle counter from ARGO-HYTOS.

## Determining the cleaning speed

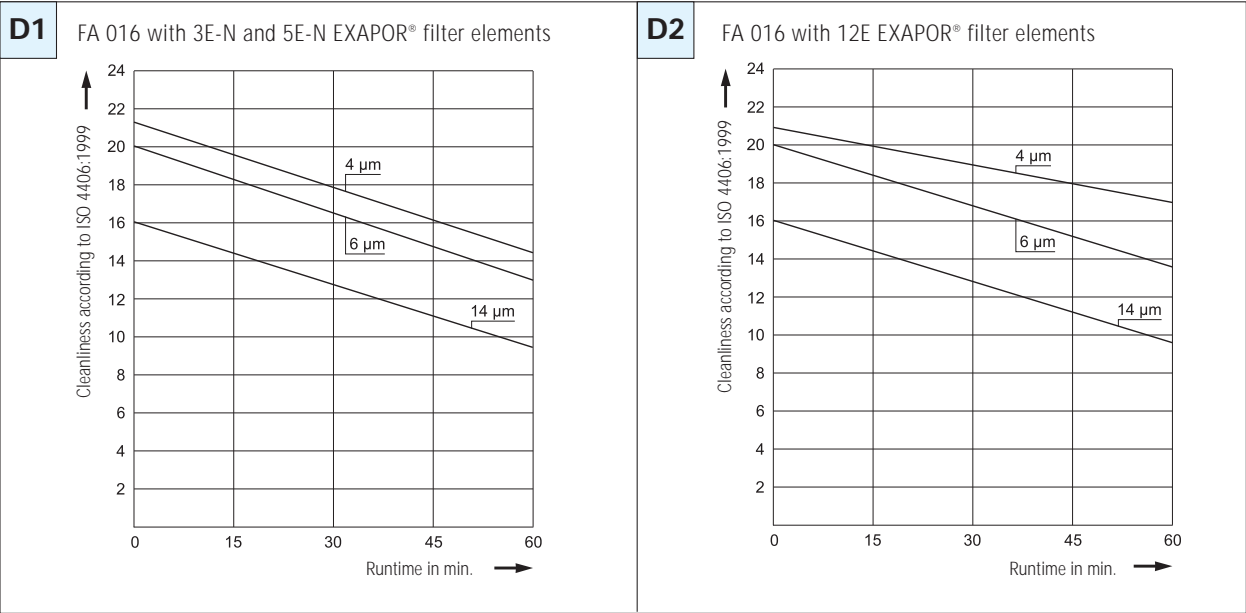


1. Determine the initial cleanliness class and enter it on the graph, e. g. 19/17/14 according to ISO 4406:1999
2. Enter the target cleanliness class on the graph, e.g. 16/14/11 according to ISO 4406:1999
3. Determine  $\Delta t$ , in this case  $\Delta t = 25$  min
4. Insert the value in the formula, where  $V_{\text{actual}} = 350$  l and  $Q_{\text{nominal}} = 16$  l/min

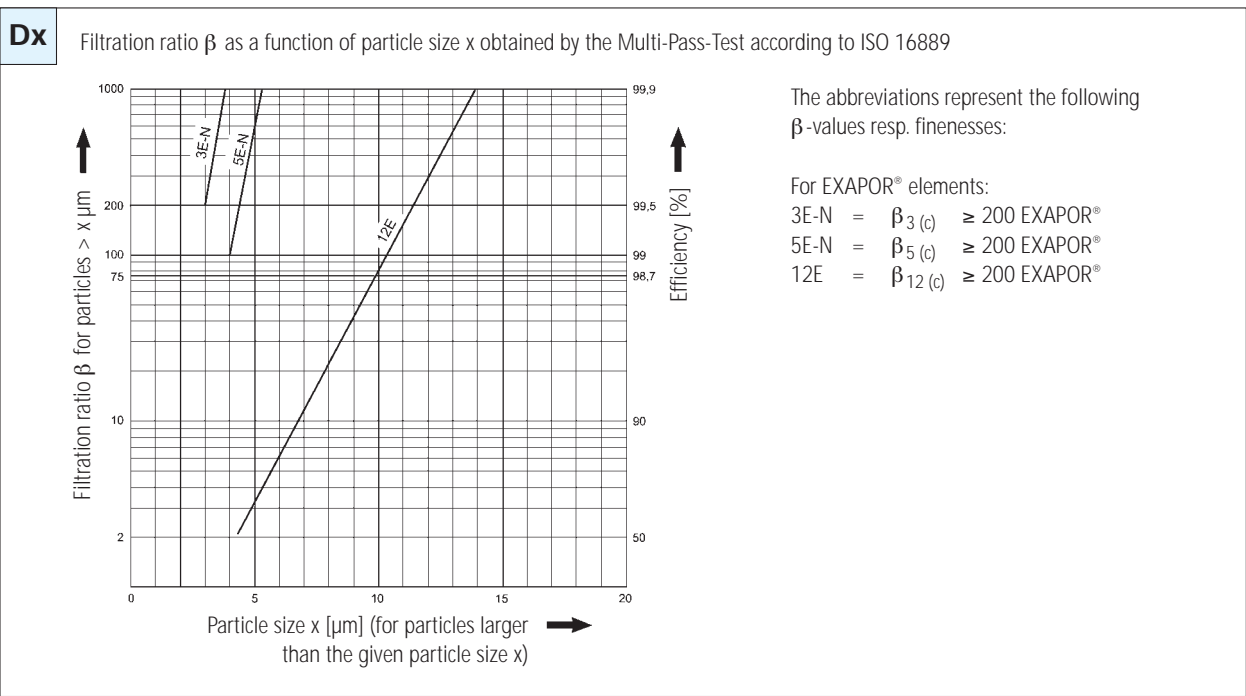
$$t_{\text{actual}} = \frac{V_{\text{actual}} \cdot \Delta t}{12 \cdot Q_{\text{nominal}}}$$
$$= \frac{350 \cdot 25}{12 \cdot 16} \approx 46 \text{ min}$$



Curves for cleaning speed as a function of the filter fineness



Filter fineness curves in selection chart





# Selection Chart

	Order no. FA 016-1100	Order no. FA 016-1300	Order no. FA 016-1600	Order no. FA 016-1110	Order no. FA 016-1150*	Order no. FAPC 016-1100
Nominal flow rate	16 l/min	16 l/min	16 l/min	16 l/min	16 l/min	16 l/min
Filter fineness see diagram Dx	3 E-N	5 E-N	12 E	3 E-N	3 E-N	3 E-N
Dirt capacity Mi at Q	160 g	160 g	90 g	160 g	160 g	160 g
E-Motor operating voltage	1 ~ 230 V	1 ~ 230 V	1 ~ 230 V	1 ~ 110 V	24 V DC	1 ~ 230 V
E-Motor max. operating frequency	50 (60) Hz	50 (60) Hz	50 (60) Hz	60 Hz	DC	50 (60) Hz
E-Motor power	0,45 kW	0,45 kW	0,45 kW	0,3 kW	0,25 kW	0,45 kW
Length suction hose	1,8 m	1,8 m	1,8 m	1,8 m	1,8 m	1,8 m
Length pressure hose	2 m	2 m	2 m	2 m	2 m	2 m
Viscosity max.	400 mm²/s	400 mm²/s	400 mm²/s	400 mm²/s	200 mm²/s	150 mm²/s
Suction height max.	1,5 m	1,5 m	1,5 m	1,5 m	1,5 m	1,5 m
Operating pressure PRV max.	4 bar	4 bar	4 bar	4 bar	4 bar	4 bar
Symbol	1	1	1	1	1	2
Replacement element order no.	V7.1220-113	V7.1220-13	V7.1220-06	V7.1220-113	V7.1220-113	V7.1220-113
Weight	18,9 kg	18,9 kg	18,9 kg	18,9 kg	18,9 kg	24 kg
Clogging indicator	Manometer	Manometer	Manometer	Manometer	Manometer	Manometer

Other versions on request.

\* without plug

**Filter elements:** see selection chart.  
 Water-absorbing filter elements order no. Y7.1220-05 on request.

**Accessories:** Hose extensions on request.  
 For the appropriate clogging indicators see datasheet 60.20.  
 Trolley for FA 016 and FAPC 016 order no. FA 016-1760

Subject to technical changes.



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## **Oil Service Units**

### **Cleanline portable light**

#### **FA 014**

- Easy filling and cleaning
- Compact design
- Comfortable handling

# Cleanline portable light – quick, simple and compact

With the oil service unit FA 014 hydraulic or lubricating systems can be easily filled or cleaned.

## Dirt-holding capacity

Values in g test dust ISO MTD according to ISO 16889

## Hydraulic fluids

Mineral oil and biodegradable fluids (HEES and HETG, see info sheet 00.20). Other fluids on request.

## Temperature range of fluids /

### Viscosity range

0 °C...+60 °C

Continuous operation min.: 15 mm²/s

Continuous operation max.: 250 mm²/s

Short-term operation max.: 400 mm²/s

## Ambient temperature range

0 °C...+50 °C

## Suction height

max. 1,5 m

## Operating pressure

max. 4 bar

## Clogging indicator

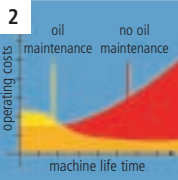
Manometer

Order no.	FA 014-1600
Nominal flow rate	16 l/min
Filter fineness	12 E ( $\beta_{12(c)} = 200$ )
Dirt-holding capacity	45 g
Operating voltage / frequency	1 ~ 230 V / 50 Hz
Power / Protection type	0,45 kW / IP 55
Replacement element order no.	V7.1210-06
Weight	16 kg



## 1. Compact design

The compact design allows easy access to the oil tank. FA 014 comes ready to connect, with hose packages.



## 2. Economical

Efficiency through ARGO-HYTOS Fluid Management systems. After just a short time your investments will be amortized due to longer service intervals and increase of machine availability.

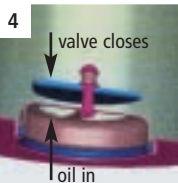
## 3. User-friendly filter element change

Optimal operator handling has been a key feature in the development of FA 014. No extra tools are needed to open the housing and the filter element can be pulled out through the hang-in technique.



## 4. Maintenance-free filter housing thanks to a clever filter element technique

On the bottom of the from inside to outside flown through filter elements there is a dirt retention valve. If the filter element is pulled out of the filter housing with the cover, the dirt retention valve will close. Sedimented dirt is removed from the housing with the filter element.



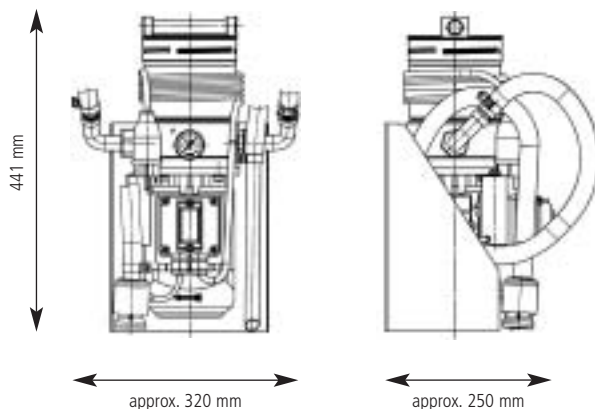
## 5. Quality in detail

The EXAPOR® fine element is the heart of the FA 014. High cleanliness levels protect hydraulic systems against dirt during the oil filling process.

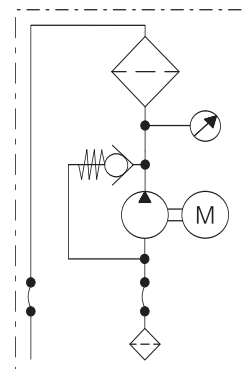


For filling and cleaning of hydraulic or lubricating systems with high demands to the oil cleanliness we recommend the ARGO-HYTOS oil service unit Cleanline portable FA 016.

## Dimensions



## Hydraulic symbol





## Oil Service Units

### ECOLINE

#### UM 045 / UMP 045

- Easy filling, cleaning and pumping over
- Unbeatable ergonomics, optimal handling
- High filtration performance
- Optionally with portable oil diagnostic system



**Oil service – simple, quick and compact**



## **ECOLINE**

Easy, compact and ergonomic

### **ECOLINE**

With ECOLINE hydraulic or lubrication systems can simply be filled, cleaned or fluid can be pumped over without using the filter function. The ergonomic design allows simple handling also on closest work space.

### **Protection of components through ultra-fine filtration**

The EXAPOR® ultra-fine element is the heart of the ARGO-HYTOS oil service unit ECOLINE. High separation efficiency guarantees excellent cleanliness levels and thereby highest protection of components. The high dirt holding capacity of the EXAPOR® ultra-fine elements allows economic operation of the ECOLINE.



## ECOLINE with oil diagnostic system PODS *Pro*

ECOLINE in the UMP 045 version, is equipped with adapters for the portable ARGO-HYTOS oil diagnostic system PODS *Pro*. With few turns of your hand PODS *Pro* can be attached to the ECOLINE and is immediately ready for operation. The oil cleanliness is controlled by the PODS *Pro* when filling hydraulic systems or during cleaning in off-line filtration.

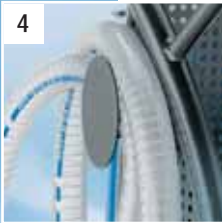
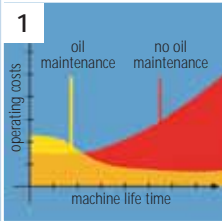
Selective cleaning is possible by input of the desired cleanliness class. After reaching the programmed target cleanliness class the complete unit ECOLINE and PODS *Pro* turns off. The determined cleanliness classes can be documented on a print-out on-site, indicated on the PODS *Pro* itself at any time or can be downloaded on an external memory later on by using the special PODSWare. The PODSWare enables the user to issue a purity certificate with individual labels.

## Unbeatable ergonomics

Superior technology and excellent design are of no use if the service equipment requires great physical effort from the operator. Therefore, ergonomics were of primary importance when the ECOLINE design was conceived.

Owing to its optimized weight distribution, the ECOLINE can be tilted from the standing position with minimum effort. In the tilted position, the ECOLINE can be moved walking upright, removing strain from the back.

# Advantages at a glance



## 1. Economical

Efficiency through ARGO-HYTOS Fluid Management systems. An investment in ARGO-HYTOS systems will be amortized after just a short time, because intervals between services will be longer and machine availability will increase.

## 2. User-friendly filter element change

The filter element can be removed from the housing together with the cover. The dirt retention valve ensures that solid particle sediment is completely removed with the filter element. During operation, the fluid passes through the filter element from the inside to the outside, which eliminates the need for flushing the filter housing.

## 3. Switching functions

The rotary valve is used to switch between the basic modes of operation: "filling and filtering" and "pumping over without filtering". In position III, the PODS *Pro* (Portable Oil Diagnostic System) can be switched on.

## 4. Keeping hoses in place

The retainers attached to the sides of the frame secure the hoses in any transport position.

## 5. Compact design

Among the numerous advanced features, listed in the specification of the ECOLINE, compact design was a basic requirement to be met by our team of design engineers. Transporting the ECOLINE in horizontal position, e.g. in the cargo area of a service vehicle, is facilitated by the wheels and the curved design of the frame.

## 6. Fluid Management

In conjunction with PODS *Pro* (Portable Oil Diagnostic System), ECOLINE makes it possible to verify the cleaning efficiency. The fluid cleanliness grade can be determined on-line or by bottle sampling according to any common fluid cleanliness classification while an off-line filtration or filling operation is being performed. The intelligent software also enables the implementation of cleaning processes that are controlled by the level of fluid contamination.

# Characteristics

### Hydraulic connection

Hoses:  
Suction hose NG 32, length 2,7 m, with suction strainer 280 µm,  
pressure hose NG 25, length 2,7 m

### Electrical connection / Electric motor

Electric motor, air cooled fan type  
Cable: length 6 m  
Electro motor types: 1~ 230 V / 50 Hz  
3~ 400 V / 50 Hz  
Type of protection: IP 54  
See selection chart

### Tank capacity

approx. 13 l

### Pump design

Internal gear pump

### Operating and transportation position

Operating position: upright  
Transportation position: upright or horizontal

### Hydraulic fluids

Mineral oil and biodegradable fluids (see info service sheet 00.20).  
Other fluids on request.

### Temperature range of fluids

0 °C ...+65 °C (also see fluid viscosity range).

### Ambient temperature range

0 °C ...+50 °C

### Options

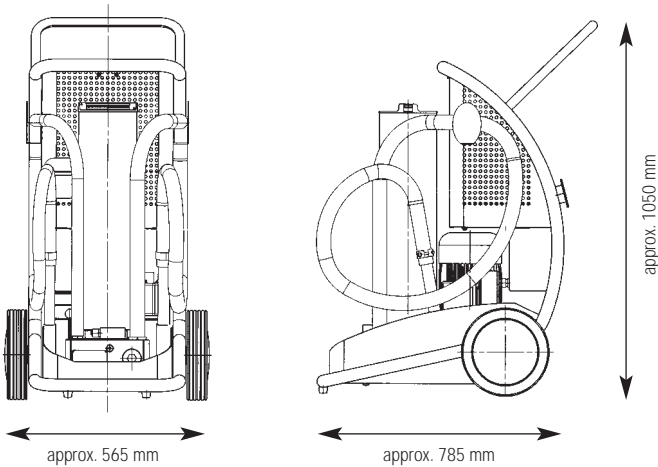
#### Water-absorbing filter elements EXAPOR® Aqua

These can be used for short-term water absorption in  
all standard units. (please inquire)

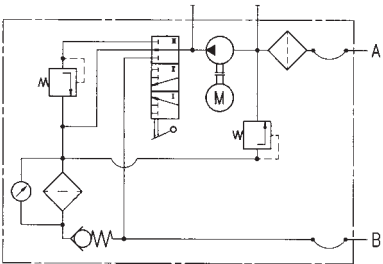
### Viscosity range

Type	Continuous operation min.	Continuous operation max.	Short-term operation max.
all types UM 045/UMP 045	15 mm²/s	600 mm²/s	800 mm²/s

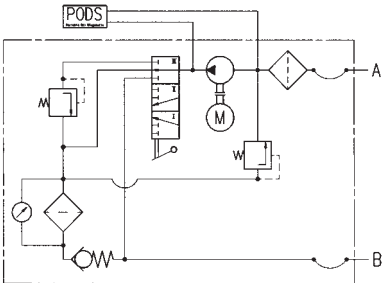
# Dimensions



Symbol 1



Symbol 2





# Description

## Cleaning Speed

The cleaning speed depends on the efficiency of the filter elements ( $\beta_x(c)$ ), the nominal volume flow ( $Q_{\text{nominal}}$ ) and the oil volume ( $V_{\text{actual}}$ ).

In graph D1-D2 the cleaning speeds are shown in relation to the filter fineness (cleanliness information according to ISO 4406:1999). The values are recorded by laboratory methods and they may be influenced by environmental conditions (such as continuous additional introduction of dirt on running systems, high water content, etc.).

All characteristic curves (see graphs D1-D2) relate to a reference oil volume of 180 l and a nominal volume flow of 15 l/min.

The following formula should be used to convert to the actual oil volume:

$$t_{\text{actual}} = \frac{V_{\text{actual}} \cdot \Delta t}{12 \cdot Q_{\text{nominal}}}$$

$t_{\text{actual}}$  = actual cleaning speed

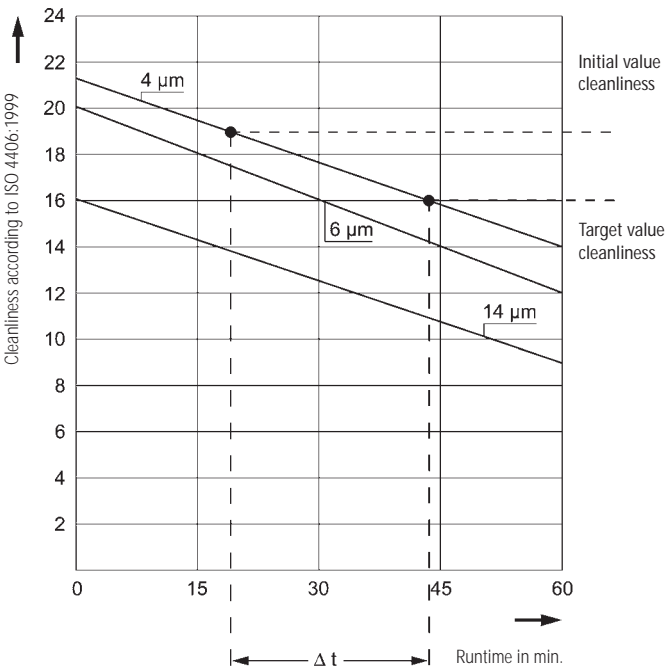
$\Delta t$  = cleaning speed for oil volume of 180 l

$V_{\text{actual}}$  = volume of oil to be cleaned

$Q_{\text{nominal}}$  = nominal volume flow, see selection chart

For monitoring purposes we recommend the PODS *Pro* (Portable Oil Diagnostic System) particle counter from ARGO-HYTOS.

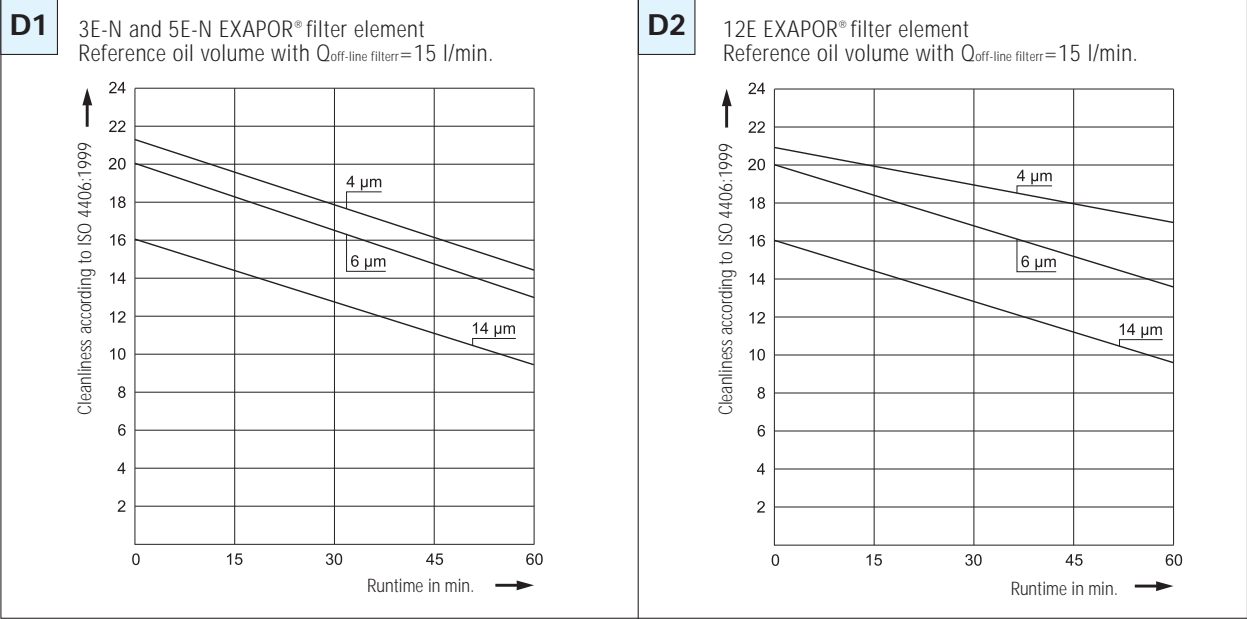
## Determining the cleaning speed



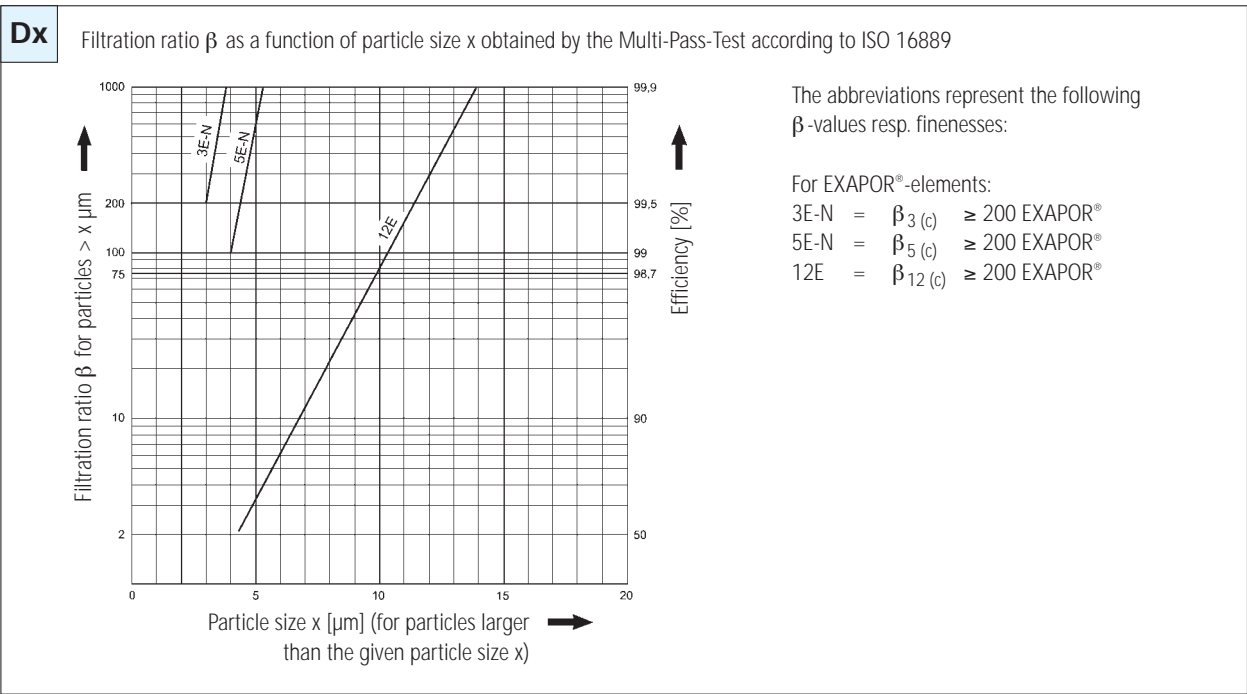
1. Determine the initial cleanliness class and enter it on the graph, e. g. 19/17/14 according to ISO 4406:1999
2. Enter the target cleanliness class on the graph, e.g. 16/14/11 according to ISO 4406:1999
3. Determine  $\Delta t$ , in this case  $\Delta t = 25$  min
4. Insert the value in the formula, where  $V_{\text{actual}} = 350$  l and  $Q_{\text{nominal}} = 16$  l/min

$$t_{\text{actual}} = \frac{V_{\text{actual}} \cdot \Delta t}{12 \cdot Q_{\text{nominal}}} = \frac{350 \cdot 25}{12 \cdot 16} \approx 46 \text{ min}$$

Curves for cleaning speed as a function of the filter fineness



Filter fineness curves in selection chart



## Selection Chart

	Order No. UM 045-1553	Order No. UM 045-4553	Order No. UM 045-1153	Order No. UM 045-4153	Order No. UMP 045-1553	Order No. UMP 045-4553	Order No. UMP 045-1153	Order No. UMP 045-4153
Nominal flow rate	45 l/min	45 l/min	45 l/min	45 l/min	45 l/min	45 l/min	45 l/min	45 l/min
Filter fineness see diagram Dx	3E-N	3E-N	5E-N	5E-N	3E-N	3E-N	5E-N	5E-N
Dirt capacity Mi at Q	840 g	840 g	840 g	840 g	840 g	840 g	840 g	840 g
E-Motor operating voltage	1~230 V	3~400 V	1~230 V	3~400 V	1~230 V	3~400 V	1~230 V	3~400 V
E-Motor max. operating frequency	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
E-Motor power	1,1 kW	1,1 kW	1,1 kW	1,1 kW	1,1 kW	1,1 kW	1,1 kW	1,1 kW
Length suction hose (lance incl.)	2,7 m	2,7 m	2,7 m	2,7 m	2,7 m	2,7 m	2,7 m	2,7 m
Length pressure hose (lance incl.)	2,7 m	2,7 m	2,7 m	2,7 m	2,7 m	2,7 m	2,7 m	2,7 m
Viscosity	15...600 mm²/s	15...600 mm²/s	15...600 mm²/s	15...600 mm²/s	15...600 mm²/s	15...600 mm²/s	15...600 mm²/s	15...600 mm²/s
Suction height (max.)	2,0 m	2,0 m	2,0 m	2,0 m	2,0 m	2,0 m	2,0 m	2,0 m
Symbol	1	1	1	1	2	2	2	2
Replacement element order no.	V7.1560-103	V7.1560-103	V7.1560-03	V7.1560-03	V7.1560-103	V7.1560-103	V7.1560-03	V7.1560-03
Weight	75 kg	75 kg	75 kg	75 kg	84 kg	84 kg	84 kg	84 kg
Clogging indicator	optical	optical	optical	optical	optical	optical	optical	optical

Other versions on request.

**Filter elements:** see selection chart

Water-absorbing filter elements EXAPOR® Aqua on request.

**Accessories:** Hose extensions on request.

For the appropriate clogging indicators see datasheet 60.20.

Subject to technical changes.



**Off-line Filter**

**FN 060 · FN 300**

- In-line mounting
- Operating pressure up to 12 bar
- Nominal flow rate up to 370 l/min



## Description

### Application

Main flow filter or off-line filter in hydraulic and lubricating systems.

### Performance features

Protection

against wear: By means of filter elements that in full-flow filtration, meet even the highest demands regarding cleanliness classes.

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

### Special design features

Cover: The cover of the FN 060 can be opened without special auxiliary tools. Fold-out handle parts at the cover of the FN 300 for easy opening.

Automatic ventilation valve (only FN 300): The quick automatic deaeration after putting into operation prevents components from consequential damage by a too high air amount in the oil as e.g. prevention of cavitation damages and micro diesel effect.

Dirt retention valve: On the bottom of the from inside to outside flown through filter elements, there is a dirt retention valve. If the filter element is pulled out of the filter housing with the cover the dirt retention valve will close. Sedimented dirt is removed from the housing with the filter element. Because of the design of the cover the filter element can be changed almost without losing any oil.

### Filter elements

Flow direction from centre to outside. The star-shaped pleating of the filter material results in:

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

### Filter maintenance

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

### Materials:

Filter head: Aluminium alloy

Filter housing: Steel (FN 060)  
Aluminium alloy (FN 300)

Cover: Aluminium alloy

Seals: NBR (Viton on request)

Filter media: EXAPOR® - inorganic, multi-layer microfibre web

Seals: NBR (Viton on request)

### Accessories

Water-absorbing filter elements (EXAPOR® AQUA) are available on request.

For FN 060 a bleeder screw is available on request and with Part no. FNS 060.1720 a fastening kit.

Electrical and/or optical clogging indicators are available on request - optionally with one or two switching points resp. temperature suppression. Dimensions and technical data of the clogging indicators see catalogue sheet 60.30.

## Characteristics

### Operating pressure

Max. 12 bar (FN 060)

Max. 10 bar (FN 300)

### Nominal flow rate

Up to 370 l/min (see Selection Chart, column 2)

The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at  $v \leq 200 \text{ mm}^2/\text{s}$
- element service life > 1000 operating hours at an average fluid contamination of 0,07 g per l/min flow volume
- flow velocity in the connection lines:  
up to 10 bar  $\leq 4,5 \text{ m/s}$

### Filter fineness

3  $\mu\text{m(c)}$  ... 12  $\mu\text{m(c)}$

$\beta$ -values according to ISO 16889

(see Selection Chart, column 4 and diagram Dx)

### Dirt-holding capacity

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

### Hydraulic fluids

Mineral oil and biodegradable fluids

(HEES and HETG, see info-sheet 00.20)

### Temperature range

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

### Viscosity at nominal flow rate

- at operating temperature:  $v < 35 \text{ mm}^2/\text{s}$
- as starting viscosity:  $v_{\text{max}} = 1200 \text{ mm}^2/\text{s}$
- at initial operation: The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70%  $\Delta p$  of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the  $\Delta p$  curve at a point. Read this point on the horizontal axis for the viscosity.

### Mounting position

Vertical, connection port at the bottom

### Connection

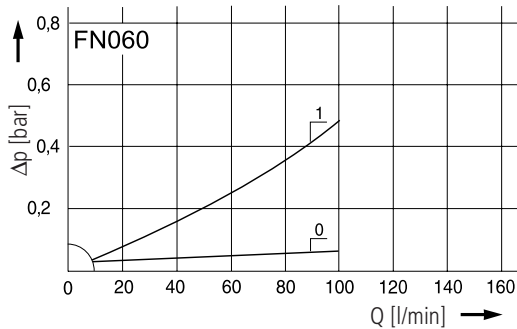
Threaded ports according to ISO 228 or DIN 13 (FN 060) or flange mounting according to SAE-J518 (FN 300).

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

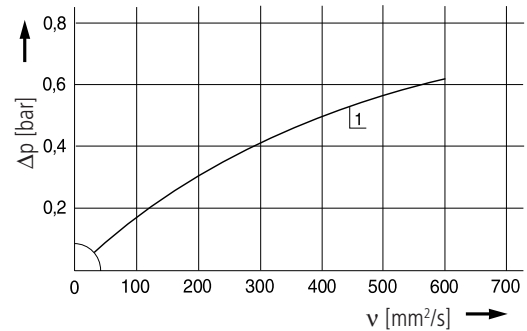
## Diagrams

### $\Delta p$ -curves for complete filters in Selection Chart, column 3

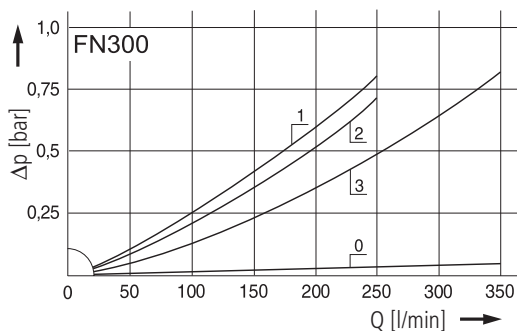
**D1** Pressure drop as a function of the **flow volume**  
at  $v = 35 \text{ mm}^2/\text{s}$  (0 = casing empty)



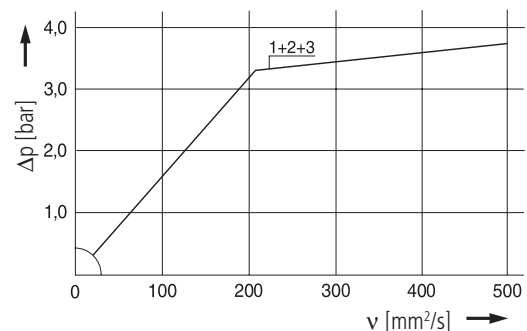
Pressure drop as a function of the **kinematic viscosity**  
at nominal flow



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

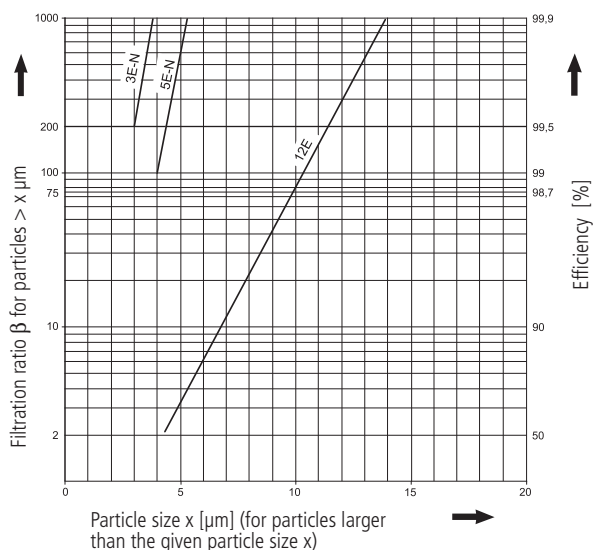


Pressure drop as a function of the **kinematic viscosity**  
at nominal flow



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

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



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

**For EXAPOR®-Elements:**

**3 E-N** =  $\bar{\beta}_{3(c)} = 200$  EXAPOR®  
**5 E-N** =  $\bar{\beta}_{5(c)} = 200$  EXAPOR®  
**12 E** =  $\bar{\beta}_{12(c)} = 200$  EXAPOR®

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

## Selection Chart

[illegible]

Optical or electrical indicators are available to monitor the clogging condition of the element.

For the appropriate clogging indicators see catalogue sheet 60.20.

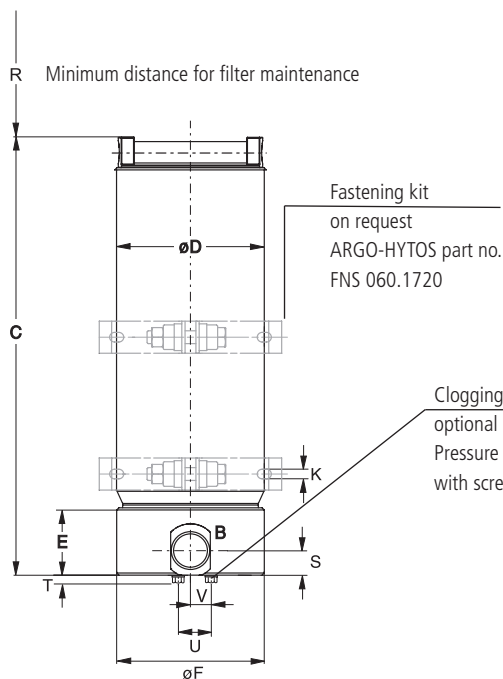
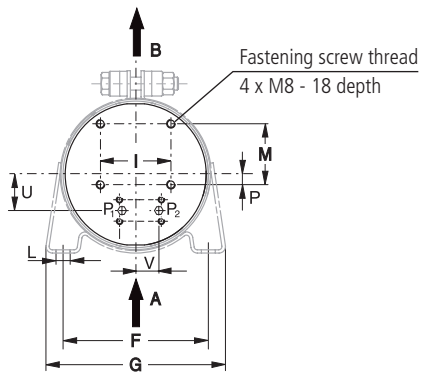
## Remarks:

- The response/switching pressure of the clogging indicator used must be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- The clogging indicators are optional and always delivered detached from the filter.
- The filters listed in this chart are standard filters. If modifications are required, e. g. with water-absorbing filter elements or fastening kit, we kindly ask for your request.

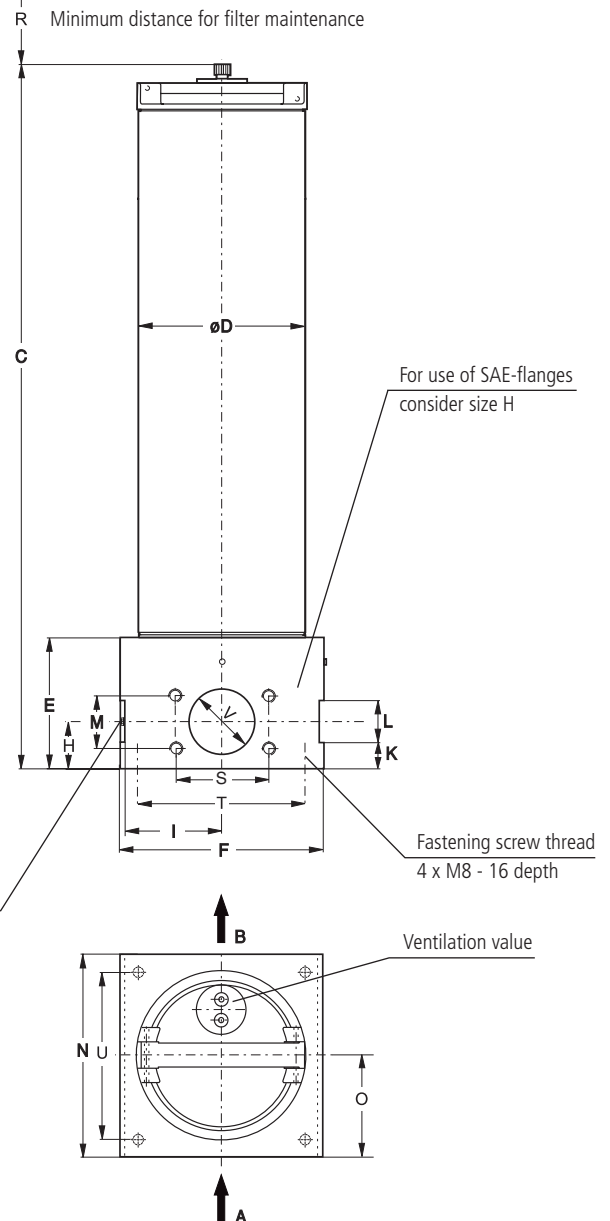
\* with automatic ventilation valve

## Dimensions

FN 060



FN 300

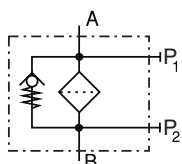


## Measurements

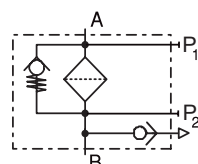
Type	A / B	C	D	E	F	G	H	I	K	L	M	N	O	P	R	S	T	U	V
FN 060	G1	410	138	63	136	170	95	66	9	12	56,5	177	78	9,5	300	23	4	34	21
FN 300	SAE 2½	775	160	126	200	231	45	96	25	40	50,8	195	97,5	112,5	700	88,9	170	165	63

## Symbols

1

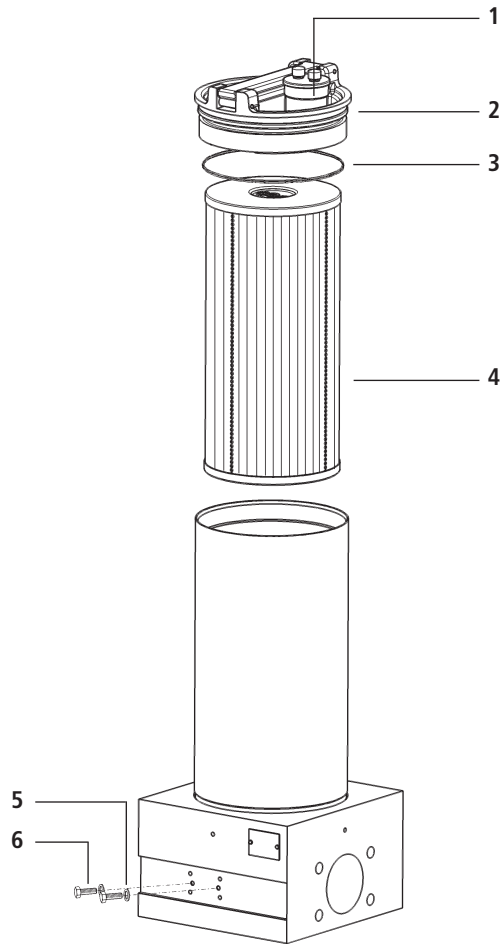


2





## Spare Parts



Pos.	Designation	Part No.
<b>1</b>	Automatic ventilation valve (FN 300)	FA 016.1801
<b>2a</b>	Cover (FN 060)	FNA 008.1290
<b>2b</b>	Cover (FN 300) (with automatic ventilation valve and Pos. 3b)	FNA 045.1210
<b>3a</b>	O-ring 117,48 x 5,3 (FN 060)	N007.1175
<b>3b</b>	O-ring 145,42 x 5,33 (FN 300)	N007.1455
<b>4</b>	Filter element	see Chart/col. 9
<b>5</b>	Bonded seal 4,1 x 7,2 x 1	3404074
<b>6</b>	Hexagonal head screw M4x8 DIN 933-88	3301051

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

## Quality Assurance

### Quality management according to DIN EN ISO 9001

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

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

### ISO 2942 ISO 3968 ISO 16889

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

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

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

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



### We produce fluid power solutions

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### Off-line Filter Units

#### **FNA 008 • FNA 016**

- Operating pressure up to 4 bar
- Nominal flow rate up to 16 l/min
- For tank capacities up to 1500 l

## Description

### Application

Off-line filtration in hydraulic and lubricating oil systems.

### Performance features

Protection

against wear:

By means of filter elements that meet even the highest demands regarding cleanliness classes and dirt-holding capacity.

Protection against

malfunction:

By means of permanent filtration in the off-line circuits excellent cleanliness classes can be achieved. This can lead to significantly longer intervals between maintenance work and oil changes, as well as reduction of machine failures due to contamination.

### Special design features

Cover:

The cover can be opened without special auxiliary tools. Because of the cover design the filter element can be changed almost without losing any oil. No pipes are needed except for the connection lines. The power units feature minimal noise output and low power consumption.

Pressure

relief valve:

An integrated PRV (pressure relief valve) protects against overload.

Dirt

retention valve:

Ensures that dirt accumulated in the filter is removed together with the element. Settled dirt cannot return into the system.

### Filter elements

Flow direction from centre to outside. The star-shaped pleating of the filter material results in:

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

### Filter maintenance

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

### Materials

Pump housing: Aluminium alloy

Filter housing: Steel

Cover: Aluminium alloy

Seals: NBR (Viton on request)

Filter media: EXAPOR® - inorganic, multi-layer microfibre web

### Accessories

Water-absorbing filter elements (EXAPOR® AQUA) are available on request.

With Part No. FNA 008.1700 a mounting set that facilitates the fitting of incoming and outgoing pipes onto an existing filling/venting connection is available.

For installation in filter cooling circuits a version with by-pass valve is available on request.

Electrical and optical clogging indicators are available.

Dimensions and technical data see catalogue sheet 60.20.

## Characteristics

### Nominal flow rate

Up to 16 l/min at  $v = 35 \text{ mm}^2/\text{s}$

(see Selection Chart, column 2)

### Connection

Threaded port according to ISO 228 or DIN 13.

Sizes see Selection Chart, columns 9 and 10

### Filter fineness

$3 \mu\text{m(c)}$  ...  $12 \mu\text{m(c)}$

$\beta$ -values according to ISO 16889

(see Selection Chart, column 3 and Diagram Dx)

### Dirt-holding capacity

Values in g test dust ISO MTD according to ISO 16889

(see Selection Chart, column 5)

### Hydraulic fluids

Mineral oil and biodegradable fluids

(HEES and HETG, see info-sheet 00.20)

### Temperature range of fluids

$0^\circ\text{C}$  ...  $+65^\circ\text{C}$  (also see viscosity range)

### Ambient temperature range

$0^\circ\text{C}$  ...  $+50^\circ\text{C}$

### Viscosity range

Electro motor air cooled type of protection: IP 55	Continuous operation min.	Continuous operation max.	Short-term operation max.
3 ~ 400 V / 460 V	15 mm <sup>2</sup> /s	200 mm <sup>2</sup> /s	400 mm <sup>2</sup> /s
1 ~ 230 V	15 mm <sup>2</sup> /s	200 mm <sup>2</sup> /s	400 mm <sup>2</sup> /s
1 ~ 110 V	15 mm <sup>2</sup> /s	100 mm <sup>2</sup> /s	200 mm <sup>2</sup> /s
24 V	15 mm <sup>2</sup> /s	100 mm <sup>2</sup> /s	150 mm <sup>2</sup> /s

### Tank capacity

approx. 2,4 l

### Maximum suction height

1,5 m

### Operating pressure

Max. 4 bar, pressure protection with pressure relief valve;  
cracking pressure see Selection Chart, column 11

### Operating position

Vertical, pump block at the bottom

### Recommended tank capacities

FNA 008: 100 l ... 800 l

FNA 016: 400 l ... 1500 l

Off-line filter units for tank capacities exceeding 1500 l  
see catalogue sheet 80.50

## Selection Chart, columns 1-10

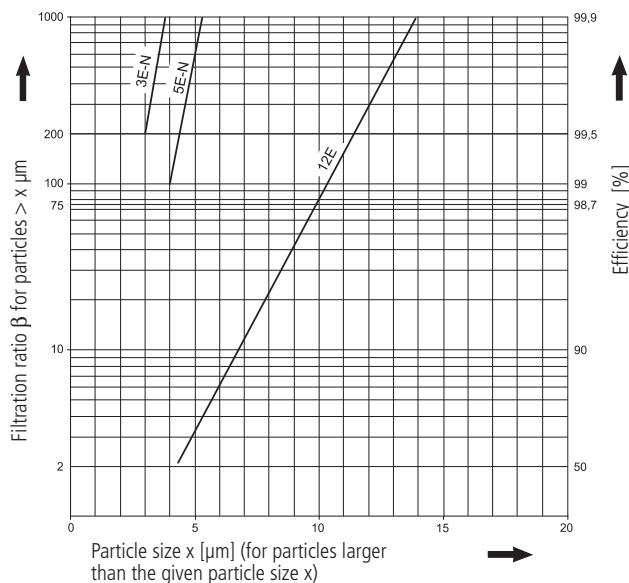
Part No.	Nominal flow rate	Filter fineness, see Diagr. Dx	Dirt-holding capacity	E-motor operating voltage	E-motor operating frequency (max.)	E-motor power (max.)	Engine speed at 50 Hz (max.)	Connection A Inlet	Connection B Outlet
	l/min		g	V	Hz	kW	min <sup>-1</sup>		
1	2	3	4	5	6	7	8	9	10
FNA 008-763	8	3 E-N	180	1 ~ 110 V	(60)	0,25 (0,3)	1400 (1700)	1 1/16-12UN2B	3/4-16UN-2B
FNA 008-163	8	5 E-N	180	1 ~ 110 V	(60)	0,25 (0,3)	1400 (1700)	1 1/16-12UN2B	3/4-16UN-2B
FNA 008-573	8	3 E-N	180	1 ~ 230 V	50	0,25	1400 (1700)	G 3/4	G 1/2
FNA 008-553	8	3 E-N	180	3 ~ 400 V/460 V	50 (60)	0,25 (0,3)	1400 (1700)	G 3/4	G 1/2
FNA 008-753	8	3 E-N	180	3 ~ 400 V/460 V	50 (60)	0,25 (0,3)	1400 (1700)	1 1/16-12UN2B	3/4-16UN-2B
FNA 008-153	8	5 E-N	180	3 ~ 400 V/460 V	50 (60)	0,25 (0,3)	1400 (1700)	G 3/4	G 1/2
FNA 008-556	8	12 E	85	3 ~ 400 V/460 V	50 (60)	0,25 (0,3)	1400 (1700)	G 3/4	G 1/2
FNA 016-763	16	3 E-N	160	1 ~ 110 V	(60)	(0,3)	2800 (3300)	1 1/16-12UN2B	3/4-16UN-2B
FNA 016-163	16	5 E-N	160	1 ~ 110 V	(60)	(0,3)	2800 (3300)	1 1/16-12UN2B	3/4-16UN-2B
FNA 016-573	16	3 E-N	160	1 ~ 230 V	50	0,45	2700 (3200)	G 3/4	G 1/2
FNA 016-173	16	5 E-N	160	1 ~ 230 V	50	0,45	2700 (3200)	G 3/4	G 1/2
FNA 016-553	16	3 E-N	160	3 ~ 400 V/460 V	50 (60)	0,45 (0,55)	2700 (3200)	G 3/4	G 1/2
FNA 016-753	16	3 E-N	160	3 ~ 400 V/460 V	50 (60)	0,45 (0,55)	2700 (3200)	1 1/16-12UN2B	3/4-16UN-2B
FNA 016-153	16	5 E-N	160	3 ~ 400 V/460 V	50 (60)	0,45 (0,55)	2700 (3200)	G 3/4	G 1/2
FNA 016-773	16	5 E-N	160	3 ~ 400 V/460 V	50 (60)	0,45 (0,55)	2700 (3200)	1 1/16-12UN2B	3/4-16UN-2B
FNA 016-6553	16	3 E-N	160	24 V DC	—	0,25	2820	G 3/4	G 1/2
FNA 016-193	16	5 E-N	160	24 V DC	—	0,25	2820	G 3/4	G 1/2

## Diagrams

### Filter fineness curves in Selection Chart, column 3

**Dx**

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



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

For EXAPOR®-elements:

**3 E-N** =  $\beta_{3(c)} = 200$  EXAPOR®  
**5 E-N** =  $\beta_{5(c)} = 200$  EXAPOR®  
**12 E** =  $\beta_{12(c)} = 200$  EXAPOR®

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

## Selection Chart, columns 11-17

Part No.	Cracking pressure of by-pass	Symbols hydraulic	Symbols electric	Measurements, Type No.	Replacement filter element Part No.	Clogging indicator	Remarks
	bar						
	11	12	13	14	15	16	17
FNA 008-763	4	1	3	2	V7.1220-113	optional	
FNA 008-163	4	1	3	2	V7.1220-13	optional	
FNA 008-573	4	1	3	1	V7.1220-113	optional	
FNA 008-553	4	1	1, 2	1	V7.1220-113	optional	
FNA 008-753	4	1	1, 2	2	V7.1220-113	optional	
FNA 008-153	4	1	1, 2	1	V7.1220-13	optional	
FNA 008-556	4	1	1, 2	1	V7.1220-06	optional	
FNA 016-763	4	1	3	2	V7.1220-113	optional	
FNA 016-163	4	1	3	2	V7.1220-13	optional	
FNA 016-573	4	1	3	1	V7.1220-113	optional	
FNA 016-173	4	1	3	1	V7.1220-13	optional	
FNA 016-553	4	1	1, 2	1	V7.1220-113	optional	
FNA 016-753	4	1	1, 2	2	V7.1220-113	optional	
FNA 016-153	4	1	1, 2	1	V7.1220-13	optional	
FNA 016-773	4	1	1, 2	2	V7.1220-13	optional	
FNA 016-6553	4	1	4	3	V7.1220-113	optional	
FNA 016-193	4	1	4	3	V7.1220-13	optional	

All filter units are delivered with an unplugged clogging indicator connection M12 x 1,5. As clogging indicators either manometers or electrical pressure switches can be used.

### For the appropriate clogging indicators see catalogue sheet 60.20.

By the use of a manometer version DG 200-16\* has to be chosen.

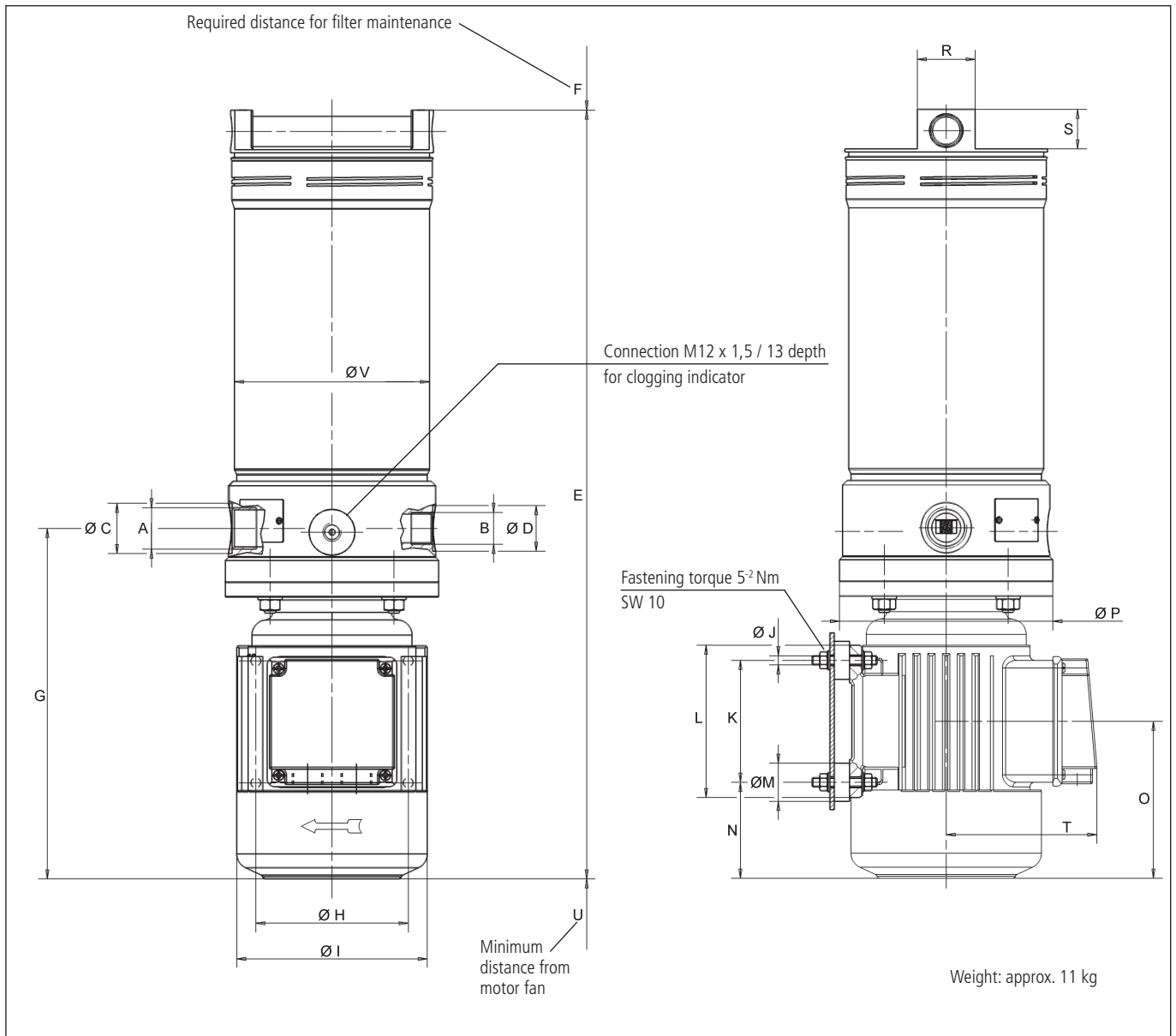
#### Remarks:

- If operating frequency increases, pump delivery will increase as well.
- The filter units listed in this chart are standard units. If modifications are required, e.g. with water-absorbing filter elements, pipe extensions or mounting sets, we kindly ask for your request.
- The clogging indicators are optionally available and then will be loosely provided.

\* Manometer without throttle screw



## Dimensions



## Measurements

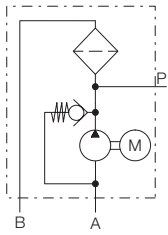
Type*	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R	S	T	U min.	V
1	G3/4	G1/2	33	30	510	340	230	100	125	M6	80	100	25	63	105	140	38,5	27	100	20	128
2	1 1/16-12UN2B	3/4-16UN-2B	33	30	510	340	230	100	125	M6	80	100	25	63	105	140	38,5	27	100	20	128
3	G3/4	G1/2	33	30	550	340	265	100	125	M6	80	100	25	105	145	140	38,5	27	100	20	128

\*Type see Selection Chart, column 14

# Symbols

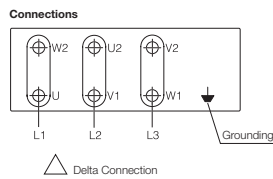
## Hydraulic:

1

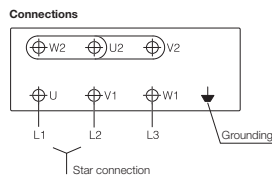


## Electric:

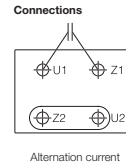
1



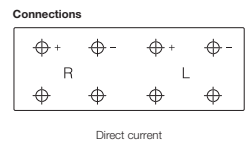
2



3



4



# Quality Assurance

## Quality management according to DIN EN ISO 9001

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

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

**ISO 2942**  
**ISO 3968**  
**ISO 16889**

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

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

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## We produce fluid power solutions

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## Off-line Filter Units

### FNA 045

- Operating pressure up to 4 bar
- Nominal flow rate up to 45 l/min
- For tank capacities up to 5000 l

## Description

### Application

In the off-line circuits of hydraulic and lubricating oil systems.

### Performance features

Protection

against wear: By means of filter elements that, meet even the highest demands regarding cleanliness classes and dirt-holding capacity.

Protection against

malfunction: By means of permanent filtration in the off-line circuits excellent cleanliness classes can be achieved. This can lead to significantly longer intervals between maintenance work and oil changes, as well as reducing machine failure due to contamination.

### Special design features

Cover: The fold-out handles at the cover facilitate opening. Because of the cover design the filter element can be changed almost without losing any oil. No pipes are needed except for the connection lines. The power units feature minimal noise output and low power consumption.

Pressure

relief valve: An integrated PRV (pressure relief valve) protects against overload.

Dirt

retention valve: Ensures that dirt accumulated in the filter is removed together with the element. Settled dirt cannot return into the system.

### Filter elements

Flow direction from centre to outside. The star-shaped pleating of the filter material results in:

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

### Filter maintenance

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

### Materials

Pump and

filter housing: Aluminium alloy

Cover: Aluminium alloy

Seals: NBR (Viton on request)

Filter media: EXAPOR® - inorganic, multi-layer microfibre web

### Accessories

Water-absorbing filter elements (EXAPOR® AQUA) are available on request.

Electrical and optical clogging indicators are available on request – optionally with one or two switching points resp. temperature suppression. Dimensions and technical data see catalogue sheet 60.30.

## Characteristics

### Nominal flow rate

Up to 45 l/min at  $v = 35 \text{ mm}^2/\text{s}$   
(see Selection Chart, column 2)

### Connection

Threaded port according to ISO 228.  
Sizes see Selection Chart, columns 9 and 10

### Filter fineness

$3 \mu\text{m(c)} \dots 5 \mu\text{m(c)}$   
 $\beta$ -values according to ISO 16889  
(see Selection Chart, column 3 and diagram Dx)

### Dirt-holding capacity

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

### Hydraulic fluids

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

### Temperature range of fluids

$0^\circ\text{C} \dots +65^\circ\text{C}$  (also see viscosity range)

### Ambient temperature range

$0^\circ\text{C} \dots +50^\circ\text{C}$

### Viscosity range

Electro motor air cooled type of protection: IP 55	Continuous operation min.	Continuous operation max.	Short-term operation max.
3 ~ 400 V / 460 V	15 mm <sup>2</sup> /s	600 mm <sup>2</sup> /s*	800 mm <sup>2</sup> /s*
1 ~ 230 V	15 mm <sup>2</sup> /s	600 mm <sup>2</sup> /s*	800 mm <sup>2</sup> /s*

\* If the filter unit is operated together with the ARGO-HYTOS oil particle counter PODS, maximum viscosity in the "PODS" position is 400 mm<sup>2</sup>/s.

### Tank capacity

approx. 10 l

### Maximum suction height

1,5 m

### Operating pressure

Max. 4 bar, pressure protection with pressure relief valve;  
cracking pressure see Selection Chart, column 11

### Operating position

Vertical, pump block at the bottom

### Recommended tank capacities

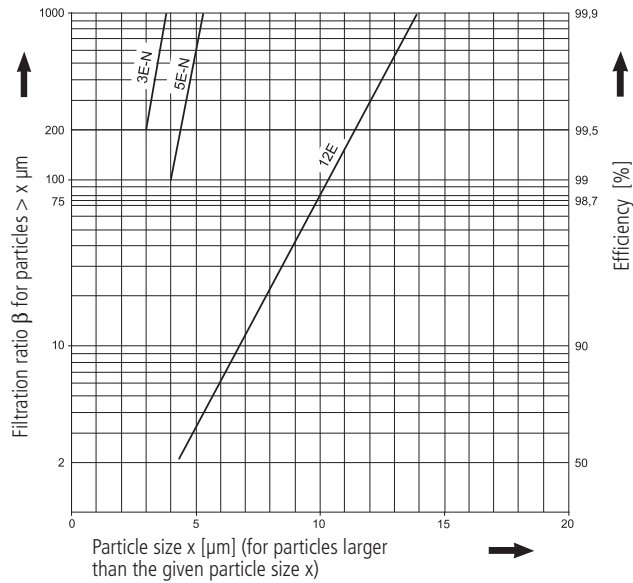
From 500 l ... 5000 l  
Off-line filter units for smaller tank capacities  
see catalogue sheet 80.40.

## Diagrams

### Filter fineness curves in Selection Chart, column 3

**Dx**

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



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

**For EXAPOR®-elements:**

**3 E-N** =  $\beta_{3(c)}$  = 200 EXAPOR®  
**5 E-N** =  $\beta_{5(c)}$  = 200 EXAPOR®  
**12 E** =  $\beta_{12(c)}$  = 200 EXAPOR®

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



## Selection Chart

[illegible]

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

**Order example:** The filter FNA 045-1553 has to be supplied with optical clogging indicator - response pressure 2,0 bar.

Order example: FN 045-1553 / DG 042-01 M

Part No. (Basic unit) \_\_\_\_\_ mounted

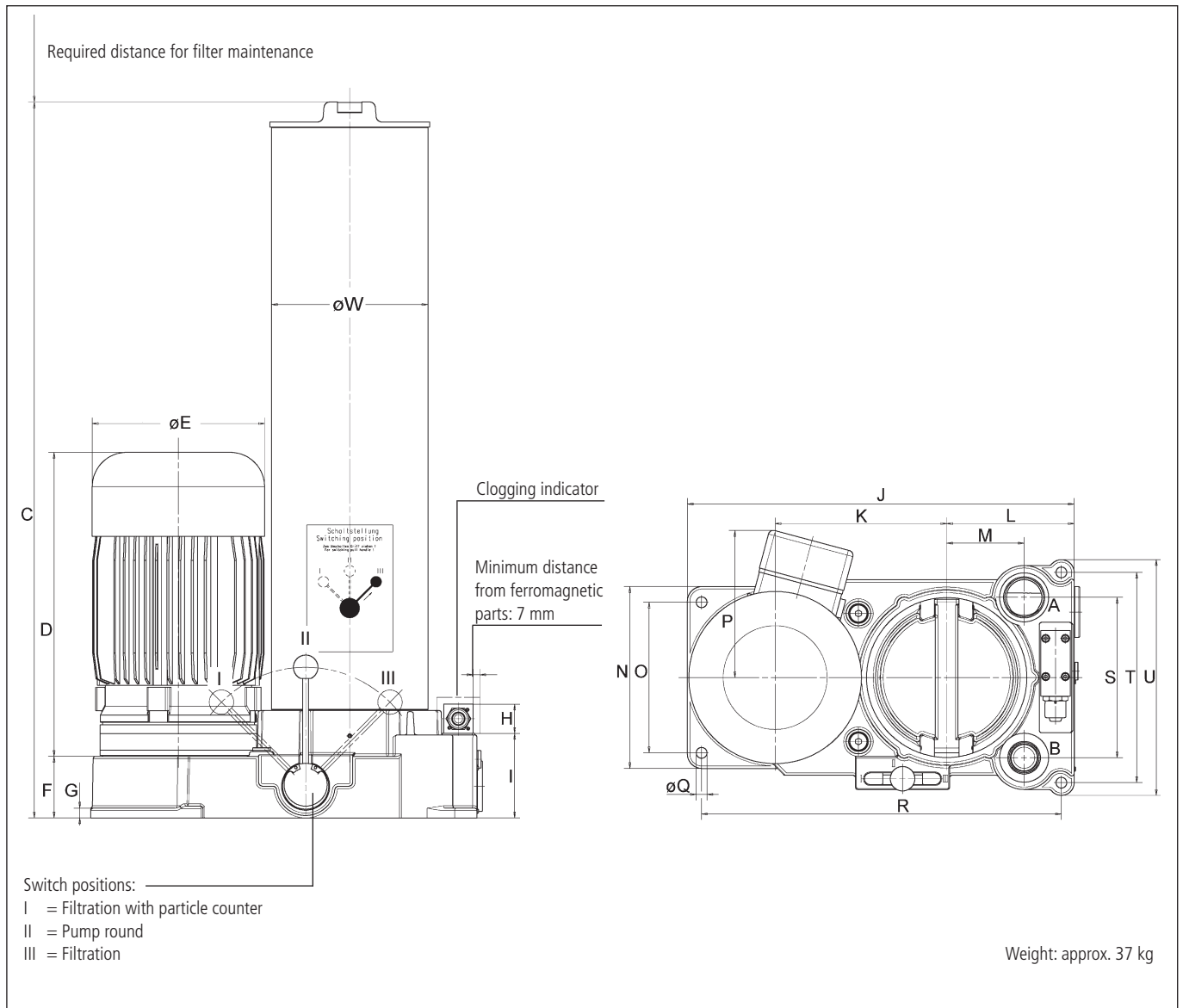
Clogging indicator \_\_\_\_\_

For the appropriate clogging indicators see catalogue sheet 60.30.

## Remarks:

- If operating frequency increases, pump delivery will increase as well.
- The filter units listed in this chart are standard units. If modifications are required, e.g. with water-absorbing filter elements, we kindly ask for your request.

## Dimensions



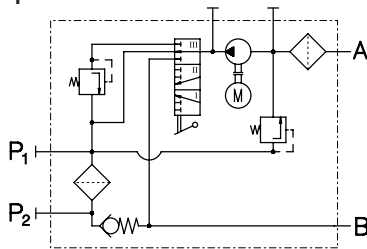
## Measurements

Type	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
<b>FNA 045</b>	G1¼	G 1	735	312	176	63	10	30	87	395+2	175	130	79±0,3	186+2	154±0,3
	P	Q	R		S		T		U		V	W			
<b>FNA 045</b>	150	11	367±0,3		164±0,3		215±0,3		241+2		700	160			

## Symbols

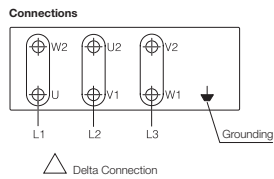
### Hydraulic:

1

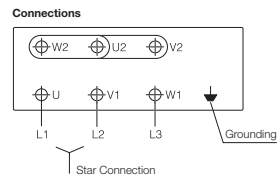


### Electric:

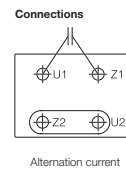
1



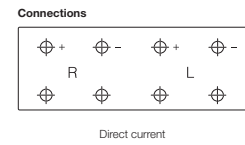
2



3



4



## Quality Assurance

### Quality management according to DIN EN ISO 9001

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

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

**ISO 2942**  
**ISO 3968**  
**ISO 16889**

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

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

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

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



**We produce fluid power solutions**

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### Off-line Filters

#### **FNS 060**

- With flow control valve
- Operating pressure up to 320 bar
- Nominal flow rate up to 4 l/min

## Description

### Application

In the high pressure circuits of hydraulic and lubricating oil systems.

### Performance features

Protection

against wear: By means of ultra-fine filter elements that meet even the highest demands regarding cleanliness classes and dirt-holding capacity.

Protection against

malfunction: By means of permanent filtration in the off-line circuits excellent cleanliness classes can be achieved.

### Special design features

Cover: The cover can be opened without special auxiliary tools. Because of the cover design the filter element can be changed almost without losing any oil. From the high-pressure circuit is cleaned by the fine filter element.

Dirt

retention valve: Ensures that dirt accumulated in the filter is removed together with the element. Settled dirt cannot return into the system.

### Filter elements

Flow direction from centre to outside. The star-shaped pleating of the filter material results in:

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

### Filter maintenance

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

### Materials

Filter head: Aluminium alloy  
Filter housing: Steel  
Cover: Aluminium alloy  
Seals: NBR (Viton on request)  
Filter media: EXAPOR® - inorganic, multi-layer microfibre web

### Accessories

Water-absorbing filter elements (EXAPOR® AQUA) are available on request. Electrical and optical clogging indicators are available on request. Dimensions and technical data see catalogue sheet 60.20.

## Characteristics

### Nominal flow rate

Up to 4 l/min (see Selection Chart, column 2)

Refers to the medium flow rate of the flow control valve. With selection of the flow control valve a sufficient surplus volume from the high-pressure circuit has to be guaranteed. If necessary the machine manufacturer should be consulted.

### Connection

Threaded port according to ISO 228 or DIN 13.

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

### Filter fineness

3 µm(c)

β-values according to ISO 16889

(see Selection Chart, column 4 and diagram Dx)

### Dirt-holding capacity

Values in g test dust ISO MTD according to ISO 16889

(see Selection Chart, column 5)

### Hydraulic fluids

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

### Temperature range

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

### Viscosity at nominal flow rate

- at operating temperature:  $v < 35 \text{ mm}^2/\text{s}$
- as starting viscosity:  $v_{\text{max}} = 1200 \text{ mm}^2/\text{s}$

### Operating pressure

Max. 320 bar

(max. 5 bar without flow control valve)

Minimum inlet pressure at the flow control valve: 10 bar

### Mounting position

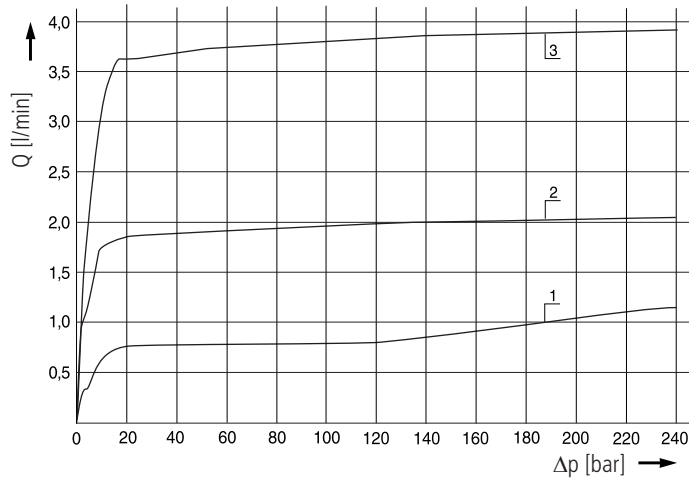
Vertical, connection port at the bottom



## Diagrams

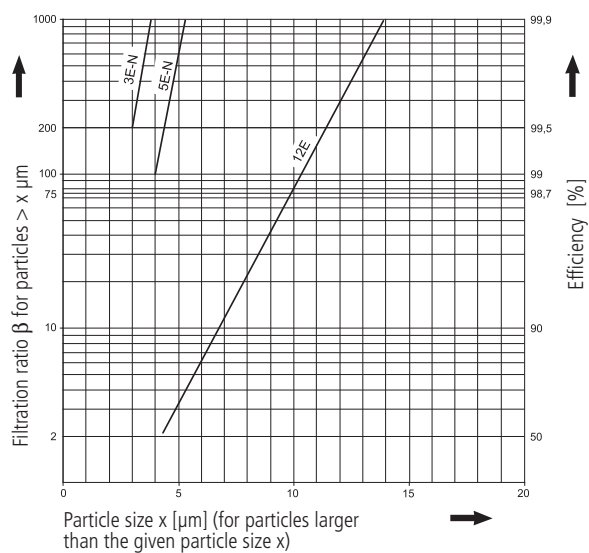
### $\Delta p$ -curves for complete filters in Selection Chart, column 3

**D1** Flow volume as a function of the differential pressure at the flow control valve at  $v = 35 \text{ mm}^2/\text{s}$



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

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



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

**For EXAPOR®-elements:**

**3 E-N** =  $\beta_{3(d)} = 200$  EXAPOR®  
**5 E-N** =  $\beta_{5(d)} = 200$  EXAPOR®  
**12 E** =  $\beta_{12(d)} = 200$  EXAPOR®

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

## Selection Chart

[illegible]

The housing of the off-line filter is designed for a max. operating pressure of 5 bar. To avoid back pressures no components as e.g. ball valves can be inserted at the housing outlet and in the continuative circuit.

Optical or electrical indicators are available to monitor the clogging condition of the element.

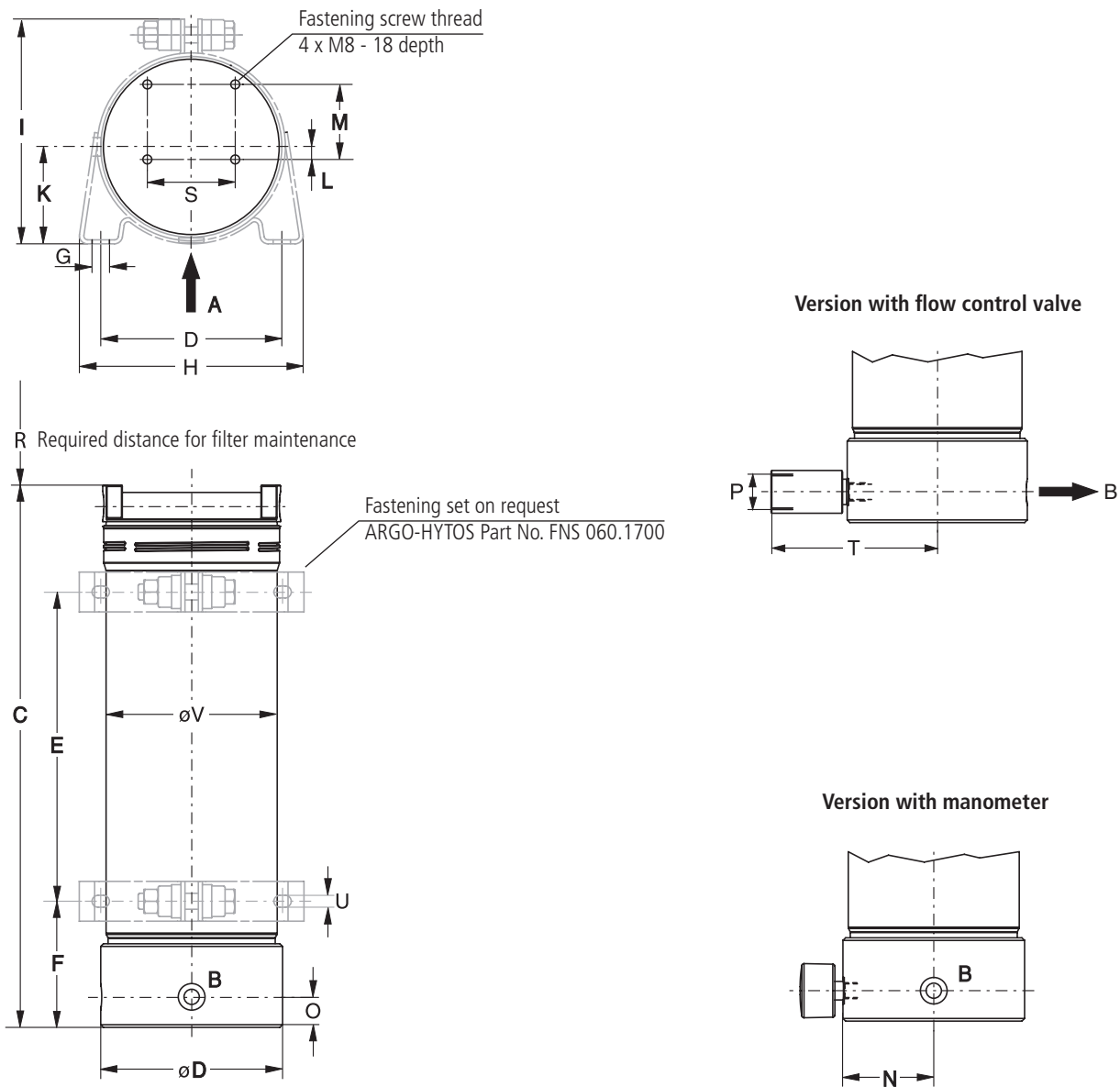
For the appropriate clogging indicators see catalogue sheet 60.20.

## Remarks:

- The response/switching pressure of the clogging indicator used must be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- The clogging indicators and flow control valves are optional and always delivered detached from the filter.
- The filter units listed in this chart are standard units. If modifications are required, e. g. with water-absorbing filter elements, we kindly ask for your request.

\* see Nominal flow rate of the flow control valves

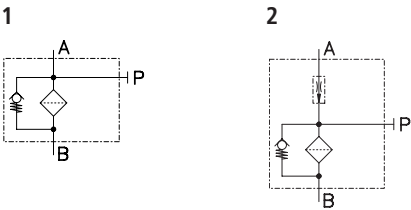
# Dimensions



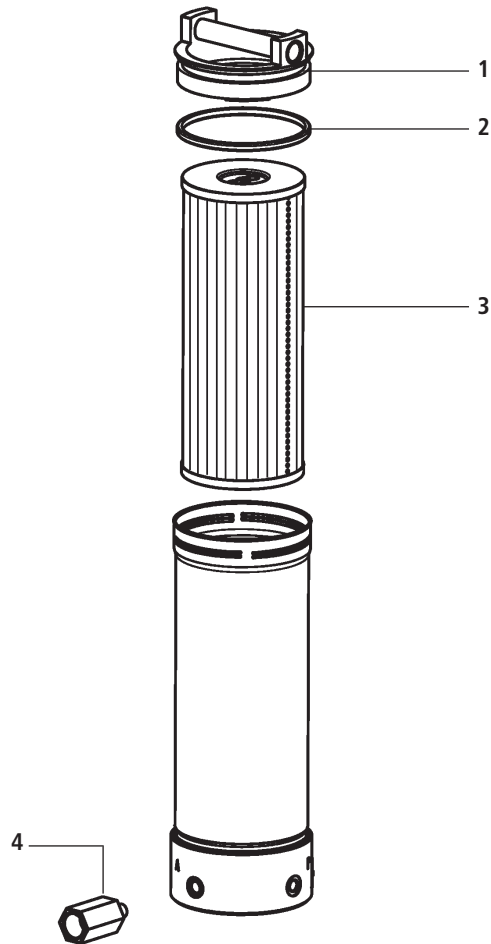
# Measurement

Type	A / B	C	D	E	F	G	H	I	K	L	M	N	O	P	R	S	T	U	V
FNS 060	G1/4	410	136	233	95	12	170	169	73	9,5	56,5	67	23	G3/4	300	66	124	9	128

# Symbols



## Spare Parts



Pos.	Designation	Part No.
1	Cover	FNA 008.1250
2	O-ring	N007.1175
3	Filter element	see Selection Chart
4	Flow control valve	see Selection Chart

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

## Quality Assurance

### Quality management according to DIN EN ISO 9001

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

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

**ISO 2942**  
**ISO 3968**  
**ISO 16889**

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

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

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