We produce fluid power **solutions**

# Filtration

Suction Filters
Return Filters · Return-Suction Filters
Filter Cooling Units
Pressure Filters
High Pressure Filters
Ventilating Filters · Desiccant Breathers
Clogging Indicators
Oil Level Dipsticks · Oil Level Gauges · Oil Drain Valves
Filter Elements

Lightline · High Performance · It's your choice

Products with these icons are specially made for:

**Industrial Applications**

**Mobile Applications**

# *Lightline* Products

**Dedicated quality for best price**

# Content

Product range

# Filtration

Suction filters

Return-suction filters

Return filters

Filter cooling units

Pressure filters

High pressure filters

Tank solutions

Filling and ventilating filters

## Description

ARGO-HYTOS produces sophisticated filter solutions together with hydraulic and lubrication systems. The range of solutions we have implemented extends from fixed-position industrial plants to mobile applications.

As well as customized developments, exactly adjusted to the individual requirements of the customer, ARGO-HYTOS offers a comprehensive range of innovative standard solutions for a wide variety of applications:

- Suction filters
- Return-suction filters and return filters
- Filter cooling units
- Pressure and high pressure filters
- Filling and ventilating filters
- Tank solutions
- Filter and tank accessories

# Fluid and Motion Control

Customized solutions

Control solutions

Gear pumps

Plates

Product range

# Fluid and Motion Control


Directional and proportional valves


Modular valves

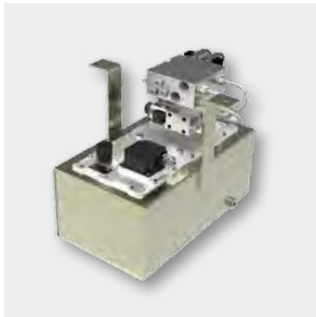

Sandwich valves


Screw-in cartridge valves


Slip-in cartridge valves


Load motion cartridges


Explosion proof valves


Hydraulic power packs

## Description

ARGO-HYTOS' expertise in control technology is the fruit of more than 70 years' experience. We focus here on a wide range of valves, power units and integrated manifolds featuring all commonly used design features and functions, together with proportional valves and the associated control electronics:

- Directly operated directional valves in CETOP 02 to CETOP 05 and pilot operated directional valves in CETOP 07 and CETOP 08
- Valves sub-plate and sandwich type – flow control, pressure and check valves in CETOP 02 to CETOP 05
- Cartridge valves
- Directly activated proportional valves with compensator sandwich valve, in CETOP 02 to CETOP 05
- Analog and digital control electronics – on-board, or for installation in control cabinets
- Power pack assembly kits
- Customized control blocks

Product range

# Fluid Management


Off-line filter


Off-line filter


Off-line filter unit


Off-line filter unit


Oil service unit


Oil service unit


Compact filter pack


Dewatering system

## Description

As well as reducing maintenance and servicing costs, effective fluid management is also a key factor in boosting the reliability, productivity and cost-effectiveness of the operation. ARGO-HYTOS supplies application-oriented products for manual and automatic cleaning of hydraulic fluids:

› Off-line filters
› Off-line filter units
› Oil service units
› Dewatering systems

# Sensors and Measurement

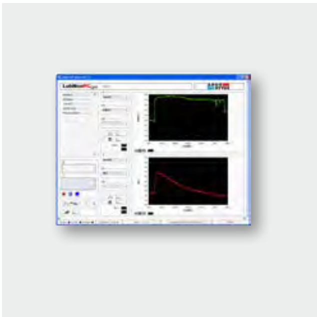
Portable particle counter

Portable particle monitor

Particle monitor

Wear sensor

Condition sensors



Software

Remote interfaces / display units

Valve electronics

## Description

Systems that provide reliable assessment of the condition of hydraulic fluids are the key feature of continuous fluid monitoring.
The sensors and measurement technology from ARGO-HYTOS precisely targets this range of tasks. Our fluid monitoring products comprise equipment and system solutions to enable online monitoring during continuous operation as well as analysis of bottled samples under laboratory conditions.

› Portable oil diagnosis equipment
› Stationary and portable particle monitor
› Oil condition sensors
› Software to evaluate data and analyze trends

Filter Selection

# Guideline

Tips and information on how to select the optimal hydraulic filter

Return-Suction Filter E 198

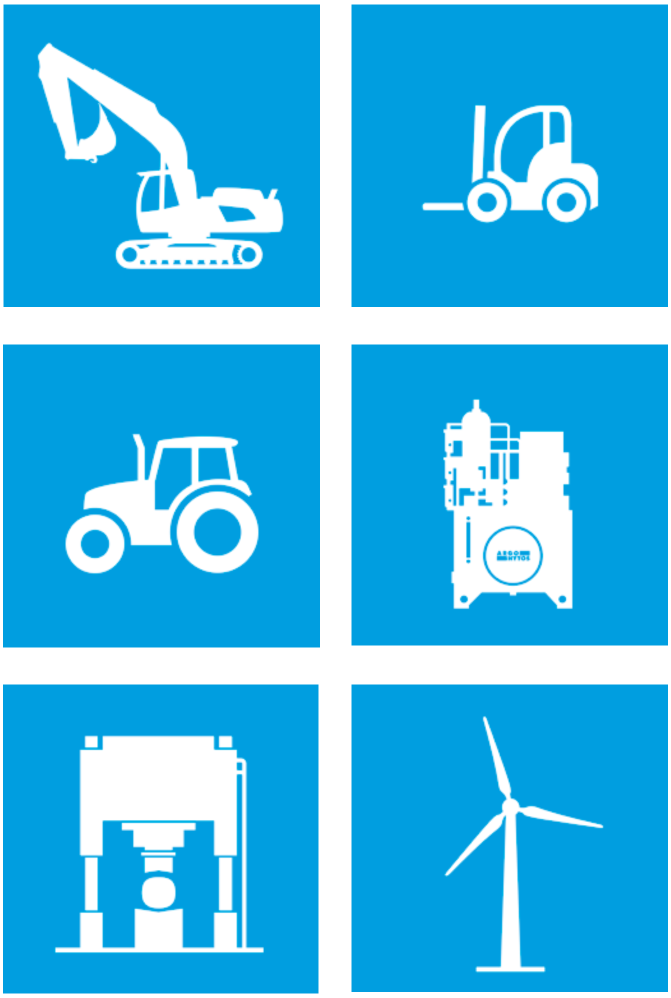
## Preface

When determining the required cleanliness in a hydraulic system, additionally to the technical requirements of the hydraulic components and the operating pressure, the user's expectations regarding the availability, safety and service life of a machine become increasingly important. These aspects were particularly taken into account in the present ARGO-HYTOS guideline. Detailed attention is also given to two filter concepts which are becoming more and more important: return-suction filters and off-line filters.
More than ever, the ARGO-HYTOS guideline offers useful advice on selecting technically and economically optimal filter concepts for hydraulic systems and it also contains important information for experts.

### Do you know that …

- fresh oil can often contain 10 times more dirt particles than are acceptable for the operation of high-quality hydraulic systems?
- if the operating pressure is increased by only 50%, the number of dirt particles in the oil must be reduced by a factor of 3 to avoid a deterioration in the lifetime of the components?
- a filtration quotient of $\beta$ = 200 corresponds to a filtration efficiency of 99.5% for all dirt particles that are larger than the specified size, and an $\beta$-value of only 10 still corresponds to a 90% efficiency?
- even oil sample bottles declared as clean can contain considerably more dirt particles than the oil to be examined from hydraulic systems with good filtration?
- the service life of a hydraulic filter of 1,000 operating hours corresponds to a mileage of a passenger car of about 60,000 km / 37,300 miles?
- only an online count can determine the actual values for ordinal numbers < 10 (ISO 4406)?

## Our know-how - your benefit



At ARGO-HYTOS, the focus is consistently on the customer – and a major element of our development work is to implement customer-specific solutions for filters and systems.

Continuous improvement of our filter elements is another major goal of our development work: for example, this includes increasing the dirt capacity while keeping the installed volume as small as possible. This optimization goal is excellently achieved by our range of standard return-suction filters – just one example of many.

Our sales engineers are just as reliable as our filters themselves. They are trained and experienced filter specialists who speak YOUR language. We believe that before the actual sales discussion there should be the best possible technical advice and assistance with planning - if requested. This is the only way to ensure that our customers decide on the right product.

**Another benefit from ARGO-HYTOS:**

Spare parts can be delivered from our factories in the shortest possible time – and additionally, our subsidiaries in all important industrial countries and representatives all over the world always keep minimum stocks available. This ensures you rapid access to our know-how and our products.

## Quality and safety

Multi-Pass test rig

Collapse / burst pressure test rig

Test rig to determine pressure drop

The area of the entire hydraulic sector is characterized by the high and increasing demands which the user - for understandable reasons - places on the quality and performance of the filters used. These requirements must also be met by the test technology used in the development of filters. And here is the difference between "Filters" and ARGO-HYTOS Filters.

ARGO-HYTOS operates testing rigs that are equipped with ultra-modern technology, enabling fast test sequences, extended testing procedures and accurate documentation of all parameters:

› Multi-Pass test rig
› Collapse / burst pressure test rig
› Test rig to determine the pressure drop
› Test rig to prove the flow-fatigue resistance characteristics
› Pressure pulse test rig to confirm fatigue strength

The ARGO-HYTOS test department is highly equipped with efficient testing equipment and human resources and makes an important contribution to the development of new technologies. Practical requirements can already be taken into account during filter testing in the test laboratory. Individual customer demands are integrated into the development process in the form of load tests which reflect practical conditions. The performance parameters of the installed test rigs allow testing of all filters throughout their performance ranges.

The state-of-the-art **Multi-Pass test rig** enables us to determine filter efficiency data according to ISO 16889.

The **collapse / burst pressure test rig** (for testing according to ISO 2941) is used to determine the specified permissible differential pressure; if this pressure difference is exceeded, the element will be damaged.

The **test rig to determine pressure drop** in filters and their components (such as housings, filter elements and valves) is based on ISO 3968. It is suitable both for testing the pressure drop as a function of the flow rate and in relation to the kinematic viscosity. As a result, the pressure loss in a filter can also be determined for unfavorable operating conditions – for example, during a cold start.

Here at ARGO-HYTOS, the **flow fatigue resistance characteristics** of filter elements are determined on the test rig according to ISO 23181, in such a way that a Multi-Pass test can be carried out afterwards. Thus, the filter characterstics after the fatigue test can be compared with the values of a new filter. Tests carried out on this rig are of great importance in connection with the extension of the filter element replacement intervals. Long-term loads of 1 million cycles or more, which may occur during practical use, can be simulated on the test rig within a short time by means of a testing frequency of up to 1 Hz.

The **pressure pulse test** rig is used to validate filter housings to maximum pressure for lifetime, up to 5 weeks, in order to confirm the fatigue strength – and this can be done up to 600 bar / 8.700 psi.

Alongside the laboratory tests, "field trials" are carried out at customers' applications. Under tough operating conditions, the filters are tested in practice. Thanks to these "field trials" which can often go on for months, even the smallest weak point is sure to be discovered. The result:

**ARGO-HYTOS offers tested quality and safety from A–Z.**


ARGO-HYTOS service vehicle in use

## ARGO-HYTOS service vehicle

Oil cleanliness requirements become constantly higher. Filters are now expected to offer service lifetimes of 1,000 hours or more. Oils that stay clean not only extend the usual intervals between oil changes – they also prevent faults during operation, and they substantially extend the lifetimes of all the hydraulic components. Only rarely it is known how clean or dirty the pressure fluid in a hydraulic system really is. In many cases, the medium is only examined when a failure occurs or when damage is noticed. ARGO-HYTOS has developed its mobile customer service so that potential risks can be identified.

An ARGO-HYTOS service vehicle can travel to you whenever you need it. Oil samples can be analyzed on the spot, and we can determine the type and size of the dirt particles in the pressure fluid just a short time after the samples have been taken. This means that we can make appropriate suggestions about improving or redesigning the filtration in your hydraulic system while we are still on site.

Furthermore, the ARGO-HYTOS service vehicle plays a vital part in our development work resp. in carrying out on-site field tests.


Portable oil diagnostic device OPCount

## Oil diagnostic systems

Portable oil diagnostic systems make it possible for you, the user, to carry out oil analyses yourself on your own systems – at any time.

This instrument can be used in two different ways:

*Analysis of samples in bottles*
Small quantities of oil are taken from a suitable location in the system; the samples are filled in bottles and examined. Maximum cleanliness must be ensured both for the sampling process and the bottles themselves, so that the results of the measurements are not unintentionally affected by dirt from external sources.

*Online analysis*
Online analysis is based on continuous sampling with the help of a measuring hose – so external influences on the measured results can be virtually ruled out in this case. Depending on the sampling location, the oil diagnostic equipment must also be able to withstand the maximum system pressure, as well as to provide reliable measurements at low pressures.

The most important benefit of portable oil diagnostic systems is that the results are always available after just a few minutes. This means that any action that is needed can be initiated as quickly as possible. Convenient evaluation and documentation of the results is provided thanks to a PC interface and appropriate software, making it easy to identify any changes and trends.

It is possible to monitor the cleaning procedure by using oil diagnostic equipment in combination with mobile off-line filter systems. As soon as the desired level of oil cleanliness has been reached, the filtration process is stopped. The filling of systems with oil of a defined cleanliness level is hereby also possible.

Permanently installed equipment for online oil cleanliness monitoring is ideal for cyclical monitoring of oil cleanliness in hydraulic and lubrication systems, and it also offers benefits in terms of preventive maintenance and early detection of damage in large systems. Suitable interfaces can be used to provide a direct link to the machine control system.

Suction filters

Return filters and return-suction filters

Pressure filters

High-pressure filters

### The ARGO-HYTOS filter selection process

The selection procedure described below will make it easy for you to choose the right filter for your hydraulic system. For easier handling, the method is divided into the following steps:

› determine the right filter type
› determine the filter fineness that is needed
› determine the filter size that is needed
› other considerations

This filter selection procedure is based on many years of practical experience with countless mobile and industrial hydraulic systems that are equipped with correctly chosen ARGO-HYTOS filters.

### How to determine the proper filter type

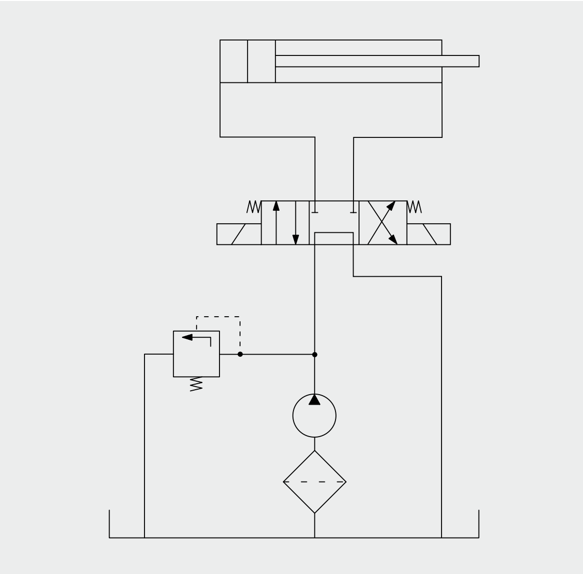
Unfortunately, there is no generally applicable concept which dictates the proper type of filter for each of the different hydraulic systems. To a large extent, the decision on whether to use suction, return, pressure or high-pressure filters – or a combination of these types – depends on these factors:

› the contamination sensitivity of the components in the existing or planned system
› the priority given to protect the function of the component, or to prevent wear
› design or requirements of pumps, motors and valves, which may result in specified requirements from the component manufacturer
› the way dirt is generated, the locations where it occurs and the possibility of ingression from outside
› the available installation space and the accessibility for servicing

Depending on these factors, the criteria detailed below should be taken into account when you are choosing from possible types of filters. A basic distinction can be made here between protective filters that protect the function of components, and working filters that attain a specified level of cleanliness for the pressure fluid.

## How to determine the proper filter type

1



Hydraulic system with suction filter

2

Suction filter ES 075

### Suction filters

Hydraulic systems have to be equipped with a suction filter if there is a particularly high risk of damage to the pump from coarse contamination (figure 1).

*Typical applications of this sort include:*

- systems with a common oil reservoir for working hydraulics and gear transmissions.
- units with oil tanks of large dimensions and / or complex shapes, or those which are welded or casted. Experience shows that 100% cleaning of the tank prior to assembly is impossible under these circumstances.
- systems that are filled under difficult conditions in the field.

Often relatively coarse suction filters (e.g. screen filter elements with a mesh size of ≥ 40 μm) are planned that can only guarantee functional protection for the pump. In this case, the required protection against wear on the hydraulic components must be ensured by a finer filter at another location.

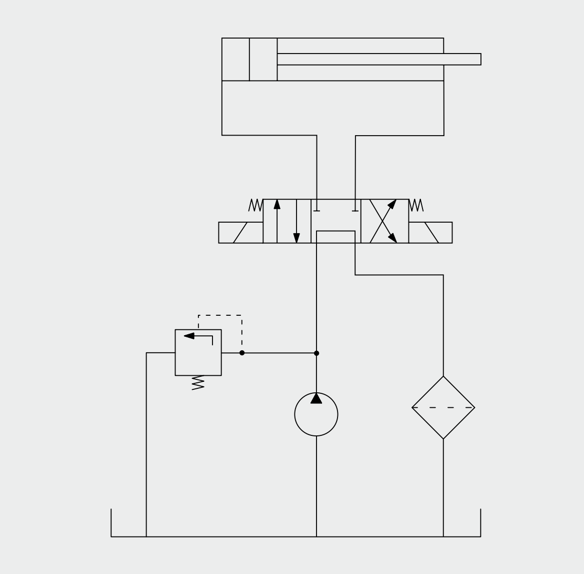
Specialized literature and company publications sometimes take the view that the use of finer suction filters with paper or glass fiber elements is either impractical or inadvisable: however, this view is not tenable. Positive field experience – even with filter finenesses of 16 μm abs. – in hydraulic systems (especially in the mobile sector) have demonstrated that these objections are not justified.

However, it is essential to consider the following criteria when designing a hydraulic system with a suction filter:

- low pressure drop on the clean filter, due to optimal design of the filter element and housing, also taking account of high start viscosities
- filter monitoring with a vacuum switch or vacuum manometer
- the filter element must be easily accessible and simple to replace for maintenance purposes
- the suction pipe should be designed with the lowest possible pressure drop, i.e. large nominal width (inner diameter), few and / or constant changes of direction (bent pipe instead of 90° fittings) and shortest possible length
- the oil tank should be positioned higher than the pump (gravitation drop)
- the system should be designed so that the planned operating temperature is reached as soon as possible after a cold start (tank volume should not be too large, oil cooler should be bypassed during the cold start phase)
- the hydraulic oils used should have the lowest permitted viscosity and a low increase in viscosity if the temperature drops (high viscosity index)
- the pump types used should not be very sensitive to cavitation (e.g. gear pumps).

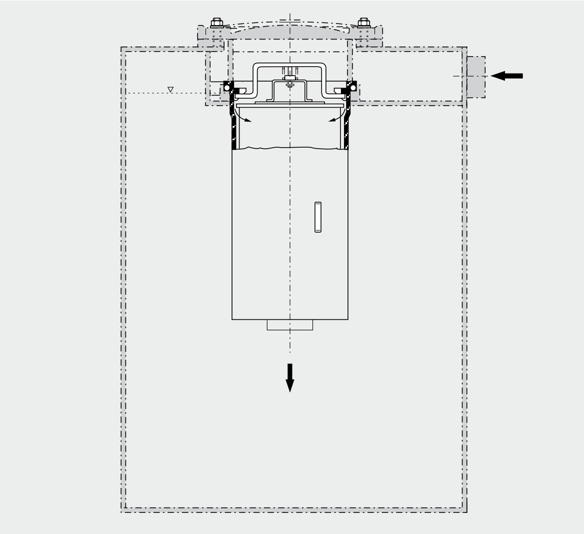
The ARGO-HYTOS ES filter line offers a range of easy-to-maintain tank-mounted suction filters that have proven their excellence, especially in hydrostatic transmissions on mobile equipment (figure 2).

1



Hydraulic system with return filter

2



Return filter E 441 ... E 700 for installation in tank chambers

3

2 in 1: Return filter E 103 for tank installation with integrated tank ventilating filter

## Return filters

It is particularly beneficial to use filters that are mounted on the tank or integrated in it, because this method allows filtering of the entire oil flow (full flow filtration) at low cost and with low space requirements (figure 1).

Full flow filtration in the return flow protects the pumps against dirt which penetrates the system from outside (especially via hydraulic cylinders) or which is generated by abrasion.

When selecting the right filter size, it is essential to consider the maximum possible flow rate. Depending on the area ratio between the piston and piston rod side of the hydraulic cylinder (for cylinders with single-ended piston rod), this is larger than the flow rate of the pump(s).

Full flow filtering in the return may be problematic and therefore inadvisable if the maximum flow rate is very high in relation to the pump flow rate (for example due to a large area ratio for the cylinders, and / or due to the emptying of hydro-accumulators.

The maximum pressure build-up (mainly determined by the actuating pressure and characteristic curve of the bypass valve) should be considered on the basis of these conditions:

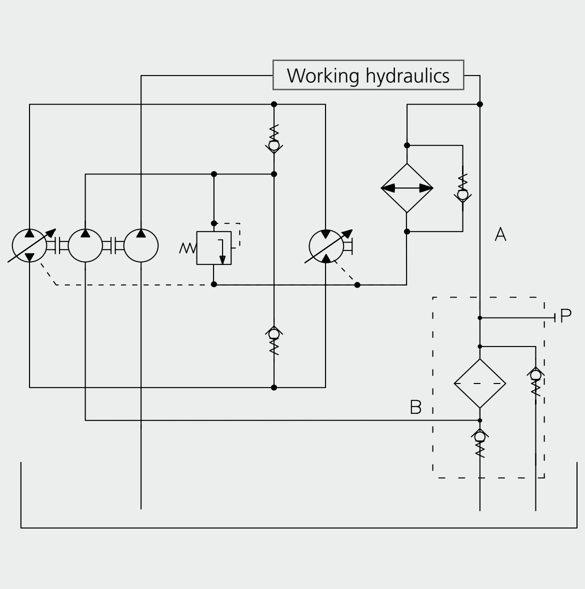
› if drain lines for pumps and / or hydro-motors are connected to the return filter system, the maximum pressure build-up specified for these components by the manufacturer must not be exceeded. (The limitation is usually on the sealing rings of the input/output shafts).
› in certain cases where several components are connected in a system, high pressure build-up can trigger uncontrolled functions – for example, the hydraulic cylinders may be moved out unintentionally.

To prevent oil foaming in the tank, it is essential to ensure that the oil outlet is always below the oil level under all operating conditions. The distance from the tank bottom should be 2 to 3 x the diameter of the outlet (extension pipe diameter), in order to avoid swirling particles which have already settled on the bottom.

At a very early stage, ARGO-HYTOS pushed the consistent introduction of return filters for mobile units mounted below the tank surface, in a separate oil return chamber (figure 2).

As long ago as 1971, ARGO-HYTOS was the first manufacturer to launch tank-mounted return filters on the market, with integrated tank ventilating filter within the filter head (figure 3).

1




Hydraulic system with return-suction filter

2

## Return-suction filters

ARGO-HYTOS first developed its return suction filters in the mid-1980's. On equipment with a hydrostatic drive and combined working hydraulics, these filters replace the suction and / or pressure filters that were previously required for the filling pump of the closed hydrostatic drive, and in an open circuit they replace the return filter for the working hydraulics (figure 1).

The benefit of these filters is that filtered oil is fed to the filling pump at an overpressure of 0.5 bar / 7.3 psi, avoiding the risk of cavitation in the filling pump so that excellent cold start characteristics are possible.

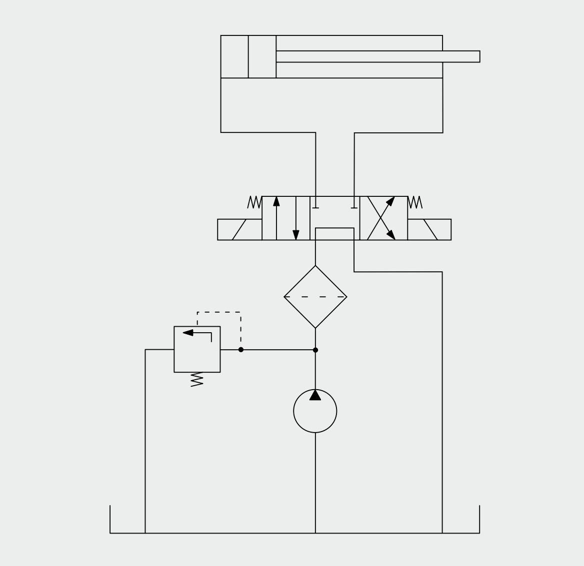
In order to maintain a boost pressure of approx. 0.5 bar / 7.3 psi at the connection to the filling pump, a surplus between the return and suction flow is required under all operating conditions.

A pressure relief valve is used to feed the oil directly into the tank starting from a $\Delta p$ of 2.5 bar / 36 psi (so no bypass for the closed circuit!).

If the drain oil from the hydrostatic drive is fed through the filter as well as the flow in the open circuit, remember that – in order to protect the radial shaft seals – the permissible drain line pressure must not be exceeded (taking account of the pressure drop in the drain lines, the oil cooler and the pressure relief valve on the filter).

Return suction filters from ARGO-HYTOS have also been available for inline mounting for several years. This innovative filter concept can therefore be used in hydraulic systems in which the oil tank is not suitable for insertion of tank-mounted filters

1



Hydraulic system with high-pressure filter

2

ARGO-HYTOS high-pressure filter HD 419

### Pressure and high-pressure filters

The main function of this type of filter is to ensure that the functions of downstream hydraulic components are protected. For this reason, these filters are installed directly upstream of the components if possible (figure 1).

Taking account of the risks of dirt penetrating the system from outside and the possibility of pump abrasion, the following aspects can be particularly decisive for the use of a pressure or high-pressure filter:

- the components are particularly sensitive to dirt (such as servo valves) and / or they are integral to the functioning of a complex system
- the components are particularly expensive (such as large cylinders, servo valves, hydro motors) and they are extremely important for the safety of the equipment (such as hydraulic steering, transmission or brake systems)
- exceptionally high costs are possible if a system is shut down due to malfunctions or damage to a hydraulic component caused by contamination.

High pressure filters must withstand the maximum system pressure, and in many cases the fatigue strength must also be guaranteed because there are frequent pressure peaks in the system.

ARGO-HYTOS has always attached great importance to safety. For example, housings must undergo a fatigue strength test before they are released for series production, and leakage tests are performed regularly during production.

In many cases, high-pressure filters carry out their function by filtering only part of the flow or only relatively coarse particles. In these cases, the filter basically operates as a safety filter. Under these conditions, a fine filter should be positioned at another point in the system so as to take account of the requirements for protection against wear.

High-pressure filters that mainly work as safety filters should preferably be equipped with a differential pressure switch that monitors the contamination of the filter element. Only high-pressure filters without a bypass valve should be fitted upstream of particularly critical components. Those filter types must be fitted with a high collapse filter element that itself is able to withstand higher differential pressure loads without damage.

In this case, a decisive influence on the maximum differential pressure is the ratio between startup viscosity $\nu_2$ and operating viscosity $\nu_1$.

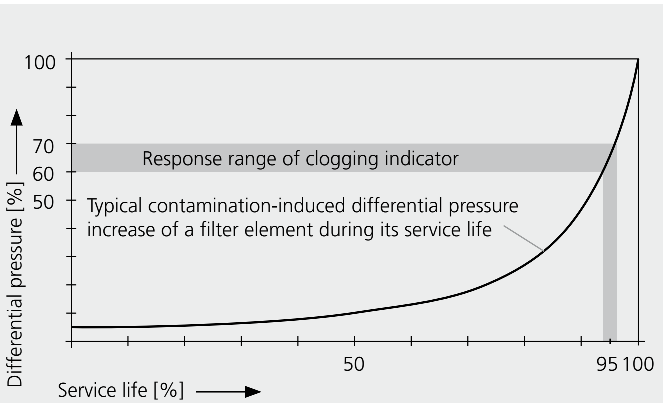
Assuming that the filter element is changed when the differential pressure indicator responds, the following formula can be used to determine the highest possible differential pressure that will occur on the element:

$$\Delta p_2 = \frac{\nu_2}{\nu_1} \times \Delta p_1$$

$\nu_1$ = kinematic operating viscosity
$\nu_2$ = kinematic start viscosity
$\Delta p_1$ = max. differential pressure switch responds at operating viscosity $\nu_1$
$\Delta p_2$ = max. differential pressure at start viscosity $\nu_2$

ARGO-HYTOS differential pressure indicators


ARGO-HYTOS pressure switches and manometers




Progression of the contamination of a filter element throughout its service life

*Example of calculation:*

- operating viscosity $\nu_1$ = 35 mm²/s / 162 SUS
- start viscosity $\nu_2$ = 700 mm²/s / 3240 SUS
- switching pressure of differential pressure switch = 5±0,5 bar / 7.3 psi
- max. differential pressure $\Delta p_1$ = 5,5 bar / 80.3 psi

$$\Delta p_2 = \frac{700}{35} \times 5.5 \text{ resp. } \frac{3240}{162} \times 80.3 = 110 \text{ bar} / 1606 \text{ psi}$$

The differential pressure which occurs here would be 110 bar / 1606 psi. ARGO-HYTOS EXAPOR®MAX 2-elements, with a collapse pressure of 160 bar / 2320 psi, have been specially developed to meet these demanding requirements.

The filter elements that are used in ARGO-HYTOS high-pressure filters without a bypass valve have a collapse pressure of 160 bar / 2320 psi and they are stable in response to differential pressure, so they satisfy the highest safety requirements:

- damage to the filter layer up to the specified differential pressure of 160 bar / 2320 psi is impossible thanks to the exceptional support offered by the filter medium, together with its high intrinsic stability.
- there is consistent monitoring of the manufacturing process for filter elements, with continuous checks on production quality to ISO 2942.

### Clogging indicators

With increasing service life, the contamination of a filter element and thus the pressure drop increases. The resulting differential pressure is monitored by the clogging indicator and converted into an electrical and / or optical signal when a preset value has been reached.

*The following points should be noted here:*
The pressure drop on the filter element increases not only with the contamination, but also with the volume flow and the kinematic viscosity of the pressure fluid.

For these reasons, a filter element is only regarded as contaminated and in need of replacement when the clogging indicator responds at the operating temperature of the hydraulic system, and when the signal is permanent.

**Effects of delaying the replacement of a filter element:**

*On filters with bypass valve:*

- The more heavily the filter element is contaminated, the more frequently the bypass valve will respond, and part of the hydraulic fluid will not be filtered.

*On filters without a bypass valve:*

- The pressure drop on the filter element, and hence the loss of efficiency in the system, will increase continuously: this can lead to impermissible heating of the hydraulic oil.

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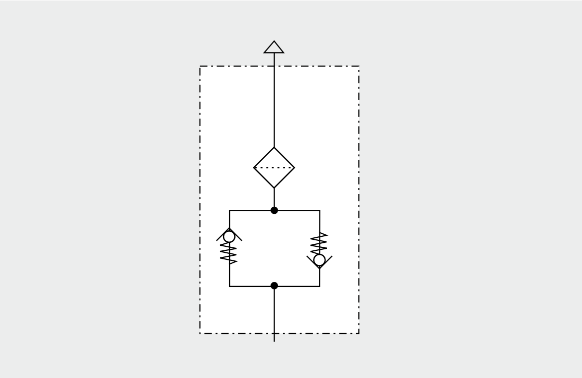


Circuit diagram for ventilating filters with double check valve

2

ARGO-HYTOS ventilating filter (left) and filling and ventilating filter in Vandalism Proof version

3

ARGO-HYTOS desiccant breather

### Ventilating filters

Temperature changes, together with the use of cylinders and / or pressure accumulators, cause the oil level in the tanks of hydraulic systems to have constant fluctuations.

The created difference in pressure with the surrounding environment, which is compensated by an exchange of air, can allow dirt to penetrate the tank.

A ventilating filter can prevent dirt from entering. Ideally, it should have at least the same fineness as the system filters in the hydraulic circuit.

Ventilating filters with double check valves can be used to achieve a major reduction in the exchange of air between the tank and the environment, so that the entry of dirt and dust is minimized and the service life of the ventilating filter element can be prolonged (figure 1).
An important factor here is that the air volume in the tank and the valve cracking pressure must be optimally coordinated with the specific design of the system.

With the specified air volume in the tank, higher response pressures tend to cause a reduction in the exchange of air. The air exchange at the defined response pressure of the ventilating filter can be reduced by increasing the air volume.

With a suitable design, a defined pressure level can be generated in the tank in order to improve the suction conditions for the pumps.

Optionally, a reliable anti-surge baffle prevents oil from spilling into the ventilation filter or escaping from the tank (e.g. by moving a mobile machine).

Further options are integrated dipsticks for oil level control as well as customer-specific connection geometries and imprints such as company logos on the product.

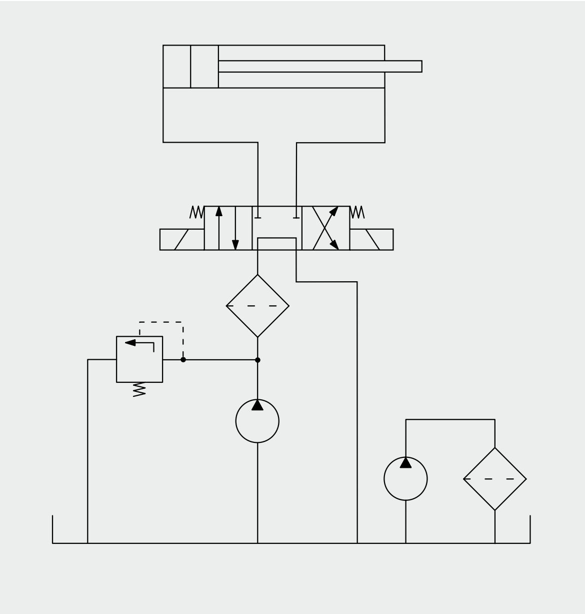
A special feature: ARGO-HYTOS ventilating filters in the patented Vandalism-Proof version (figure 2).

These ventilating filters can only be dismantled with a special tool which is supplied with the product. This makes it considerably more difficult to remove the ventilating filter, or to pour dirt in through the filling/ventilation opening.

### New: Desiccant breathers

Desiccant breathers prevent the penetration of solid particles as well as humidity, snow, spray or rainwater (figure 3).

1



Hydraulic system with high-pressure filter and off-line filter unit

2

ARGO-HYTOS off-line filter unit with motor and pump

3

ARGO-HYTOS mobile filter unit with oil diagnostic system

### Off-line filters

Increasingly, additional off-line filters are being used in systems that are subject to high stress in order to prevent the build-up of superfine particles. Unlike main flow filters, off-line filters only filter part of the total flow in the system (fig.1). Depending on the influence of the environment (incidence of dirt) and the selected filter fineness, the partial flow (in l/min / gpm) should be approx. 2 to 10% of the tank volume (in l / gal).

In combination with superfine filter elements, outstanding levels of oil cleanliness can be achieved by continuous filtration, independently of the machine's working cycle. Furthermore, the load on the main filters is reduced, so that intervals between replacements can be extended.

Off-line filter systems should be used in addition to main flow filters; in this case, the latter can be designed as protective filters, i.e. they do not filter so finely.

A distinction is usually made between two different concepts:

*Off-line filters with a flow control valve*
Through a flow control valve, the off-line filter can be connected to the high pressure line. From the pressure circuit of the system, the required quantity of oil initially flows via the integrated flow control valve and then it is fed into the tank via the offline filter. The small installation effort for this concept makes it especially suitable for retrofitting systems.

*Off-line filter units*
These products are equipped with an integrated motor/pump unit (fig. 2). This results in significantly lower energy consumption than with off-line filters with a flow control valve.
In combination with an oil cooler, separate filter-cooler circuits can be implemented.

### Filter units

To guarantee the required level of oil cleanliness when a system is filled for the first time or refilled, the operating medium should be cleaned using filter units with superfine filter elements.

Mobile filter units are also suitable for cyclical cleaning of hydraulic or lubrication systems where no provision was made for off-line filters when the systems were equipped for the first time, and it is impossible to install them at a later stage.

Optimal results can be achieved if the cleaning and / or filling processes are monitored by an oil diagnosis system such as particle counters (figure 3).

## How to determine the required filter fineness

### Definition of the filter fineness

The Multi-Pass test according to ISO 16889 is used to determine the number of particles upstream and downstream of a filter, in relation to specified particle sizes. This makes it possible to calculate the respective beta value (the filtration ratio) which is the quotient of the numbers of particles upstream and downstream of the filter.

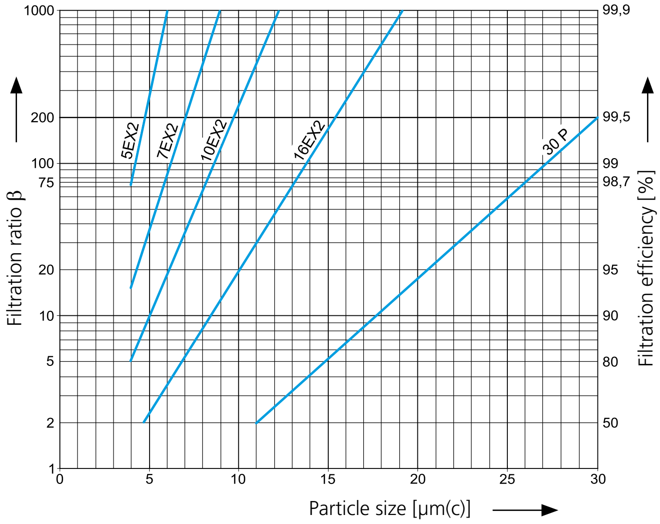
$$\text{Beta value } \beta = \frac{\text{number of particles upstream of filter}}{\text{number of particles downstream of filter}}$$

The filtration level (or filtration efficiency) can be calculated analogously.

$$\text{Filtration efficiency} = \frac{\text{no. of particles upstream of filter} - \text{no. of particles downstream of filter}}{\text{no. of particles upstream of filter}} \times 100\%$$

The following relation exists between the two values:

$$\text{Filtration efficiency (in \%)} = \left(1 - \frac{1}{\beta}\right) \times 100\%$$




ARGO-HYTOS filter fineness:
filtration ratio and filtration efficiency in relation to particle size to ISO 16889

The following table provides some numerical values.

| Beta value β | 1 | 1.5 | 2 | 5 | 10 | 20 | 50 | 75 | 100 | 200 | 1,000 | 10,000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Filtr. efficiency | 0% | 33.33% | 50% | 80% | 90% | 95% | 98% | 98.67% | 99% | 99.5% | 99.9% | 99.99% |

Relation between beta value and filtration efficiency

ARGO-HYTOS filter fineness is based on the mean beta value 200 ($\bar{\beta}_{x(c)}$ = 200 according to ISO 16889) corresponding to a filtration efficiency of 99.5%.
The diagram on the upper right shows the separation characteristics of the standard filter units.

For various particle sizes, the filtration quotient and the degree of separation can easily be read there. This makes the connection between the different finenesses clear. The characteristic of the individual characteristics is ultimately decisive for the degree of cleanliness of the pressurized fluid that can be achieved in practical use.

### Oil cleanliness classification

The classification systems ISO 4406 and NAS 1638 or its successor AS 4059 are most common. Both systems are used to describe the distribution of solid particles in hydraulic fluids according to number and size.

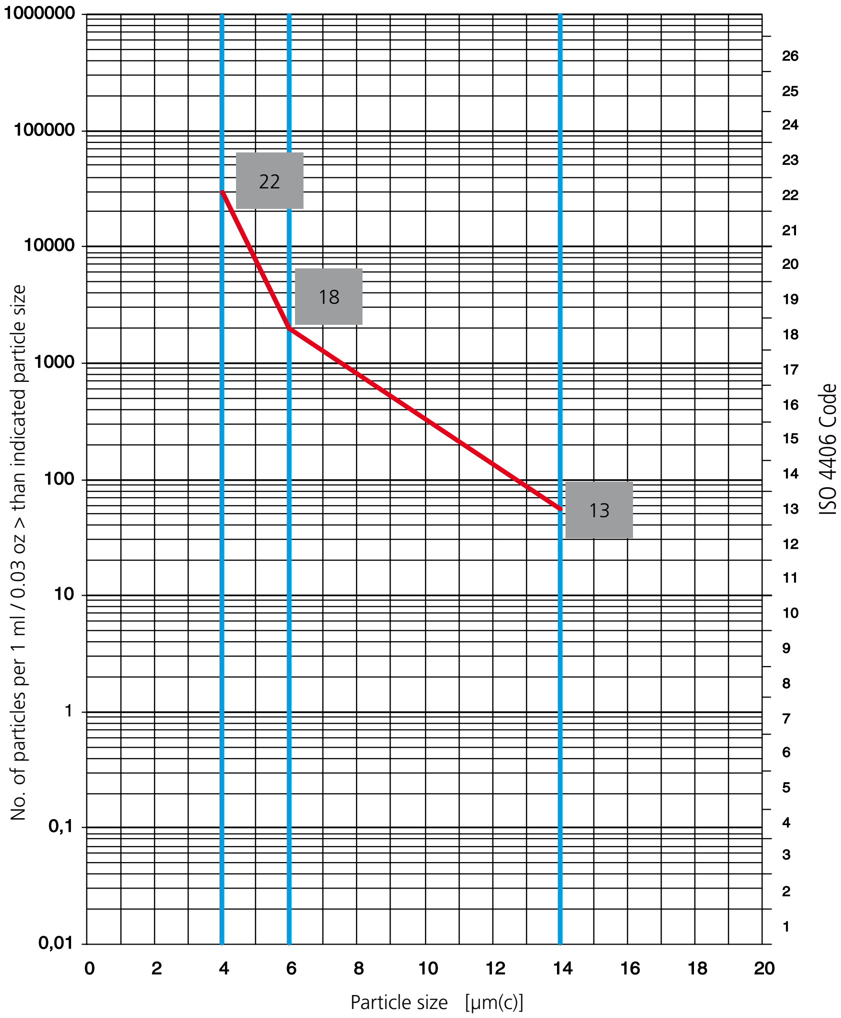
This is done by assigning the number of particles of a specific size to a code number or class. Each time the oil cleanliness deteriorates by a class, the number of particles is doubled. This relationship is shown in the table, using ISO 4406 as the example.

NAS 1638 and AS 4059 use different particle size ranges to describe the distribution of particles, whereas ISO 4406 indicates the number of particles > 4 µm(c), > 6 µm(c) or > 14 µm(c) as codes.

The following chart shows the evaluation of an oil sample according to ISO 4406.

| No. of particles per 1 ml / 0.03 oz | | Code number |
|---|---|---|
| from | up | |
| 80,000 | 160,000 | 24 |
| 40,000 | 80,000 | 23 |
| 20,000 | 40,000 | 22 |
| 10,000 | 20,000 | 21 |
| 5,000 | 10,000 | 20 |
| 2,500 | 5,000 | 19 |
| 1,300 | 2,500 | 18 |
| 640 | 1,300 | 17 |
| 320 | 640 | 16 |
| 160 | 320 | 15 |
| 80 | 160 | 14 |
| 40 | 80 | 13 |
| 20 | 40 | 12 |
| 10 | 20 | 11 |
| 5 | 10 | 10 |
| 2.5 | 5 | 9 |
| 1,3 | 2.5 | 8 |
| 0.64 | 1.3 | 7 |
| 0.32 | 0.64 | 6 |
| 0.16 | 0.32 | 5 |
| 0.08 | 0.16 | 4 |
| 0.04 | 0.08 | 3 |
| 0.02 | 0.04 | 2 |
| 0.01 | 0.02 | 1 |

Extract from ISO 4406




Evaluation of an oil sample according to ISO 4406

## How to determine the required filter fineness

1

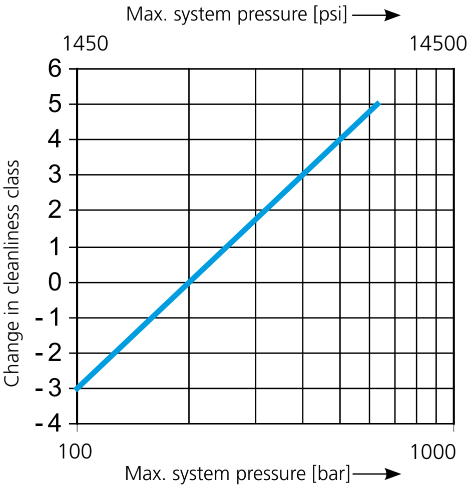
| Pumps | |
|---|---|
| Axial piston pumps | 21 / 18 / 15 |
| Radial piston pumps | 21 / 18 / 15 |
| Gear pumps | 21 / 18 / 15 |
| Vane pumps | 20 / 17 / 14 |
| **Motors** | |
| Axial piston motor | 21 / 18 / 15 |
| Radial piston motor | 21 / 18 / 15 |
| Gear motors | 21 / 18 / 15 |
| Vane motors | 20 / 17 / 14 |
| **Valves** | |
| Directional control valves (solenoid valves) | 21 / 18 / 15 |
| Pressure valves | 21 / 18 / 15 |
| Flow control valves | 21 / 18 / 15 |
| Check valves | 21 / 18 / 15 |
| Proportional valves | 20 / 17 / 14 |
| Servo valves | 17 / 14 / 11 |
| **Cylinders** | 21 / 18 / 15 |

Oil cleanliness level required for
hydraulic components (160 … 210 bar / 2320 ... 3050 psi)

2

| Operating pressure | Change in oil cleanliness |
|---|---|
| 0 ... 100 bar / 0 ... 1450 psi | 3 classes worse |
| 100 … 160 bar / 1450 ... 2320 psi | 1 class worse |
| 160 … 210 bar / 2320 ... 3050 psi | none |
| 210 … 250 bar / 3050 ... 3625 psi | 1 class better |
| 250 … 315 bar / 3625 ... 4570 psi | 2 classes better |
| 315 … 420 bar / 4570 ... 6090 psi | 3 classes better |
| 420 … 500 bar / 6090 ... 7250 psi | 4 classes better |
| 500 … 630 bar / 7250 ... 9140 psi | 5 classes better |

3




Influence of the operating pressure on required oil cleanliness

### Required oil cleanliness

The oil cleanliness required in the system is determined by the component which is most sensitive to dirt. If the component manufacturer does not provide any specific information about the required oil cleanliness or filter fineness, it is advisable to determine the oil cleanliness on the basis of the adjoining tables (fig. 1).

The listed reference values for normal components refer to a basic pressure range of 160 ... 210 bar / 2320 ... 3050 psi.

If the operating pressure is increased in a system, it is necessary to improve the oil cleanliness in order to achieve the same wear lifetime for the components.

The adjoining table lists the required change in oil cleanliness when the operating pressure increases in relation to the basic pressure range of 160 ... 210 bar / 2320 ... 3050 psi (fig. 2 and fig. 3).

Using an example, we will now explain the influence of the operating pressure on the required oil cleanliness, and hence on the filter fineness.

In a system with gear pump and proportional valves, oil cleanliness of 20/17/14 to ISO 4406 is required for an operating pressure of up to 210 bar / 3050 psi. If the operating pressure is raised to 250 bar / 3625 psi, the table shows that the oil cleanliness must be improved by 1 class to 19/16/13.

The required oil cleanliness is determined by other influencing variables as well as the operating pressure:

- expected lifetime of the machine
- costs of repairs / spare parts
- downtime costs due to machine standstill
- requirements for the safety of the system (these are not only influenced by the cleanliness of the oil!)

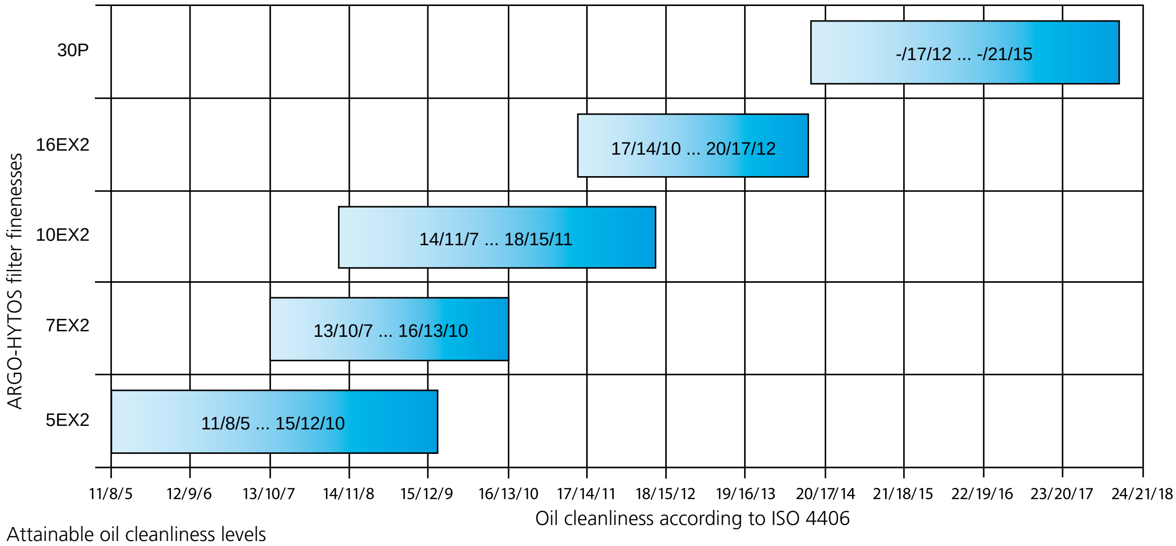
If one of these aspects is especially important, the required oil cleanliness should be improved by one class. If two or more criteria apply, the required oil cleanliness must be up-graded by two classes.

In the example given above, if high-grade cylinders are used as well, and if high interruption costs can be expected due to a system shutdown, 17/14/11 should be recommended as the oil cleanliness class instead of 19/16/13 (2 classes better).

## How to determine the required filter fineness

### Required ARGO-HYTOS filter fineness

Continuous evaluation of oil samples for several decades has shown which level of oil cleanliness can be achieved with which filter fineness under specified system conditions. For full flow filtration under the least favorable conditions, cleanliness levels according to ISO 4406 can be achieved with ARGO-HYTOS filter finenesses as follows:




Attainable oil cleanliness levels

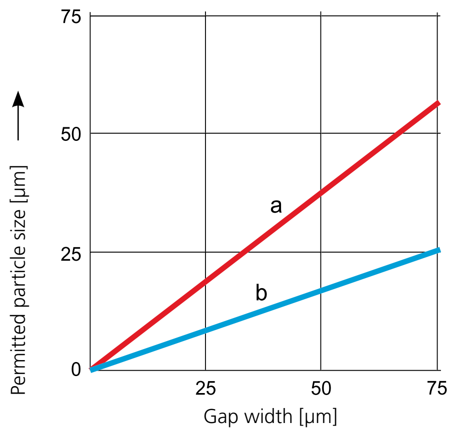
Depending on the ambient conditions and system conditions, different oil cleanliness levels can be achieved. Conditions that can positively influence the degree of purity are:

- design features that reduce the penetration of dirt from outside (high-quality packing seals in hydraulic cylinders, good shaft sealing rings)
- tank ventilating filters with fine filter elements
- uniform flow instead of pulsation (caused, for example, by variable displacement pumps)
- low pressure drop, e.g. when suction filters or off-line filters are used

Depending on the influence of one or more of the criteria mentioned above, the oil cleanliness levels that are achieved will be at the left end of the bandwidths shown (in favorable cases) or at the right end (in unfavorable cases).

In the aforementioned calculation example, an oil cleanliness of 19/16/13 was required. Now it should be determined which ARGO-HYTOS filter fineness is required to achieve this.

According to the chart, filter fineness 16EX2 can be used to achieve oil cleanliness of 17/14/10 in the most favorable case. But under unfavorable conditions, it will only be possible to attain class 20/17/12. On the other hand, filter fineness 10EX2 can reliably achieve the required oil cleanliness of 19/16/13 even under the most unfavorable conditions.




Permitted particle size in relation to gap width with (a) large and (b) small relative movement of the gap surfaces.

### Necessary fineness to avoid gap and nozzle blockage

Typical phenomena that cause functional failures on hydraulic components include blockage of gaps and nozzles. Flow control valves, restrictor valves and servo valves are particularly susceptible to this problem. If the relative movement of the gap surfaces is small, there is a greater risk that the gap will clog up when the size of the dirt particles exceeds 1/3 of the smallest gap height (characteristic b in the chart below). Bearing the possibility of blockage in mind, this means that the absolute filter fineness must be at least equal to the given value, or better less than this value. The adjoining chart shows how the gap width and the permitted particle size are related.

## How to determine the required filter size

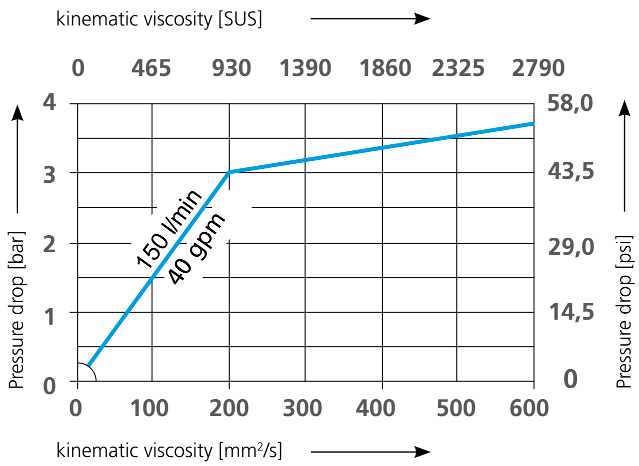
### Nominal flow rate

The correct choice of filter size, taking account of application-specific operating conditions, is the only way to ensure that:

- economically acceptable filter lifetimes are achieved
- even with higher starting viscosity, 100% filtering guarantees the best possible functional protection for the hydraulic components, with pressure drops in the system kept to a minimum

These important criteria must be taken into account when the nominal flow of a hydraulic filter is determined.

- in practical operating conditions, the filter service life must be at least 1,000 operating hours (for this purpose, ARGO-HYTOS operational experience shows that a specific dirt accumulation of at least 0.07 g per l/min / 0.27 g per gpm flow rate has to be taken as a basis).
- at nominal flow rate, the bypass valve of the filter must remain closed during first startup (new filter element) up to a starting viscosity of 200 mm²/s / 930 SUS (see the following chart). This corresponds to a temperature of approx. 15 °C / 59 °F with an ISO VG 46 or HLP 46 hydraulic oil.




Pressure drop of a filter in relation to the kinematic viscosity

Given that the pressure drop on superfine filter elements is more or less proportional to the kinematic viscosity, the approximate permitted flow rate on a filter for pressure fluids that vary from ISO VG 46 can be determined as follows:

$$Q_{max} = Q_N \times \frac{\nu_1}{\nu_2}$$

$Q_{max}$ = permitted maximum flow with a pressure fluid that varies from ISO VG 46

$Q_N$ = nominal flow rate based on ISO VG 46

$\nu_1$ = kinematic viscosity of the ISO VG 46 pressure fluid at 15 °C / 59 °F (corresponds to 200 mm²/s / 930 SUS)

$\nu_2$ = kinematic viscosity of the variant pressure fluid at 15 °C / 59 °F

When using hydraulic oils of higher viscosity, a lower flow rate is permitted as compared with the nominal flow rate. For low-viscosity media, on the other hand, a higher flow load compared to the nominal volume flow is possible, but the flow velocities listed below must be taken into account.

When hydraulic oils of different viscosity classes are used, this results in the following factors for $Q_N$:

| ISO viscosity class | Factor for $Q_N$ |
|---|---|
| 22 | 2.60 |
| 32 | 1.60 |
| 46 | 1.00 |
| 68 | 0.60 |
| 100 | 0.38 |
| 150 | 0.23 |
| 220 | 0.14 |
| 320 | 0.09 |

The following flow speeds in pipes and hoses should not be exceeded:

- suction line: 1.5 m/s / 4.9 ft/s
- return line: 4.5 m/s / 14.8 ft/s
- pressure line up to 100 bar / 1450 psi: 6 m/s / 19.8 ft/s
- pressure/high-pressure line up to 250 bar / 3625 psi: 8 m/s / 26.3 ft/s
- high-pressure line up to 600 bar / 8700 psi: 12 m/s / 39.4 ft/s

All nominal flow rates indicated by ARGO-HYTOS are based on the criteria listed before, which have been fully tried and tested in practice.

## How to determine the required dirt capacity

In many cases, the user indicates either the required filter lifetime in operating hours (OH in the formulas) or the dirt capacity in grams of ISO MTD.

If the lifetime is specified (usually it is identical to the intervals between replacements according to the operating and maintenance instructions), a safety factor of 1.2 to 2.0 should be applied in order to calculate the required ISO MTD capacity of the filter element.

The safety factor is based on the importance or weighting of criteria such as

- nature of influences from the environment (dust, moisture, temperature)
- following the maintenance instructions (original spare parts, oil quality, intervals between replacements)
- filter monitoring by clogging indicators
- preventive replacement of filter elements

The required set point dirt capacity in grams ISO MTD is calculated according to this formula:

$$\text{Dirt capacity}_{\text{setpoint}} = \frac{\text{Specified lifetime}}{1000\ \text{OH}} \times S \times SPS \times Q$$

| | |
|---|---|
| Specified lifetime | = desired filter lifetime in operating hours (OH) |
| S | = safety factor (1.2 ... 2.0) |
| SPS | = specific dirt ingression in g per l/min resp. g per gpm /1000 OH |
| Q | = pumped flow rate of the working pump in l/min resp. gpm |

## SPS values

SPS = specific dirt ingression, indicated in g per l/min resp. g per gpm pumping flow in 1000 operating hours.

In the Multi-Pass test, the dirt capacity of a filter is determined with the help of a test dust whose chemical and physical characteristics cannot be compared to those of dirt that occurs in practice. The filter lifetimes that can actually be achieved in various hydraulic systems under practical conditions can only be determined by extensive investigations in the field. The SPS value represents the relationship between the dirt capacity determined in the Multi-Pass test and the filter lifetime that can be achieved in practice. SPS values for commonly used hydraulic systems are shown in the chart.

These experience values refer to a machine concept with well-protected hydraulic cylinders and highly efficient tank ventilating filters.

For systems and equipment that are not included in this list, please consult ARGO-HYTOS for the relevant SPS value.

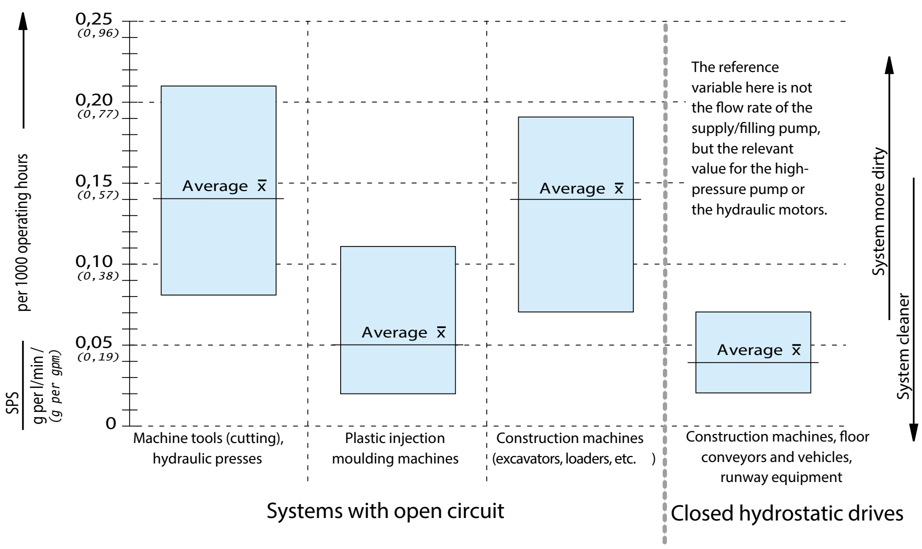
## How to determine the lifetime

The calculated dirt capacity should now be compared with the ISO MTD values shown in the ARGO-HYTOS data sheets, taking account of the filter fineness that has already been determined, and the nominal flow rate.

If the selection table shows that the dirt capacity of the selected filter varies substantially from the calculated value, it may be necessary to select the next largest type. If the variance is insignificant, the decision is ultimately up to the user. The lifetime in hours can then be determined as follows:

$$\text{Lifetime}_{\text{actual}} = \frac{\text{Dirt capacity}_{\text{actual}}}{S \times SPS \times Q} \times 1000\ \text{OH}$$

If the result varies substantially from the specified lifetime, you should again verify the initial data and safety factors, and check whether the system has been classified in the correct machine group based on the SPS value.




SPS values for typical hydraulic systems

## Further considerations

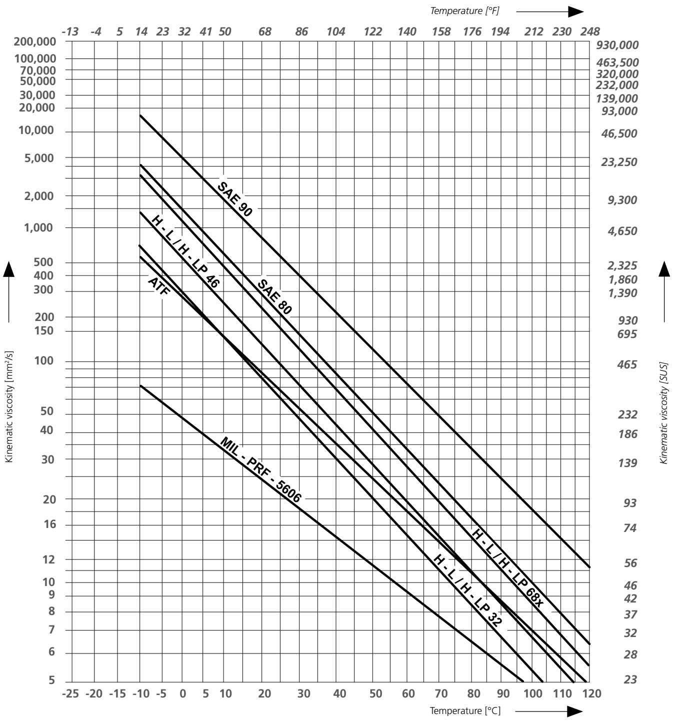
Clogging indicators

High-pressure filters with flanged / threaded connection

Before you finally determine the hydraulic filter that is suitable, you should also clarify these points:

**Design-related factors:**

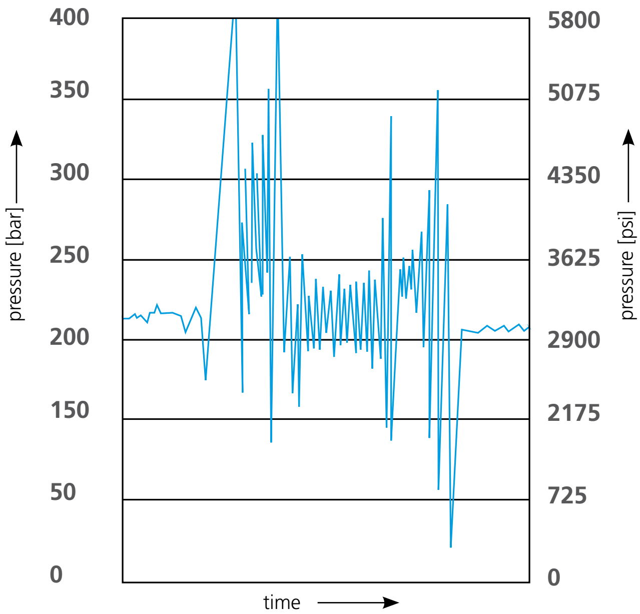
› accessibility for changing the filter element
› type of clogging indicator
› positioning / dimensions of the oil tank
› level differences / angles
› connection threads / flanges



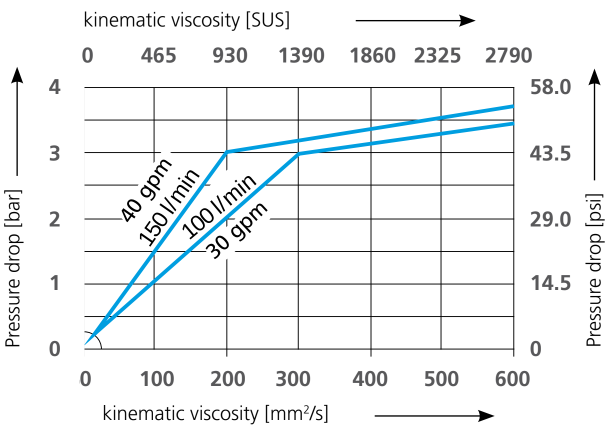

Viscosity (see catalog datasheet 00.003)

**Hydraulic factors:**

› type of fluid
› level / number of possible pressure peaks
› pressure drop at nominal flow
› viscosity
› electrical conductivity
› bypass valve required / allowed




Pressure peaks




Pressure drop

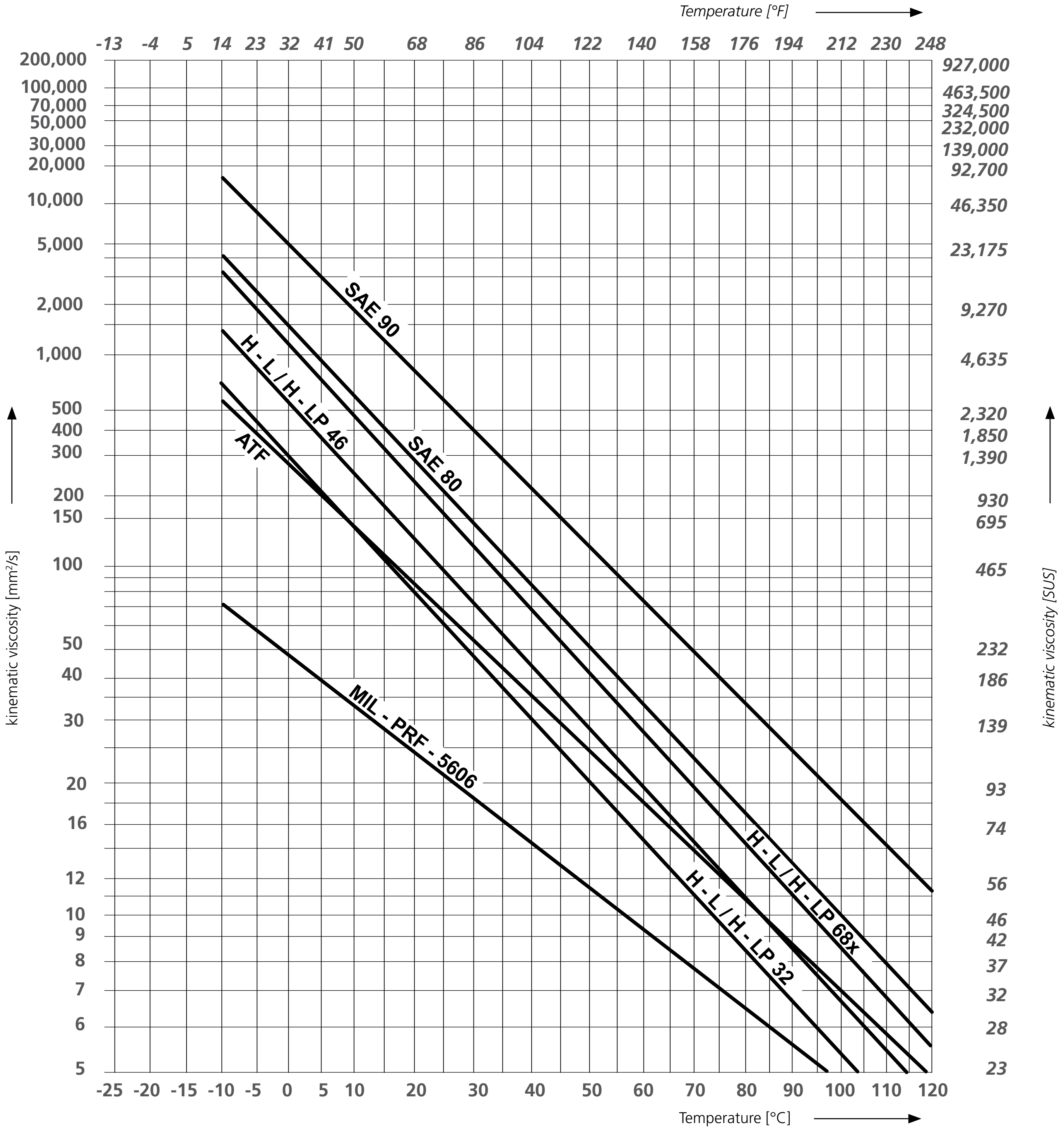
**We are certain that these Guidelines have provided you with some important information and that they will help you to reach a decision. However, the Guidelines cannot be a substitute for personal advice from our qualified filter specialists, nor are they intended as such.**

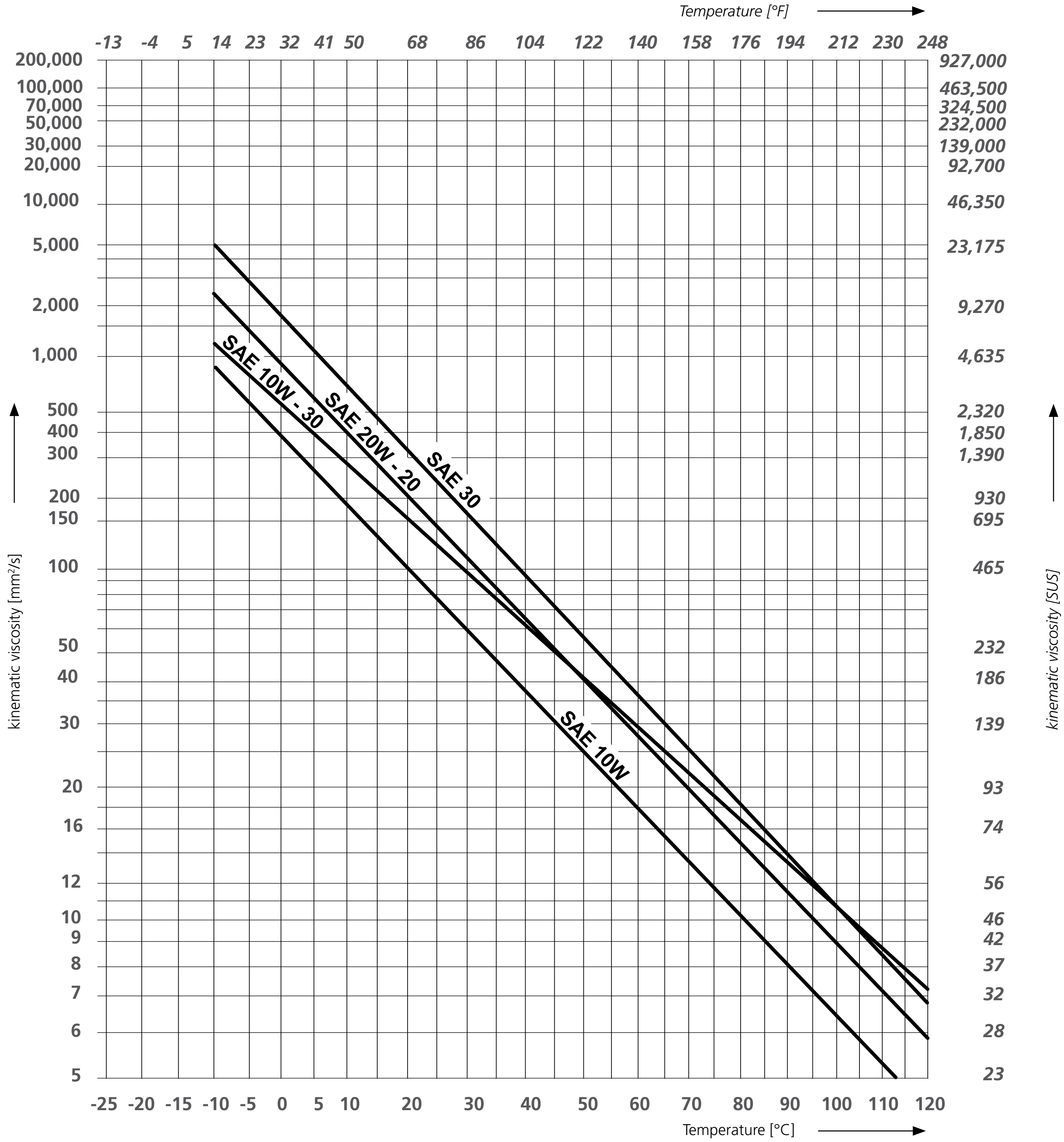
## Flow chart filter selection procedure

| Determine the correct type of filter | Determine the required filter fineness | Determine the required filter size | Further considerations |
|---|---|---|---|
| Suction filter<br>Return filter<br>Return-suction-Filter<br>Pressure filter<br>High-pressure filter<br>Off-line filter<br>Ventilating filter<br>Clogging indicator | Determine the required level of oil cleanliness | Select size based on nominal flow rate | Design-related factors |
| | Assign the required filter fineness | Determine the required dirt capacity | Hydraulic factors |
| | Check the filter fineness for prevention of gap and nozzle blockage | Determine the lifetime | |

## Viscosity Temperature Diagram

# Hydraulic Oils · Vehicle Gear Oils · ATF-Oils · MIL-PRF-5606






**Remarks:**

› The actual viscosity-temperature behavior may vary from the characteristic curves for average values which are indicated here. For a precise determination, the information from the respective oil manufacturer should be used.

› On request we will send you a file (MS Excel) with the viscosity curves of common hydraulic media.

ARGO HYTOS



# Use of Components in Systems

with environmentally friendly hydraulic fluids

### Environmentally friendly hydraulic fluids

At present, three groups of environmentally sound[1] or environmentally compatible[1] hydraulic fluids are used:

- Native esters (HETG), e.g., rapeseed oil
- Synthetic esters (HEES), e.g., dicarboxylic acid ester
- Polyalkylene glycols (HEPG), e.g., polyethylene glycol

### Chemical resistance tests

The chemical resistance of ARGO-HYTOS products is currently tested with typical representatives of the groups native esters (HETG), synthetic esters (HEES) and mineral oils (HL, HLP, HLPV).

### Ventilating Filters, Filling and Ventilating Filters, Accessories for Filters and Tanks

*Native esters (vegetable oils)*

The current level of knowledge shows that the above mentioned components can be used in vegetable oils without any problems, provided that the vegetable oils are kept free of water during operation.

If water is allowed to enter, the sealing materials (as well as metal components) may corrode due to hydrolytic[2] separation of the rapeseed oils.

*Synthetic esters*

The current level of knowledge shows that the above mentioned components can be used in synthetic esters without any problems.

### Hydraulic Filters

*Native esters and synthetic esters*

In fluids of these groups, ARGO-HYTOS filters can be used without any problems. For these components no chemical resistance problems occur in case of no other sealing materials than NBR[3] is specified by the fluid manufacturer and provided that the subsequent recommendations are observed.

*Polyalkylene glycols*

If you intend to use the hydraulic filters for fluids of the polyalkylene glycol type (HEPG), it is essential that you first consult ARGO-HYTOS.

[1] The terms "environmentally sound" and "environmentally compatible" should be regarded in relation to mineral oil-based hydraulic oils (fluids). The term "environmentally friendly" should not be used in connection with hydraulic fluids.

[2] Separation into glycerine and fatty acid

[3] In oil hydraulics NBR sealing materials are standard. If in the technical datasheet of the used oil a higher quality sealing material than NBR is recommended, ARGO-HYTOS should be consulted.

[4] e.g. condensation water

[5] Deposits which have built up during operation with mineral oil are loosened

### Required Replacement Intervals for ARGO-HYTOS Filter Elements

### Initial fill of hydraulic systems

Hydraulic components are normally tested with mineral oil. Rapeseed oil-based hydraulic fluids and synthetic esters can both be mixed with mineral oils.

*With native esters (vegetable oils)*

- First filter element change after running-in period, but not later than after 50 operating hours.
- Second filter element change after 500 operating hours, together with change of hydraulic fluid

Subsequent filter element changes every 1000 operating hours and / or always together with hydraulic fluid change, but at least once a year. The hydraulic fluid should be tested by the supplier / manufacturer in all cases after 1000 operating hours, and thereafter at intervals of 300 operating hours, owing to the risk of hydrolysis[2] if water[4] enters.

*With synthetic esters*

- First filter element change after running-in period, but not later than after 50 operating hours.
- Second filter element change after 500 operating hours, together with change of hydraulic fluid.

Subsequent filter element changes every 1000 operating hours and/or always together with hydraulic fluid change, but at least once a year.

### Changing the oil type of hydraulic systems to native or synthetic esters

After filling with vegetable oil or synthetic ester for the first time, and using new filter elements, the entire hydraulic system should be flushed. All hydraulic functions should be operated several times to ensure that any residue of used oil is flushed out of the entire system. After this first flushing process, a full oil change should be carried out, whereby the filter elements should also be replaced with new ones.

As both vegetable oils and synthetic esters have good dirt dissolving[5] properties, the

- first filter element change should be made approx. 10 … 20 operating hours after changing the oil type.

All subsequent filter element changes should be carried out at the same intervals as for initial fill of hydraulic systems (see above).

ARGO HYTOS



# Taking Oil Samples from Hydraulic Systems

## Basic requirements

### Particle counting and oil sample analysis

Counting the particles contained in an oil sample and analyzing the oil condition is very complex.
The information value of the analysis exclusively depends on whether the particle distribution of the oil sample is representative to the oil situation of the hydraulic system. Therefore we ask you to observe the following instructions and to take special care when taking samples.

### Sampling points

When selecting sampling points make sure that representative samples are withdrawn from the system (for more information see Adequate Sampling Points).

### Sampling time

Samples must be taken at machine operating temperature.

### Sampling bottles

The sampling bottles supplied by ARGO-HYTOS are thoroughly cleaned. They may only be taken out of the plastic bag right before sampling.

### Sampling conditions

On mobile hydraulic systems preparation of the oil sampling as well as the oil sampling itself should be carried out at locations where external contamination through airborne particles is prevented. Samples taken under windy or rainy conditions cause special problems (water makes any particle counting worthless).

### Adequate sampling points

*Systems with in-line filters, pressure filters or high-pressure filters*
Sampling downstream of the filter

- by means of a special sampling valve or
- by means of a micro port and hose

*Systems equipped with tank-mounted return filters*
Sampling upstream of the filter

- by means of a special sampling valve or
- by means of a micro port and hose

*Systems equipped with suction filters*
Sampling

- by means of a special sampling valve or
- by means of a micro port and hose connected to the pressure line or
- from the oil tank, using special equipment, if no other method is possible

### Sampling

Before an oil sample has been withdrawn from a hydraulic system (when the operating temperature has been reached) the hydraulic fluid should be re-circulated at maximum flow rate for at least 5 to 10 minutes. All machine movements should be actuated several times.

### Sampling by means of a special sampling valve or a micro port and hose

This is the most reliable method for obtaining reproducible results as secondary contamination will effectively be prevented. Furthermore, the sample will be directly taken from the oil flow. On hydraulic systems operated on a fixed location, sampling is possible without shutting down the system.
When taking a sample you are requested to proceed as follows:

- While the pump is operating (max. flow rate) open the sampling valve and drain a sufficient quantity of fluid (approx. 2 l / 0.5 gal) into a separate container in order to flush the sampling valve and dead volumes in the area of the sampling port. Never take a sample right after opening the sampling valve.
- Open the plastic bag, take the sampling bottle, remove the screw cap and hold it without touching its inner surface.
- Place the bottle directly under the fluid stream and fill it up to at least 50%, max. up to 80%.

Please note: Reduce the bottled quantity instantly in case the prescribed maximum has been exceeded.[1]

- Seal the bottle with the screw cap immediately, close the sampling valve afterwards.
- Label one of the self-sticking tags (to be found in the plastic bag) and stick it to the outward-cleaned bottle.
- Operating hours: ............................
- Type: .............................................
- No.: ................................................
- Date: .............................................
- Company: .....................................

- Fill in the data sheet (00.320). Please answer the questions accurately.
- Send the oil samples together with the data sheet to ARGO-HYTOS.

[1] To prepare the sample in our laboratory (homogenization) a volume of min. 130 ml / 0.03 gal and max. 200 ml / 0.05 gal will be required (by using 250 ml / 0.07 gal sampling bottles provided by ARGO-HYTOS).

**Sampling from the tank**

This sampling method should only be applied in exceptional cases.
Please contact a staff member of our research department if there is no other possibility to sample. He will advise you.

**Remark:**

In case the oil sampling will be carried out together with a filter element change, please label the contaminated filter element and send it to ARGO-HYTOS, together with the filled in data sheet (00.320).

ARGO HYTOS

Datasheet

# Oil sampling ☐ Filter element change ☐

Company ____________________ Industry ____________________

Address ____________________ Phone ____________________

Machine / application ____________________ Manufacturer ____________________

Type / model ____________________ Chassis / machine no. ____________________

Operating hours ________ h Year of manufacture ________ Power ________ kW ( ________ HP)

Oil sampling / element change date ________ by ________ from company ____________________

Operating hours of oil ________ h Designation / type of oil ____________________

Circulation time through filter before sampling ________ ☐ min ☐ h

Operating hrs of element ________ h Tank volume ________ ☐ l ☐ gal Max. operating temp. ________ ☐ °C ☐ °F

Filter tpye ____________________ Manufacturer ____________________

Filter identification ____________________

Element fineness ________ µm ☐ nom. ☐ abs. Clogging indicator ☐ no ☐ optical ☐ electr. ☐ electr./opt.

Sampling location ☐ Upstream filter ☐ Downstream filter ☐ Tank

☐ Others ____________________

Sampling through ☐ System valve ☐ Minimess ☐ Vacuum bottle

☐ Others ____________________

Hydraulic circuit ☐ Closed ☐ Open ☐ Ventilating filter

Type ____________________ Manufacturer ____________________

Hydraulic pump ☐ Variable displacement ☐ Fixed displacement Design ____________________

Type ____________________ Manufacturer ____________________

Capacity ________ ☐ l/min ☐ gpm Operating pressure max. ________ ☐ bar ☐ psi

Field of application ☐ Construction site equipment ☐ Machine tool ☐ Hydraulic press ☐ Injection moulding

☐ Others ____________________

Maintenance Last hydraulic fluid change at ________ operating hours on ________

Prescribed fluid change interval after every ________ operating hours resp. ________ months

Last element change / cleaning at ________ operating hours on ________

Recommended element change interval after every ________ operating hours resp. ________ months

Repairs ☐ No

☐ Yes, at ________ operating hours Type of repair ____________________

Contact person ____________________ Phone / Email ____________________

Confirmation: We hereby confirm that the oil sample(s) in question does (do) not contain PCB (polychlorinated biphenyl) nor PCT (polychlorinated terphenyl).

________ ________ ________

Place Date Stamp and signature

# Maintenance of Hydraulic and Ventilating Filters

**General**

The task of filters is to remove solid particles from hydraulic and lubrication systems. As a result the filter contaminates itself.

Ventilating filters contaminate due to the dusty ambient air.

To avoid malfunctions in the system, the maintenance intervals recommended by the manufacturer should be observed.

*In filtration we differentiate between 2 filtration principles:*

- Depth filters with chaotically arranged fibers (e.g. glass fibers, polyester fibers)
- Surface filters with geometrically defined gaps (e.g. filter mesh of metal or plastic wires)

With **depth filters** open pores or gaps in the filter material are clogged by different sized dirt particles and thus the differential pressure continuously increases. **Cleaning such a filter is not possible.**

**Surface filters** hold back all particles which are larger than the mesh size. Particularly strainers with a mesh size smaller 60 µm might be completely clogged at high contamination. **These filters are cleanable.**

**Ventilating filters**

ARGO-HYTOS ventilating filters are depth filters. These filters cannot be cleaned.
For operational safety reasons and to simplify maintenance, the housings cannot be opened. Changing the filter element is therefore not possible.

ARGO-HYTOS recommends changing the ventilating filters every 1000 operating hours, at least once a year.
This applies to the operation of filters with the nominal volume flow rates specified by ARGO-HYTOS.

**Hydraulic Filters**

**Maintaining filters with clogging indicator**

By the use of a clogging indicator the pending filter maintenance is indicated and this results in an optimum utilization of the dirt holding capacity.

Clogging of the filter element and thus the differential pressure increase with growing lifetime.

The clogging indicator monitors the differential pressure and generates an electrical and / or optical signal as soon as the preset value is reached.

*It should be noted that:*
The differential pressure at the filter element increases not just due to clogging but also with the volume flow and the kinematic viscosity of the hydraulic fluid.

Therefore, the signal of the clogging indicator can be ignored If it occurs at high viscosity (low temperature of the hydraulic fluid) or exceeded flow rate.

So the filter element has to be replaced as soon as possible if the clogging indicator responds and causes a continuous signal at operating temperature and nominal flow.

**Maintaining filters without clogging indicator**

*Depth filters*
Should the ARGO-HYTOS filters be operated with the volume flow rates indicated in the catalogue with a medium dirt ingress of 0.07 g per l/min / 0.27 g per gpm, **a maintenance interval of 1000 operating hours, at least once a year** is recommended.

Taking into account the specific operating conditions, the maintenance interval may differ from this indication.

Ventilating filters

Depth filter (EXAPOR®MAX 2 filter element)

### Surface filters

Due to their filter fineness, normally larger than 60 µm, surface filters cannot produce a sufficient oil cleanliness and are therefore used to protect the system.

The robust design allows the use in many applications throughout the entire lifetime, provided that visual inspections are regularly performed and that the filter elements are cleaned if necessary.

*For cleaning we recommend:*

› Cleaning in ultrasonic bath for a few minutes. As an alternative, put filter in cleaning agent for approx. 15 minutes and remove dirt from the outside using a brush.
› Then flush with fresh cleaning fluid from the inside to the outside.
› Blow out with compressed air from the inside to the outside.

In any case be careful that no dirt enters the inner side (clean oil side) of the suction filter.

This kind of **cleaning can be performed up to 3 times**, then the filter has to be replaced.

### Exceptions

### Suction filter without sealing point to the surrounding

To guarantee lowest differential pressures in the suction line, a fixed maintenance interval is advisable.

The ARGO-HYTOS suction filters of series AS are surface filters and have a robust design with metal end caps, inner frame and filter mesh, so that **cleaning as above described is possible.**

Suction filter without sealing point to the surrounding

### Suction filter with sealing point to the surrounding

The operational reliability of seals reduces with increasing lifetime. Thus suction filters as e.g. products of the ARGO-HYTOS series S0 have to be replaced regularly, preferably in connection with the change of the hydraulic fluid

It is recommended to install a new filter every **2000 operating hours, at least every 2 years.** In this case be careful that no dirt enters the inner side (clean oil side) of the suction filter.

**Suction filters with synthetic fabric should not be cleaned but replaced.**

Suction filter with synthetic fabric and sealing point to the surrounding

### High pressure safety filter

Due to their design it is not economical to replace filter elements of high pressure safety filters, so that a new filter has to be installed when servicing.
Servicing should always be performed when the system is repaired as a result of a larger damage.

High pressure safety filters

### Additional information

ARGO-HYTOS recommends to check the seals with each filter maintenance and replace them if necessary.
Maintenance kits consisting e.g. of filter element, housing seal and maintenance instructions can be put together individually.

All by ARGO-HYTOS announced functionalities of the complete filters as well as the excellent characteristics of the filter element can only be guaranteed when using original ARGO-HYTOS spare parts.

Technical Recommendation

# Storage of Replacement Filter Elements

Tips for storage

**INFO**

**ARGO-HYTOS replacement filter elements are usually supplied in a film tube** so that they do not become dirty during transport and storage.
**High quality cardboard boxes** guarantee safe transport and storage / handling.
The **label used** bears a **QR code**, serves as a **closure seal** and thus ensures the new and unopened product condition.

**ARGO-HYTOS filter elements are available in two basic types:**

- Surface filters with geometrically defined gaps (e. g. screen elements with filter mesh made of metal or plastic wires)
- Depth filters with chaotically arranged fibers (e. g. elements with non-woven materials made of glass fibers, polyester fibers or cellulose fibers)

The replacement filter elements for service purposes are usually packed in a plastic bag for dust proofing and then in a folding box. Often, accessories such as gaskets, seals or screws are enclosed.

When storing these spare parts the products have to be protected from heat sources and direct insolation. Ideally, storage takes place in a dry room with 0 … +25 °C / +32 ... +77 °F and relative air humidity below 65% (similar to DIN 7716).

Although there is no expiration date on the packaging of the replacement filter elements, ARGO-HYTOS recommends storing these goods no longer than four years, even though the guidelines above are considered. Especially the glue and binder in the filter media of non-woven materials lose more and more of their required technical characteristics during prolonged storage.

Screen elements having metal fabrics are an exception. When stored correctly, they can be kept longer than four years due to their robust design, which allows the usage of such elements in many applications throughout the entire machine lifetime. However, regularly performed visual inspections and filter element cleaning based on necessity are vital prerequisites for a long usage. Cleaning processes can be performed up to three times; after that, the filter element must be replaced.

Products having synthetic fabrics should not be cleaned but always replaced.

Filter elements that have been oil-wetted cannot be put in storage again, even if they were used only a short period of time. They need to be disposed of. Please always drip off and drain the wetted filter elements prior to disposing of them in accordance with environmental regulations.

Product Overview

# High Performance / Lightline

## Suction Filters

| High Performance | High Performance | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Series** | **S0.0426** | **S0.0638** | **AS 010** | **AS 025** | **AS 040** | **AS 060** | **AS 080** | **AS 100** | **AS 150** |
| Nominal flow rate | 60 l/min<br>15.9 gpm | 160 l/min<br>42.3 gpm | 15 l/min<br>4.0 gpm | 35 l/min<br>9.2 gpm | 60 l/min<br>15.9 gpm | 90 l/min<br>23.8 gpm | 120 l/min<br>31.7 gpm | 200 l/min<br>52.8 gpm | 350 l/min<br>92.5 gpm |
| Connection | DN 32 | DN 60 | G ½ | G ¾ | G 1 | G 1¼ | G 1½ | G 2 | G 2½ |
| Operating pressure | | | | | | | | | |

| High Performance | | | | High Performance | | Lightline | | | |
|---|---|---|---|---|---|---|---|---|---|
| **LS 025** | **LS 035** | **LS 040** | **LS 075** | **ES 075** | **ES 094** | **SFL 025** | **SFL 035** | **SFL 040** | **SFL 075** |
| 25 l/min<br>6.6 gpm | 33 l/min<br>8.7 gpm | 40 l/min<br>10.5 gpm | 75 l/min<br>19.8 gpm | 45 l/min<br>11.9 gpm | 70 l/min<br>18.5 gpm | 30 l/min<br>7.9 gpm | 40 l/min<br>10.6 gpm | 50 l/min<br>13.2 gpm | 90 l/min<br>23.8 gpm |
| G ¾<br>-12 SAE | | G 1¼<br>-20 SAE | | G 1/G 1¼<br>-16 SAE /<br>- 20 SAE | G 1¼<br>-20 SAE | G ¾<br>-12 SAE | | G 1¼<br>-20 SAE | |

## Return Filters

| High Performance | | | | High Performance | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **D 090** | **D 100** | **D 170** | **D 230** | **E 043** | **E 072** | **E 094** | **E 103** | **E 143** | **E 212** | **E 222** |
| 85 l/min<br>22.5 gpm | 110 l/min<br>29.1 gpm | 170 l/min<br>44.9 gpm | 225 l/min<br>59.5 gpm | 35 l/min<br>9.2 gpm | 70 l/min<br>18.5 gpm | 50 l/min<br>13.2 gpm | 110 l/min<br>29.1 gpm | 135 l/min<br>35.7 gpm | 190 l/min<br>50.2 gpm | 220 l/min<br>58.1 gpm |
| G ¾<br>-12 SAE | | G 1¼<br>-20 SAE | | G ½<br>-12 SAE | G ¾<br>-12 SAE | | G ¾ / G1<br>-16 SAE | | G 1¼<br>-20/-16 SAE | |
| 10 bar / 145 psi | | | | | | | | | | |

| High Performance | | High Performance |
|---|---|---|
| **FR 043** | **FR 072** | **MFE 200** |
| 35 l/min<br>9.2 gpm | 70 l/min<br>18.5 gpm | 200 l/min<br>52.8 gpm |
| ID 16 | ID 19 | G 1¼* |
| 6 bar / 87 psi | | 10 bar / 145 psi |

* for optional connections see catalog sheet

Product Overview

# High Performance / Lightline

## Return Filters

### High Performance

| E 441 | E 451 | E 461 | E 641 | E 700 | E 444 | E 454 | E 464 | E 644 | E 303 | E 503 | E 703 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 270 l/min<br>71 gpm | 480 l/min<br>127 gpm | 600 l/min<br>159 gpm | 680 l/min<br>180 gpm | 800 l/min<br>211 gpm | 270 l/min<br>71 gpm | 525 l/min<br>139 gpm | 600 l/min<br>159 gpm | 680 l/min<br>180 gpm | 500 l/min<br>132 gpm | 750 l/min<br>198 gpm | 900 l/min<br>238 gpm |
| Ø 142 (chamber of reservoir) | | | | Ø 167 | 2x G 1¼ / SAE 1½, G ¾ + G 1*<br>-24 SAE / SAE2 / -16 SAE | | | | 2x G 1¼ / SAE 1½,<br>G ¾ + G 1*<br>SAE 2½ / -16 SAE | | |

10 bar / 145 psi

### Lightline

| RFL 090 | RFL 100 | RFL 170 | RFL 230 | RFT 043 | RFT 072 | RFT 103 | RFT 125 | RFT 222 | RFT 454 | RFT 464 |
|---|---|---|---|---|---|---|---|---|---|---|
| 100 l/min<br>26 gpm | 120 l/min<br>32 gpm | 190 l/min<br>50 gpm | 290 l/min<br>77 gpm | 50 l/min<br>13 gpm | 90 l/min<br>24 gpm | 125 l/min<br>33 gpm | 175 l/min<br>46 gpm | 270 l/min<br>71 gpm | 500 l/min<br>132 gpm | 650 l/min<br>172 gpm |
| G ¾<br>-12 SAE | | G 1¼<br>-20 SAE | | G ¾<br>-12 SAE | | G 1<br>-16 SAE | | G 1¼<br>-20 SAE | 2x G 1¼ /<br>SAE 1½ + G ¾ + G 1<br>-24 SAE / SAE 2 | |

10 bar / 145 psi

## Return-Suction Filters

### High Performance

| E 068 | E 088 | E 178 | E 258 | E 084 | E 158 | E 198 | E 248 | E 328 | E 498 | E 598 | E 998 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 80 l/min<br>21.1 gpm | 100 l/min<br>26.4 gpm | 210 l/min<br>55.5 gpm | 250 l/min<br>66 gpm | 80 l/min<br>21.1 gpm | 180 l/min<br>47.6 gpm | 200 l/min<br>52.8 gpm | 250 l/min<br>66.0 gpm | 470 l/min<br>124.2 gpm | 600 l/min<br>158.5 gpm | 630 l/min<br>166.4 gpm | 850 l/min<br>224.6 gpm |
| G ¾<br>-12 SAE | | G 1<br>-16 SAE | | G ¾ / G1<br>-12 SAE/<br>- 16 SAE | G 1 / G 1¼<br>-16 SAE / - 20 SAE | | | G 1½ / SAE 2 + G 1*<br>-24 SAE / SAE2 +<br>-16 SAE | | G 1½ / SAE 2,<br>2x G 1¼ / SAE 1½,<br>G ¾, G1 /<br>-24 SAE / SAE 2,<br>2x -20 SAE / SAE 1½,<br>-12 SAE, -16 SAE | |

10 bar / 145 psi

* for optional connections see catalog sheet

# High Performance / Lightline

## Filter Cooling Units

**High Performance**

|  |  |
|---|---|
| **FNK 050** | **FNK 100** |
| 75 l/min<br>19.8 gpm | 125 l/min<br>33 gpm |
| G 1¼ | |
| 10 bar / 145 psi | |

## Pressure Filters

**High Performance**

|  |  |  |  |  |  |  |  |  | |
|---|---|---|---|---|---|---|---|---|---|
| **D 042** | **D 062** | **D 072** | **D 112** | **D 152** | **D 162** | **D 232** | **D 332** | **FNL 1000** | **FNL 2000** |
| 44 l/min<br>11.6 gpm | 90 l/min<br>23.8 gpm | 48 l/min<br>12.7 gpm | 130 l/min<br>34.3 gpm | 170 l/min<br>44.9 gpm | 250 l/min<br>66.0 gpm | 300 l/min<br>79.3 gpm | 350 l/min<br>92.5 gpm | 555 l/min<br>146.6 gpm | 1450 l/min<br>383 gpm |
| G ½<br>- 8 SAE | G ¾*<br>-12 SAE* | G ½<br>- 8 SAE | G ¾ / G 1<br>-12 SAE / -16 SAE | | G 1¼<br>-20 SAE | G 1¼ / G 1½<br>- 20 SAE / -24 SAE | | SAE 2 | SAE 4 |
| 100 bar / 1450 psi | | | | | 63 bar / 914 psi | | | 40 bar / 580 psi | |

## High Pressure Safety Filters

**High Performance**

|  |  |  |
|---|---|---|
| **HD 040** | **HD 081** | **HD 150** |
| 40 l/min<br>10.6 gpm | 80 l/min<br>21.1 gpm | 100 l/min<br>26.4 gpm |
| M22 | M26 | G ¾<br>-12 SAE |
| 500 bar / 7250 psi | | |

* for optional connections see catalog sheet

## Product Overview

# High Performance / Lightline

## High Pressure Filters

### High Performance

| HD 049 | HD 069 | HD 152 | HD 172 | HD 319 | HD 419 | HD 619 | HD 790 | HD 990 |
|---|---|---|---|---|---|---|---|---|
| 75 l/min<br>19.8 gpm | 105 l/min<br>27.7 gpm | 175 l/min<br>46.2 gpm | 190 l/min<br>50.2 gpm | 330 l/min<br>87.2 gpm | 380 l/min<br>100.4 gpm | 450 l/min<br>118.9 gpm | 750 l/min<br>198.1 gpm | 1000 l/min<br>264.2 gpm |
| G ½<br>-8 SAE | G ¾<br>-12 SAE | G ¾ / G 1<br>-12 SAE /<br>-16 SAE | G 1<br>-16 SAE | G 1¼<br>-20 SAE | | G 1½<br>-24 SAE | SAE 2 | |
| 630 bar / 9137 psi | | | | | | | | |

### High Performance

| HD 044 | HD 064 | HD 314 | HD 414 | HD 614 | HD 417 | HD 617 |
|---|---|---|---|---|---|---|
| 75 l/min<br>19.8 gpm | 105 l/min<br>27.7 gpm | 300 l/min<br>79.3 gpm | 360 l/min<br>95.1 gpm | 400 l/min<br>105.7 gpm | 350 l/min<br>92.5 gpm | 420 l/min<br>111 gpm |
| Ø 15 mm<br>Ø 0.59 inch | | Ø 31 mm<br>Ø 1.22 inch | | | SAE 1¼ | SAE 1½ |
| 500 bar / 7250 psi | | | | | | |

## Ventilating Filters / Vandalism Proof

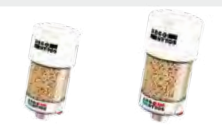
## Filling and Ventilating Filters / Vandalism Proof

### High Performance

| L1.0406 | L1.0506 | L1.0706 | L1.0807 | L1.0808 | L1.0809 | LE.0716 | LE.0817 | LE.0827 | LE.0818 | LE.0819 |
|---|---|---|---|---|---|---|---|---|---|---|
| 135 l/min<br>32 gpm | 150 l/min<br>40 gpm | 250 l/min<br>66 gpm | 850 l/min<br>225 gpm | 550 / 850 l/min<br>145 / 225 gpm | | 250 l/min<br>66 gpm | 550 / 850 l/min<br>145 / 225 gpm | | 550 / 850 l/min<br>145 / 225 gpm | |
| M22x1.5* | M22x1.5* | M42x2* | M60x2* | M24x2 | G ¾* | 6 hole flange (DIN 24557/T2) | | | | |

## Desiccant Breathers

### High Performance



| LT.1021 | LT.1325 |
|---|---|
| 300 l/min<br>79.3 gpm | 400 l/min<br>105.7 gpm |
| G ¾ | G 1¼ |

* for optional connections see catalog sheet

## Suction Filter

# S0.0426 · S0.0638

In-tank mounting · Hose connection up to DN 60 · Nominal flow rate up to 160 l/min / 42.3 gpm

M

Suction Filter S0.0426

## Description

### Application

In the suction line of pumps of hydraulic or lubricating circuits.

### Performance features

*Protection against malfunction:*
By full-flow filtration in the suction line, particularly the pumps are protected from coarse dirt particles that have remained in the system after manufacture or repair, or enter the system when it is filled with oil.

### Special features

The robust construction with hose fittings, corpus out of reinforced plastics and embedded mesh screen material offers the following advantages:

- high reliability at low dead weight
- enormous shock and vibration resistance
- easy mounting

### Construction

Flow direction from outside to center. By using optimized filter material, pressure drops are kept down.
The suction filters operate without by-pass valves. This guarantees continuous full flow filtration.

### Filter maintenance

These suction filters have to be replaced on regular basis, e.g. together with the replacement of the hydraulic fluid. It is recommended to change the filter every 2 years or every 2000 operating hours, depending on what occurs first.
When replacing, it is inevitable to prevent any dirt from entering the inner side (clean oil side) of the filter.
Please refrain from cleaning these suction filters.

## Characteristics

### Nominal flow rate

Up to 160 l/min / 42.3 gpm (see Selection Chart, column 2).
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- pressure drop Δp — < 0.035 bar at ν = 35 mm²/s; < 0.507 psi at ν = 162 SUS
- pressure drop Δp — ≤ 0.25 bar / 3.62 psi at 1/3 of the nominal flow rate and ν = 4,000 mm²/s / 18,600 SUS (~ HLP 46 at -20 °C / 4 °F)
- flow velocity in the connection lines — ≤ 1.5 m/s / 4.9 ft/s

### Connection

Fittings for hoses up to DN 60.
Sizes see Selection Chart, column 6,
(other port threads on request).

### Filter fineness

135 µm, 280 µm

### Hydraulic fluids

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

### Temperature range

-30 °C ... +80 °C (temporary -40 °C ... +100 °C)
-22 °F ... +176 °F (temporary -40 °F ... +212 °F)

### Materials

| | |
|---|---|
| Corpus: | Polyamide, GF reinforced |
| Cap: | Polyamide, GF reinforced |
| Seal: | NBR (FPM on request) |
| Filter mesh: | Polyester |

### Viscosity at nominal flow rate

- ν < 60 mm²/s / 280 SUS at operating temperature
- as start-up viscosity $\nu_{max}$ equivalent to the permitted pump inlet pressure (refer to diagram D1), Δp to be determined as a function of the viscosity (take pressure loss in connection lines into account!)

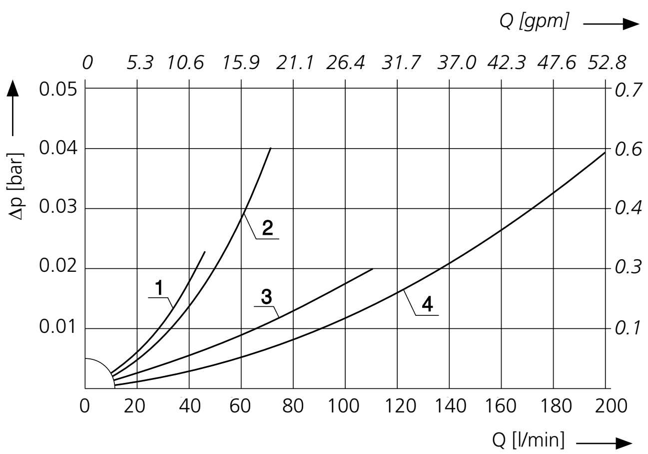
### Mounting position

Optional, preferably in horizontal position.
Under all operating conditions (min. oil level, max. inclination) the suction must occur under the oil level.

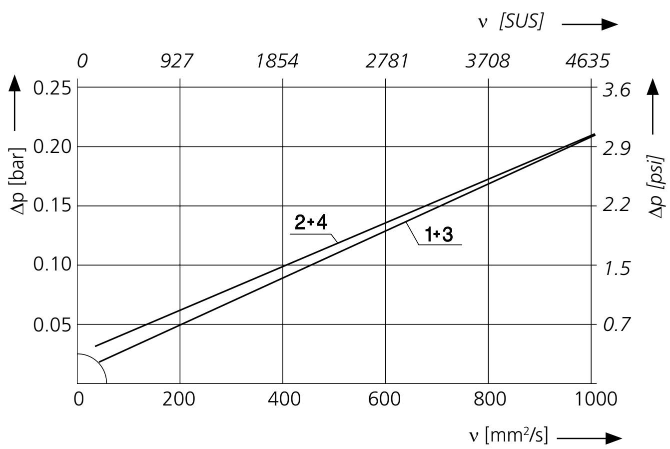
## Diagrams

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

**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS




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



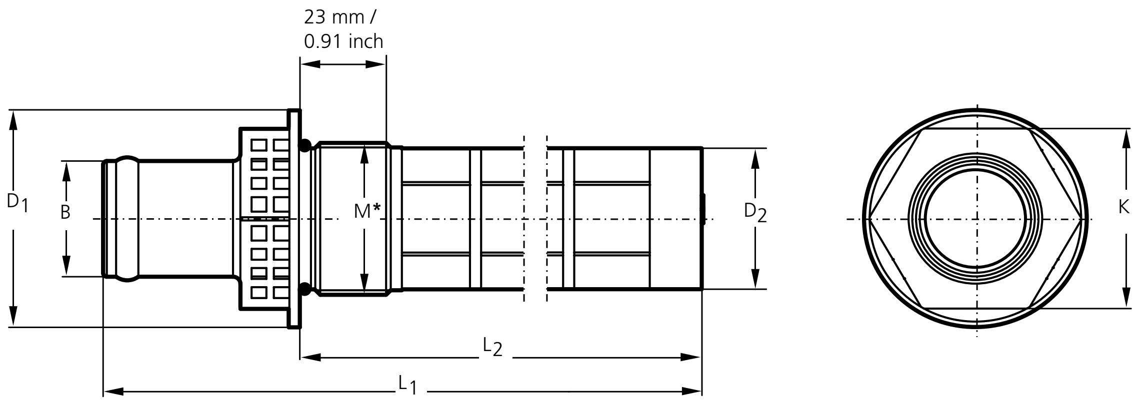
## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness | Filter surface | Connection B | Connection M* | Diameter $D_1$ | Diameter $D_2$ | Lenght $L_1$ | Lenght $L_2$ | Dimension K | Symbol | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | µm | cm² | mm | | mm | mm | mm | mm | mm | | kg |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| S0.0426-02 | 30 | **D1**/1 | 135 | 115 | 32.0 | M42 x 2 | 60 | 39 | 251 | 198 | AF 50 | 1 | 0.09 |
| S0.0426-13 | 60 | **D1**/2 | 280 | 115 | 32.0 | M42 x 2 | 60 | 39 | 251 | 198 | AF 50 | 1 | 0.09 |
| | | | | | | | | | | | | | |
| S0.0638-01 | 80 | **D1**/3 | 135 | 320 | 60.5 | M64 x 2 | 85 | 55 | 370 | 290 | AF 65 | 1 | 0.17 |
| S0.0638-03 | 160 | **D1**/4 | 280 | 320 | 60.5 | M64 x 2 | 85 | 55 | 370 | 290 | AF 65 | 1 | 0.17 |

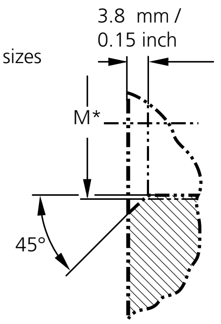
| | gpm | | µm | inch² | inch | | inch | inch | inch | inch | mm | | lbs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| S0.0426-02 | 7.9 | **D1**/1 | 135 | 18 | 1.3 | M42 x 2 | 2.4 | 1.5 | 9.9 | 7.8 | AF 50 | 1 | 0.20 |
| S0.0426-13 | 15.9 | **D1**/2 | 280 | 18 | 1.3 | M42 x 2 | 2.4 | 1.5 | 9.9 | 7.8 | AF 50 | 1 | 0.20 |
| | | | | | | | | | | | | | |
| S0.0638-01 | 21.1 | **D1**/3 | 135 | 50 | 2.4 | M64 x 2 | 3.3 | 2.2 | 14.6 | 11.4 | AF 65 | 1 | 0.37 |
| S0.0638-03 | 42.3 | **D1**/4 | 280 | 50 | 2.4 | M64 x 2 | 3.3 | 2.2 | 14.6 | 11.4 | AF 65 | 1 | 0.37 |

**Remarks:**
The filters listed in this chart are standard filters. If modifications are required we kindly ask for your request.

## Dimensions



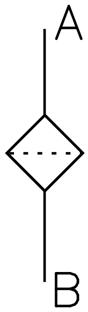

Recommended port sizes



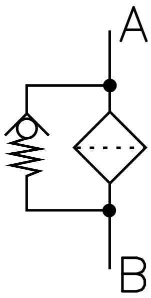

*The thread dimensions do not exactly conform to the DIN ISO standard thread (functioning with the DIN ISO standard thread is guaranteed)

## Symbols

1




2




## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

# AS 010 · AS 025 · AS 040 · AS 060 · AS 080 · AS 100 · AS 150

In-tank mounting · Connection up to G2½ · Nominal flow rate up to 350 l/min / 92.5 gpm

Suction Filter AS 080

## Description

### Application

In the suction line of pumps of hydraulic or lubricating circuits.

### Performance features

*Protection against malfunction:*
By full-flow filtration in the suction line, particularly the pumps are protected from coarse dirt particles that have remained in the system after manufacture or repair, or enter the system when it is filled with oil.

### Special features

The robust construction with end caps, inner core and mesh screen material, all out of metal, offers the following advantages:

- maximum reliability at increased operating temperatures
- enormous shock and vibration resistance

### Construction

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

- large filter surfaces
- low pressure drop
- long service life

### Filter maintenance

- Cleaning in ultrasonic bath for a few minutes.
  As an alternative, put suction filter in cleaning agent for approx. 15 minutes and remove dirt from the outside using a brush.
- Then flush with fresh cleaning fluid from the inside to the outside.
- Blow out with compressed air from the inside to the outside.

In any case, be careful that no dirt enters the inner side (clean oil side) of the suction filter.

## Characteristics

### Nominal flow rate

Up to 350 l/min / 92.5 gpm (see Selection Chart, column 2).
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- pressure drop $\Delta p$ — < 0.035 bar at $\nu$ = 35 mm²/s; < 0.507 psi at $\nu$ = 162 SUS
- closed by-pass valve at $\nu$ — ≤ 200 mm²/s / 927 SUS
- flow velocity in the connection lines — ≤ 1.5 m/s / 4.9 ft/s

### Connection

Threaded ports according to ISO 228 or DIN 13.
Sizes see Selection Chart, column 7,
(other port threads on request).

### Filter fineness

100 µm

### 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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

### Materials

- AS 010-00 / AS 025-01 / AS 040-01 / AS 060-01 / AS 150-01
  end caps out of steel,
  support mesh out of steel, zinc plated,
  filter mesh out of stainless steel (1.4301)
- AS 080-01 / AS 100-01
  end cap with hexagon out of aluminum,
  bottom end cap out of steel,
  support mesh out of steel, zinc plated,
  filter mesh out of stainless steel (1.4301)
- AS 040-71
  end caps out of steel,
  filter mesh out of stainless steel (1.4301)
- AS 080-81 / AS 100-81
  end cap with hexagon out of aluminum,
  bottom end cap out of steel,
  filter mesh out of stainless steel (1.4301)

### Viscosity at nominal flow rate

- $\nu$ < 60 mm²/s / 280 SUS at operating temperature
- start-up viscosity $\nu_{max}$ equivalent to the permitted pump inlet pressure (refer to diagram D), $\Delta p$ to be determined as a function of the viscosity (take pressure loss in connection lines into account!).

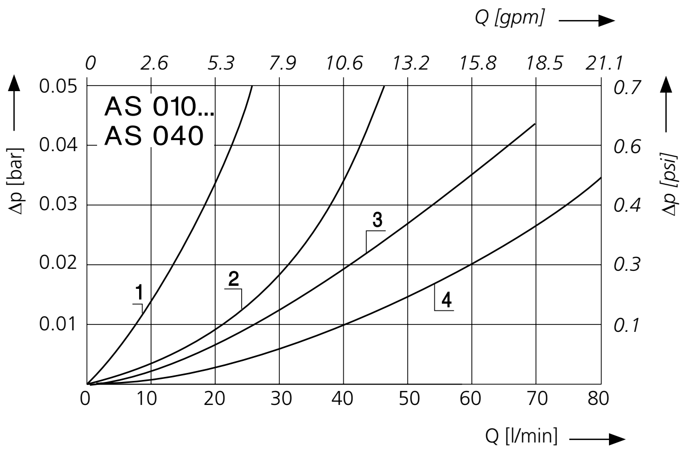
### Mounting position

Optional; versions equipped with bypass valve preferably in horizontal position.
Under all operating conditions (min. oil level, max. inclination) the suction must occur under the oil level.

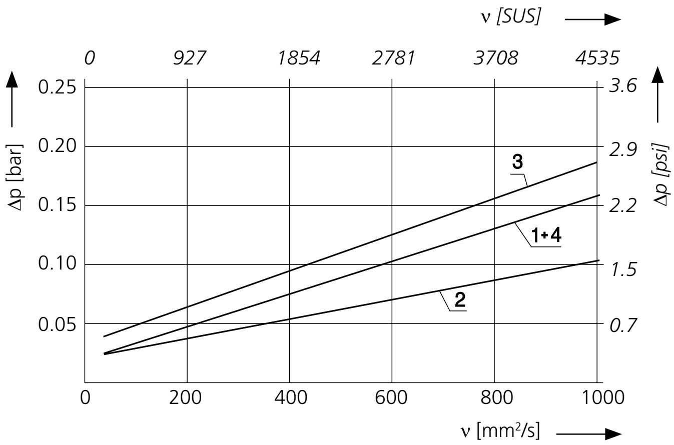
## Diagrams

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

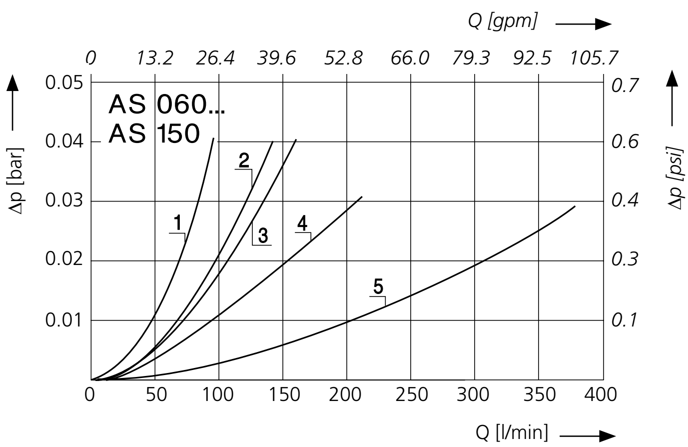
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS



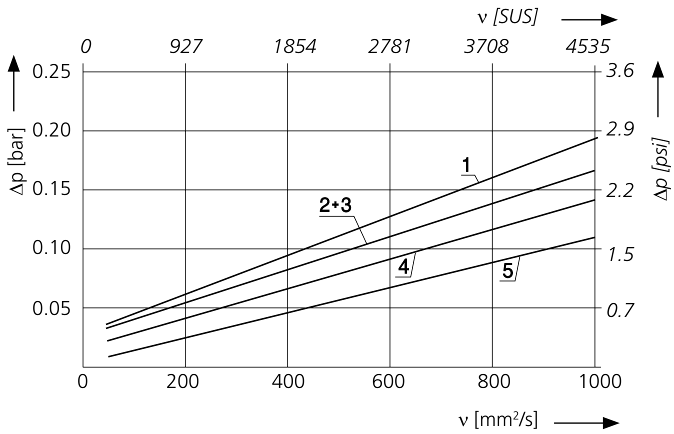

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS




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



## Selection Chart

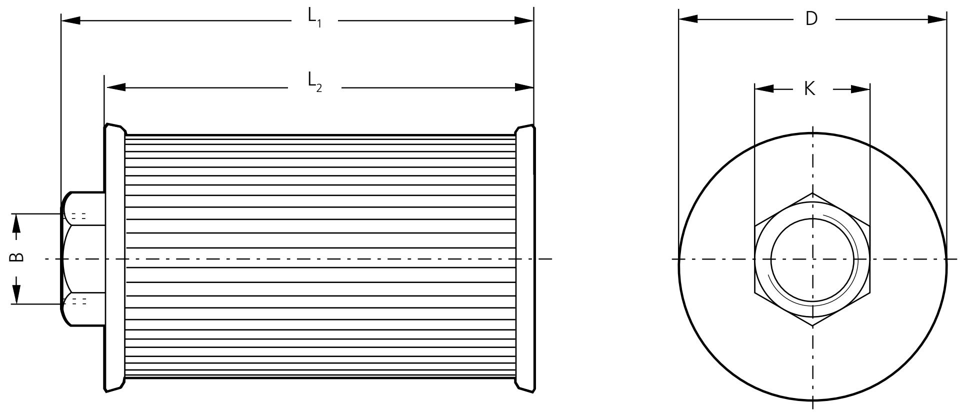
| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness | Filter surface | Cracking pressure of by-pass | Connection B | Connection D | Length $L_1$ | Length $L_2$ | Dimension K | Symbol | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | µm | cm² | bar | | mm | mm | mm | mm | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| AS 010-00 | 15 | **D1**/1 | 100 | 155 | - | G½ | 45 | 82 | 60 | AF 27 | 1 | 0.13 | - |
| AS 025-01 | 35 | **D1**/2 | 100 | 420 | - | G¾ | 69.5 | 91 | 75 | AF 36 | 1 | 0.24 | - |
| AS 040-01 | 60 | **D1**/4 | 100 | 650 | - | G1 | 69.5 | 133 | 117 | AF 41 | 1 | 0.30 | - |
| AS 040-71 | 60 | **D1**/3 | 100 | 650 | -0.3 | G1 | 69.5 | 133 | 117 | AF 41 | 2 | 0.30 | - |
| AS 060-01 | 90 | **D2**/1 | 100 | 1030 | - | G1¼ | 70 | 205 | 185 | AF 50 | 1 | 0.42 | - |
| AS 080-01 | 120 | **D2**/2 | 100 | 1280 | - | G1½ | 100 | 182 | 165 | AF 70 | 1 | 0.50 | - |
| AS 080-81 | 120 | **D2**/2 | 100 | 1400 | -0.3 | G1½ | 100 | 182 | 165 | AF 70 | 2 | 0.50 | - |
| AS 100-01 | 200 | **D2**/4 | 100 | 2300 | - | G2 | 100 | 213 | 196 | AF 70 | 1 | 0.60 | - |
| AS 100-81 | 150 | **D2**/3 | 100 | 1750 | -0.3 | G2 | 100 | 213 | 196 | AF 70 | 2 | 0.60 | - |
| AS 150-01 | 350 | **D2**/5 | 100 | 2300 | - | G2½ | 150 | 191 | 165 | Ø 82 | 1 | 1.40 | - |

| | gpm | | µm | inch² | psi | | inch | inch | inch | mm | | lbs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| AS 010-00 | 4.0 | **D1**/1 | 100 | 24 | - | G½ | 1.8 | 3.2 | 2.4 | AF 27 | 1 | 0.29 | - |
| AS 025-01 | 9.2 | **D1**/2 | 100 | 65 | - | G¾ | 2.7 | 3.6 | 3 | AF 36 | 1 | 0.53 | - |
| AS 040-01 | 15.9 | **D1**/4 | 100 | 101 | - | G1 | 2.7 | 5.2 | 4.6 | AF 41 | 1 | 0.66 | - |
| AS 040-71 | 15.9 | **D1**/3 | 100 | 101 | -4.4 | G1 | 2.7 | 5.2 | 4.6 | AF 41 | 2 | 0.66 | - |
| AS 060-01 | 23.8 | **D2**/1 | 100 | 160 | - | G1¼ | 2.8 | 8.1 | 7.3 | AF 50 | 1 | 0.93 | - |
| AS 080-01 | 31.7 | **D2**/2 | 100 | 198 | - | G1½ | 3.9 | 7.2 | 6.5 | AF 70 | 1 | 1.10 | - |
| AS 080-81 | 31.7 | **D2**/2 | 100 | 217 | -4.4 | G1½ | 3.9 | 7.2 | 6.5 | AF 70 | 2 | 1.10 | - |
| AS 100-01 | 52.8 | **D2**/4 | 100 | 357 | - | G2 | 3.9 | 8.4 | 7.7 | AF 70 | 1 | 1.32 | - |
| AS 100-81 | 39.6 | **D2**/3 | 100 | 271 | -4.4 | G2 | 3.9 | 8.4 | 7.7 | AF 70 | 2 | 1.32 | - |
| AS 150-01 | 92.5 | **D2**/5 | 100 | 357 | - | G2½ | 5.9 | 7.5 | 6.5 | Ø 82 | 1 | 3.09 | - |

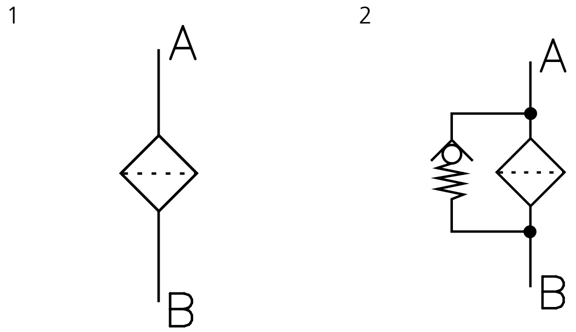
**Remarks:**

The filters listed in this chart are standard filters. Other designs, e.g. other filter finenesses, available on request.

## Dimensions




## Symbols




## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

Suction Filters

# LS 025 · LS 035

In-line mounting · Connection up to G¾ / -12 SAE · Nominal flow rate up to 33 l/min / 8.7 gpm

Suction Filter LS 025

## Description

### Application

To be installed in the suction line of the pumps of hydraulic systems resp. upstream of the charge pumps of hydrostatic drives.

### Performance features

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

*Protection against malfunction:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

### Filter elements

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

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

### 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: | Aluminum alloy |
| Filter bowl: | Polyamide, GF reinforced |
| Seals: | NBR (FPM on request) |
| Filter media: | Paper-cellulose web, impregnated with resin |

### Accessories

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

## Characteristics

### Nominal flow rate

Up to 33 l/min / 8.7 gpm (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- Closed by-pass valve at $\nu \leq 200\ mm^2/s$ / 927 SUS
- Element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- Flow velocity in the connection lines ≤ 1.5 m/s / 4.9 ft/s

If units not equipped with a bypass valve are used in hydrostatic drives, the recommendations regarding their technical application given on catalogue sheet 10.310 should be observed.

### Connection

Threaded ports according to

- ISO 228 or DIN 13
- SAE standard J514

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

### Filter fineness

50 µm(c)
ß-values according 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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

### Viscosity at nominal flow rate

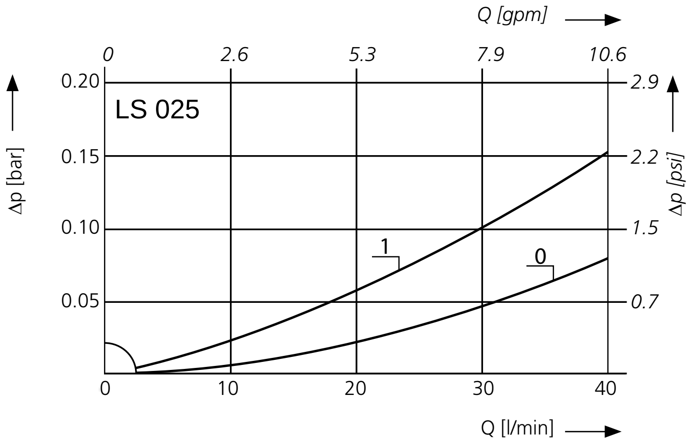
- at operating temperature: $\nu < 60\ mm^2/s$ / 280 SUS
- start-up viscosity:
  Determine $\nu_{max}$, observing the permissible pressure at the pump inlet according to diagram D; determine $\Delta p$ as a function of the viscosity (take into account the pressure loss in the connecting lines!).
- at 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

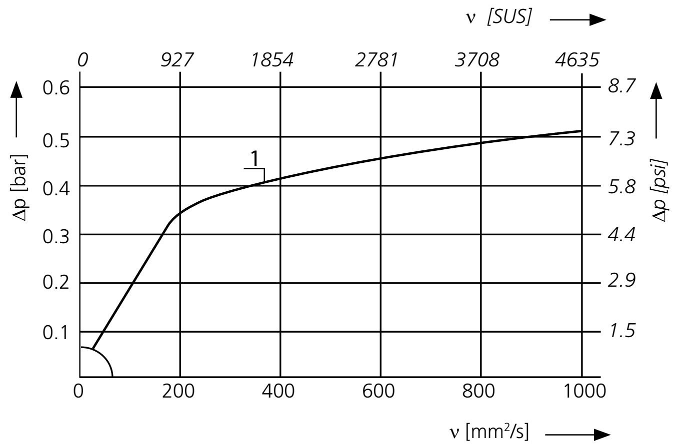
Vertical mounting to be preferred, filter head on top.

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

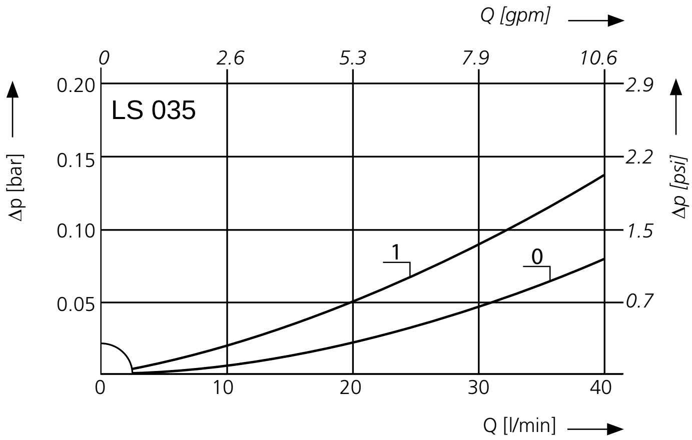
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



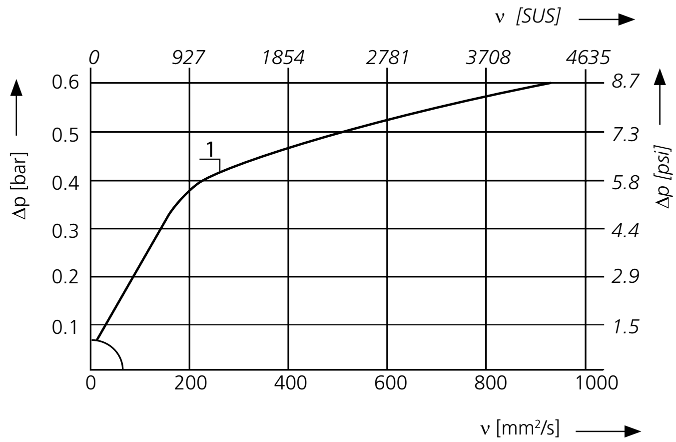

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

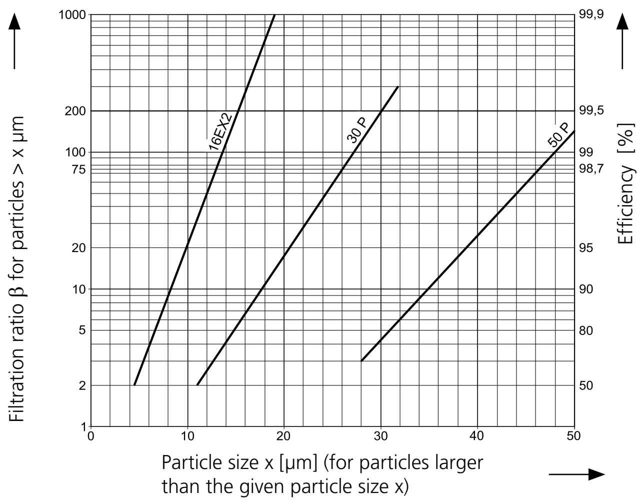



Pressure drop as a function of the **kinematic viscosity** at nominal flow




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

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX 2 and Paper elements:**

16EX2 = $\bar{\beta}_{16\,(c)}$ = 200 EXAPOR®MAX 2
30P = $\bar{\beta}_{30\,(c)}$ = 200 Paper
50P = $\bar{\beta}_{50(c)}$ = 200 Paper

Based on the structure of the filter media of the 30P and 50P paper elements, deviations from the printed curves are quite probable.

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189.

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

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt holding capacity Filter surface in ( ) | Connection A/B | Cracking pressure of by-pass | Symbol | Replacement filter element Part No | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| LS 025-152 | 25 | **D1**/1 | 50P | 15 | G¾ | -0.3 | 2 | P3.0714-02 | 0.9 | - |
| LS 035-152 | 33 | **D2**/1 | 50P | 19 | G¾ | -0.3 | 2 | P3.0717-02 | 1.0 | - |

| | gpm | | | g | SAE | psi | | | lbs | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| LS 025-752 | 6.6 | **D1**/1 | 50P | 15 | -12* | -4.4 | 2 | P3.0714-02 | 2.0 | - |
| LS 035-752 | 8.7 | **D2**/1 | 50P | 19 | -12* | -4.4 | 2 | P3.0717-02 | 2.2 | - |

*Corresponds to 1 1/16-12 UN-2B

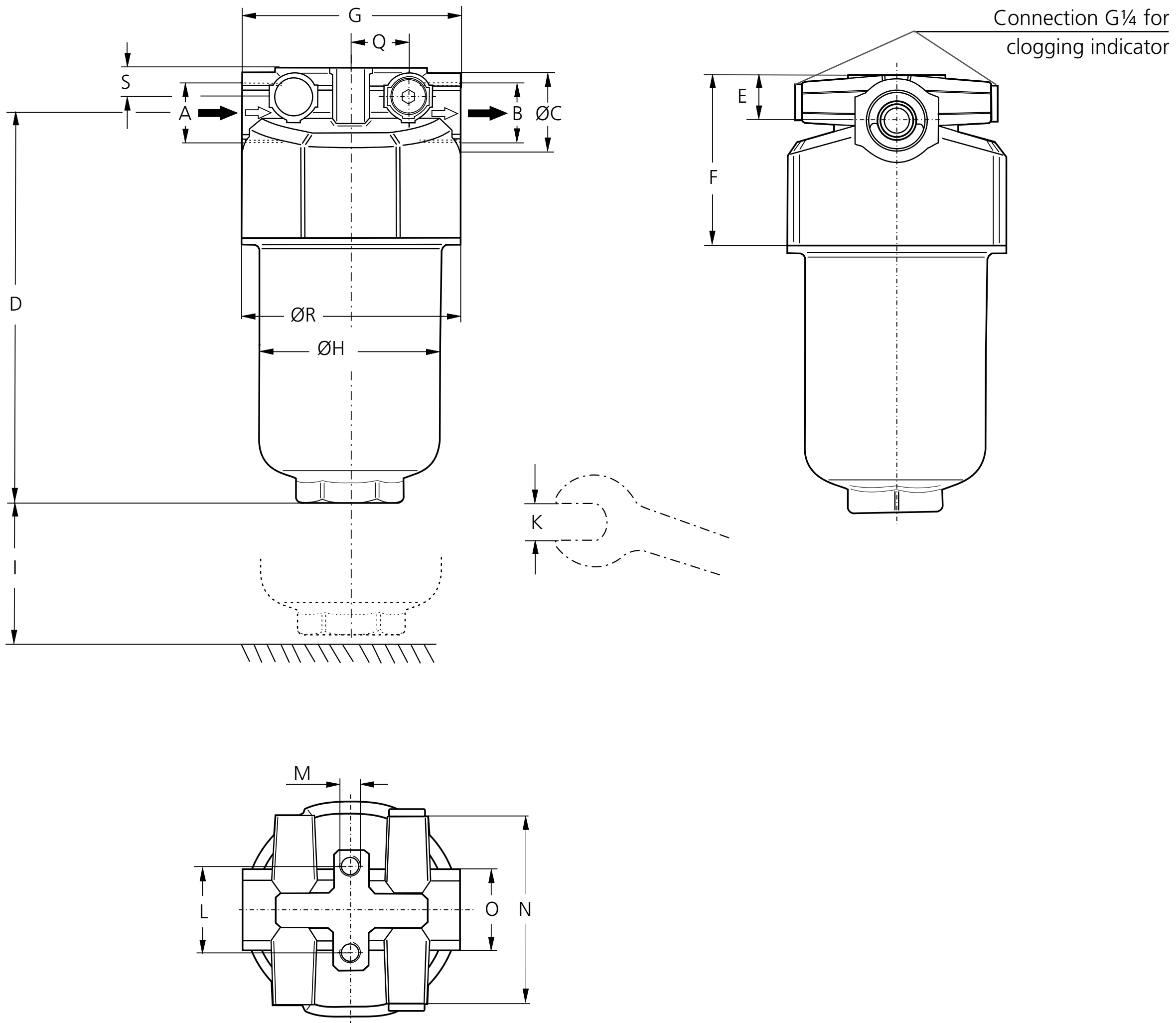
All filters are delivered with a plugged clogging indicator connection G¼. As clogging indicators either manometers or vacuum switches can be used.

**For the appropriate clogging indicator see catalog sheet 60.20.**

**Remarks:**

- The start of the red area respectively the actuating pressure of the vacuum switch has always to be higher than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- Clogging indicators are optional and always delivered detached from the filter.
- The filters listed in this chart are standard filters. Other designs available on request.

## Dimensions




## Measurements in mm

| Type | A | B | C | D | E | F | G | H | I | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LS 025 | G¾ | G¾ | 35 | 178 | 20 | 74 | 95 | 80 | 70 | AF 41 | 38.1 |
| LS 035 | G¾ | G¾ | 35 | 212 | 20 | 74 | 95 | 80 | 70 | AF 41 | 38.1 |

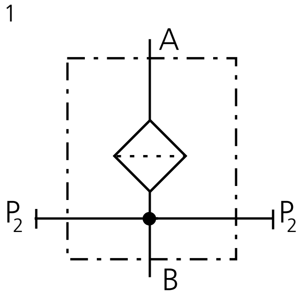
| Type | M<br>Ø / depth | N | O | Q | R | S |
|---|---|---|---|---|---|---|
| LS 025 | M8 / 15 | 82 | AF 36 | 25 | 95 | 12 |
| LS 035 | M8 / 15 | 82 | AF 36 | 25 | 95 | 12 |

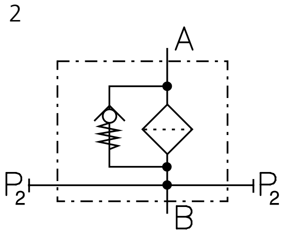
## Measurements in inch

| Type | A | B | C | D | E | F | G | H | I | K<br>mm | L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LS 025 | -12 SAE | -12 SAE | 1.38 | 7.01 | 0.79 | 2.91 | 3.74 | 3.15 | 2.76 | AF 41 | 1.50 |
| LS 035 | -12 SAE | -12 SAE | 1.38 | 8.35 | 0.79 | 2.91 | 3.74 | 3.15 | 2.76 | AF 41 | 1.50 |

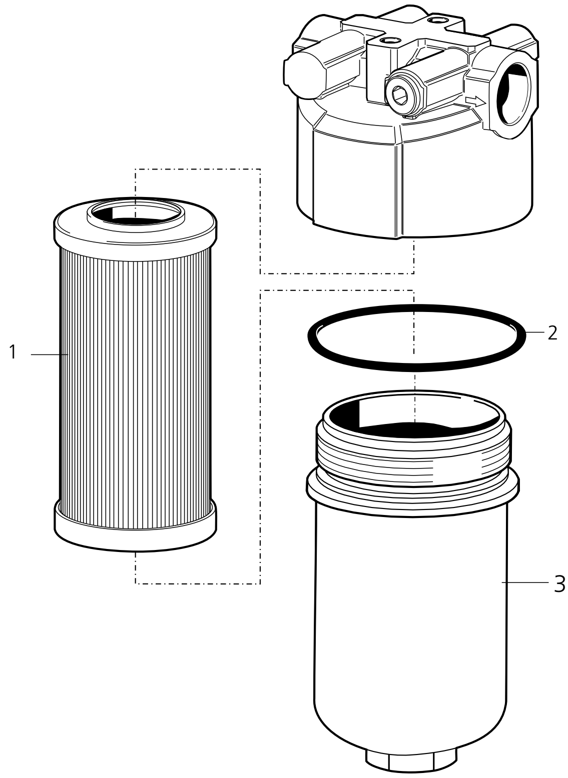
| Type | M<br>Ø / depth | N | O<br>mm | Q | R | S |
|---|---|---|---|---|---|---|
| LS 025 | M8 / 0.6 | 3.23 | AF 36 | 0.98 | 3.74 | 0.47 |
| LS 035 | M8 / 0.6 | 3.23 | AF 36 | 0.98 | 3.74 | 0.47 |

## Symbols




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Replacement filter element | s. Chart / col. 9 |
| 2 | O-ring<br>82.14 x 3.53 mm<br>3.23 x 0.14 inch | N007.0824 |
| 3 | Filter bowl LS 025 | E 068.0101 |
| 3 | Filter bowl LS 035 | E 068.0102 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

ARGO HYTOS

Suction Filters - Lightline

# SFL 025 · SFL 035

In-line mounting · Connection G¾ / -12 SAE · Nominal flow rate up to 40 l/min / 10.6 gpm

M

In-line Suction Filter SFL 025

## Description

### Application

To be installed in the suction line of the pumps of hydraulic systems resp. upstream of the charge pumps of hydrostatic drives.

### Filter maintenance

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

### Materials

| | |
|---|---|
| Filter head: | Aluminum alloy |
| Filter bowl: | Polyamide, GF reinforced |
| Seals: | NBR (FPM on request) |
| Filter media: | Paper - cellulose web, impregnated with resin |

### Accessories

Electrical and optical clogging indicators are available.
For technical data and dimensions see datasheet 60.20.

## Characteristics

### Nominal flow rate

Up to 40 l/min / 10.6 gpm (see Selection Chart, page 3).
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- Closed by-pass valve at $\nu \leq 150$ mm²/s / 695 SUS
- Element service life > 500 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- Flow velocity in the connection lines ≤ 2 m/s / 6.5 ft/s

### Connection

Threaded ports according to ISO 228 or DIN 13 and SAE standard J514. Sizes see Selection Chart, page 3, (other port threads on request).

### Filter fineness

50 µm(c)
ß-values according to ISO 16889 (see diagrams)

### Hydraulic fluids

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

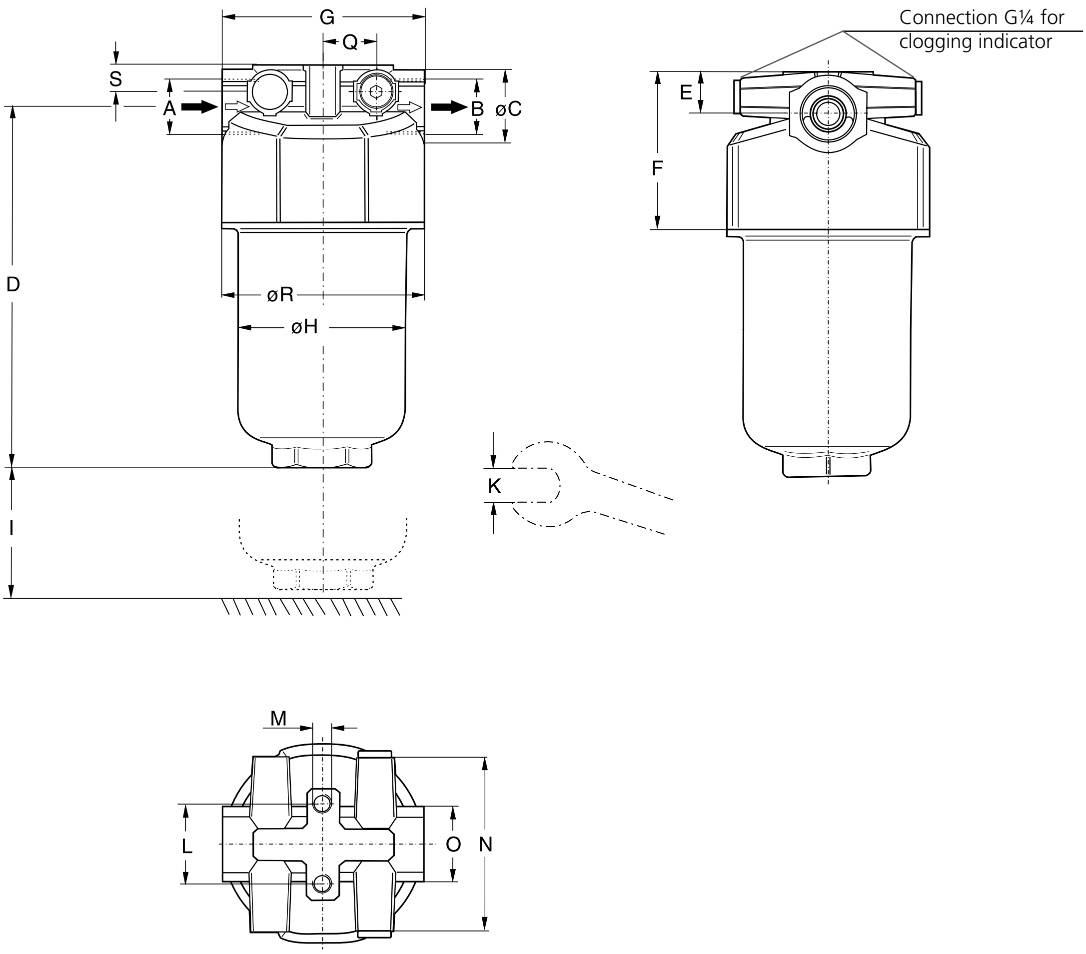
### Temperature range

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

### Mounting position

Vertical mounting to be preferred, filter head on top.

## Dimensions




## Measurements in mm / inch

| Type [mm] | A | B | C | D | E | F | G | H | I | K | L | M Ø/depth | N | O | Q | R | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SFL 025 | G¾ | G¾ | 35 | 178 | 20 | 74 | 95 | 80 | 70 | AF 41 | 38.1 | M8 / 15 | 82 | AF 36 | 25 | 95 | 12 |
| SFL 035 | G¾ | G¾ | 35 | 212 | 20 | 74 | 95 | 80 | 70 | AF 41 | 38.1 | M8 / 15 | 82 | AF 36 | 25 | 95 | 12 |

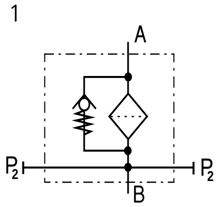
| Type [inch] | A | B | C | D | E | F | G | H | I | K mm | L | M Ø/depth | N | O mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SFL 025 | -12 SAE* | -12 SAE* | 1.38 | 7.01 | 0.79 | 2.91 | 3.74 | 3.15 | 1.57 | AF 41 | 1.50 | M8 / 15 | 3.23 | AF 36 |
| SFL 035 | -12 SAE* | -12 SAE* | 1.38 | 8.35 | 0.79 | 2.91 | 3.74 | 3.15 | 1.57 | AF 41 | 1.50 | M8 / 15 | 3.23 | AF 36 |

| Type [inch] | Q | R | S |
|---|---|---|---|
| SFL 025 | 0.98 | 3.74 | 0.47 |
| SFL 035 | 0.98 | 3.74 | 0.47 |

*Corresponds to $1^{1}/_{16}$ - 12 UN-2B

## Symbol

1



## Ordering Code

### Filter assembly

**SFL - ___ - ___ - P3 - DM - 100**

| Type of filter | Code |
|---|---|
| Suction Filter, In-line | SFL |

| Flow rate, max. | Code |
|---|---|
| 30 l/min / 7.9 gpm | 025 |
| 40 l/min / 10.6 gpm | 035 |

| Connection thread | Code |
|---|---|
| G¾ | GC |
| -12 SAE | UC |

| Filter fineness | Code |
|---|---|
| 50 µm (50P) | P3 |

| Air breather | Code |
|---|---|
| not available | 100 |

| Bypass setting | Code |
|---|---|
| -0.3 bar / -4.4 psi | DM |

Filters delivered with 2 plugged connections G¼ for clogging indicators.

**Order example:**
SFL - 025 - GC - P3 - DM - 100

### Spare filter element

**P 3 . 07 ___ - 0 2**

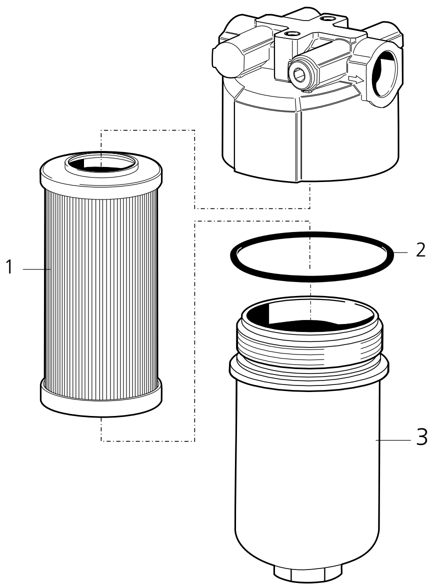
| Filter media | Code |
|---|---|
| Paper | P |

| Length | Code |
|---|---|
| for SFL 025 | 14 |
| for SFL 035 | 17 |

| Filter fineness | Code |
|---|---|
| 50P | 2 |

**Order example:**
P3.0714-02

## Spare parts



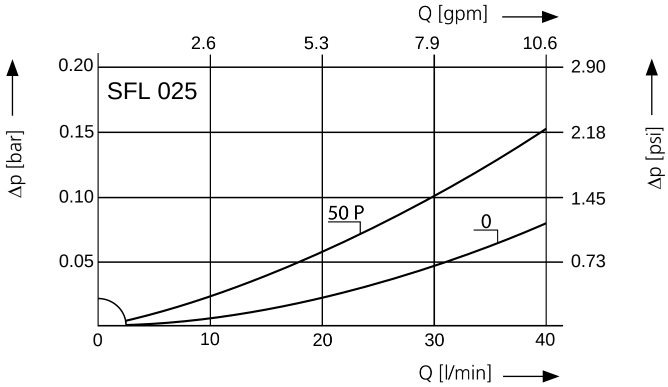

| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Filter element | see above |
| 2 | O-ring<br>82.14 x 3.53 mm<br>3.23 x 0.14 inch | N007.0824 |
| 3 | Filter bowl SFL 025 | E 068.0101 |
| 3 | Filter bowl SFL 035 | E 068.0102 |

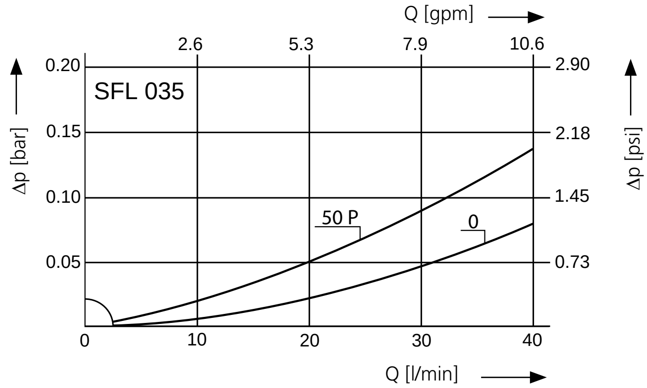
The functions of the complete filters as well as the outstanding features of the filter elements assured by ARGO-HYTOS can only be guaranteed if original ARGO-HYTOS spare parts are used.

## Diagrams

### Δp-curves for complete filters

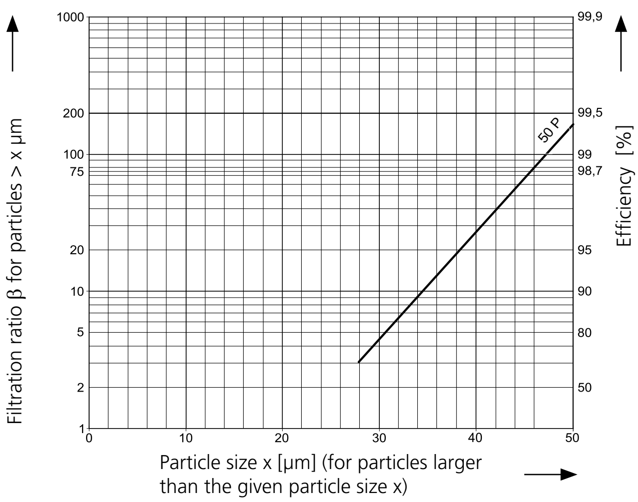
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = housing empty)




### Filter fineness curves

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®Light and Paper elements:**

50 P = $\bar{\beta}_{50(c)}$ = 200 Paper

Based on the structure of the filter media of the 50P paper elements, deviations from the printed curves are quite probable.

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189.

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

## Quality Assurance

### Quality management according to DIN EN ISO 9001

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

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

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

## Suction Filters

# LS 040 · LS 075

In-line mounting · Connection up to G1¼ / -20 SAE · Nominal flow rate up to 75 l/min / 19.8 gpm

M

In-line Suction Filter LS 075

## Description

### Application

To be installed in the suction line of the pumps of hydraulic systems resp. upstream of the charge pumps of hydrostatic drives.

### Performance features

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

*Protection against malfunction:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

### Filter elements

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

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

### 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: | Aluminum alloy |
| Filter bowl: | Polyamide, GF reinforced |
| Seals: | NBR (FPM on request) |
| Filter media: | Paper-cellulose web, impregnated with resin |

### Accessories

Electrical and / or optical clogging indicators are available.
Dimensions and technical data see catalog sheet 60.20.

## Characteristics

### Nominal flow rate

Up to 75 l/min / 19.8 gpm (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- Closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- Element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- Flow velocity in the connection lines ≤ 1.5 m/s / 4.9 ft/s.

If units not equipped with a bypass valve are used in hydrostatic drives, the recommendations regarding their technical application given on catalog sheet 10.310 should be observed.

### Connection

Threaded ports according to

- ISO 228 or DIN 13
- SAE standard J514

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

### Filter fineness

50 µm(c)
ß-values according 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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

### Viscosity at nominal flow rate

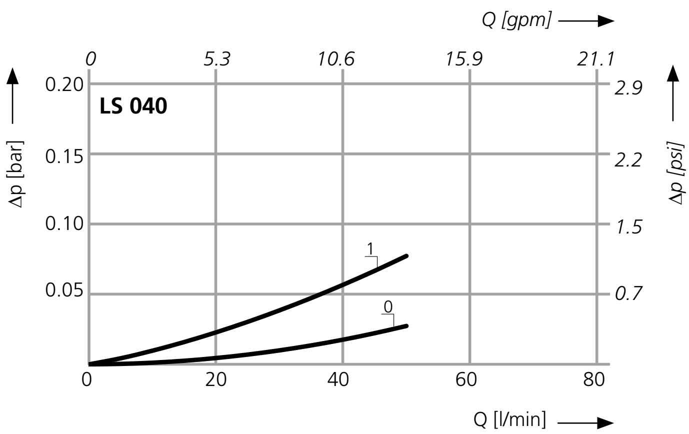
- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- start-up viscosity:
  Determine $\nu_{max}$, observing the permissible pressure at the pump inlet according to diagram D; determine $\Delta p$ as a function of the viscosity (take into account the pressure loss in the connecting lines!).
- at initial 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

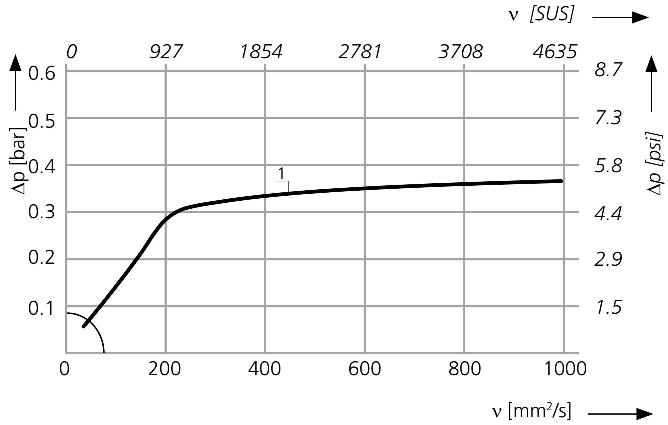
Vertical mounting to be preferred, filter head on top.

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

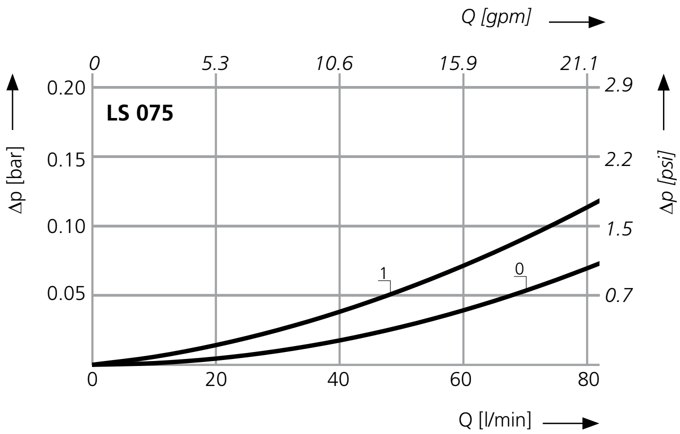
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



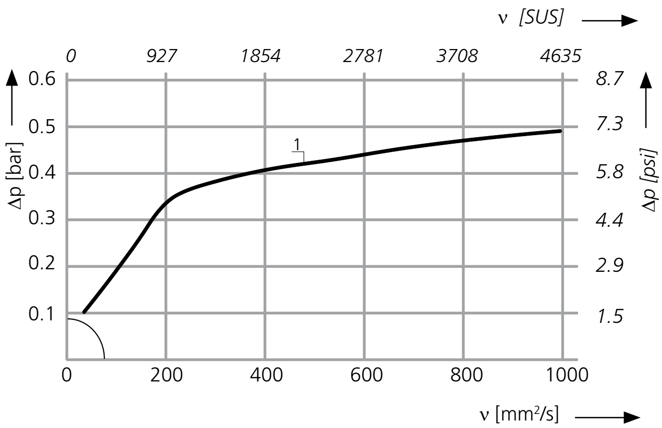

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

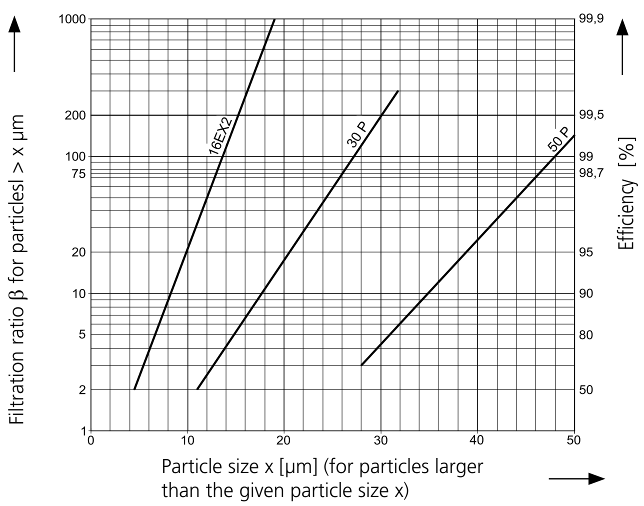



Pressure drop as a function of the **kinematic viscosity** at nominal flow




## Filter fineness curves in Selection Chart, column 4

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX 2 and Paper elements:**

16EX2 = $\bar{\beta}_{16(c)}$ = 200 EXAPOR®MAX 2
30P = $\beta_{30\,(c)}$ = 200 Paper
50P = $\beta_{50\,(c)}$ = 200 Paper

Based on the structure of the filter media of the 30P and 50P paper elements, deviations from the printed curves are quite probable.

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189.

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

## Selection Chart

| Part. No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt -holding capacity Filter surface in ( ) | Connection A/B | Cracking pressure of by-pass | Symbol | Replacement filter element Part. No. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| LS 040-152 | 40 | **D1**/1 | 50P | 40 | G1¼ | -0.3 | 2 | P3.1014-02 | 1.8 | - |
| | | | | | | | | | | |
| LS 075-152 | 75 | **D2**/1 | 50P | 77 | G1¼ | -0.3 | 2 | P3.1025-02 | 2.1 | - |

| | gpm | | | g | SAE | psi | | | lbs | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| LS 040-752 | 10.5 | **D1**/1 | 50P | 40 | -20* | -4.4 | 2 | P3.1014-02 | 4.0 | - |
| | | | | | | | | | | |
| LS 075-752 | 19.8 | **D2**/1 | 50P | 77 | -20* | -4.4 | 2 | P3.1025-02 | 4.6 | - |

*Corresponds to 1⅝-12 UN-2B

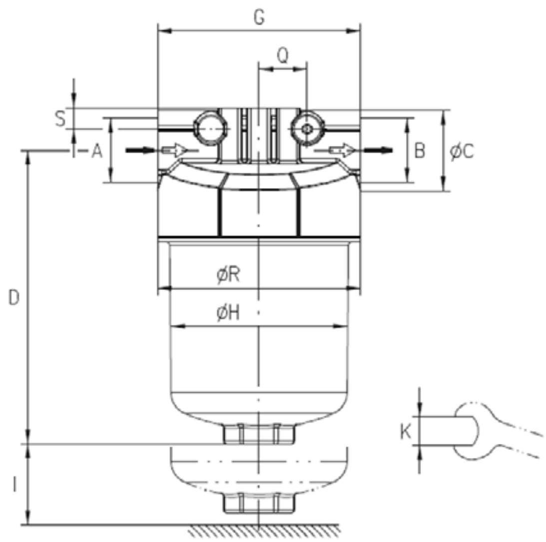
All filters are delivered with a plugged clogging indicator connection G¼.
As clogging indicators either manometers or vacuum switches can be used.

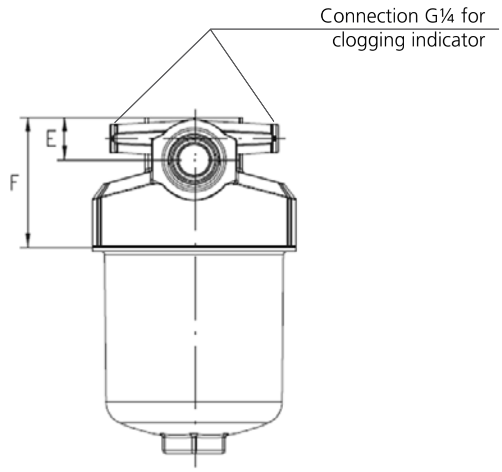
**For the appropriate clogging indicator see catalog sheet 60.20.**

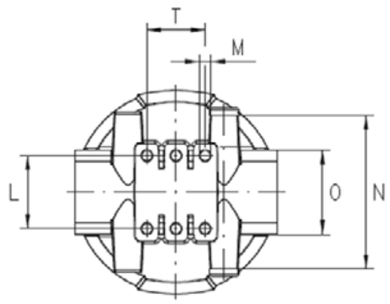
**Remarks:**

- The start of the red area respectively the actuating pressure of the vacuum switch has always to be higher than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- Clogging indicators are optional and always delivered detached from the filter.
- The filters listed in this chart are standard filters. Other designs available on request.

## Dimensions




## Measurements in mm

| Type | A | B | C | D | E | F | G | H | I | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LS 040 | G1¼ | G1¼ | 52 | 192 | 28 | 85 | 133 | 117 | 60 | AF 41 | 47.6 |
| LS 075 | G1¼ | G1¼ | 52 | 302 | 28 | 85 | 133 | 117 | 60 | AF 41 | 47.6 |

| Type | M<br>Ø / depth | N | O | Q | R | S | T | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LS 040 | M8 / 15 | 100 | AF 55 | 31.5 | 133 | 14 | 38.1 | | | | |
| LS 075 | M8 / 15 | 100 | AF 55 | 31.5 | 133 | 14 | 38.1 | | | | |

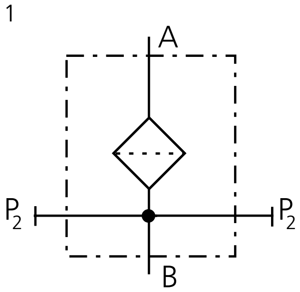
## Measurements in inch

| Type | A<br>SAE | B<br>SAE | C | D | E | F | G | H | I | K<br>mm | L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LS 040 | -20 | -20 | 2.05 | 7.56 | 1.10 | 3.35 | 5.24 | 4.61 | 2.36 | AF 41 | 1.87 |
| LS 075 | -20 | -20 | 2.05 | 11.89 | 1.10 | 3.35 | 5.24 | 4.61 | 2.36 | AF 41 | 1.87 |

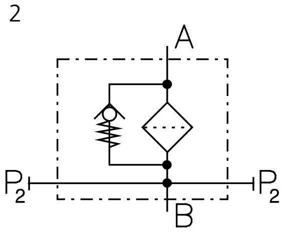
| Type | M<br>Ø / depth | N | O<br>mm | Q | R | S | T | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LS 040 | M8 / 0.6 | 3.94 | AF 55 | 1.24 | 5.24 | 0.55 | 1.50 | | | | |
| LS 075 | M8 / 0.6 | 3.94 | AF 55 | 1.24 | 5.24 | 0.55 | 1.50 | | | | |

## Symbols

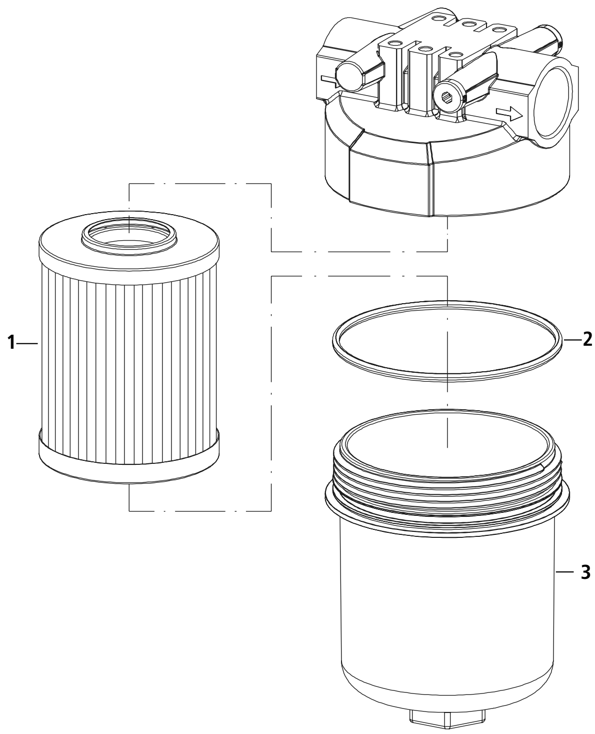
1




2




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Replacement filter element | see Chart / col. 9 |
| 2 | O-ring<br>115.00 x 4.50 mm<br>4.53 x 0.18 inch | N007.1155 |
| 3 | Filter bowl LS 040 | D 230.0102 |
| 3 | Filter bowl LS 075 | D 230.0101 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

Suction Filters - Lightline

# SFL 040 · SFL 075

In-line mounting · Connection G1¼ / -20 SAE · Nominal flow rate up to 90 l/min / 23.8 gpm

In-line Suction Filter SFL 075

## Description

### Application

To be installed in the suction line of the pumps of hydraulic systems resp. upstream of the charge pumps of hydrostatic drives.

### Filter maintenance

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

### Materials

| | |
|---|---|
| Filter head: | Aluminum alloy |
| Filter bowl: | Polyamide, GF reinforced |
| Seals: | NBR (FPM on request) |
| Filter media: | Paper - cellulose web, impregnated with resin |

### Accessories

Electrical and optical clogging indicators are available.
For technical data and dimensions see datasheet 60.20.

## Characteristics

### Nominal flow rate

Up to 90 l/min / 23.8 gpm (see Selection Chart, page 3).
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- Closed by-pass valve at $\nu \leq 150$ mm²/s / 695 SUS
- Element service life > 500 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- Flow velocity in the connection lines ≤ 2 m/s / 6.5 ft/s

### Connection

Threaded ports according to ISO 228 or DIN 13 and SAE standard J514. Sizes see Selection Chart, page 3,
(other port threads on request).

### Filter fineness

50 µm(c)
ß-values according to ISO 16889 (see diagrams)

### Hydraulic fluids

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

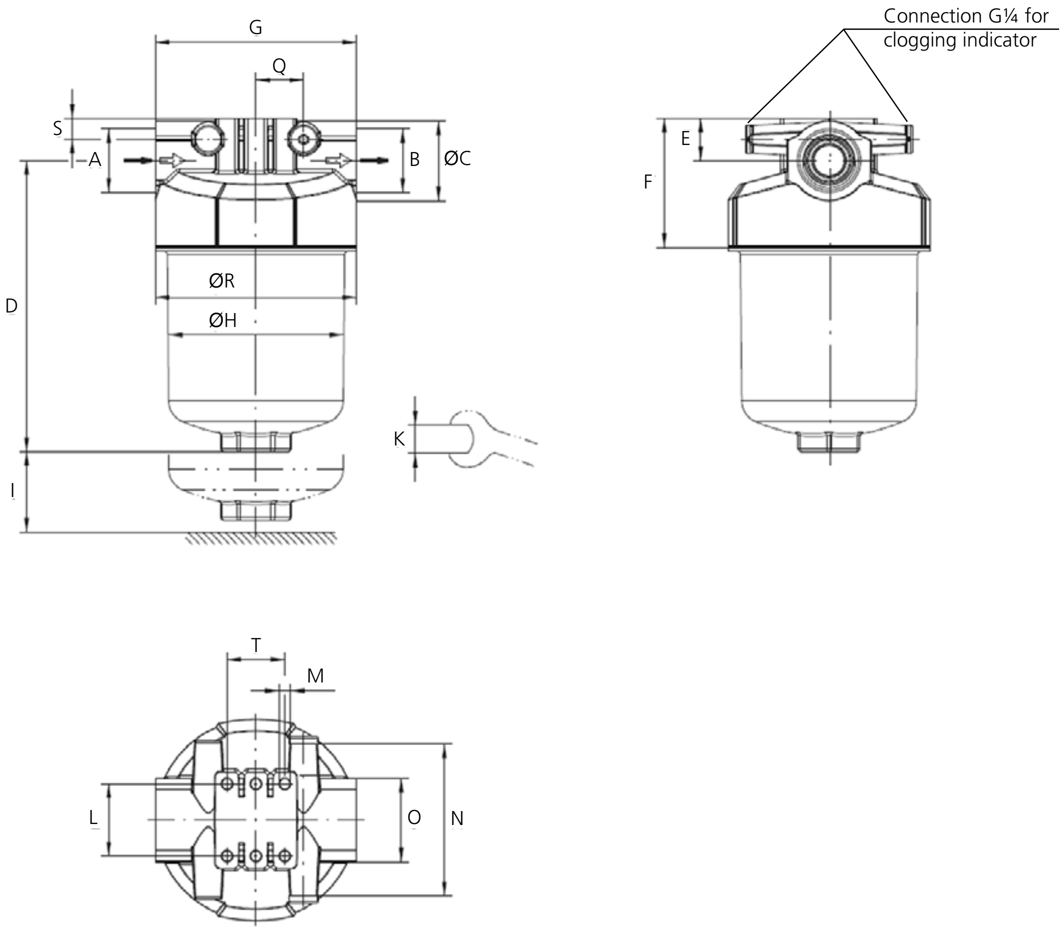
### Temperature range

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

### Mounting position

Vertical mounting to be preferred, filter head on top.

## Dimensions




## Measurements in mm / inch

| Type [mm] | A | B | C | D | E | F | G | H | I | K | L | M Ø/depth | N | O | Q | R | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SFL 040 | G1¼ | G1¼ | 52 | 192 | 28 | 85 | 133 | 117 | 60 | AF 41 | 47.6 | M8 / 15 | 100 | AF 55 | 31.5 | 133 | 14 | 38.1 |
| SFL 075 | G1¼ | G1¼ | 52 | 302 | 28 | 85 | 133 | 117 | 60 | AF 41 | 47.6 | M8 / 15 | 100 | AF 55 | 31.5 | 133 | 14 | 38.1 |

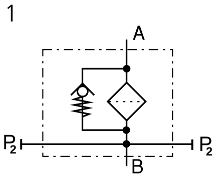
| Type [inch] | A | B | C | D | E | F | G | H | I | K mm | L | M Ø/depth | N | O mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SFL 040 | -20 SAE* | -20 SAE* | 2.05 | 7.56 | 1.10 | 3.35 | 5.24 | 4.61 | 2.36 | AF 41 | 1.87 | M8 / 15 | 3.94 | AF 55 |
| SFL 075 | -20 SAE* | -20 SAE* | 2.05 | 11.89 | 1.10 | 3.35 | 5.24 | 4.61 | 2.36 | AF 41 | 1.87 | M8 / 15 | 3.94 | AF 55 |

| Type [inch] | Q | R | S | T |
|---|---|---|---|---|
| SFL 040 | 1.24 | 5.24 | 0.55 | 1.50 |
| SFL 075 | 1.24 | 5.24 | 0.55 | 1.50 |

*Corresponds to 1$^{5}/_{8}$-12 UN-2B

## Symbol

1



## Ordering Code

### Filter assembly

**SFL - ___ - ___ - P3 - DM - 100**

| Type of filter | Code |
|---|---|
| Suction Filter, In-line | SFL |

| Flow rate, max. | Code |
|---|---|
| 50 l/min / 13.2 gpm | 040 |
| 90 l/min / 23.8 gpm | 075 |

| Connection thread | Code |
|---|---|
| G1¼ | GE |
| - 20 SAE | UE |

| Filter fineness | Code |
|---|---|
| 50 µm (50P) | P3 |

| Bypass setting | Code |
|---|---|
| -0.3 bar / -4.4 psi | DM |

| Air breather | Code |
|---|---|
| not available | 100 |

**Order example:**
SFL - 040 - GE - P3 - DM - 100

Filters delivered with 2 plugged connections G1¼ for clogging indicators.

### Spare filter element

**P 3 . 10 ___ - 0 2**

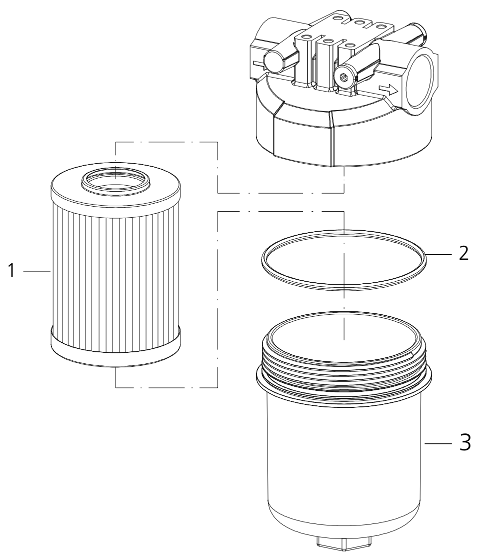
| Filter media | Code |
|---|---|
| Paper | P |

| Length | Code |
|---|---|
| for SFL 040 | 14 |
| for SFL 075 | 25 |

| Filter fineness | Code |
|---|---|
| 50P | 2 |

**Order example:**
P3.1014-02

## Spare parts



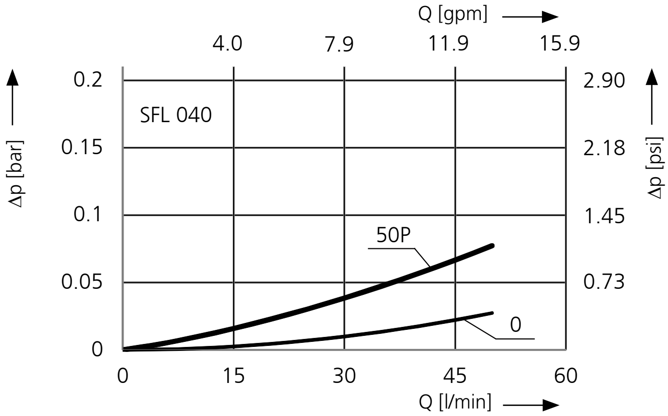

| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Filter element | see above |
| 2 | O-ring<br>115 x 4.5 mm<br>4.53 x 0.18 inch | N007.1155 |
| 3 | Filter bowl SFL 040 | D 230.0102 |
| 3 | Filter bowl SFL 075 | D 230.0101 |

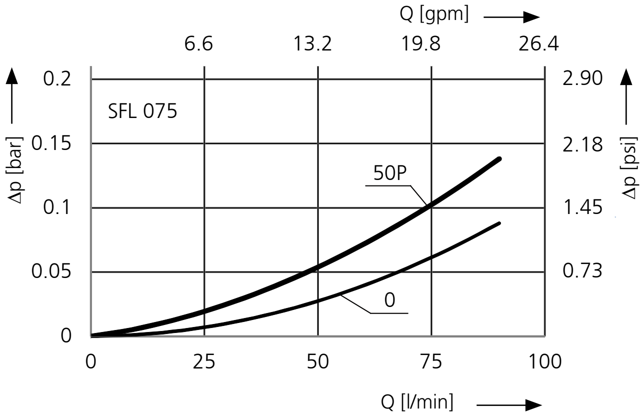
The functions of the complete filters as well as the outstanding features of the filter elements assured by ARGO-HYTOS can only be guaranteed if original ARGO-HYTOS spare parts are used.

## Diagrams

### Δp-curves for complete filters

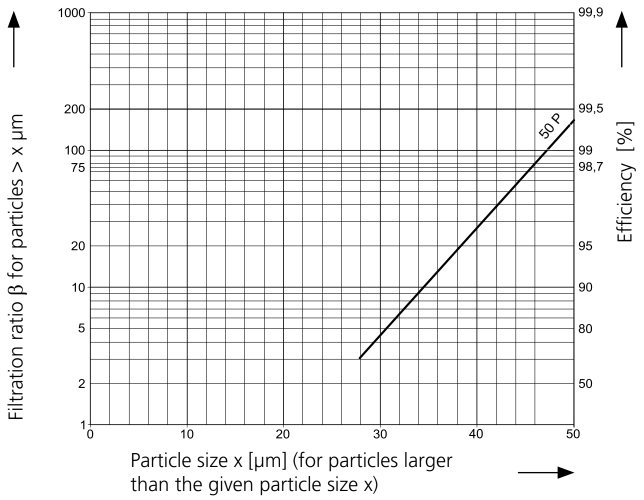
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = housing empty)




### Filter fineness curves

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®Light and Paper elements:**

50 P = $\overline{\beta}_{50(c)}$ = 200 Paper

Based on the structure of the filter media of the 50P paper elements, deviations from the printed curves are quite probable.

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189.

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

## Quality Assurance

### Quality management according to DIN EN ISO 9001

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

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

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

ARGO HYTOS



# ES 075

Tank top mounting · Connection up to G1¼ / -20 SAE · Nominal flow rate up to 45 l/min / 11.9 gpm

Suction Filter ES 075

## Description

### Application

To be installed in the suction line of the pumps of hydraulic systems resp. upstream of the charge pumps of hydrostatic drives.

### Performance features

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

*Protection against malfunction:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

### Special features

- Bypass valve (optionally):
  The location close to the suction inlet prevents dirt particles retained by the filter element from entering into the clean oil side.
- Foot valve:
  When the screw-on cap is removed for maintenance, the foot valve closes automatically. This makes it possible to service the filter even if it is submerged below the oil level in a full tank.

### Filter elements

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

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

### Filter maintenance

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

### Materials

| | |
|---|---|
| Screw-on cap: | Polyester, GF reinforced |
| Filter head: | Aluminum alloy |
| Filter bowl: | Polyamide, GF reinforced |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web<br>Paper – cellulose web, impregnated with resin |

### Accessories

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

## Characteristics

### Nominal flow rate

Up to 45 l/min / 11.9 gpm (see Selection Chart, column 2).
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed bypass valve at $\nu \leq 200$ mm²/s / 927 SUS
- Element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume.
- Flow velocity in the connection lines ≤ 1.5 m/s / 4.9 ft/s

If units, not equipped with a bypass valve, are used in hydrostatic drives, the recommendations regarding their technical application given on catalog sheet 10.310 should be observed.

### Connection

Threaded ports according to

- ISO 228 or DIN 13
- SAE standard J514

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

### Filter fineness

16 µm(c) ... 30 µm(c)
β-values according 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)
-22 °F ... +212 °C (temporary -40 °F ... + 248 °F)

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- start-up viscosity:
  Determine $\nu_{max}$, observing the permissible pressure at the pump inlet according to diagram D; determine $\Delta p$ as a function of the viscosity (take pressure loss in connection lines into account!)
- at initial operation of units equipped with a bypass valve:
  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 bypass 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

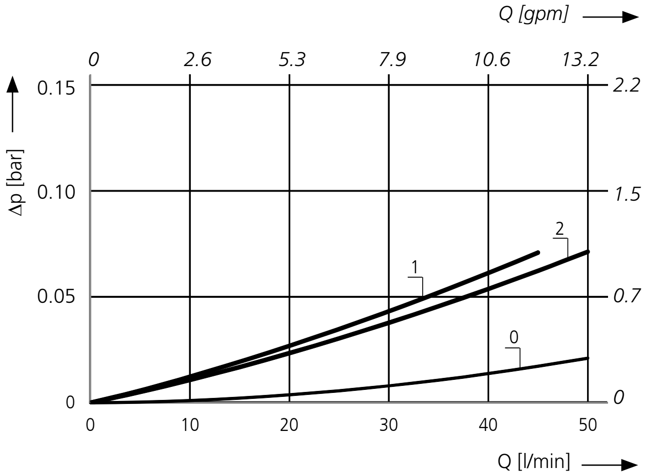
### Mounting position

Vertical mounting to be preferred, suction opening pointing downwards. Due to the standardly assembled foot valve, all filters of series ES 075 may also be mounted in horizontal position.

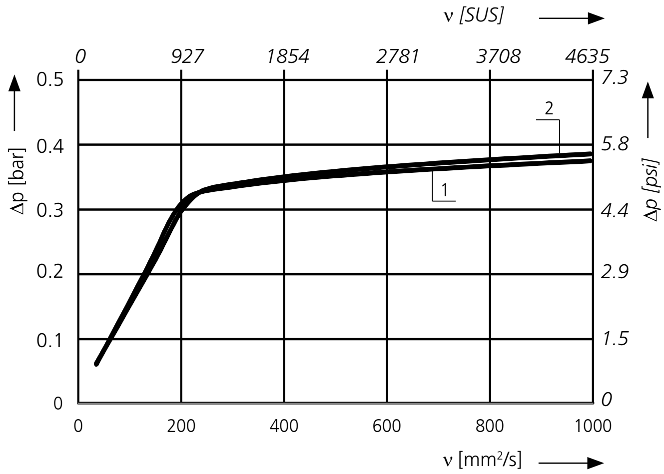
## Diagrams

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

**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

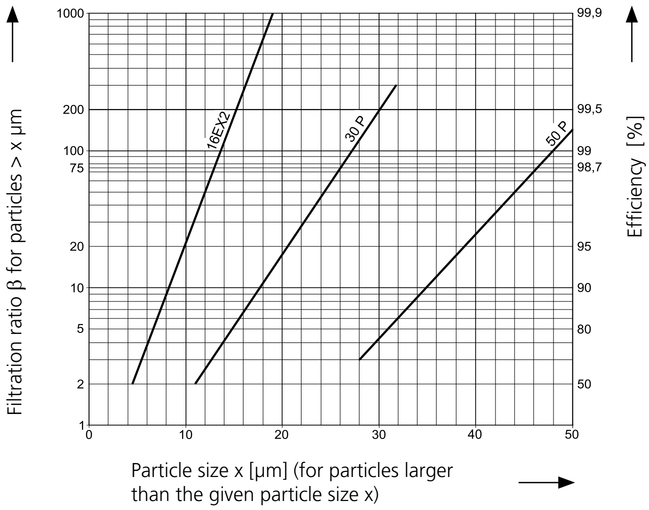



Pressure drop as a function of the **kinematic viscosity** at nominal flow




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

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX 2 and Paper elements:**

16EX2 = $\overline{\beta}_{16(c)}$ = 200 EXAPOR®MAX 2
30P = $\overline{\beta}_{30\,(c)}$ = 200 Paper
50P = $\overline{\beta}_{50\,(c)}$ = 200 Paper

Based on the structure of the filter media of the 30 P and 50 P paper elements, deviations from the printed curves are quite probable.

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189.

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

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt holding capacity | Connection B | Cracking pressure of by-pass valve [2] | Foot valve | Symbol | Replacement filter element Part. No. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | | | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| ES 075-6801 | 40[1] | **D1**/1 | 16EX2 | 26 | G1¼ | - | • | 1 | V3.1130-08 | 1.6 | - |
| ES 075-6811 | 40[1] | **D1**/1 | 16EX2 | 26 | G1 | - | • | 1 | V3.1130-08 | 1.6 | - |
| ES 075-6141 | 45[1] | **D1**/2 | 30P | 23 | G1¼ | - | • | 1 | P3.1130-01 | 1.6 | - |
| ES 075-6121 | 45[1] | **D1**/2 | 30P | 23 | G1 | - | • | 1 | P3.1130-01 | 1.6 | - |

| | gpm | | | g | | psi | | | | lbs | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| ES 075-6801 | 10.6[1] | **D1**/1 | 16EX2 | 26 | G1¼ | - | • | 1 | V3.1130-08 | 3.5 | - |
| ES 075-6811 | 10.6[1] | **D1**/1 | 16EX2 | 26 | G1 | - | • | 1 | V3.1130-08 | 3.5 | - |
| ES 075-6141 | 11.9[1] | **D1**/2 | 30P | 23 | G1¼ | - | • | 1 | P3.1130-01 | 3.5 | - |
| ES 075-6121 | 11.9[1] | **D1**/2 | 30P | 23 | G1 | - | • | 1 | P3.1130-01 | 3.5 | - |

[1] Those values apply when used in hydrostatic drives. Instructions in catalogue sheet 10.310 have to be observed.
[2] Versions with by-pass valve on request.

All filters are delivered with a plugged clogging indicator connection G¼. As clogging indicators either manometers or vacuum switches can be used.
Optional extension pipes adapt the filter length to various tank depths. For ordering of accessories please use the below mentioned codes.

**Order example: The filter ES 075-6801 has to be supplied with an extension pipe (EV) for a mounting depth of 400 mm / 15.75 inch.**

**Order description:** **ES 075-6801 / EV 400**

**Part No. (Basic unit)** → ES 075-6801

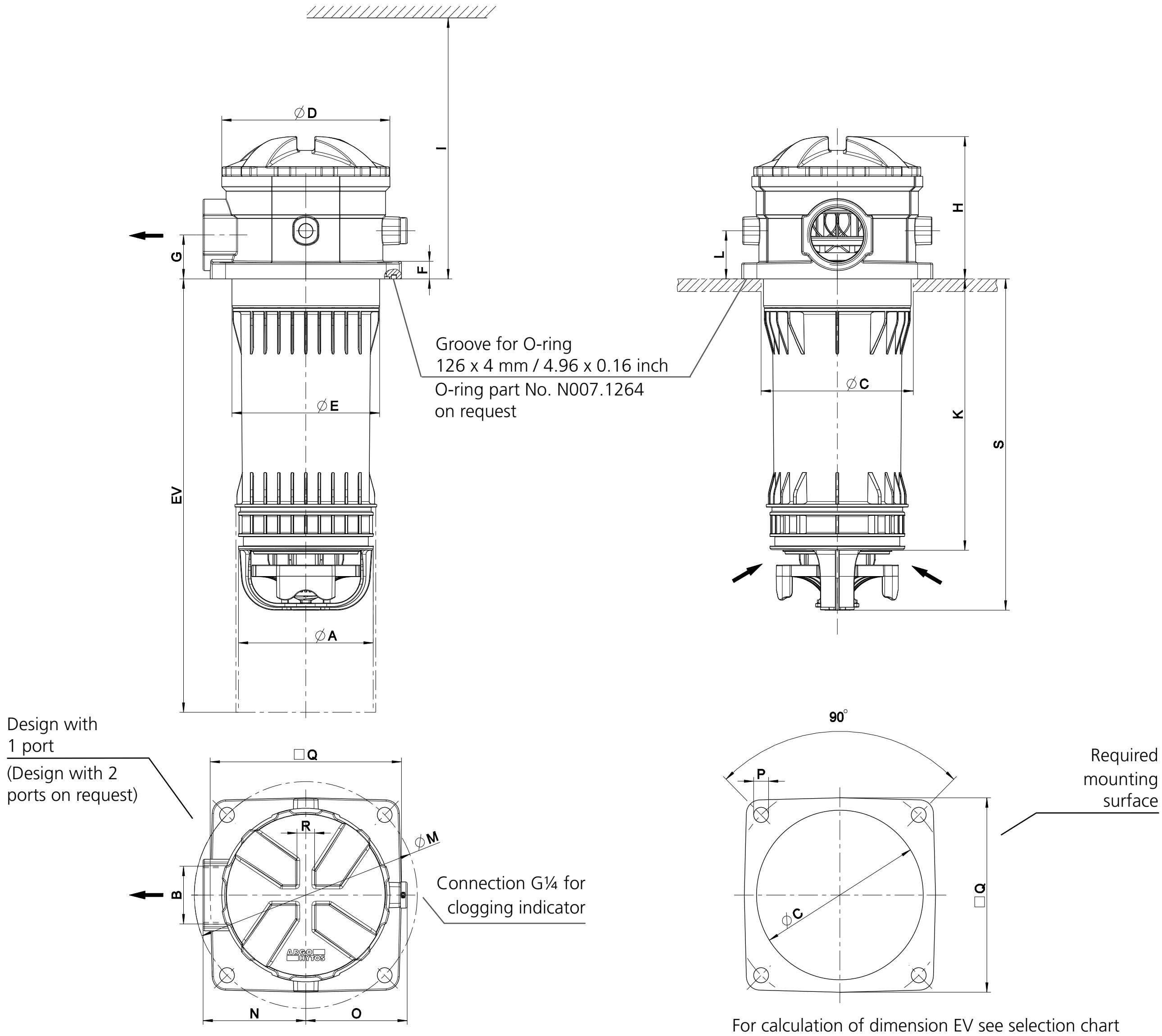
**Extension pipe (2 lengths are available)** → EV 400
EV = 400 / 500 mm (15.75 / 19.69 inch) see dimensions and measurements

**For the appropriate clogging indicator see catalog sheet 60.20.**

**Remarks:**

- Clogging indicators are optional and always delivered detached from the filter.
- At versions with by-pass valve (available on request), the start of the red area respectively the actuating pressure of the vacuum switch has always to be higher than the cracking pressure of the by-pass valve.
- The filters listed in this chart are standard filters. Other designs available on request.

## Dimensions




For calculation of dimension EV see selection chart

## Measurements in mm

| Type | A | B | C min./max. | D | E | F | G | H | I | K | L | M | N | O | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ES 075 | 100 | G1, G1¼ | 111/121 | 126 | 110 | 11.5 | 32 | 104 | 400 | 197.5 | 35 | 165 | 76 | 75 | 11 |

| Type | Q | R | S |
|---|---|---|---|
| ES 075 | 141.5 | 13 | 241 |

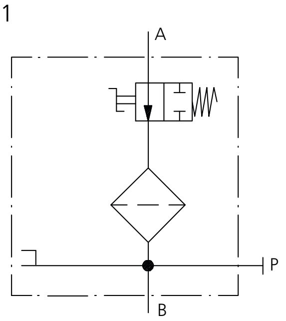
## Measurements in inch

| Type | A | B SAE | C min./max. | D | E | F | G | H | I | K | L | M | N | O | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ES 075 | 3.94 | -16, -20 | 4.37/4.76 | 4.96 | 4.33 | 0.45 | 1.26 | 4.09 | 15.75 | 7.78 | 1.38 | 6.50 | 2.99 | 2.95 | 0.43 |

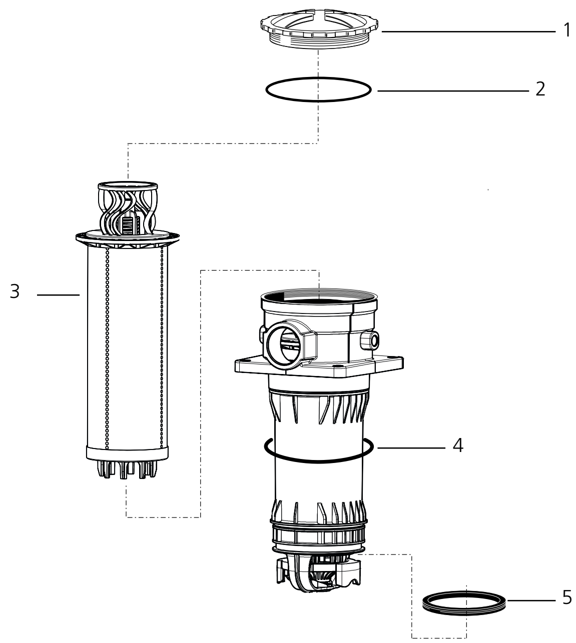
| Type | Q | R | S |
|---|---|---|---|
| ES 075 | 5.57 | 0.51 | 9.49 |

## Symbol

1




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Screw-on cap with Pos. 2 | ES 074.1212 |
| 2 | O-ring<br>100 x 4 mm<br>3.94 x 0.16 inch | N007.1004 |
| 3 | Replacement filter element | see Selection Chart / col. 10 |
| 4 | O-ring<br>126 x 4 mm*<br>4.96 x 0.16 inch* | N007.1264 |
| 5 | Rubber ring | ES 075.0109 |

*not included in basic equipment

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

# ES 094

Tank top mounting · Connection G1¼ / -20 SAE · Nominal flow rate up to 70 l/min / 18.5 gpm

Suction Filter ES 094

## Description

### Application

To be installed in the suction line of the pumps of hydraulic systems resp. upstream of the charge pumps of hydrostatic drives.

### Performance features

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

*Protection against malfunction:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

### Special features

- By-pass valve:
  The location close to the suction inlet prevents dirt particles retained by the filter element from entering into the clean oil side.
- Filter element locking valve:
  Ensures that dirt accumulated in the filter element is removed together with the element and cannot return to the tank.
- Foot valve:
  When the screw-on cap is removed for maintenance, the foot valve closes automatically. This makes it possible to service the filter even if it is submerged below the oil level in a full tank.

### Filter elements

Flow direction from center 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**

| | |
|---|---|
| Screw-on cap: | Polyester, GF reinforced |
| Filter head: | Aluminum alloy |
| Filter bowl: | Steel, phosphated |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic microfiber web<br>Paper – cellulose web,<br>impregnated with resin |

**Accessories**

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

## Characteristics

**Nominal flow rate**

Up to 70 l/min / 18.5 gpm (see Selection Chart, column 2).
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

› closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS

› Element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume.

› Flow velocity in the connection lines ≤ 1.5 m/s / 4.9 ft/s.

If units, not equipped with a bypass valve, are used in hydrostatic drives, the recommendations regarding their technical application given on catalog sheet 10.310 should be observed.

**Connection**

Threaded ports according to

› ISO 228 or DIN 13

› SAE standard J514

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

**Filter fineness**

16 µm(c) ... 30 µm(c)
β-values according 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)
-22 °F ... +212 °C (temporary -40 °F ... + 248 °F)

**Viscosity at nominal flow rate**

› at operating temperature: $\nu < 60$ mm²/s / 280 SUS

› start-up viscosity:
Determine $\nu_{max}$, observing the permissible pressure at the pump inlet according to diagram D; determine $\Delta p$ as a function of the viscosity (take pressure loss in connection lines into account!)

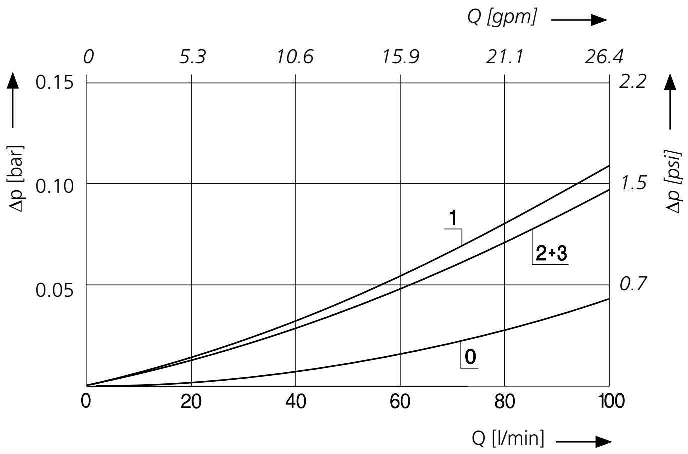
› at initial operation of units equipped with a by-pass valve:
The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

**Mounting position**

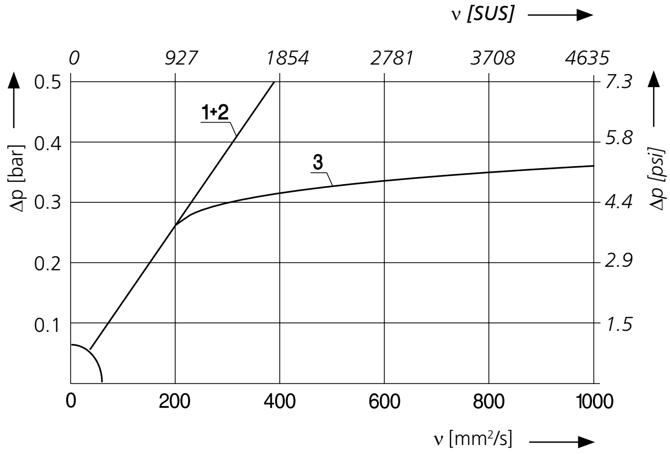
Vertical mounting to be preferred, suction opening pointing downwards, versions equipped with foot valve for horizontal mounting also.

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

**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

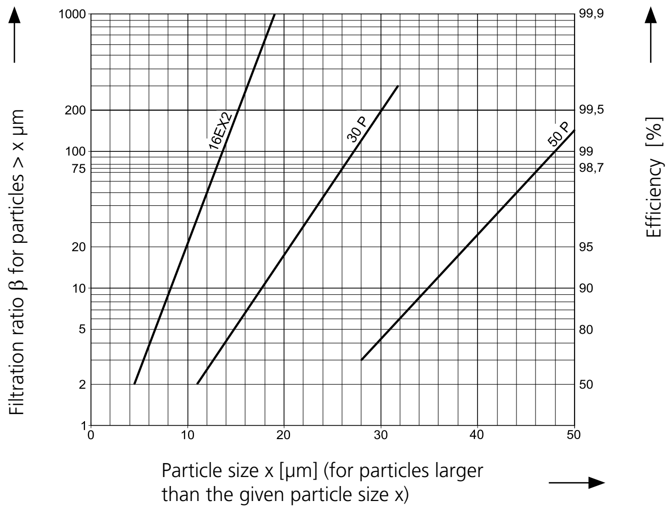



Pressure drop as a function of the **kinematic viscosity** at nominal flow




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

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX 2 and Paper elements:**

16EX2 = $\bar{\beta}_{16(c)}$ = 200 EXAPOR®MAX 2
30P = $\bar{\beta}_{30\,(c)}$ = 200 Paper
50P = $\bar{\beta}_{50\,(c)}$ = 200 Paper

Based on the structure of the filter media of the 30 P and 50 P paper elements, deviations from the printed curves are quite probable.

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189.

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

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt-holding capacity | Connection B | Cracking pressure of by-pass | Foot valve | Symbol | Replacement filter element Part. No. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | | | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| ES 094-6801 | 60[1] | **D1**/1 | 16EX2 | 40 | G1¼ | - | • | 3 | V2.0933-08 | 3.2 | - |
| ES 094-6110 | 70[1] | **D1**/2 | 30P | 34 | G1¼ | - | - | 1 | P2.0933-01 | 3.0 | - |
| ES 094-6111 | 70[1] | **D1**/2 | 30P | 34 | G1¼ | - | • | 3 | P2.0933-01 | 3.2 | - |
| ES 094-6121 | 70 | **D1**/3 | 30P | 34 | G1¼ | -0.25 | • | 4 | P2.0933-01 | 3.2 | - |

| | gpm | | | g | SAE | psi | | | | lbs | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| ES 094-6801 | 15.9[1] | **D1**/1 | 16EX2 | 40 | -20[2] | - | • | 3 | V2.0933-08 | 7.1 | - |
| ES 094-6110 | 18.5[1] | **D1**/2 | 30P | 34 | -20[2] | - | - | 1 | P2.0933-01 | 6.6 | - |
| ES 094-6111 | 18.5[1] | **D1**/2 | 30P | 34 | -20[2] | - | • | 3 | P2.0933-01 | 7.1 | - |
| ES 094-6121 | 18.5 | **D1**/3 | 30P | 34 | -20[2] | -3.63 | • | 4 | P2.0933-01 | 7.1 | - |

[1] These values apply when used in hydrostatic drives in compliance with catalog sheet 10.310.
[2] Corresponds to 1⁵⁄₈-12 UN-2B

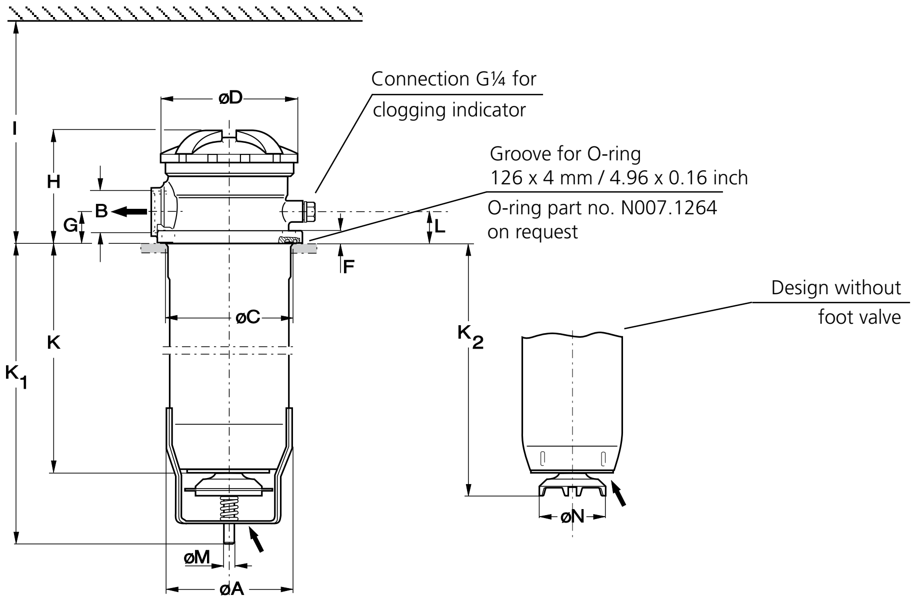
All filters are delivered with a plugged clogging indicator connection G¼.
As clogging indicators either manometers or vacuum switches can be used.
Extension pipes (available on request) adapt the filter length to various tank depths.

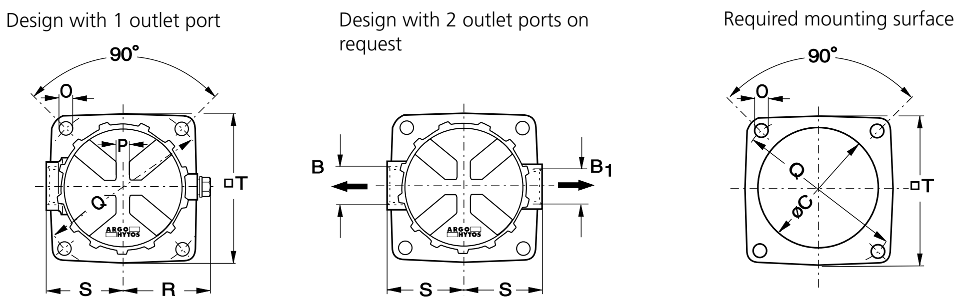
**For the appropriate clogging indicator see catalog sheet 60.20.**

**Remarks:**

- The start of the red area respectively the actuating pressure of the vacuum switch has always to be higher than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- Clogging indicators are optional and always delivered detached from the filter.
- The filters listed in this chart are standard filters. Other designs available on request.

## Dimensions




## Measurements in mm

| Type | A | B | C min./max. | D | E | F | G | H | I | K | $K_1$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ES 094 | 115 | G1¼ | 119/121 | 126.5 | - | 11.5 | 32 | 106 | 525 | 305 | 364 |

| Type | $K_2$ | L | M | N | O | P | Q | R | S | T | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ES 094 | 325 | 35 | 10 | 62.5 | 11 | 13 | 165 | 76.5 | 76 | 141 | |

## Measurements in inch

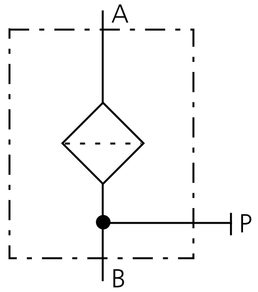
| Type | A | B SAE | C min./max. | D | E | F | G | H | I | K | $K_1$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ES 094 | 4.53 | -20* | 4.69/4.76 | 4.98 | - | 0.45 | 1.26 | 4.17 | 20.67 | 12.00 | 14.33 |

| Type | $K_2$ | L | M | N | O | P | Q | R | S | T | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ES 094 | 12.80 | 1.38 | 0.39 | 2.46 | 0.43 | 0.51 | 6.50 | 3.01 | 2.99 | 5.55 | |

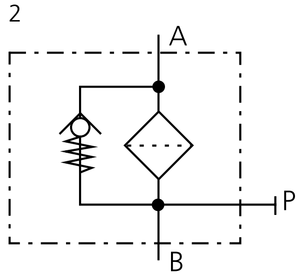
* Corresponds to 1⁵⁄₈-12 UN-2B

## Symbols

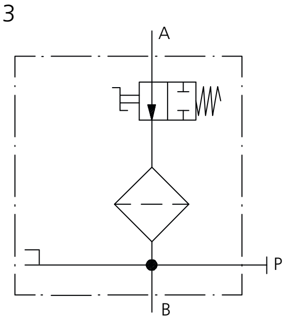
1



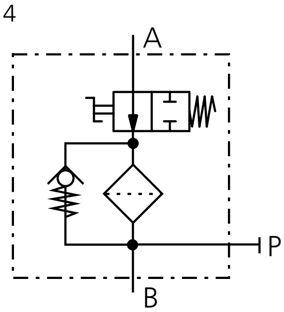

2



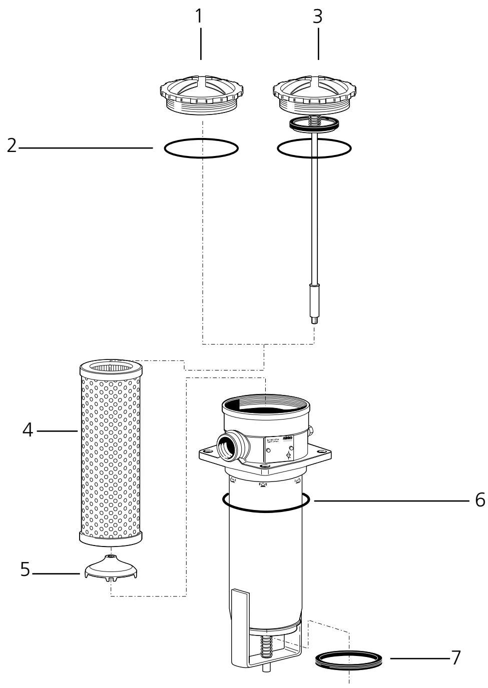

3




4




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Screw-on cap with Pos. 2 | ES 074.1212 |
| 2 | O-ring<br>100 x 4 mm<br>3.94 x 0.16 inch | N007.1004 |
| 3 | Screw-on cap with Pos. 2<br>for ES 094 (without by-pass)<br>for ES 094 (with by-pass) | <br>ES 094.1212<br>ES 094.1213 |
| 4 | Replacement filter element | see Chart / col. 10 |
| 5 | Valve cone | ES 074.0202 |
| 6 | O-ring<br>126 x 4 mm*<br>4.96 x 0.16 inch* | N007.1264 |
| 7 | Rubber ring | N042.7401 |

*not included in basic equipment

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

ARGO HYTOS



# Suction Filters

Type series ES · Application in hydrostatic gears

Suction filter type series ES

## Description

Certain versions of our built-in suction filters in the ES series are designed for use in front of boost pumps of hydrostatic gears. Particular attention has been paid to the specific requirements of the manufacturers of these gears regarding filter fineness and pressure drop.
These filters have no bypass-valve, so that unfiltered oil cannot enter the circulation.
Versions without a foot-valve are intended for vertical installation, in which case particular attention must be paid to the oil-level:

- at max. oil-level:
  sufficient safety-clearance below the filter cover must be maintained.

- at min. oil-level:
  sufficient level of oil above the filter inlet must be maintained.

Suction filters designed for installation below the oil-level are fitted with a foot-valve. The oil-feed to the boost casing is cut off automatically when the filter cover is opened.

Some gear manufacturers insist that filters be designed to handle double the maximum output of the filler pump. Our filters already conform to this requirement.
The flow-data for the filters shown in the tables are based on the following assumptions:

1. The use of ATF oils with approx. 26 to 28 mm²/s at 50 °C (120 to 130 SUS at 122 °F) or hydraulic oils with a viscosity and viscosity temperature characteristic corresponding to standard ATF oils (also see info-sheet 00.003).

2. Under normal operating conditions an operating viscosity of $\leq$ 35 mm²/s / 162 SUS should be reached within 15 minutes of commencement of operation.

3. Effective oil capacity in liters should be about 0.5 to 1 x the maximum output of the boost pump.

4. A pressure drop $\Delta p$ between filter outlet and filler pump inlet of $\leq$ 0.05 bar / 0.73 psi at viscosity of 35 mm²/s / 162 SUS.

Should operating conditions differ from the above, please contact us for further information.

Details of pressure gradients for individual filters are given on the specification sheets of the respective filters, chapter diagrams.

ARGO HYTOS

Return Filters

# D 090 · D 100

In-line mounting · Connection G¾ / -12 SAE · Nominal flow rate up to 110 l/min / 29.1 gpm

In-line Return Filter D 090

## Description

### Application

In the return line circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

### Filter elements

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

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

### 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: | Aluminum alloy |
| Filter bowl: | Polyamide, GF reinforced |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web<br>Paper - cellulose web, impregnated with resin |

### Accessories

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

## Characteristics

### Nominal flow rate

Up to 110 l/min / 29.1 gpm (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines ≤ 4,5 m/s / 14.8 ft/s

### Connection

Threaded ports according to

- ISO 228 or DIN 13
- SAE standard J514

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

### Filter fineness

10 µm(c) ... 30 µm(c)
β-values according to ISO 16889
(see Selection Chart, column 4 and diagram Dx).

### Dirt-holding capacity

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

### Hydraulic fluids

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

### Temperature range

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

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% Δp of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the Δp curve at a point. Read this point on the horizontal axis for the viscosity.

### Operating pressure

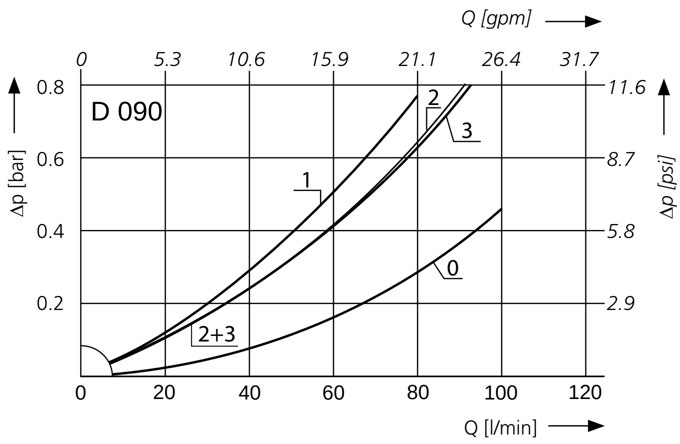
Max. 10 bar / 145 psi

### Mounting position

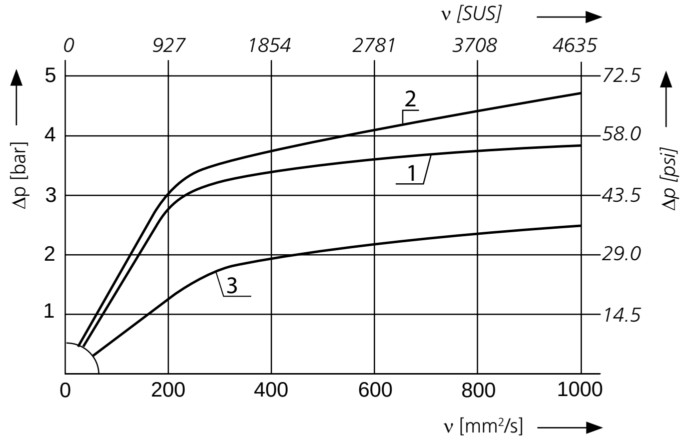
Preferably vertical, filter head on top.

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

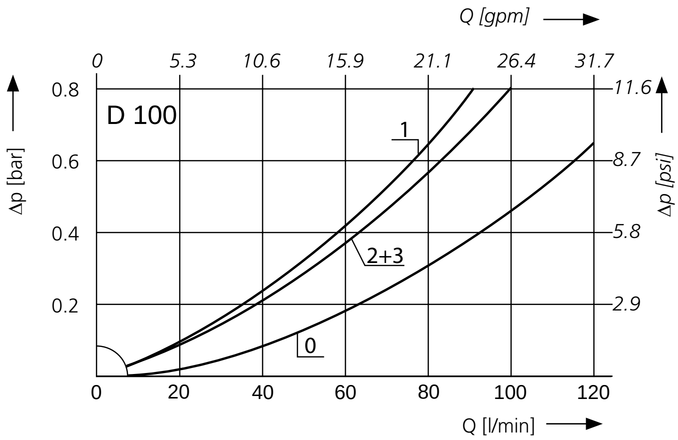
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



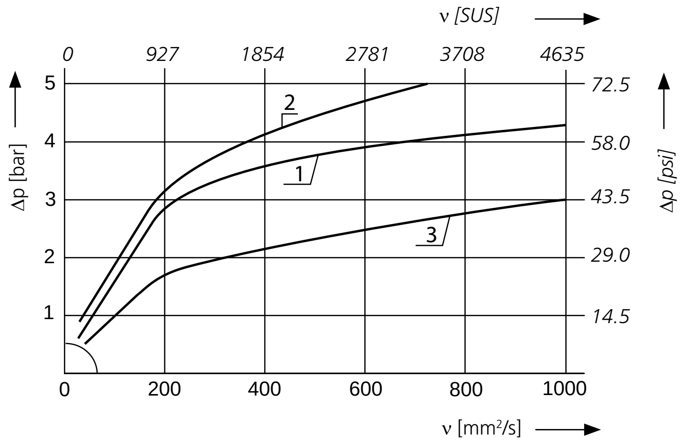

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

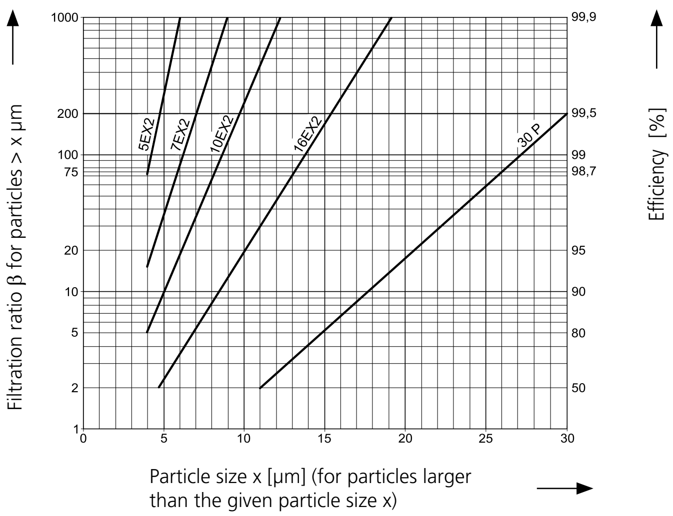



Pressure drop as a function of the **kinematic viscosity** at nominal flow




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

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX 2 and Paper elements:**

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

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

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189

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

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagramm **D**/Kcurve no. | Filter fineness see Diagr. **Dx** | Dirt-holding capacity | Connection A/B | Cracking pressure of by-pass | Symbol | Replacement element Part No. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| D 090-156 | 60 | **D1**/1 | 10EX2 | 17 | G¾ | 2.5 | 2 | V3.0714-06 | 0.9 | - |
| D 090-158 | 85 | **D1**/2 | 16EX2 | 17 | G¾ | 2.5 | 2 | V3.0714-08 | 0.9 | - |
| | | | | | | | | | | |
| D 090-151 | 50 | **D1**/3 | 30P | 7,3 | G¾ | 1.5 | 2 | P3.0714-01 | 0.9 | - |
| | | | | | | | | | | |
| D 100-156 | 75 | **D2**/1 | 10EX2 | 22 | G¾ | 2.5 | 2 | V3.0717-06 | 1.0 | - |
| D 100-158 | 110 | **D2**/2 | 16EX2 | 22 | G¾ | 2.5 | 2 | V3.0717-08 | 1.0 | - |
| | | | | | | | | | | |
| D 100-151 | 70 | **D2**/3 | 30P | 9,4 | G¾ | 1.5 | 2 | P3.0717-01 | 1.0 | - |

| | gpm | | | g | SAE | psi | | | lbs | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| D 090-756 | 15.9 | **D1**/1 | 10EX2 | 17 | -12* | 36 | 2 | V3.0714-06 | 1.98 | - |
| D 090-758 | 22.5 | **D1**/2 | 16EX2 | 17 | -12* | 36 | 2 | V3.0714-08 | 1.98 | - |
| | | | | | | | | | | |
| D 090-751 | 13.2 | **D1**/3 | 30P | 7.3 | -12* | 22 | 2 | P3.0714-01 | 1.98 | - |
| | | | | | | | | | | |
| D 100-756 | 19.8 | **D2**/1 | 10EX2 | 22 | -12* | 36 | 2 | V3.0717-06 | 2.20 | - |
| D 100-758 | 29.1 | **D2**/2 | 16EX2 | 22 | -12* | 36 | 2 | V3.0717-08 | 2.20 | - |
| | | | | | | | | | | |
| D 100-751 | 18.5 | **D2**/3 | 30P | 9.4 | -12* | 22 | 2 | P3.0717-01 | 2.20 | - |

* Corresponds to 1 1/16-12 UN-2B

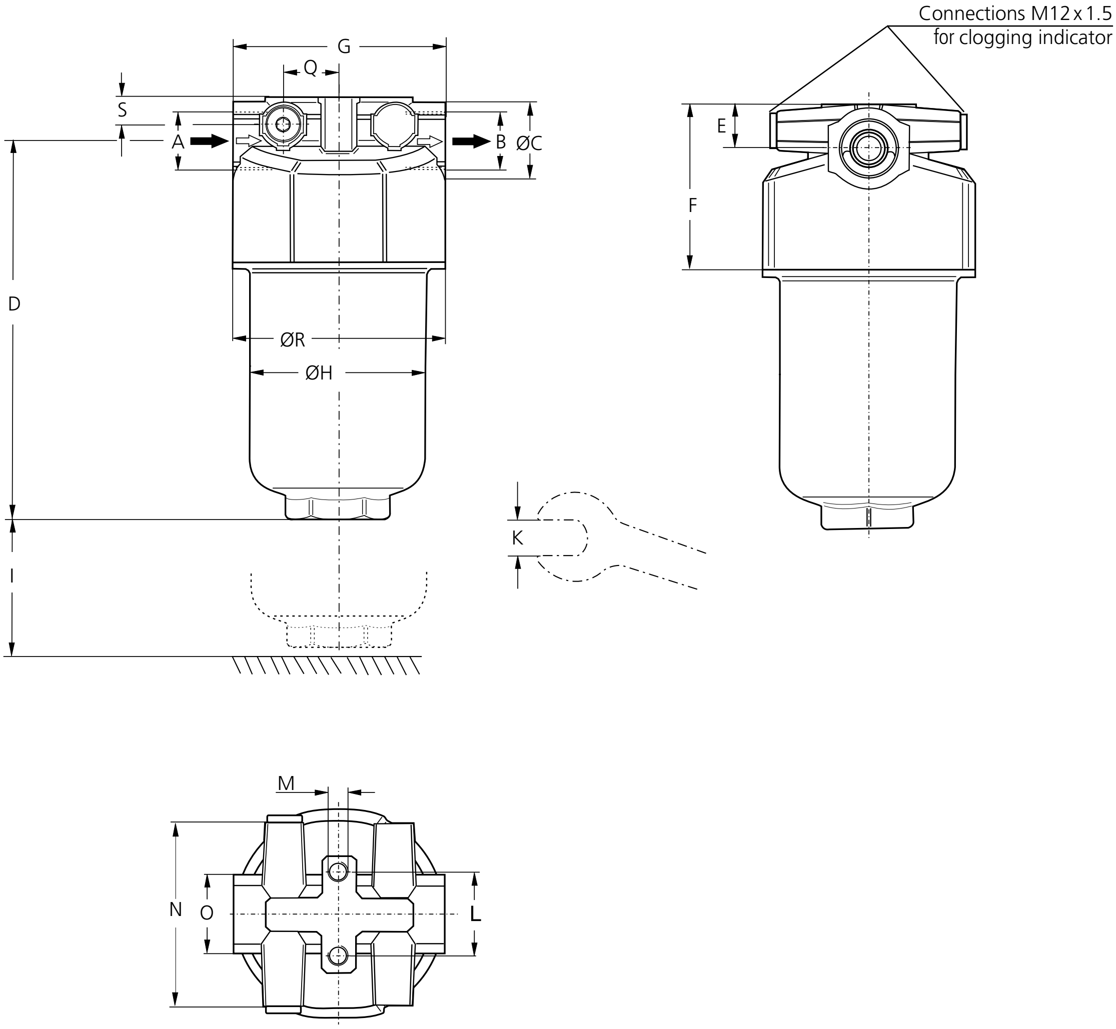
All filters are delivered with a plugged clogging indicator connection M12 x 1.5.
As clogging indicators either manometers or electrical pressure switches can be used.

**For the appropriate clogging indicator please see catalog sheet 60.20.**

**Remarks:**

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

## Dimensions




## Measurements in mm

| Type | A | B | C | D | E | F | G | H | I | K | L | M Ø / depth | N | O | Q | R | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D 090 | G¾ | G¾ | 35 | 178 | 20 | 74 | 95 | 80 | 70 | AF 41 | 38.1 | M8 / 15 | 82 | AF 36 | 25 | 95 | 12 |
| D 100 | G¾ | G¾ | 35 | 212 | 20 | 74 | 95 | 80 | 70 | AF 41 | 38.1 | M8 / 15 | 82 | AF36 | 25 | 95 | 12 |

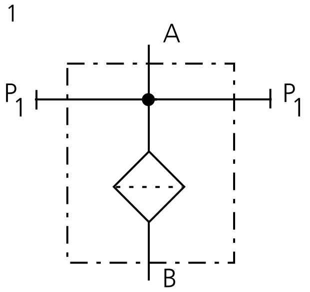
## Measurements in inch

| Type | A SAE | B SAE | C | D | E | F | G | H | I | K mm | L | M Ø / depth | N | O mm | Q | R | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D 090 | -12 | -12 | 1.38 | 7.01 | 0.79 | 2.91 | 3.74 | 3.15 | 2.76 | AF 41 | 1.50 | M8 / 15 | 3.23 | AF36 | 0.98 | 3.74 | 0.47 |
| D 100 | -12 | -12 | 1.38 | 8.35 | 0.79 | 2.91 | 3.74 | 3.15 | 2.76 | AF 41 | 1.50 | M8 / 15 | 3.23 | AF36 | 0.98 | 3.74 | 0.47 |

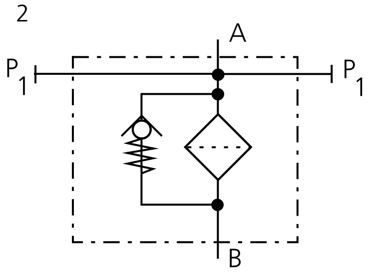
* Corresponds to 1 1/16 -12 UN-2B

## Symbols

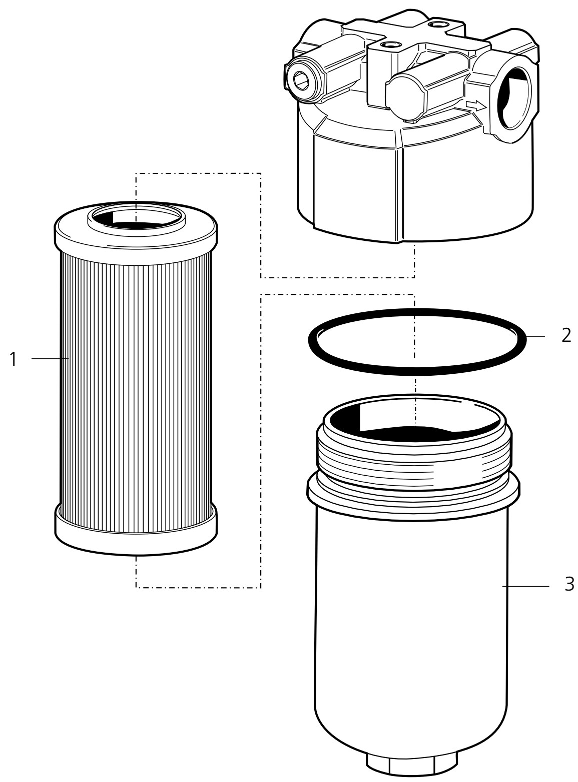
1




2




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Replacement filter element | see Chart / col. 9 |
| 2 | O-ring<br>82.14 x 3.53 mm<br>3.23 x 0.14 inch | N007.0824 |
| 3 | Filter bowl D 090 | E 068.0101 |
| 3 | Filter bowl D 100 | E 068.0102 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

Return Filters - Lightline

# RFL 090 · RFL 100

In-line mounting · Connection G¾ / -12 SAE · Nominal flow rate up to 120 l/min / 32 gpm

In-line Return Filter RFL 090

## Description

### Application

In the return line circuits of hydraulic systems.

### Filter maintenance

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

### Materials

| | |
|---|---|
| Filter head: | Aluminum alloy |
| Filter bowl: | Polyamide, GF reinforced |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®Light - inorganic multi-layer microfiber web<br>Paper - cellulose web, impregnated with resin |

### Accessories

Electrical and optical clogging indicators are available on request. For technical data and dimensions see datasheet 60.20.

## Characteristics

### Nominal flow rate

Up to 120 l/min / 32 gpm (see Selection Chart, page 3).
The nominal flow rates indicated by ARGO-HYTOS lightline are based on the following features:

- Closed by-pass valve at $\nu \leq 150$ mm²/s / 698 SUS
- Element service life > 500 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- Flow velocity in the connection lines ≤ 6 m/s / 20 ft/s

### Connection

Threaded ports according to ISO 228 or DIN 13 and SAE standard J514. Sizes see Selection Chart, page 3, (other port threads on request).

### Filter fineness

10 µm(c) ... 30 µm(c)
ß-values according ISO 16889 (see diagrams)

### 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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

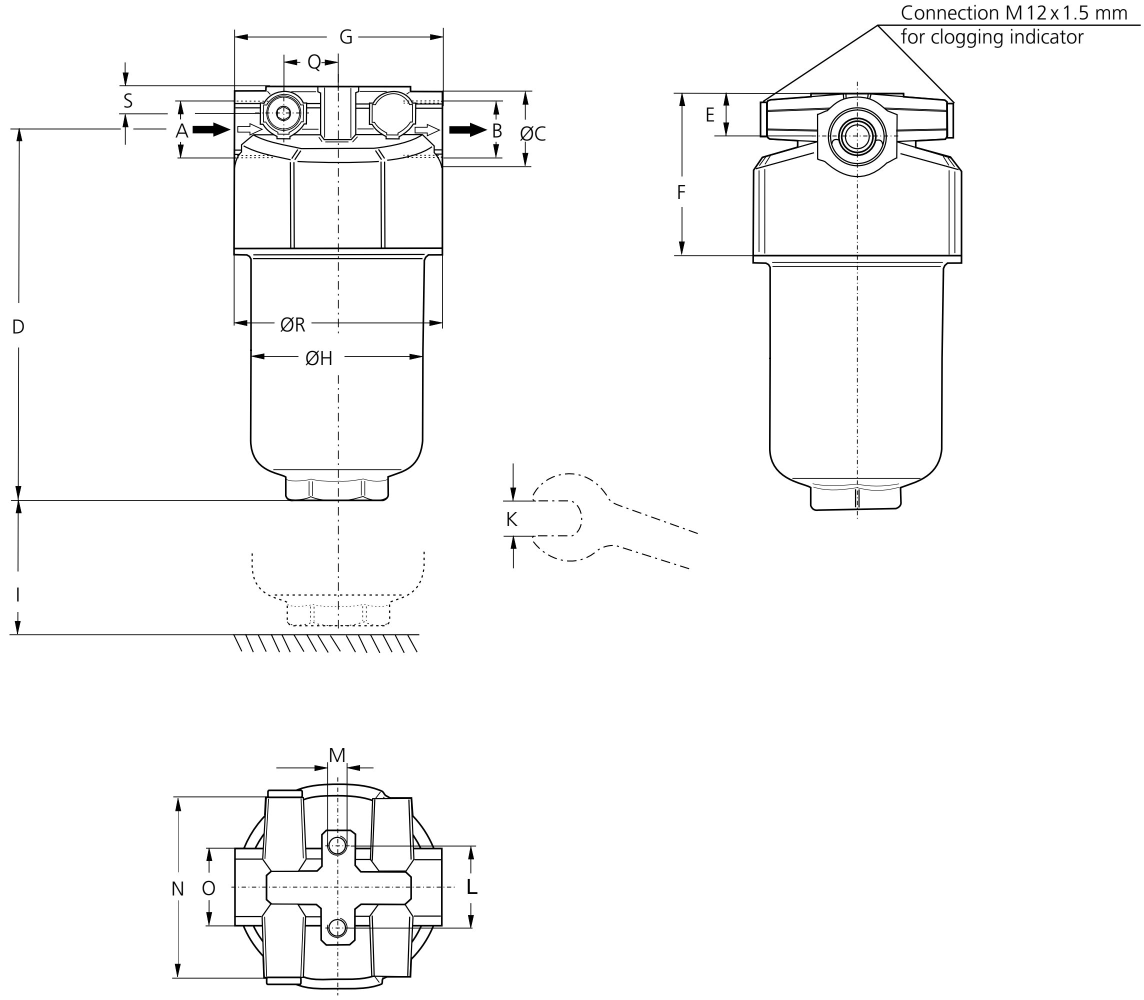
### Operating pressure

Max. 10 bar / 145 psi

### Mounting position

Vertical mounting to be preferred, filter head on top.

## Dimensions




## Measurements

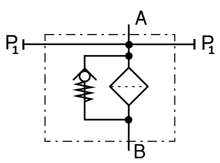
| Type [mm] | A | B | C | D | E | F | G | H | I | K | L | M Ø/ depth | N | O | Q | R | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RFL 090 | G¾ | G¾ | 35 | 178 | 20 | 74 | 95 | 80 | 70 | AF 41 | 38.1 | M8 / 15 | 82 | AF 36 | 25 | 95 | 12 |
| RFL 100 | G¾ | G¾ | 35 | 212 | 20 | 74 | 95 | 80 | 70 | AF 41 | 38.1 | M8 / 15 | 82 | AF 36 | 25 | 95 | 12 |

| Type [inch] | A | B | C | D | E | F | G | H | I | K mm | L | M Ø / depth | N | O mm | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RFL 090 | -12 SAE* | -12 SAE* | 1.38 | 7.01 | 0.79 | 2.91 | 3.74 | 3.15 | 1.57 | AF 41 | 1.50 | M8 / 0.6 | 3.23 | AF 36 | 0.98 |
| RFL 100 | -12 SAE* | -12 SAE* | 1.38 | 8.35 | 0.79 | 2.91 | 3.74 | 3.15 | 1.57 | AF 41 | 1.50 | M8 / 0.6 | 3.23 | AF 36 | 0.98 |

| Type [inch] | R | S |
|---|---|---|
| RFL 090 | 3.74 | 0.47 |
| RFL 100 | 3.74 | 0.47 |

*Corresponds to $1^{1}/_{16}$ -12 UN - 2B

## Symbol



## Ordering Code

### Filter assembly

RFL - ___ - ___ - ___ - ___ - 100

| Type of filter | Code |
|---|---|
| Return Filter, In-line | RFL |

| Flow rate, max. | Code |
|---|---|
| 100 l/min / 26 gpm | 090 |
| 120 l/min / 32 gpm | 100 |

| Connection thread | Code |
|---|---|
| G¾ | GC |
| -12 SAE | UC |

| Filter fineness | Code |
|---|---|
| 10 µm (10EL) | G2 |
| 16 µm (16EL) | I2 |
| 30 µm (30P) | N3 |

**Order example:**

RFL - 090 - UC - I2 - OM - 100

| Air breather | Code |
|---|---|
| without air breather | 100 |

| Bypass setting | Code |
|---|---|
| 2.5 bar / 36 psi (for 10EL, 16EL) | OM |
| 1.5 bar / 22 psi (for 30P) | KM |

Filters delivered with 2 plugged connections M12 x 1.5 for clogging indicators.

### Spare filter element

___ 3 . 07 ___ - 0 ___

| Filter media | Code |
|---|---|
| EXAPOR®Light | F |
| Paper | P |

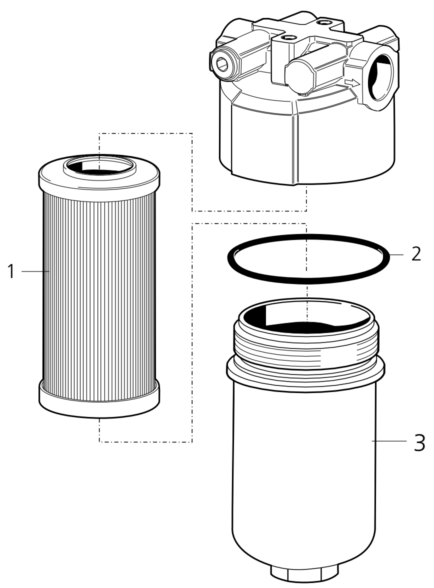
| Length | Code |
|---|---|
| for RFL 090 | 14 |
| for RFL 100 | 17 |

**Order example:**

F3.0714-08

| Filter fineness | Code |
|---|---|
| 10EL | 6 |
| 16EL | 8 |
| 30P | 1 |

## Spare parts



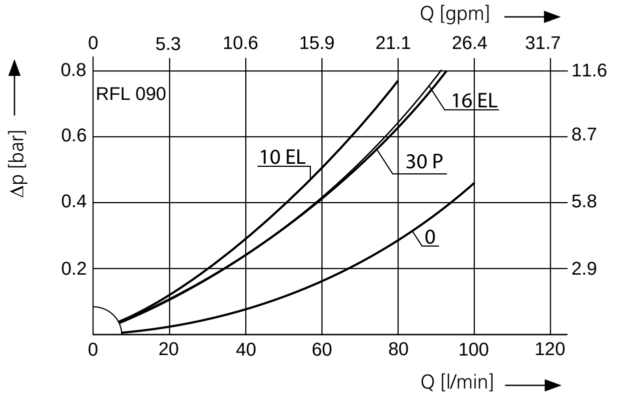

| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Replacement filter element | see above |
| 2 | O-ring<br>82.14 x 3.53 mm<br>3.23 x 0.14 inch | N007.0824 |
| 3 | Filter bowl RFL 090 | E 068.0101 |
| 3 | Filter bowl RFL 100 | E 068.0102 |

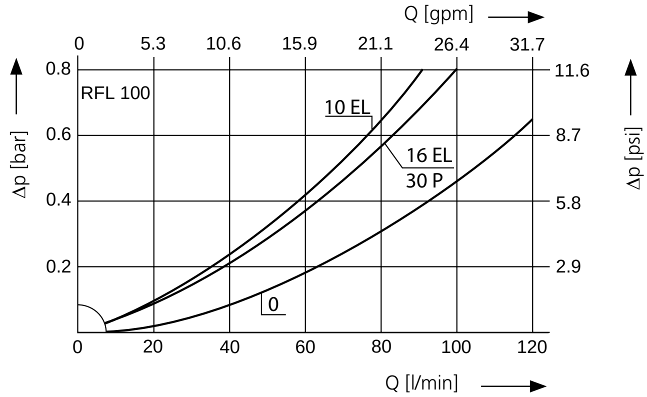
The functions of the complete filters as well as the outstanding features of the filter elements assured by ARGO-HYTOS can only be guaranteed if original ARGO-HYTOS spare parts are used.

## Diagrams

### Δp-curves for complete filters

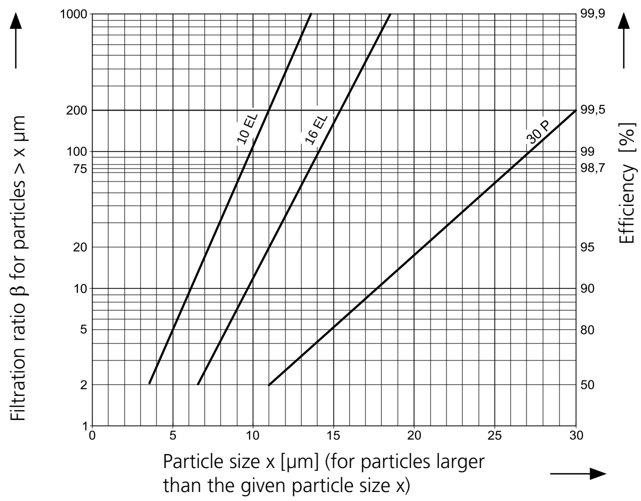
**D1** Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s / ν = 162 SUS (0 = housing empty)




### Filter fineness curves

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®Light and Paper elements:**

10 EL = $\overline{\beta}_{10\,(c)}$ = 200 EXAPOR®Light
16 EL = $\overline{\beta}_{16\,(c)}$ = 200 EXAPOR®Light
30 P = $\beta_{30(c)}$ = 200 Paper

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

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

## Quality Assurance

### Quality management according to DIN EN ISO 9001

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

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

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

## Return Filter

# D 170 · D 230

In-line mounting · Connection G 1¼ / - 20 SAE · Nominal flow rate up to 225 l/min / 59.5 gpm

In-line Return filter D 170

## Description

### Application

In the return line circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

### Filter elements

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

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

### 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: | Aluminum alloy |
| Filter bowl: | Polyamide, GF reinforced |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web<br>Paper - cellulose web, impregnated with resin |

### Accessories

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

## Characteristics

### Nominal flow rate

Up to 225 l/min / 59.5 gpm (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines ≤ 4,5 m/s / 14.8 ft/s

### Connection

Threaded ports according to

- ISO 228 or DIN 13
- SAE standard J514

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

### Filter fineness

10 µm(c) ... 30 µm(c)
β-values according to ISO 16889
(see Selection Chart, column 4 and diagram Dx).

### Dirt-holding capacity

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

### Hydraulic fluids

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

### Temperature range

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

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Operating pressure

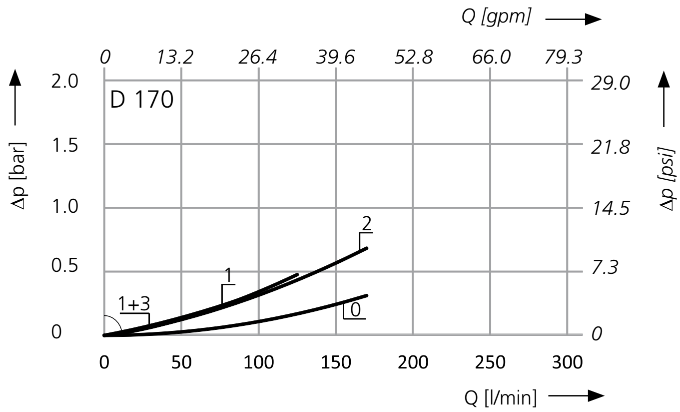
Maximal 10 bar / 145 psi

### Mounting position

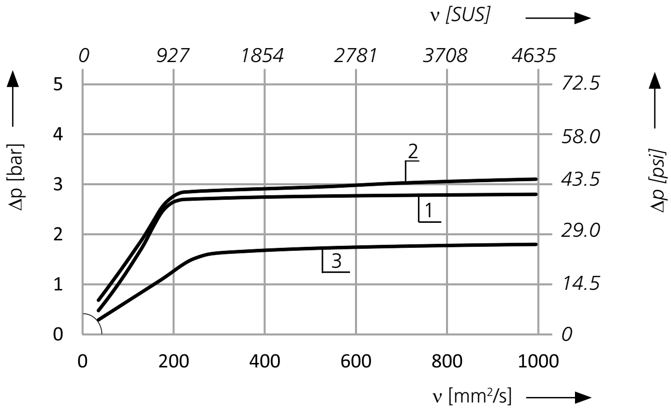
Preferably vertical, filter head on top.

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

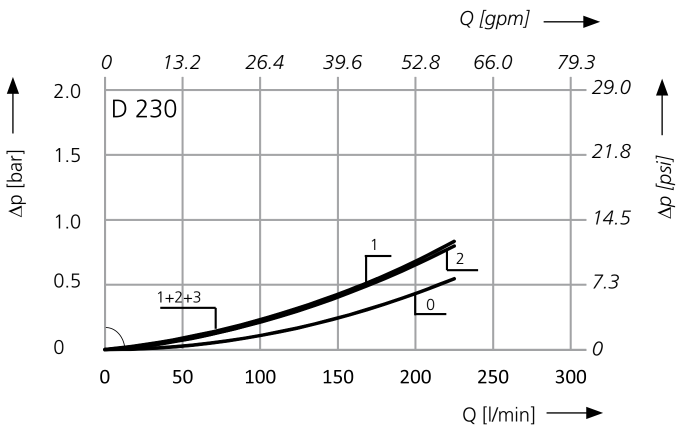
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



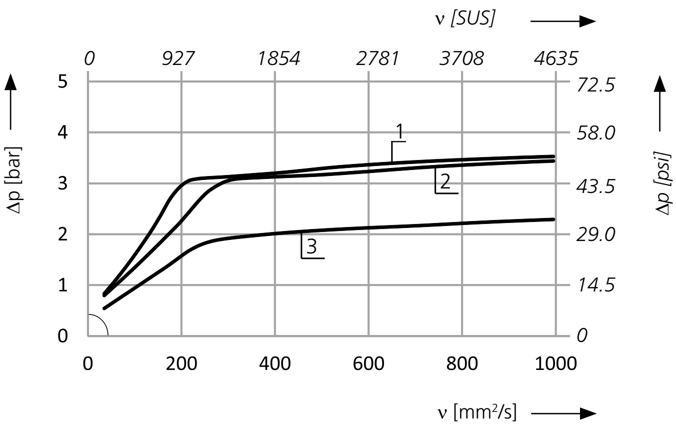

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

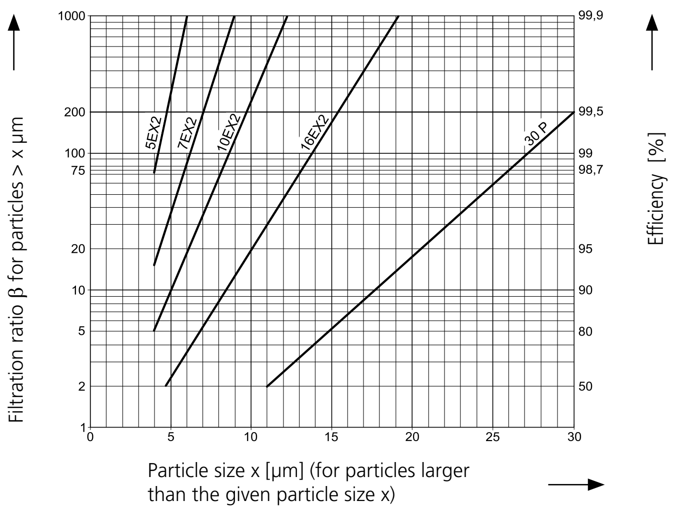



Pressure drop as a function of the **kinematic viscosity** at nominal flow




## Filter fineness curves in Selection Chart, column 4

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX 2 and Paper elements:**

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

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

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189

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

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagramm **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt-holding capacity | Connection A/B | Cracking pressure of by-pass | Symbol | Replacement element Part No. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| D 170-156 | 125 | **D1**/1 | 10EX2 | 41 | G1¼ | 2.5 | 2 | V3.1014-26 | 1.9 | - |
| D 170-158 | 170 | **D1**/2 | 16EX2 | 42 | G1¼ | 2.5 | 2 | V3.1014-28 | 1.9 | - |
| | | | | | | | | | | |
| D 170-151 | 90 | **D1**/3 | 30P | 22 | G1¼ | 1.5 | 2 | P3.1014-01 | 1.9 | - |
| | | | | | | | | | | |
| D 230-156 | 225 | **D2**/1 | 10EX2 | 80 | G1¼ | 2.5 | 2 | V3.1025-06 | 2.4 | - |
| D 230-158 | 225 | **D2**/2 | 16EX2 | 82 | G1¼ | 2.5 | 2 | V3.1025-08 | 2.4 | - |
| | | | | | | | | | | |
| D 230-151 | 175 | **D2**/3 | 30P | 42 | G1¼ | 1.5 | 2 | P3.1025-01 | 2.4 | - |

| | gpm | | | g | SAE | psi | | | lbs | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| D 170-756 | 33.0 | **D1**/1 | 10EX2 | 41 | -20* | 36 | 2 | V3.1014-26 | 4.12 | - |
| D 170-758 | 44.9 | **D1**/2 | 16EX2 | 42 | -20* | 36 | 2 | V3.1014-28 | 4.12 | - |
| | | | | | | | | | | |
| D 170-751 | 23.8 | **D1**/3 | 30P | 22 | -20* | 22 | 2 | P3.1014-01 | 4.12 | - |
| | | | | | | | | | | |
| D 230-756 | 59.5 | **D2**/1 | 10EX2 | 80 | -20* | 36 | 2 | V3.1025-06 | 5.29 | - |
| D 230-758 | 59.5 | **D2**/2 | 16EX2 | 82 | -20* | 36 | 2 | V3.1025-08 | 5.29 | - |
| | | | | | | | | | | |
| D 230-751 | 46.2 | **D2**/3 | 30P | 42 | -20* | 22 | 2 | P3.1025-01 | 5.29 | - |

*Corresponds to 1⅝-12 UN-2B

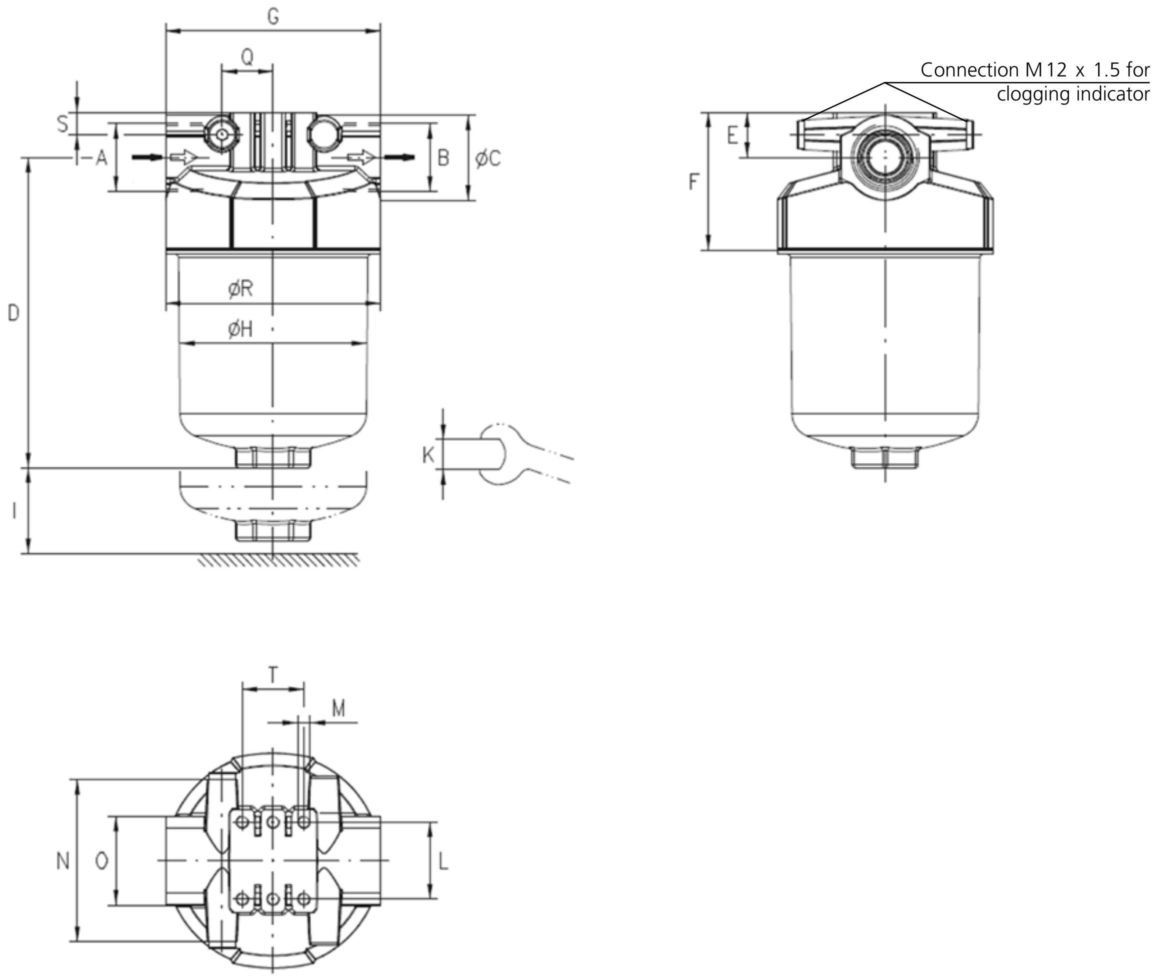
All filters are delivered with a plugged clogging indicator connection M12 x 1.5 mm.
As clogging indicators either manometers or electrical pressure switches can be used.

**For the appropriate clogging indicator please see catalog sheet 60.20.**

**Remarks:**

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

## Dimensions




## Measurements in mm

| Type | A | B | C | D | E | F | G | H | I | K | L | M | N | O | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Ø / depth | | | | |
| D 170 | G1¼ | G1¼ | 52 | 192 | 28 | 85 | 133 | 117 | 60 | AF 41 | 47.6 | M8 / 15 | 100 | AF 55 | 31.5 | 133 |
| D 230 | G1¼ | G1¼ | 52 | 302 | 28 | 85 | 133 | 117 | 60 | AF 41 | 47.6 | M8 / 15 | 100 | AF 55 | 31.5 | 133 |
| **Type** | **S** | **T** | | | | | | | | | | | | | | |
| D 170 | 14 | 38.1 | | | | | | | | | | | | | | |
| D 230 | 14 | 38.1 | | | | | | | | | | | | | | |

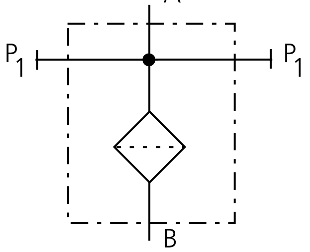
## Measurements in inch

| Type | A | B | C | D | E | F | G | H | I | K | L | M | N | O | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SAE | SAE | | | | | | | | | | Ø / depth | | | | |
| D 170 | -20 | -20 | 2.05 | 7.56 | 1.12 | 3.35 | 5.23 | 4.60 | 2.36 | AF 41 | 1.87 | M8 / 0.59 | 3.94 | AF 55 | 1.24 | 5.24 |
| D 230 | -20 | -20 | 2.05 | 11.89 | 1.12 | 3.35 | 5.23 | 4.60 | 2.36 | AF 41 | 1.87 | M8 / 0.59 | 3.94 | AF 55 | 1.24 | 5.24 |
| **Type** | **S** | **T** | | | | | | | | | | | | | | |
| D 170 | 0.55 | 1.5 | | | | | | | | | | | | | | |
| D 230 | 0.55 | 1.5 | | | | | | | | | | | | | | |

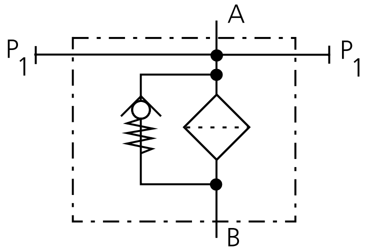
* Corresponds to $1^5/_8$-12 UN-2B

## Symbols

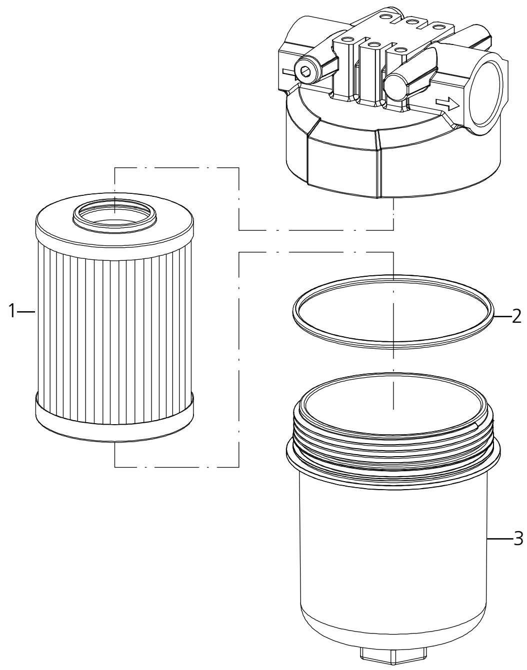
1




2




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Replacement filter element | see Chart / col. 9 |
| 2 | O-ring<br>115 x 4.5 mm<br>4.53 x 0.18 inch | N007.1155 |
| 3 | Filter bowl D 170 | D 230.0102 |
| 3 | Filter bowl D 230 | D 230.0101 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

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

Return Filters - Lightline

# RFL 170 · RFL 230

In-line mounting · Connection G1¼ / -20 SAE · Nominal flow rate up to 290 l/min / 77 gpm

M

In-line Return Filter RFL 170

## Description

### Application

In the return line circuits of hydraulic systems.

### Filter maintenance

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

### Materials

| | |
|---|---|
| Filter head: | Aluminum alloy |
| Filter bowl: | Polyamide, GF reinforced |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®Light - inorganic multi-layer microfiber web |
| | Paper - cellulose web, impregnated with resin |

### Accessories

Electrical and optical clogging indicators are available on request. For technical data and dimensions see datasheet 60.20.

## Characteristics

### Nominal flow rate

Up to 290 l/min / 77 gpm (see Selection Chart, page 3).
The nominal flow rates indicated by ARGO-HYTOS lightline are based on the following features:

› Closed by-pass valve at $\nu \leq 150$ mm²/s / 698 SUS
› Element service life > 500 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
› Flow velocity in the connection lines ≤ 6 m/s / 20 ft/s

### Connection

Threaded ports according to ISO 228 or DIN 13 and SAE standard J514. Sizes see Selection Chart, page 3, (other port threads on request).

### Filter fineness

10 µm(c) ... 30 µm(c)
ß-values according ISO 16889 (see diagrams).

### 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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

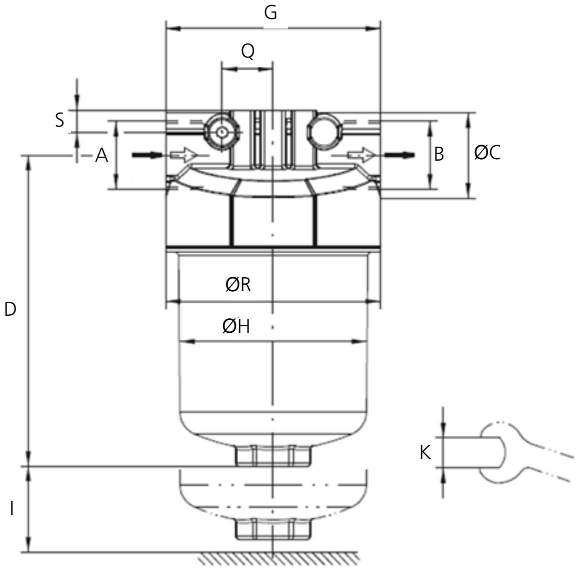
### Operating pressure

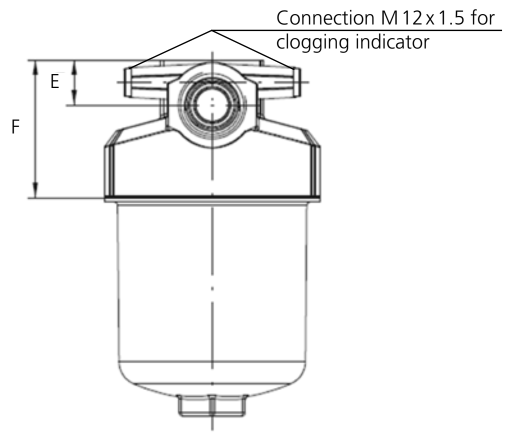
Max. 10 bar / 145 psi

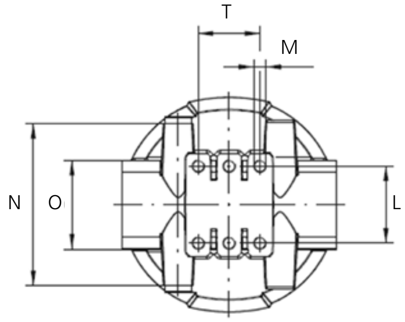
### Mounting position

Vertical mounting to be preferred, filter head on top.

## Dimensions




## Measurements

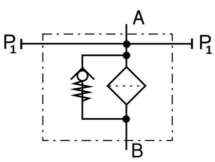
| Type [mm] | A | B | C | D | E | F | G | H | I | K | L | M Ø / depth | N | O | Q | R | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RFL 170 | G1¼ | G1¼ | 52 | 192 | 28 | 85 | 133 | 117 | 60 | AF 41 | 47.6 | M8 / 15 | 100 | AF 55 | 31.5 | 133 | 14 | 38.1 |
| RFL 230 | G1¼ | G1¼ | 52 | 302 | 28 | 85 | 133 | 117 | 60 | AF 41 | 47.6 | M8 / 15 | 100 | AF 55 | 31.5 | 133 | 14 | 38.1 |

| Type [inch] | A | B | C | D | E | F | G | H | I | K mm | L | M Ø / depth | N | O mm | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RFL 170 | -20 SAE* | -20 SAE* | 2.05 | 7.56 | 1.12 | 3.35 | 5.23 | 4.60 | 2.36 | AF 41 | 1.87 | M8 / 0.6 | 3.94 | AF 55 | 1.24 |
| RFL 230 | -20 SAE* | -20 SAE* | 2.05 | 11.89 | 1.12 | 3.35 | 5.23 | 4.60 | 2.36 | AF 41 | 1.87 | M8 / 0.6 | 3.94 | AF 55 | 1.24 |

| Type [inch] | R | S | T |
|---|---|---|---|
| RFL 170 | 5.24 | 0.55 | 1.5 |
| RFL 230 | 5.24 | 0.55 | 1.5 |

*Corresponds to 1 5/8 - 12 UN - 2B

## Symbol



## Ordering Code

### Filter assembly

RFL - ___ - ___ - ___ - ___ - 100

| Type of filter | Code |
|---|---|
| Return Filter, In-line | RFL |

| Flow rate, max. | Code |
|---|---|
| 190 l/min / 50 gpm | 170 |
| 290 l/min / 77 gpm | 230 |

| Connection thread | Code |
|---|---|
| G1¼ | GE |
| -20 SAE | UE |

| Filter fineness | Code |
|---|---|
| 10 µm (10EL) | G2 |
| 16 µm (16EL) | I2 |
| 30 µm (30P) | N3 |

**Order example:**
RFL - 230 - UE - N3 - KM - 100

| Air breather | Code |
|---|---|
| without air breather | 100 |

| Bypass setting | Code |
|---|---|
| 2.5 bar / 36 psi (for 10EL, 16EL) | OM |
| 1.5 bar / 22 psi (for 30P) | KM |

Filters delivered with 2 plugged connections M12 x 1.5 for clogging indicators.

### Spare filter element

___ 3 . 10 ___ - ___ ___

| Filter media | Code |
|---|---|
| EXAPOR®Light | F |
| Paper | P |

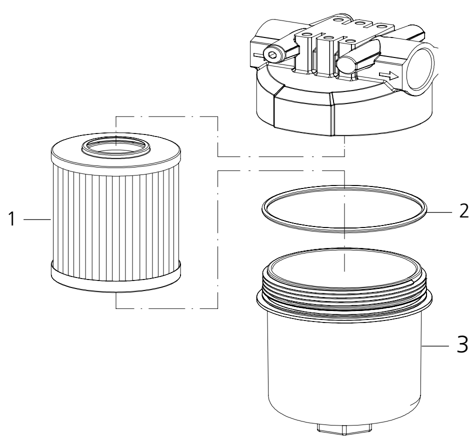
| Length | Code |
|---|---|
| for RFL 170 | 14 |
| for RFL 230 | 25 |

**Order example:**
P3.1025-01

| Filter fineness (2nd digit) | Code |
|---|---|
| 10EL | 6 |
| 16EL | 8 |
| 30P | 1 |

| Filter fineness (1st digit) | Code |
|---|---|
| for RFL 170, 10EL & 16EL | 2 |
| for RFL 170, 30P | 0 |
| for RFL 230, 10EL & 16EL & 30P | 0 |

## Spare parts



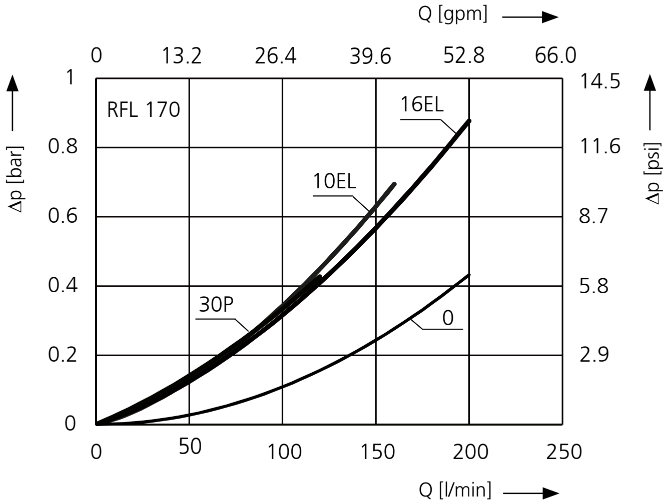

| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Replacement filter element | see above |
| 2 | O-ring<br>115 x 4.5 mm<br>4.53 x 0.18 inch | N007.1155 |
| 3 | Filter bowl RFL 170 | D 230.0102 |
| 3 | Filter bowl RFL 230 | D 230.0101 |

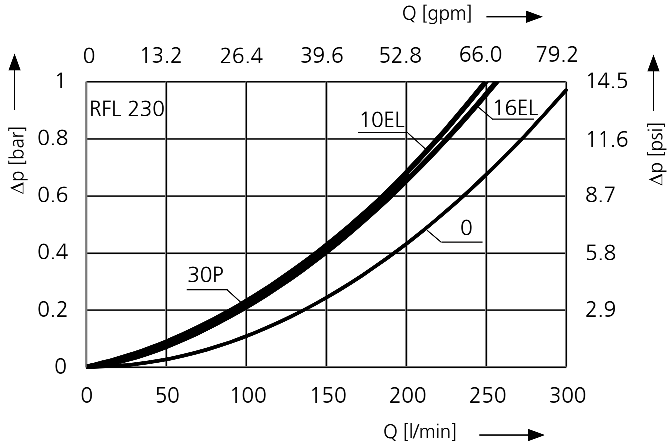
The functions of the complete filters as well as the outstanding features of the filter elements assured by ARGO-HYTOS can only be guaranteed if original ARGO-HYTOS spare parts are used.

## Diagrams

### Δp-curves for complete filters

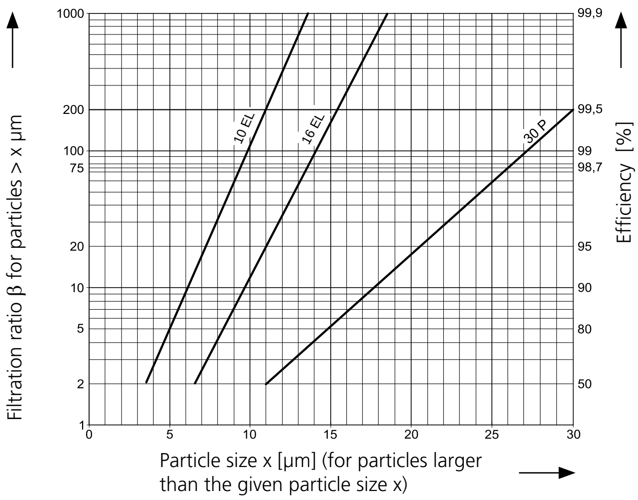
**D1** Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s / 162 SUS (0 = housing empty)




### Filter fineness curves

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®Light and Paper elements:**

10 EL = $\overline{\beta}_{10\,(c)}$ = 200 EXAPOR®Light
16 EL = $\overline{\beta}_{16\,(c)}$ = 200 EXAPOR®Light
30 P = $\overline{\beta}_{30(c)}$ = 200 Paper

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

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

## Quality Assurance

### Quality management according to DIN EN ISO 9001

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

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

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

Return Filter

# FR 043 · FR 072

Tank top mounting · Hose connection up to ID 19 mm / ¾ inch · Nominal flow rate up to 70 l/min / 18.5 gpm

M

Return Filter FR 072

## Description

### Application

In the return line circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

### Special features

- Connection: Hose nipple
- By-pass valve:
  The location close to the inlet port prevents dirt particles retained by the filter element from entering into the clean oil side.
- Removable bowl:
  In case of maintenance the filter bowl is removed together with the filter element - therefore dirt particles are not flushed back into the tank.
- Oil separator:
  Prevents oil splashing through the breather on mobile application.
- Extension pipe:
  A correct extension pipe length ensures oil outlet below minimum oil level and prevents foaming.

### Filter elements

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

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

### Ventilating Filter

Ventilation of the reservoir by an integral star-shape pleated filter element:

- removable (replace annually!)
- splash-proof
- fineness 2 µm

### Filter maintenance

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

### Materials

| | |
|---|---|
| Screw-on cap: | Polyester, GF-reinforced |
| Housing: | Polyamide, CF-reinforced, electrically conducting |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer Microfiber web<br>Paper - cellulose web, impregnated with resin |

### Accessories

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

Recommended hose clamps according to DIN 3017 Part 2 or equivalent for hose OD 23 mm or 26 mm / 0.91 inch or 1.03 inch. For orders use ARGO-HYTOS Part No. 11889400 or 13195600.

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

## Characteristics

### Nominal flow rate

Up to 70 l/min / 18.5 gpm (see Selection Chart, column 2).
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines ≤ 4.5 m/s / 14.8 ft/s

### Connection

Hose nipple for hose up to ID 19 mm / ¾ inch
Sizes see Selection Chart, column 6,
(other connections on request).

### Filter fineness

10 µm(c) ... 30 µm(c)
$\beta$-values according to ISO 16889
(see Selection Chart, column 4 and diagram Dx).

### Dirt-holding capacity

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

### Hydraulic fluids

Mineral oil and biodegradable fluids
(HEES and HETG, see info-sheet 00.20).
With high filling conditions we recommend an electrical conductivity ≥ 500 pS/m at 20 °C / 68 °F.

### Temperature range

-30 °C ... +80 °C (temporary +100 °C)
-22 °F ... +176 °F (temporary +212 °F)

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it inter-sects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Operating pressure

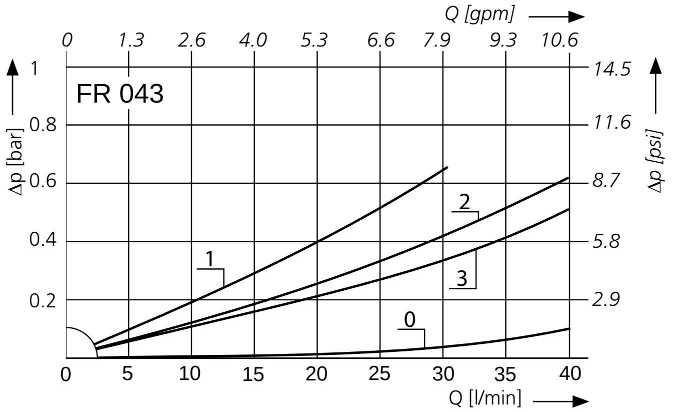
Max. 6 bar / 87 psi

### Mounting position

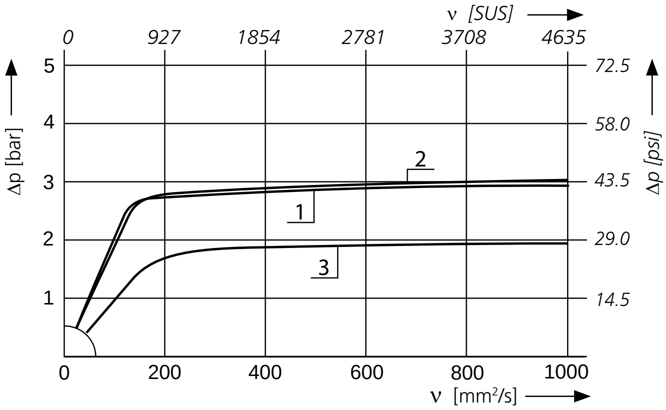
Preferably vertical, outlet downwards.

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

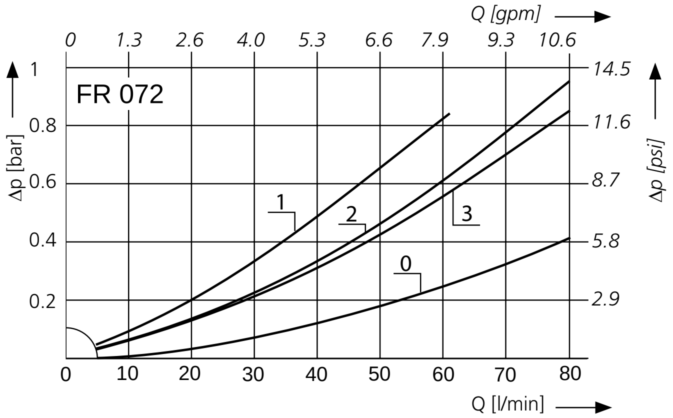
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



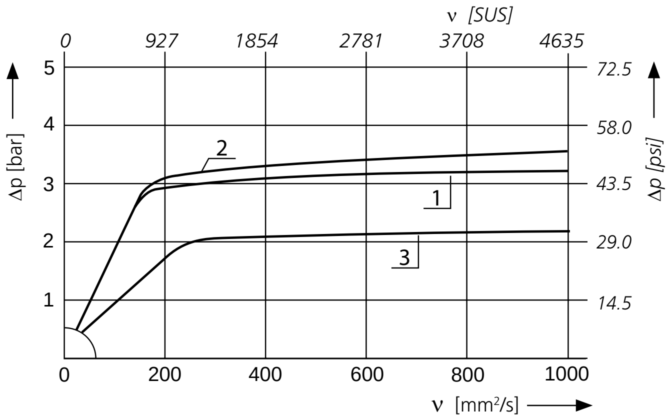

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

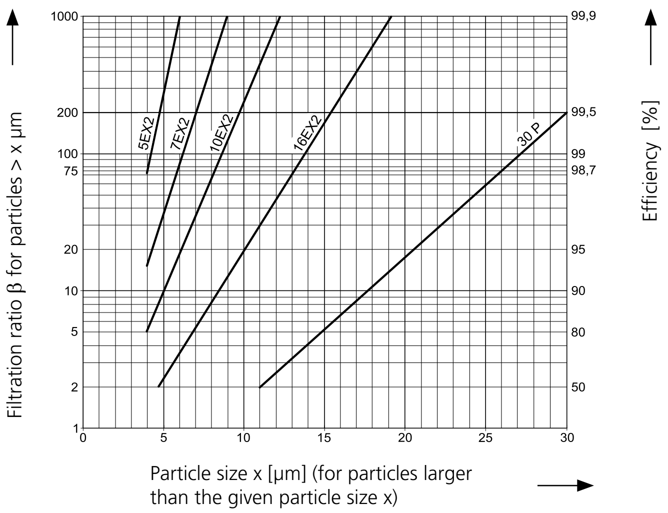



Pressure drop as a function of the **kinematic viscosity** at nominal flow




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

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX 2 and Paper elements:**

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

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

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189

**For ventilating filter elements:**

2CL = 99.5% filter efficiency for particles of size 2 µm

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

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see Diagram **D**/curve no. | Filter fineness see Diagr. **Dx** | Dirt-holding capacity | Connection A | Cracking pressure of by-pass | Symbol | Replacement filter element Part No. | Weight | Replacement ventilating filter Part No. (Filter fineness, see diagrams) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | mm | bar | | | kg | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| **FR 043-156**[1] | 25 | **D1**/1 | 10EX2 | 6.1 | 17.5 | 2.5 | 1 | V3.0510-56 | 0.42 | L1.0403-51 (2CL) | - |
| FR 043-166 | 25 | **D1**/1 | 10EX2 | 6.1 | 17.5 | 2.5 | 2 | V3.0510-56 | 0.42 | L1.0403-51 (2CL) | Indicator port M12 x 1.5 |
| **FR 043-158**[1] | 35 | **D1**/2 | 16EX2 | 6.1 | 17.5 | 2.5 | 1 | V3.0510-58 | 0.42 | L1.0403-51 (2CL) | - |
| FR 043-178 | 35 | **D1**/2 | 16EX2 | 6.1 | 17.5 | 2,5 | 2 | V3.0510-58 | 0.42 | L1.0403-51 (2CL) | Indicator port M12 x 1.5 |
| FR 043-151 | 30 | **D1**/3 | 30P | 4.0 | 17.5 | 1.5 | 1 | P3.0510-51 | 0.42 | L1.0403-51 (2CL) | - |
| FR 043-161 | 30 | **D1**/3 | 30P | 4.0 | 17.5 | 1.5 | 2 | P3.0510-51 | 0.42 | L1.0403-51 (2CL) | Indicator port M12 x 1.5 |
| **FR 072-156**[1] | 50 | **D2**/1 | 10EX2 | 13 | 20.5 | 2.5 | 1 | V3.0520-56 | 0.58 | L1.0403-51 (2CL) | - |
| FR 072-166 | 50 | **D2**/1 | 10EX2 | 13 | 20.5 | 2.5 | 2 | V3.0520-56 | 0.58 | L1.0403-51 (2CL) | Indicator port M12 x 1.5 |
| **FR 072-158**[1] | 70 | **D2**/2 | 16EX2 | 13 | 20.5 | 2.5 | 1 | V3.0520-58 | 0.58 | L1.0403-51 (2CL) | - |
| FR 072-168 | 70 | **D2**/2 | 16EX2 | 13 | 20.5 | 2.5 | 2 | V3.0520-58 | 0.58 | L1.0403-51 (2CL) | Indicator port M12 x 1.5 |
| FR 072-151 | 50 | **D2**/3 | 30P | 6.6 | 20.5 | 1.5 | 1 | P3.0520-51[2] | 0.58 | L1.0403-51 (2CL) | - |
| FR 072-171 | 50 | **D2**/3 | 30P | 6.6 | 20.5 | 1.5 | 2 | P3.0520-51[2] | 0.58 | L1.0403-51 (2CL) | Indicator port M12 x 1.5 |

[1] Preferred type, no minimum order quantity required
[2] Paper media supported with metal gauze

On types with indicator port M12 x 1.5 either manometers or electrical pressure switches can be used as clogging indicators. Optional extension pipes adapt the filter length to various tank depths. For ordering of accessories please use the below mentioned codes.

**Order example: The filter FR 072-156 has to be supplied with an extension pipe for a mounting depth of 500 mm.**

**Order description:** FR 072-156 / EV 500

**Part No. (Basic unit)**

**Extension pipe (5 various lengths are available on request)**

FR 043: EV 150, EV 200, EV 300, EV 400, EV 500
FR 072: EV 250, EV 300, EV 400, EV 500, EV 600

**For the appropriate clogging indicator see data sheet 60.20.**

When using pressure switches of series DG 813 sealing by means of an O-ring (order no. N007.0103, to be ordered separately) has to be guaranteed (torque 4 Nm). When using manometers of series DG 200 variants with preformed sealing ring are to be used.

**Remarks:**

- The switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- Clogging indicators are optional and always delivered detached from the filter.
- For fastening the filter the enclosed spring washers have to be used. Assembly torque $15^{+5}$ Nm.
- The filters listed in this chart are standard filters. Other designs available on request.

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see Diagram **D**/curve no. | Filter fineness see Diagr. **Dx** | Dirt-holding capacity | Connection A | Cracking pressure of by-pass | Symbol | Replacement filter element Part No. | Weight | Replacement ventilating filter Part No. (Filter fineness, see diagrams) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | gpm | | | g | inch | psi | | | lbs | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| FR 043-256 | 6.6 | **D1**/1 | 10EX2 | 6.1 | ID 5/8 | 36 | 3 | V3.0510-56 | 0.93 | - | w/o ventilating filter |
| **FR 043-266**[1] | 6.6 | **D1**/1 | 10EX2 | 6.1 | ID 5/8 | 36 | 4 | V3.0510-56 | 0.93 | L1.0403-51 (2CL) | with oil separator |
| FR 043-168 | 9.2 | **D1**/2 | 16EX2 | 6.1 | ID 5/8 | 36 | 3 | V3.0510-58 | 0.93 | - | w/o ventilating filter |
| **FR 043-198**[1] | 9.2 | **D1**/2 | 16EX2 | 6.1 | ID 5/8 | 36 | 4 | V3.0510-58 | 0.93 | L1.0403-51 (2CL) | with oil separator |
| FR 043-281 | 7.9 | **D1**/3 | 30P | 4.0 | ID 5/8 | 22 | 3 | P3.0510-51 | 0.93 | - | w/o ventilating filter |
| FR 043-291 | 7.9 | **D1**/3 | 30P | 4.0 | ID 5/8 | 22 | 4 | P3.0510-51 | 0.93 | L1.0403-51 (2CL) | with oil separator |
| FR 072-266 | 13.2 | **D2**/1 | 10EX2 | 13 | ID ¾ | 36 | 3 | V3.0520-56 | 1.28 | - | w/o ventilating filter |
| **FR 072-276**[1] | 13.2 | **D2**/1 | 10EX2 | 13 | ID ¾ | 36 | 4 | V3.0520-56 | 1.28 | L1.0403-51 (2CL) | with oil separator |
| FR 072-188 | 18.5 | **D2**/2 | 16EX2 | 13 | ID ¾ | 36 | 3 | V3.0520-58 | 1.28 | - | w/o ventilating filter |
| **FR 072-258**[1] | 18.5 | **D2**/2 | 16EX2 | 13 | ID ¾ | 36 | 4 | V3.0520-58 | 1.28 | L1.0403-51 (2CL) | with oil separator |
| FR 072-281 | 13.2 | **D2**/3 | 30P | 6.6 | ID ¾ | 22 | 3 | P3.0520-51* | 1.28 | - | w/o ventilating filter |
| FR 072-291 | 13.2 | **D2**/3 | 30P | 6.6 | ID ¾ | 22 | 4 | P3.0520-51* | 1.28 | L1.0403-51 (2CL) | with oil separator |

[1] Preferred type, no minimum order quantity required [2] paper media supported with metal gauze

All filters are delivered with a plugged clogging indicator connection M12 x 1.5. As clogging indicators either manometers or electrical pressure switches can be used. Optional extension pipes adapt the filter length to various tank depths. For ordering of accessories please use the below mentioned codes.

**Order example: The filter FR 072-276 has to be supplied with an extension pipe for a mounting depth of 500 mm (resp. 19.69 inch).**

**Order description:** FR 072-276 / EV 500

**Part No. (Basic unit)**

**Extension pipe (5 various lengths are available on request)**

FR 043: EV 150 (5.90 inch), EV 200 (7.87 inch), EV 300 (11.81 inch), EV 400 (15.74 inch) , EV 500 (19.69 inch)
FR 072: EV 250 (9.84 inch), EV 300 (11.81 inch), EV 400 (15.74 inch), EV 500 (19.69 inch), EV 600 (23.62 inch)

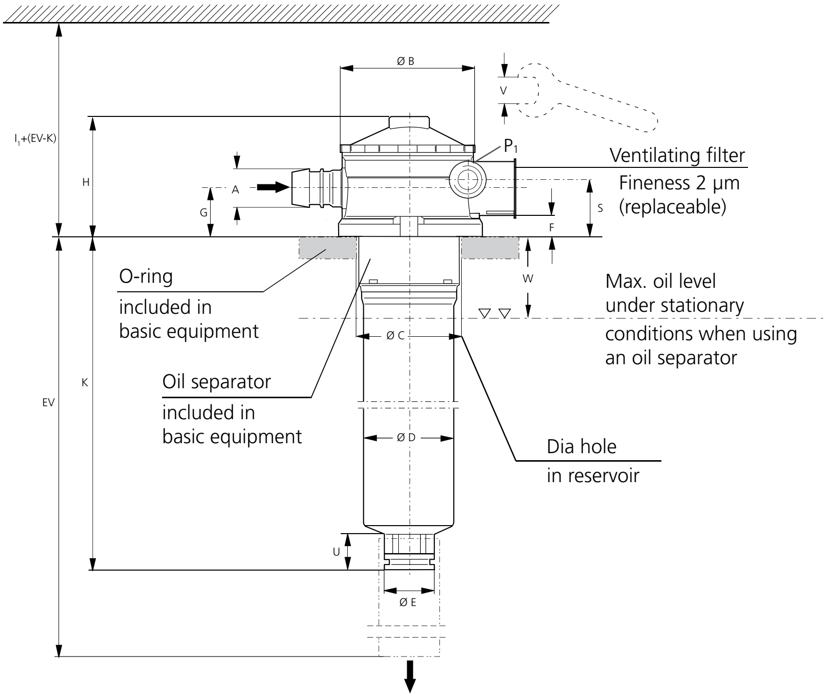
**For the appropriate clogging indicator see data sheet 60.20.**

When using pressure switches of series DG 813 sealing by means of an O-ring (order no. N007.0103, to be ordered separately) has to be guaranteed (torque 4 Nm). When using manometers of series DG 200 variants with preformed sealing ring are to be used.

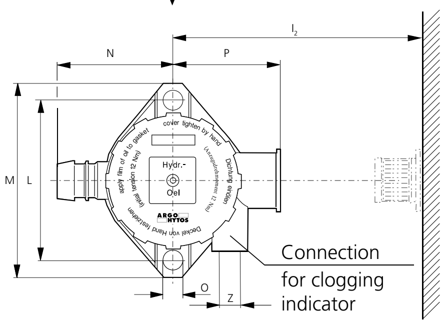
**Remarks:**

- The switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- Clogging indicators are optional and always delivered detached from the filter.
- For fastening the filter the enclosed spring washers have to be used. Assembly torque $15^{+5}$ Nm.
- The filters listed in this chart are standard filters. Other designs available on request.

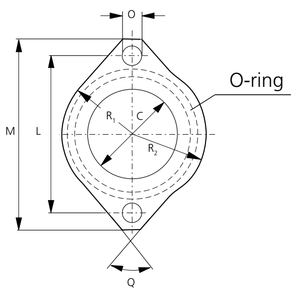
## Dimensions




For dimension EV see selection chart




Required mounting surface




## Measurements in mm

| Type | A | B | C (min/max.) | D | E | F* | G | H | $l_1$ | $l_2$ | K | L | M | N | O | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FR 043 | 17.5 | 75 | 60/61 | 51 | 27.8 | 11 | 22 | 65 | 175 | 110 | 85 | 88 | 108 | 65 | 11 | 58 |
| FR 072 | 20.5 | 75 | 60/61 | 51 | 27.8 | 11 | 22 | 65 | 270 | 110 | 182 | 88 | 108 | 65 | 11 | 58 |

| Type | Q | $R_1$ | $R_2$ | S | U | V | W | Z Ø / depth |
|---|---|---|---|---|---|---|---|---|
| FR 043 | 80° | 39 | 42 | 27 | 20 | AF 27 | 40 | M12 x 1.5 / 10 |
| FR 072 | 80° | 39 | 42 | 27 | 20 | AF 27 | 40 | M12 x 1.5 / 10 |

## Measurements in inch

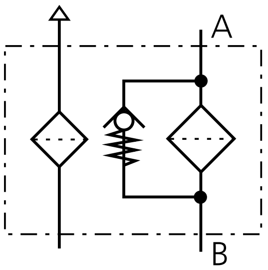
| Type | A | B | C (min/max.) | D | E | F* | G | H | $l_1$ | $l_2$ | K | L | M | N | O | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FR 043 | 0.69 | 2.95 | 2.36/2.40 | 2.01 | 1.09 | 0.43 | 0.87 | 2.56 | 6.89 | 4.33 | 3.35 | 3.46 | 4.25 | 2.56 | 0.43 | 2.28 |
| FR 072 | 0.81 | 2.95 | 2.36/2.40 | 2.01 | 1.09 | 0.43 | 0.87 | 2.56 | 10.63 | 4.33 | 7.17 | 3.46 | 4.25 | 2.56 | 0.43 | 2.28 |

| Type | Q | $R_1$ | $R_2$ | S | U | V mm | W | Z Ø / depth |
|---|---|---|---|---|---|---|---|---|
| FR 043 | 80° | 1.54 | 1.65 | 1.06 | 0.79 | AF 27 | 1.57 | M12 x 1.5 / 0.39 |
| FR 072 | 80° | 1.54 | 1.65 | 1.06 | 0.79 | AF 27 | 1.57 | M12 x 1.5 / 0.39 |

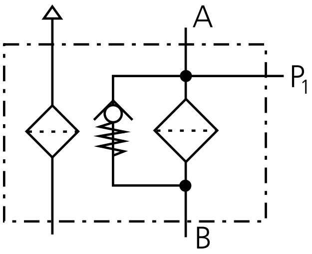
*Including the enclosed spring washers Ø10 mm (0.39 inch), DIN 137 shape B, corrugated

## Symbols

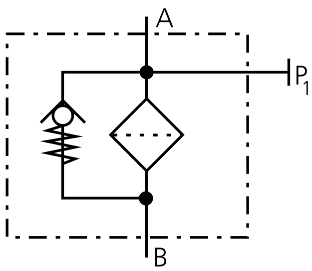
1



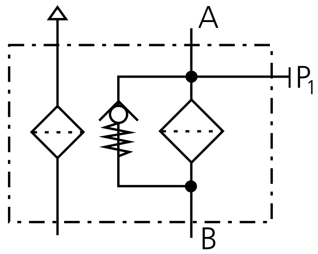

2



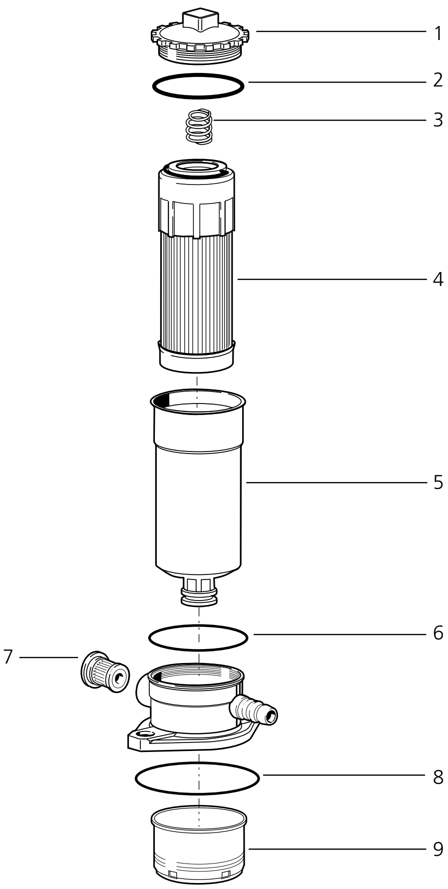

3




4




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Screw-on cap | FR 043.0201 |
| 2 | O-ring<br>57 x 3 mm<br>2.24 x 0.12 inch | N007.0573 |
| 3 | Compression spring | N015.1606 |
| 4 | Replacement filter element | s. Chart / col. 9 |
| 5 | Filter bowl FR 043* | FR 043.0107 |
| 5 | Filter bowl FR 072* | FR 072.0104 |
| 6 | O-ring<br>50 x 2 mm<br>1.97 x 0.08 inch | N007.0501 |
| 7 | Replacement ventilating filter | L1.0403-51 |
| 8 | O-ring<br>69 x 4 mm<br>2.72 x 0.16 inch | N007.0704 |
| 9 | Oil separator | FR 043.0701 |

*Specify mounting depth (EV) in mm

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

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

Return Filters

# E 043 · E 072

Tank top mounting · Connection up to G¾ / -12 SAE · Nominal flow rate up to 70 l/min / 18.5 gpm

Return Filter E 072

## Description

### Application

In the return line circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

### Special features

- By-pass valve:
  The location close to the inlet port prevents dirt particles retained by the filter element from entering into the clean oil side.
- Removable bowl:
  In case of maintenance the filter bowl is removed together with the filter element – therefore dirt particles are not flushed back into the tank.
- Extension pipe:
  A correct extension pipe length ensures oil outlet below minimum oil level and prevents foaming.

### Filter elements

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

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

### Ventilating filter

Ventilation of the reservoir by an integral star-shape pleated filter element:

- removable (replace annually!)
- splash-proof
- fineness 2 µm

### Filter maintenance

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

### Materials

| | |
|---|---|
| Screw-on cap: | Polyester, GF-reinforced |
| Filter head: | Aluminum alloy |
| Filter bowl: | Polyamide, CF-reinforced, electrically conducting |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2- organic multi-layer microfiber web<br>Paper - cellulose web, impregnated with resin |

### Accessories

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

An optional oil separator (Part No. E 043.1701) prevents oil splashing through the ventilating filter at mobile applications and is available on request.

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

## Characteristics

### Nominal flow rate

Up to 70 l/min / 18.5 gpm (see Selection Chart, column 2).
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average
- fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines ≤ 4,5 m/s / 14.8 ft/s

### Connection

Threaded ports according to

- ISO 228 or DIN 13
- SAE standard J514

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

### Filter fineness

5 µm(c) ... 30 µm(c)
β-values according to ISO 16889
(see Selection Chart, column 4 and diagram Dx).

### Dirt-holding capacity

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

### Hydraulic fluids

Mineral oil and biodegradable fluids
(HEES and HETG, see info-sheet 00.20).
With high filling conditions we recommend an electrical conductivity ≥ 500 pS/m at 20 °C / 68 °F.

### Temperature range

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

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
- at initial operation:

The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it inter-sects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Operating pressure

Max. 10 bar / 145 psi

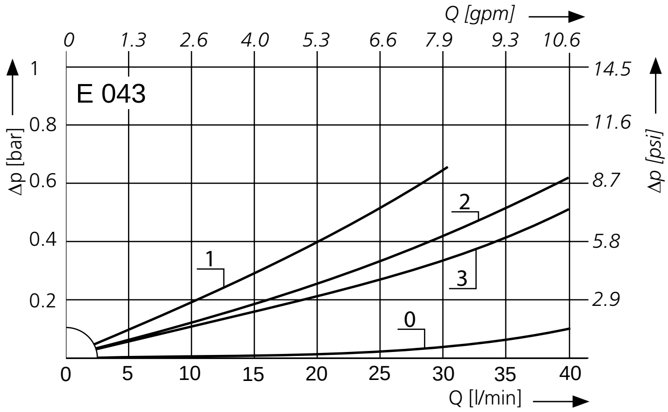
### Mounting position

Preferably vertical, outlet downwards.

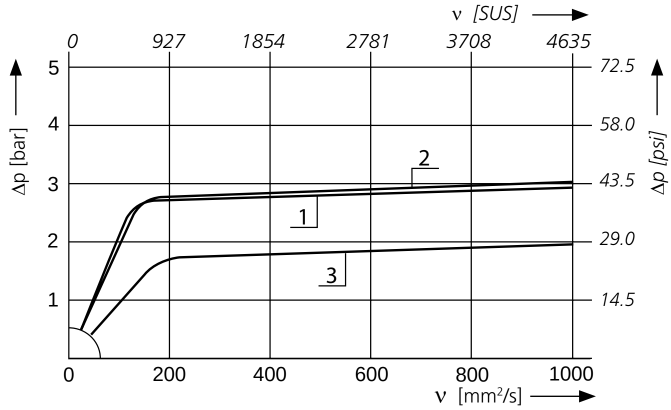
## Diagrams

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

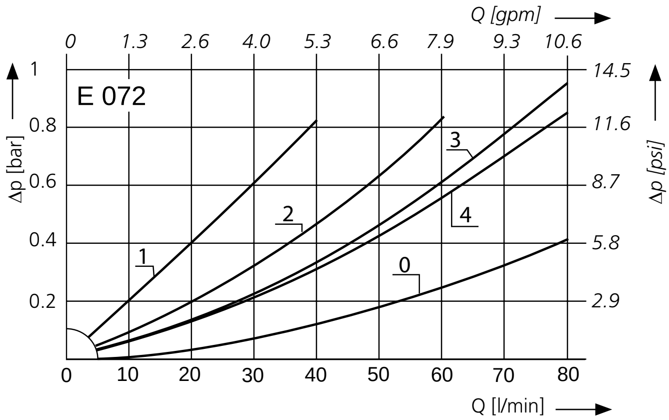
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



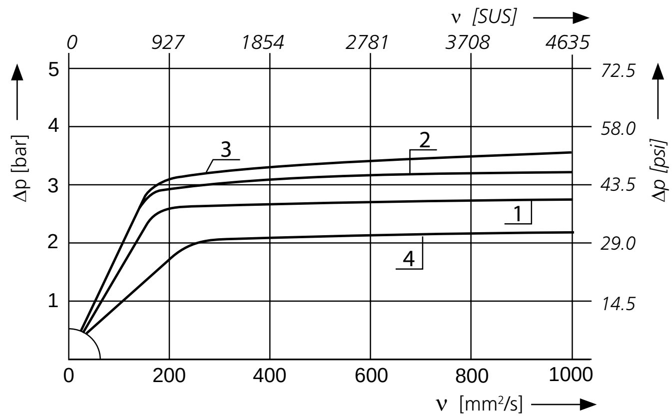

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

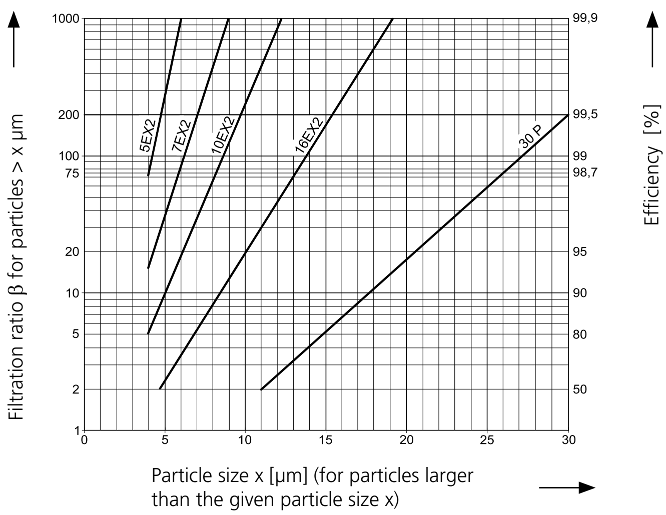



Pressure drop as a function of the **kinematic viscosity** at nominal flow




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

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX 2 and Paper elements:**

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

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

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189

**For ventilating filter elements:**

2CL = 99.5% efficiency for particles of size 2 µm

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

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/ curve no. | Filter fineness see Diagr. **Dx** | Dirt-holding capacity | Connection A | Cracking pressure of by-pass | Symbol | Replacement element Part No. | Weight | Replacement ventilating filter Part No. (Filter fineness see diagrams) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | | | kg | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| **E 043-156**[1] | 25 | **D1**/1 | 10EX2 | 6.1 | G½ | 2.5 | 2 | V3.0510-56 | 0.6 | L1.0403-01 (2CL) | - |
| **E 043-166**[1] | 25 | **D1**/1 | 10EX2 | 6.1 | G½ | 2.5 | 1 | V3.0510-56 | 0.6 | - | - |
| **E 043-158**[1] | 35 | **D1**/2 | 16EX2 | 6.1 | G½ | 2.5 | 2 | V3.0510-58 | 0.6 | L1.0403-01 (2CL) | - |
| **E 043-168**[1] | 35 | **D1**/2 | 16EX2 | 6.1 | G½ | 2.5 | 1 | V3.0510-58 | 0.6 | - | - |
| | | | | | | | | | | | |
| E 043-151 | 30 | **D1**/3 | 30P | 4.0 | G½ | 1.5 | 2 | P3.0510-51 | 0.6 | L1.0403-01 (2CL) | - |
| E 043-161 | 30 | **D1**/3 | 30P | 4.0 | G½ | 1.5 | 1 | P3.0510-51 | 0.6 | - | - |
| | | | | | | | | | | | |
| E 072-153 | 25 | **D2**/1 | 5EX2 | 7.7 | G¾ | 2.5 | 2 | V3.0520-53 | 0.8 | L1.0403-01 (2CL) | - |
| E 072-163 | 25 | **D2**/1 | 5EX2 | 7.7 | G¾ | 2.5 | 1 | V3.0520-53 | 0.8 | - | - |
| **E 072-156**[1] | 50 | **D2**/2 | 10EX2 | 13 | G¾ | 2.5 | 2 | V3.0520-56 | 0.8 | L1.0403-01 (2CL) | - |
| **E 072-166**[1] | 50 | **D2**/2 | 10EX2 | 13 | G¾ | 2.5 | 1 | V3.0520-56 | 0.8 | - | - |
| **E 072-158**[1] | 70 | **D2**/3 | 16EX2 | 13 | G¾ | 2.5 | 2 | V3.0520-58 | 0.8 | L1.0403-01 (2CL) | - |
| **E 072-168**[1] | 70 | **D2**/3 | 16EX2 | 13 | G¾ | 2.5 | 1 | V3.0520-58 | 0.8 | - | - |
| | | | | | | | | | | | |
| E 072-151 | 50 | **D2**/4 | 30P | 6.6 | G¾ | 1.5 | 2 | P3.0520-51[2] | 0.8 | L1.0403-01 (2CL) | - |
| E 072-161 | 50 | **D2**/4 | 30P | 6.6 | G¾ | 1.5 | 1 | P3.0520-51[2] | 0.8 | - | - |

[1] Preferred type, no minimum order quantity required
[2] Paper media supported with metal gauze

All filters are delivered with a plugged clogging indicator connection M12 x 1.5. As clogging indicators either manometers or electrical pressure switches can be used. Optional extension pipes adapt the filter length to various tank depths. For ordering of accessories please use the below mentioned codes.

**Order example: The filter E 072-156 has to be supplied with an extension pipe for a mounting depth of 500 mm.**

**Order description:** **E 072-156** / **EV 500**

**Part No. (Basic unit)**

**Mounted extension pipe (5 various lengths are available on request)**

E 043: EV 150, EV 200, EV 300, EV 400, EV 500
E 072: EV 250, EV 300, EV 400, EV 500, EV 600

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

Remarks:

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

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/ curve no. | Filter fineness see Diagr. **DX** | Dirt-holding capacity | Connection A | Cracking pressure of by-pass | Symbol | Replacement element Part No. | Weight | Replacement ventilating filter Part No. (Filter fineness see diagrams) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | gpm | | | g | SAE | psi | | | lbs | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| **E 043-776**[1] | 6.6 | **D1**/1 | 10EX2 | 6.1 | -12[2] | 36 | 2 | V3.0510-56 | 1.32 | L1.0403-01 (2CL) | incl. oil separator |
| **E 043-786**[1] | 6.6 | **D1**/1 | 10EX2 | 6.1 | -12[2] | 36 | 1 | V3.0510-56 | 1.32 | - | - |
| **E 043-778**[1] | 9.2 | **D1**/2 | 16EX2 | 6.1 | -12[2] | 36 | 2 | V3.0510-58 | 1.32 | L1.0403-01 (2CL) | incl. oil separator |
| **E 043-788**[1] | 9.2 | **D1**/2 | 16EX2 | 6.1 | -12[2] | 36 | 1 | V3.0510-58 | 1.32 | - | - |
| | | | | | | | | | | | |
| E 043-771 | 7.9 | **D1**/3 | 30P | 4.0 | -12[2] | 21 | 2 | P3.0510-51 | 1.32 | L1.0403-01 (2CL) | incl. oil separator |
| E 043-781 | 7.9 | **D1**/3 | 30P | 4.0 | -12[2] | 21 | 1 | P3.0510-51 | 1.32 | - | - |
| | | | | | | | | | | | |
| E 072-773 | 6.6 | **D2**/1 | 5EX2 | 7.7 | -12[2] | 36 | 2 | V3.0520-53 | 1.76 | L1.0403-01 (2CL) | incl. oil separator |
| E 072-783 | 6.6 | **D2**/1 | 5EX2 | 7.7 | -12[2] | 36 | 1 | V3.0520-53 | 1.76 | - | - |
| **E 072-776**[1] | 13.2 | **D2**/2 | 10EX2 | 13 | -12[2] | 36 | 2 | V3.0520-56 | 1.76 | L1.0403-01 (2CL) | incl. oil separator |
| **E 072-786**[1] | 13.2 | **D2**/2 | 10EX2 | 13 | -12[2] | 36 | 1 | V3.0520-56 | 1.76 | - | - |
| **E 072-778**[1] | 18.5 | **D2**/3 | 16EX2 | 13 | -12[2] | 36 | 2 | V3.0520-58 | 1.76 | L1.0403-01 (2CL) | incl. oil separator |
| **E 072-788**[1] | 18.5 | **D2**/3 | 16EX2 | 13 | -12[2] | 36 | 1 | V3.0520-58 | 1.76 | - | - |
| | | | | | | | | | | | |
| E 072-771 | 13.2 | **D2**/4 | 30P | 6.6 | -12[2] | 21 | 2 | P3.0520-51[3] | 1.76 | L1.0403-01 (2CL) | incl. oil separator |
| E 072-781 | 13.2 | **D2**/4 | 30P | 6.6 | -12[2] | 21 | 1 | P3.0520-51[3] | 1.76 | - | - |

[1] Preferred type, no minimum order quantity required
[2] Corresponds to 1 1/16 -12 UN-2B
[3] Paper media supported with metal gauze

All filters are delivered with a plugged clogging indicator connection M12 x 1.5 mm. As clogging indicators either manometers or electrical pressure switches can be used. Optional extension pipes adapt the filter length to various tank depths. For ordering of accessories please use the below mentioned codes.

**Order example: The filter E 072-776 has to be supplied with an extension pipe for a mounting depth of 500 mm (resp. 19.69 inch).**

**Order description:** **E 072-776** / **EV 500**

**Part No. (Basic unit)** → E 072-776

**Mounted extension pipe (5 various lengths are available on request)** → EV 500

E 043: EV 150 (5.90 inch), EV 200 (7.87 inch), EV 300 (11.81 inch), EV 400 (15.74 inch), EV 500 (19.69 inch)
E 072: EV 250 (9.84 inch), EV 300 (11.81 inch), EV 400 (15.74 inch), EV 500 (19.69 inch), EV 600 (23.62 inch)

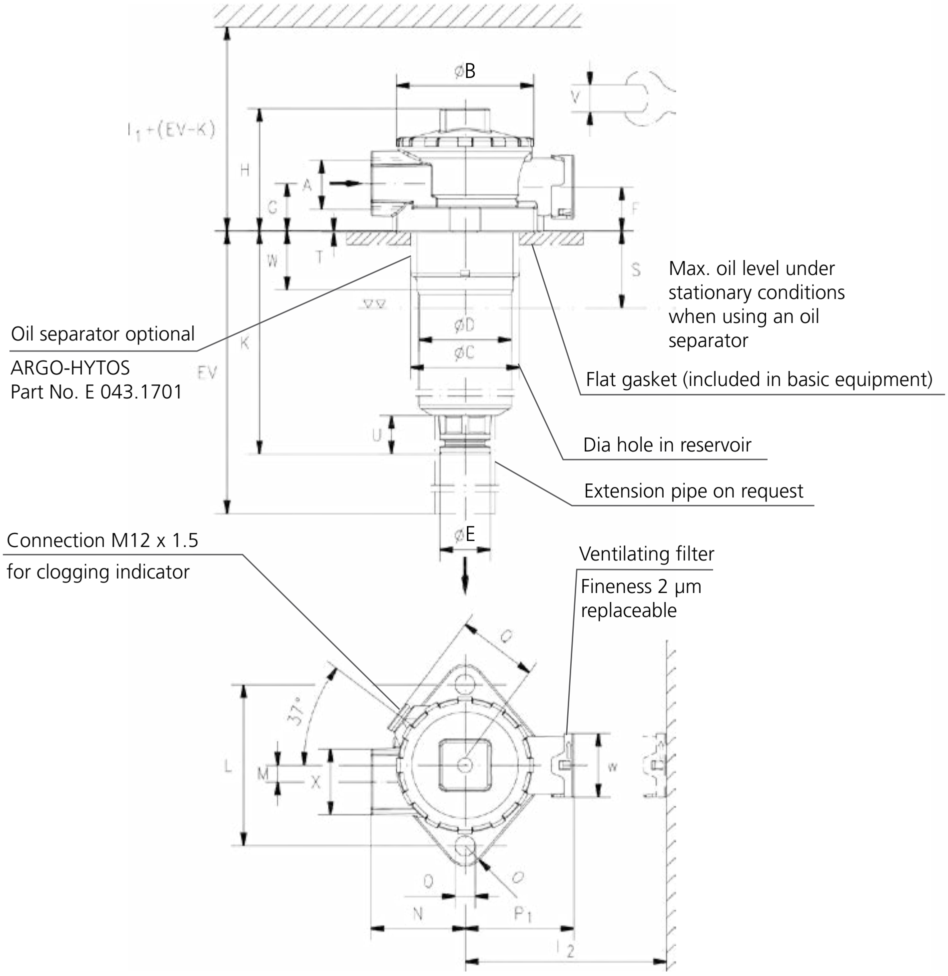
**For the appropriate clogging indicators see catalog sheet 60.20.**

Remarks:

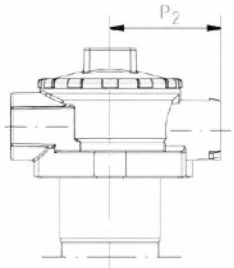
› The switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
› Clogging indicators are optional and always delivered detached from the filter.
› The filters listed in this chart are standard filters.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

## Dimensions

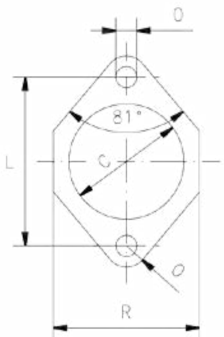
Design with ventilating filter




Design without ventilating filter




Required mounting surface




## Measurements in mm

| Type | A | B | C min/max | D | E | F | G | H | $l_1$ | $l_2$ | K | L | M | N | O | $P_1$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 043 | G½ | 75 | 60/63 | 51 | 27.8 | 24 | 26 | 67 | 175 | 110 | 83 | 88 | 9 | 51 | 11 | 59.5 |
| E 072 | G¾ | 75 | 60/63 | 51 | 27.8 | 24 | 26 | 67 | 270 | 110 | 180 | 88 | 9 | 51 | 11 | 59.5 |

| Type | $P_2$ | Q | R | S | T | U | V | W | X |
|---|---|---|---|---|---|---|---|---|---|
| E 043 | 57.5 | 46 | 79 | 42 | 2 | 21 | AF 27 | 35 | AF 36 |
| E 072 | 57.5 | 46 | 79 | 42 | 2 | 21 | AF 27 | 35 | AF 36 |

## Measurements in inch

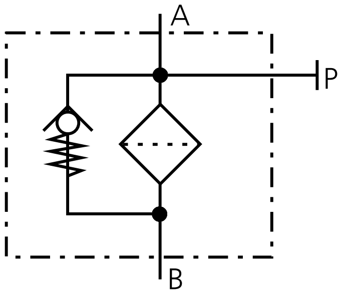
| Type | A SAE | B | C min/max | D | E | F | G | H | $l_1$ | $l_2$ | K | L | M | N | O | $P_1$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 043 | -12* | 2.95 | 2.36/2.48 | 2.01 | 1.09 | 0.94 | 1.02 | 2.64 | 6.89 | 4.33 | 3.27 | 3.46 | 0.35 | 2.01 | 0.43 | 2.34 |
| E 072 | -12* | 2.95 | 2.36/2.48 | 2.01 | 1.09 | 0.94 | 1.02 | 2.64 | 10.63 | 4.33 | 7.09 | 3.46 | 0.35 | 2.01 | 0.43 | 2.34 |

| Type | $P_2$ | Q | R | S | T | U | V mm | W | X mm |
|---|---|---|---|---|---|---|---|---|---|
| E 043 | 2.26 | 1.81 | 3.11 | 1.65 | 0.08 | 0.83 | AF 27 | 1.38 | AF 36 |
| E 072 | 2.26 | 1.81 | 3.11 | 1.65 | 0.08 | 0.83 | AF 27 | 1.38 | AF 36 |

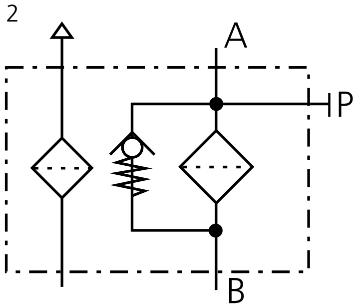
* Corresponds to 1¹/₁₆-12 UN-2B

## Symbols

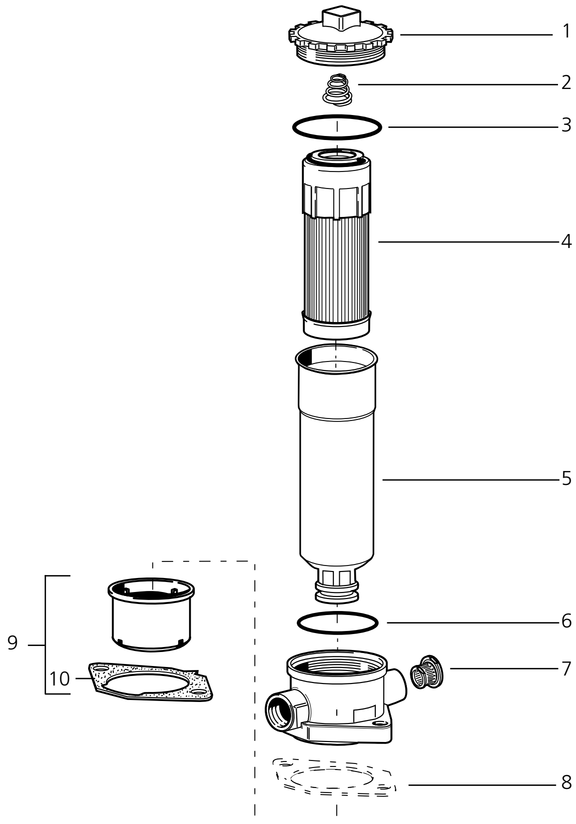
1




2




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Screw-on cap | FR 043.0201 |
| 2 | Compression spring | N015.1606 |
| 3 | O-ring<br>57 x 3 mm<br>2.24 x 0.12 inch | N007.0573 |
| 4 | Replacement filter element | see Chart / col. 9 |
| 5 | Filter bowl E 043* | FR 043.0107 |
| 5 | Filter bowl E 072* | FR 072.0104 |
| 6 | O-ring<br>50 x 2 mm<br>1.97 x 0.08 inch | N007.0501 |
| 7 | Replacement ventilating filter | L1.0403-01K |
| 8 | Flat gasket (for versions<br>without oil separator) | D 043.0113 |
| 9 | Oil separator (incl. pos. 10) | E 043.1701 |
| 10 | Flat gasket (for versions<br>with oil separator) | D 043.0118 |

*Specify mounting depth (EV) in mm

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

## Return Filters - Lightline

# RFT 043 · RFT 072

Tank top mounting · Connection G¾ / -12 SAE · Nominal flow rate up to 90 l/min / 24 gpm

Return Filter RFT 043

## Description

### Application

In the return line circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

### Special features

- Bypass valve:
  The location close to the inlet port prevents dirt particles retained by the filter element from entering into the clean oil side.
- Removable bowl:
  In case of maintenance the filter bowl is removed together with the filter element – therefore dirt particles are not flushed back into the tank.
- Extension pipe:
  A correct extension pipe length ensures oil outlet below minimum oil level and prevents foaming.

### Filter elements

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

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

### Ventilating filter

Ventilation of the reservoir by an integral star-shape pleated filter element:

- removable (replace annually!)
- splash-proof
- fineness 2 µm

### Filter maintenance

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

### Materials

| | |
|---|---|
| Screw-on cap: | Polyester, GF-reinforced |
| Filter head: | Aluminum alloy |
| Filter bowl: | Polyamide, CF-reinforced |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®Light - inorganic multi-layer microfiber web<br>Paper - cellulose web, impregnated with resin |

### Accessories

Electrical and optical clogging indicators are available on request. For technical data and dimensions see datasheet 60.20.

An optional oil separator (Part No. E 043.1701) is available on request.

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

## Characteristics

### Nominal flow rate

Up to 90 l/min / 24 gpm (see Selection Chart, page 3).
The nominal flow rates indicated by ARGO-HYTOS lightline are based on the following features:

- closed bypass valve at $\nu \leq 150$ mm²/s / 698 SUS
- element service life > 500 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines ≤ 6 m/s / 20 ft/s

### Connection

Threaded ports according to

- ISO 228 or DIN 13 and
- SAE standard J514

Sizes see Selection Chart, page 3
(other port threads on request).

### Filter fineness

10 µm(c) ... 30 µm(c)
β-values according to ISO 16889 (see diagrams).

### 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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS

### Operating pressure

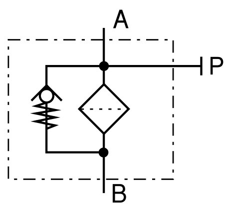
Max. 10 bar / 145 psi

### Mounting position

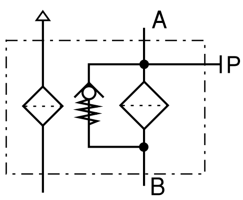
Preferably vertical, outlet downwards.

## Symbols

Without air breather

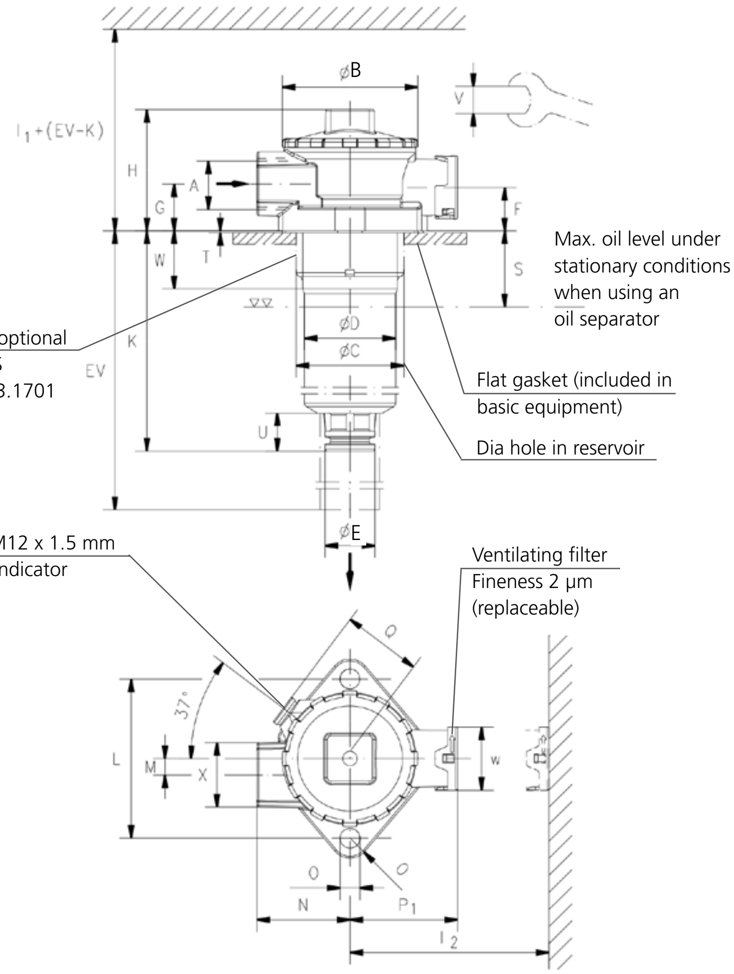



With air breather

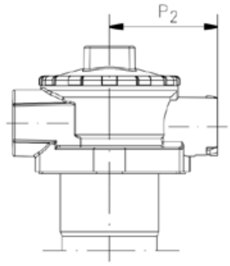


## Dimensions

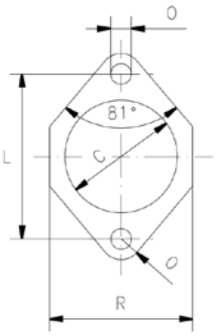
Design with ventilating filter




Design without ventilating filter




Required mounting surface




## Measurements

| Type [mm] | A | B | C min/max | D | E | F | G | H | $l_1$ | $l_2$ | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RFT 043 | G¾ | 75 | 60/63 | 51 | 27.8 | 24 | 26 | 67 | 175 | 110 | 83 | 88 | 9 | 51 | 11 |
| RFT 072 | G¾ | 75 | 60/63 | 51 | 27.8 | 24 | 26 | 67 | 270 | 110 | 180 | 88 | 9 | 51 | 11 |

| Type [mm] | $P_1$ | $P_2$ | Q | R | S | T | U | V | W | X |
|---|---|---|---|---|---|---|---|---|---|---|
| RFT 043 | 59.5 | 57.5 | 46 | 79 | 42 | 2 | 21 | AF 27 | 35 | AF 36 |
| RFT 072 | 59.5 | 57.5 | 46 | 79 | 42 | 2 | 21 | AF 27 | 35 | AF 36 |

| Type [inch] | A | B | C min/max | D | E | F | G | H | $l_1$ | $l_2$ | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RFT 043 | -12 SAE* | 2.95 | 2.36/2.48 | 2.01 | 1.09 | 0.94 | 1.02 | 2.64 | 6.89 | 4.33 | 3.27 | 3.46 | 0.35 | 2.01 | 0.43 |
| RFT 072 | -12 SAE* | 2.95 | 2.36/2.48 | 2.01 | 1.09 | 0.94 | 1.02 | 2.64 | 10.63 | 4.33 | 7.09 | 3.46 | 0.35 | 2.01 | 0.43 |

| Type [inch] | $P_1$ | $P_2$ | Q | R | S | T | U | V mm | W | X mm |
|---|---|---|---|---|---|---|---|---|---|---|
| RFT 043 | 2.34 | 2.26 | 1.81 | 3.11 | 1.65 | 0.08 | 0.83 | AF 27 | 1.38 | AF 36 |
| RFT 072 | 2.34 | 2.26 | 1.81 | 3.11 | 1.65 | 0.08 | 0.83 | AF 27 | 1.38 | AF 36 |

*Corresponds to 1 $^1/_{16}$ - 12 UN - 2B

## Ordering Code

### Filter assembly

RFT - ___ - ___ - ___ - ___ - ___

| Type of filter | Code |
|---|---|
| Return Filter, tank mounted | RFT |

| Flow rate, max. | Code |
|---|---|
| 50 l/min / 13 gpm | 043 |
| 90 l/min / 24 gpm | 072 |

| Connection thread | Code |
|---|---|
| G¾ | GC |
| -12 SAE | UC |

| Filter fineness | Code |
|---|---|
| 10 µm (10EL) | G2 |
| 16 µm (16EL) | I2 |
| 30 µm (30P) | N3 |

| Bypass setting | Code |
|---|---|
| 2.5 bar / 36 psi (for 10EL, 16EL) | OM |
| 1.5 bar / 22 psi (for 30P) | KM |

| Air breather | Code |
|---|---|
| Without air breather | 100 |
| With air breather | 101 |

**Order example:**
RFT - 043 - GC - G2 - OM - 101

Filters delivered with plugged connection M12 x 1.5 for clogging indicator.

### Spare filter element

___ 3 . 05 ___ - 5 ___

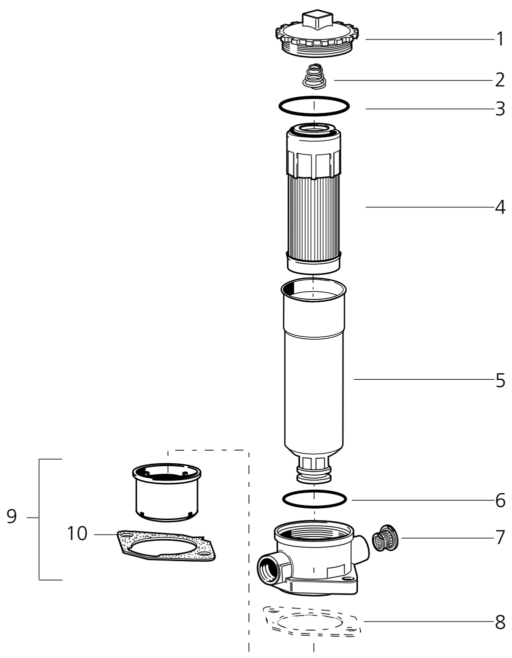
| Filter media | Code |
|---|---|
| EXAPOR®Light | F |
| Paper | P |

| Length | Code |
|---|---|
| for RFT 043 | 10 |
| for RFT 072 | 20 |

| Filter fineness | Code |
|---|---|
| 10EL | 6 |
| 16EL | 8 |
| 30P | 1 |

**Order example:**
F3.0510-56

## Spare parts



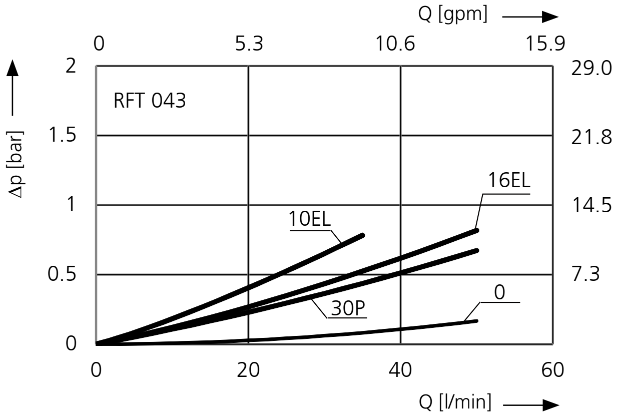

| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Screw-on cap | FR 043.0201 |
| 2 | Compression spring | N015.1606 |
| 3 | O-ring 57 x 3 mm / 2.24 x 0.12 inch | N007.0573 |
| 4 | Replacement Filter element | see above |
| 5 | Filter bowl RFT 043 | FR 043.0107 |
| 5 | Filter bowl RFT 072 | FR 072.0104 |
| 6 | O-ring 50 x 2 mm / 1.97 x 0.08 inch | N007.0501 |
| 7 | Replacement air breather | L1.0403-01K |
| 8 | Flat gasket (for versions without breather / oil separator) | D 043.0113 |
| 9 | Oil separator (incl. pos. 10) | E 043.1701 |
| 10 | Flat gasket (for versions with breather / oil separator) | D 043.0118 |

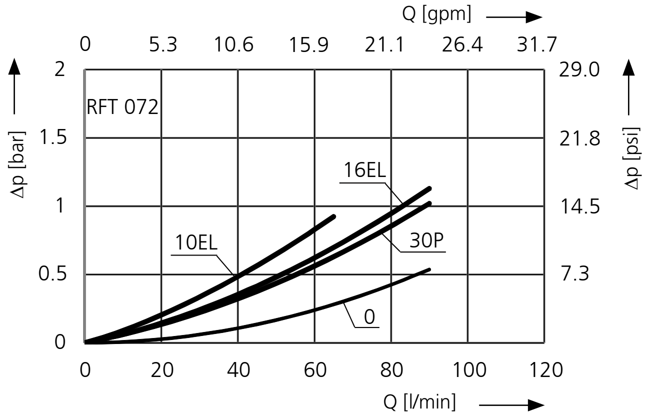
The functions of the complete filters as well as the outstanding features of the filter elements assured by ARGO-HYTOS can only be guaranteed if original ARGO-HYTOS spare parts are used.

## Diagrams

### Δp-curves for complete filters

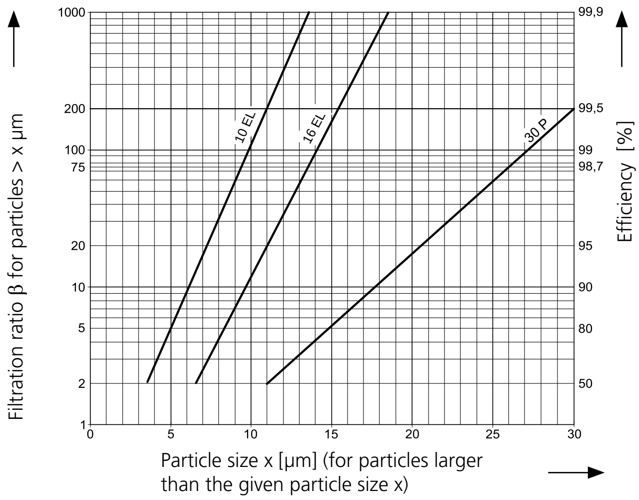
**D1** Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s / 162 SUS (0 = housing empty)




### Filter fineness curves

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®Light and Paper elements:**

10 EL = $\overline{\beta}_{10\,(c)}$ = 200 EXAPOR®Light
16 EL = $\overline{\beta}_{16\,(c)}$ = 200 EXAPOR®Light
30 P = $\beta_{30(c)}$ = 200 Paper

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

**For ventilating filter elements:**

2 CL = 99.5 % efficiency for particles of size 2 µm

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

## Quality Assurance

### Quality management according to DIN EN ISO 9001

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

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

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

## Return Filters

# E 094 · E 103 · E 143

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

Return Filter E 103

## Description

### Application

In the return line circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

### Special features

› By-pass valve:
The location close to the inlet port prevents dirt particles retained by the filter element from entering into the clean oil side.
› Removable bowl:
In case of maintenance the filter bowl is removed together with the filter element - therefore dirt particles are not flushed back into the tank.
› Extension pipe:
A correct extension pipe length ensures oil outlet below minimum oil level and prevents foaming.

### Filter elements

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

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

### Ventilating Filter

Ventilation of the reservoir by an integral star-shape pleated filter element:

› removable (replace annually!)
› splash-proof
› fineness 2 µm

### Filter maintenance

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

### Materials

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

### Accessories

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

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

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

## Characteristics

### Nominal flow rate

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

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines ≤ 4.5 m/s / 14.8 ft/s

### Connection

Threaded ports according to

- ISO 228 or DIN 13
- SAE standard J514

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

### Filter fineness

5 µm(c) ... 30 µm(c)
β-values according to ISO 16889
(see Selection Chart, column 4 and diagram Dx).

### Dirt-holding capacity

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

### Hydraulic fluids

Mineral oil and biodegradable fluids (HEES and HETG, see info-sheet 00.20).
With high filling conditions we recommend an electrical conductivity ≥ 500 pS/m at 20 °C / 68 °F.

### Temperature range

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

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Operating pressure

Max. 10 bar / 145 psi

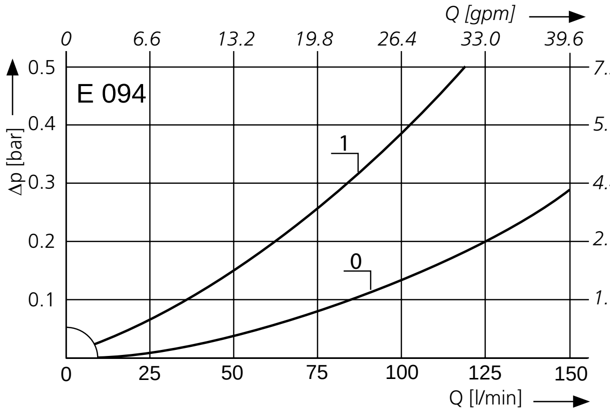
### Mounting position

Preferably vertical, outlet downwards.

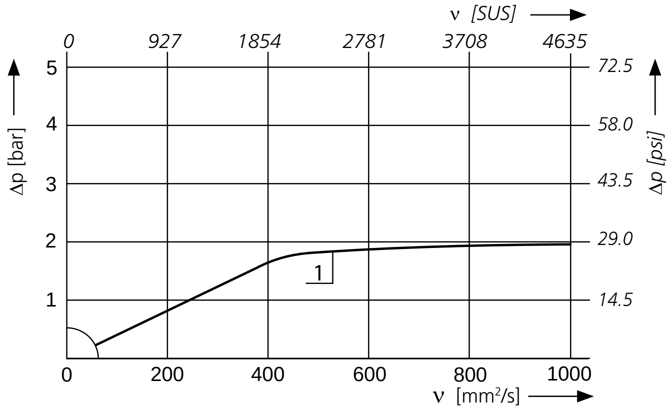
## Diagrams

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

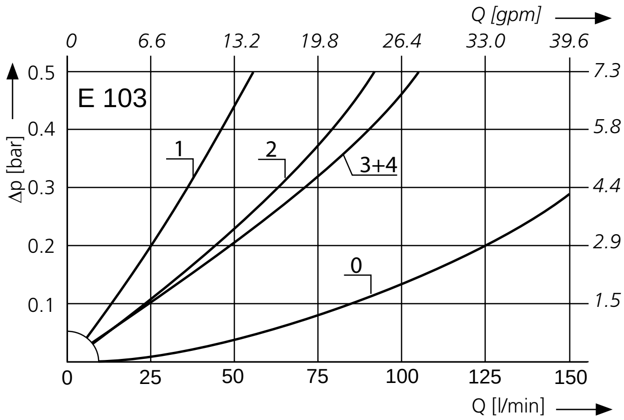
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



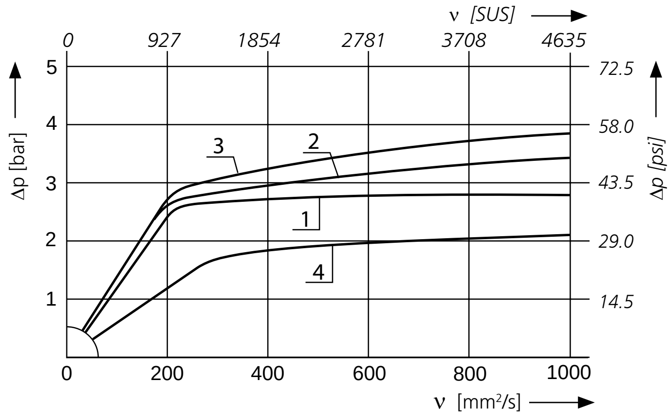

Pressure drop as a function of the **kinematic viscosity** at nominal flow



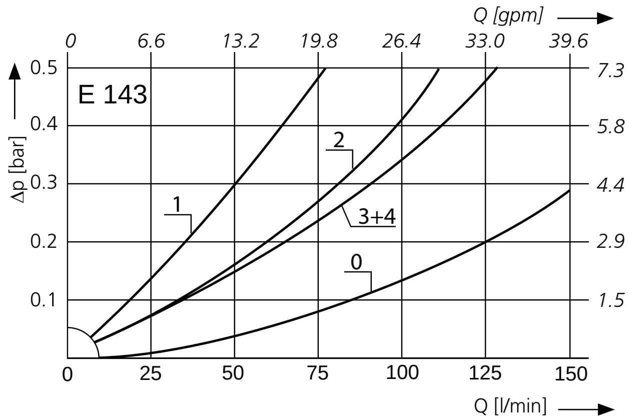

**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



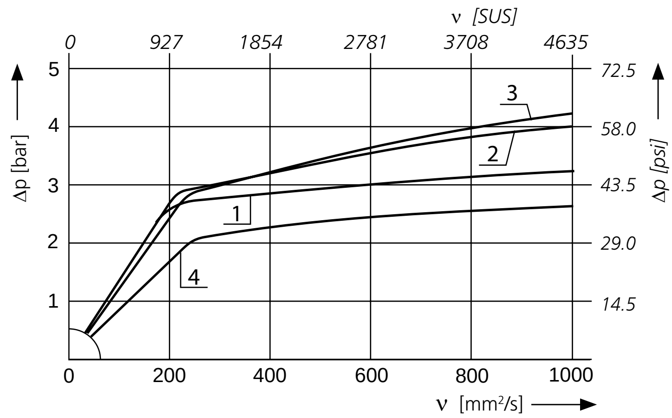

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D3** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

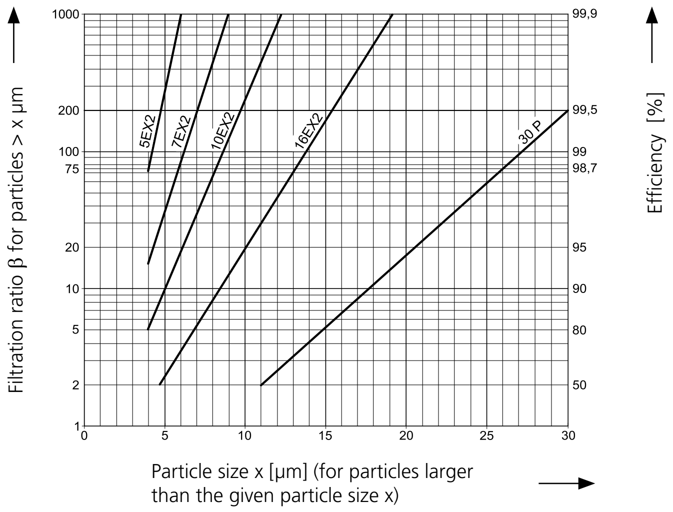



Pressure drop as a function of the **kinematic viscosity** at nominal flow



## Filter fineness curves in Selection Chart, column 4

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX2 and Paper elements:**

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

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

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189

**For ventilating filter elements:**

2CL = 99.5 % filter efficiency for particles of size 2 µm

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

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see Diagr. **Dx** | Dirt-holding capacity | Connection A | Cracking pressure of by-pass | Symbol | Replacement element Part No. | Weight | Replacement ventilating filter Part No. (Filter fineness, see diagrams) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | | | kg | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| E 094-661 | 50 | **D1**/1 | 30P | 11 | G3/4 | 1.5 | 2 | P3.0613-51 | 0.8 | L1.0503-03 (2CL) | - |
| E 094-671 | 50 | **D1**/1 | 30P | 11 | G3/4 | 1.5 | 1 | P3.0613-51 | 0.8 | - | - |
| | | | | | | | | | | | |
| E 103-657 | 45 | **D2**/1 | 5EX2 | 18 | G¾ | 2.5 | 2 | V3.0620-53 | 1.0 | L1.0503-03 (2CL) | - |
| E 103-677 | 45 | **D2**/1 | 5EX2 | 18 | G¾ | 2.5 | 1 | V3.0620-53 | 1.0 | - | - |
| **E 103-676**[1] | 80 | **D2**/2 | 10EX2 | 25 | G3/4 | 2.5 | 2 | V3.0620-56 | 1.0 | L1.0503-03 (2CL) | - |
| **E 103-686**[1] | 80 | **D2**/2 | 10EX2 | 25 | G3/4 | 2.5 | 1 | V3.0620-56 | 1.0 | - | - |
| **E 103-898**[1] | 110 | **D2**/3 | 16EX2 | 25 | G1 | 2.5 | 2 | V3.0620-58 | 1.0 | L1.0503-03 (2CL) | - |
| **E 103-888**[1] | 110 | **D2**/3 | 16EX2 | 25 | G1 | 2.5 | 1 | V3.0620-58 | 1.0 | - | - |
| | | | | | | | | | | | |
| E 103-871 | 70 | **D2**/4 | 30P | 11 | G3/4 | 1.5 | 2 | P3.0620-51[2] | 1.0 | L1.0503-03 (2CL) | - |
| E 103-861 | 70 | **D2**/4 | 30P | 11 | G3/4 | 1.5 | 1 | P3.0620-51[2] | 1.0 | - | - |
| | | | | | | | | | | | |
| E 143-657 | 70 | **D3**/1 | 5EX2 | 28 | G3/4 | 2.5 | 2 | V3.0730-53 | 1.2 | L1.0503-03 (2CL) | - |
| E 143-667 | 70 | **D3**/1 | 5EX2 | 28 | G3/4 | 2.5 | 1 | V3.0730-53 | 1.2 | - | - |
| **E 143-676**[1] | 115 | **D3**/2 | 10EX2 | 38 | G1 | 2.5 | 2 | V3.0730-56 | 1.2 | L1.0503-03 (2CL) | - |
| **E 143-686**[1] | 115 | **D3**/2 | 10EX2 | 38 | G1 | 2.5 | 1 | V3.0730-56 | 1.2 | - | - |
| **E 143-888**[1] | 135 | **D3**/3 | 16EX2 | 38 | G1 | 2.5 | 2 | V3.0730-58 | 1.2 | L1.0503-03 (2CL) | - |
| **E 143-688**[1] | 135 | **D3**/3 | 16EX2 | 38 | G1 | 2.5 | 1 | V3.0730-58 | 1.2 | - | - |
| | | | | | | | | | | | |
| E 143-851 | 120 | **D3**/4 | 30P | 17 | G1 | 1.5 | 2 | P3.0730-51[2] | 1.2 | L1.0503-03 (2 CL) | - |
| E 143-861 | 120 | **D3**/4 | 30P | 17 | G1 | 1.5 | 1 | P3.0730-51[2] | 1.2 | - | - |

[1] Preferred type, no minimum order quantity required
[2] Paper media supported with metal gauze

All filters are delivered with a plugged clogging indicator connection M12 x 1.5. As clogging indicators either manometers or electrical pressure switches can be used. Optional extension pipes adapt the filter length to various tank depths. For ordering of accessories please use the below mentioned codes.

**Order example: The filter E 103-676 has to be supplied with an extension pipe for a mounting depth of 500 mm.**

**Order description:** **E 103-676** / **EV 500**

**Part No. (Basic unit)** → E 103-676

**Mounted extension pipe (7 various lengths are available on request)** → EV 500

E 094: EV 130, EV 190, EV 234, EV 284, EV 334, EV 434, EV 534
E 103: EV 196, EV 256, EV 300, EV 350, EV 400, EV 500, EV 600
E 143: EV 297, EV 357, EV 400, EV 450, EV 500, EV 600, EV 700

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

**Remarks:**

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

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see Diagr. **DX** | Dirt-holding capacity | Connection A | Cracking pressure of by-pass | Symbol | Replacement element Part No. | Weight | Replacement ventilating filter Part No. (Filter fineness, see diagrams) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | gpm | | | g | SAE | psi | | | lbs | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| E 094-761 | 13.2 | **D1**/1 | 30P | 11 | -16[2] | 22 | 2 | P3.0613-51 | 1.8 | L1.0503-03 (2CL) | incl. oil separator |
| E 094-751 | 13.2 | **D1**/1 | 30P | 11 | -16[2] | 22 | 1 | P3.0613-51 | 1.8 | - | - |
| E 103-763 | 11.9 | **D2**/1 | 5EX2 | 18 | -16[2] | 36 | 2 | V3.0620-53 | 2.2 | L1.0503-03 (2CL) | incl. oil separator |
| E 103-753 | 11.9 | **D2**/1 | 5EX2 | 18 | -16[2] | 36 | 1 | V3.0620-53 | 2.2 | - | - |
| **E 103-777**[1] | 21.1 | **D2**/2 | 10EX2 | 25 | -16[2] | 36 | 2 | V3.0620-56 | 2.2 | L1.0503-03 (2CL) | incl. oil separator |
| **E 103-756**[1] | 21.1 | **D2**/2 | 10EX2 | 25 | -16[2] | 36 | 1 | V3.0620-56 | 2.2 | - | - |
| **E 103-798**[1] | 29.1 | **D2**/3 | 16EX2 | 25 | -16[2] | 36 | 2 | V3.0620-58 | 2.2 | L1.0503-03 (2CL) | incl. oil separator |
| **E 103-788**[1] | 29.1 | **D2**/3 | 16EX2 | 25 | -16[2] | 36 | 1 | V3.0620-58 | 2.2 | - | - |
| E 103-761 | 18.5 | **D2**/4 | 30P | 11 | -16[2] | 22 | 2 | P3.0620-51[3] | 2.2 | L1.0503-03 (2CL) | incl. oil separator |
| E 103-751 | 18.5 | **D2**/4 | 30P | 11 | -16[2] | 22 | 1 | P3.0620-51[3] | 2.2 | - | - |
| E 143-763 | 18.5 | **D3**/1 | 5EX2 | 28 | -16[2] | 36 | 2 | V3.0730-53 | 2.7 | L1.0503-03 (2CL) | incl. oil separator |
| E 143-753 | 18.5 | **D3**/1 | 5EX2 | 28 | -16[2] | 36 | 1 | V3.0730-53 | 2.7 | - | - |
| **E 143-776**[1] | 30.4 | **D3**/2 | 10EX2 | 38 | -16[2] | 36 | 2 | V3.0730-56 | 2.7 | L1.0503-03 (2CL) | incl. oil separator |
| **E 143-786**[1] | 30.4 | **D3**/2 | 10EX2 | 38 | -16[2] | 36 | 1 | V3.0730-56 | 2.7 | - | - |
| **E 143-788**[1] | 35.7 | **D3**/3 | 16EX2 | 38 | -16[2] | 36 | 2 | V3.0730-58 | 2.7 | L1.0503-03 (2CL) | incl. oil separator |
| **E 143-798**[1] | 35.7 | **D3**/3 | 16EX2 | 38 | -16[2] | 36 | 1 | V3.0730-58 | 2.7 | - | - |
| E 143-761 | 31.7 | **D3**/4 | 30P | 17 | -16[2] | 22 | 2 | P3.0730-51[3] | 2.7 | L1.0503-03 (2 CL) | incl. oil separator |
| E 143-751 | 31.7 | **D3**/4 | 30P | 17 | -16[2] | 22 | 1 | P3.0730-51[3] | 2.7 | - | - |

[1] Preferred type, no minimum order quantity required [2] Corresponds to $1^{5}/_{16}$ -12 UN-2B [3] Paper media supported with metal gauze

All filters are delivered with a plugged clogging indicator connection M12 x 1.5 mm. As clogging indicators either manometers or electrical pressure switches can be used. Optional extension pipes adapt the filter length to various tank depths. For ordering of accessories please use the below mentioned codes.

**Order example: The filter E 103-763 has to be supplied with an extension pipe for a mounting depth of 500 mm (resp. 19.69 inch).**

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

**Part No. (Basic unit)**

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

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

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

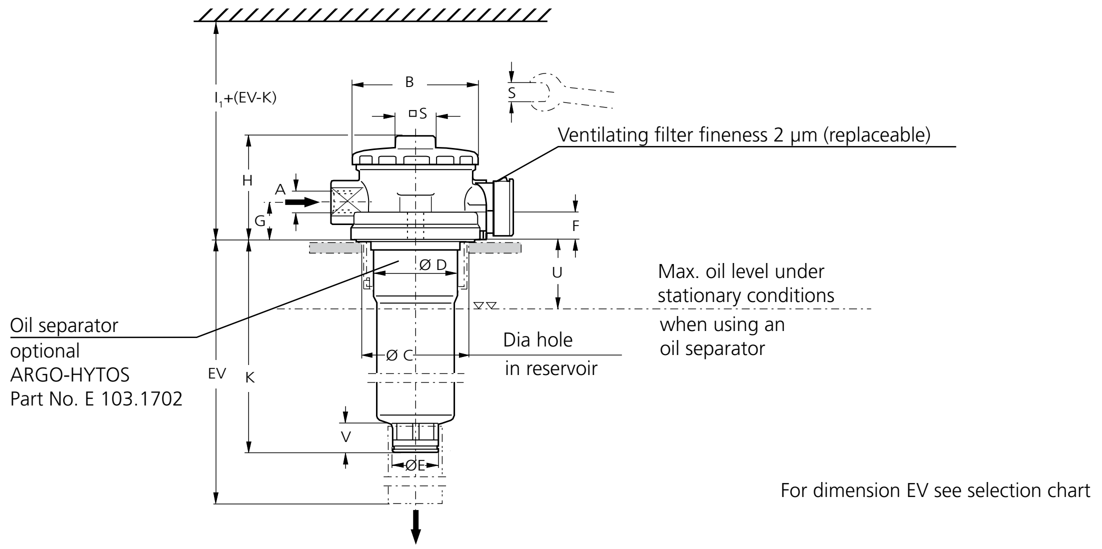
E 143: EV 297 (11.69 inch), EV 357 (14.06 inch), EV 400 (15.74 inch), EV 450 (17.71 inch), EV 500 (19.69 inch), EV 600 (23.62 inch), EV 700 (27.56 inch)

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

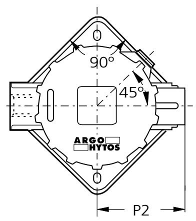
**Remarks:**

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

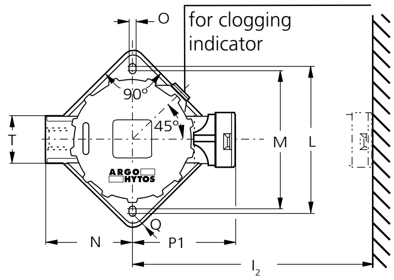
## Dimensions



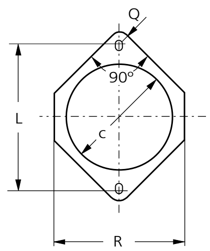

Design without ventilating filter




Design with ventilating filter




Required mounting surface




## Measurements in mm

| Type | A | B | C min./max. | D | E | F | G | H | $l_1$ | $l_2$ | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 094 | G ¾ | 105 | 87/91 | 73.5 | 38 | 20.5 | 30 | 88.5 | 235 | 125 | 111 | 115 | 110 | 70 | 11 |
| E 103 | G¾, G1 | 105 | 87/91 | 73.5 | 38 | 20.5 | 30 | 88.5 | 300 | 125 | 177 | 115 | 110 | 70 | 11 |
| E 143 | G¾, G1 | 105 | 87/91 | 73.5 | 38 | 20.5 | 30 | 88.5 | 400 | 125 | 278 | 115 | 110 | 70 | 11 |

| Type | $P_1$ | $P_2$ | Q | R | S | T | U | V |
|---|---|---|---|---|---|---|---|---|
| E 094 | 82 | 69 | 13.5 | 107.5 | AF 32 | AF 41 | 50 | 23 |
| E 103 | 82 | 69 | 13.5 | 107.5 | AF 32 | AF 41 | 50 | 23 |
| E 143 | 82 | 69 | 13.5 | 107.5 | AF 32 | AF 41 | 50 | 23 |

## Measurements in inch

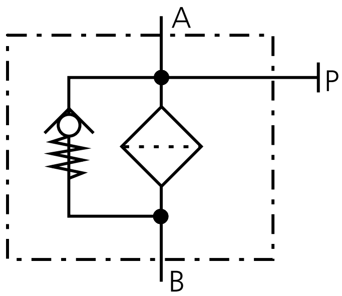
| Type | A SAE | B | C min./max. | D | E | F | G | H | $l_1$ | $l_2$ | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 094 | -16 | 4.13 | 3.43/3.58 | 2.9 | 1.5 | 0.81 | 1.18 | 3.48 | 9.25 | 4.92 | 4.37 | 4.53 | 4.33 | 2.76 | 0.43 |
| E 103 | -16 | 4.13 | 3.43/3.58 | 2.9 | 1.5 | 0.81 | 1.18 | 3.48 | 11.81 | 4.92 | 6.97 | 4.53 | 4.33 | 2.76 | 0.43 |
| E 143 | -16 | 4.13 | 3.43/3.58 | 2.9 | 1.5 | 0.81 | 1.18 | 3.48 | 15.75 | 4.92 | 10.94 | 4.53 | 4.33 | 2.76 | 0.43 |

| Type | $P_1$ | $P_2$ | Q | R | S mm | T mm | U | V |
|---|---|---|---|---|---|---|---|---|
| E 094 | 3.23 | 2.72 | 0.53 | 4.23 | AF 32 | AF 41 | 1.97 | 0.91 |
| E 103 | 3.23 | 2.72 | 0.53 | 4.23 | AF 32 | AF 41 | 1.97 | 0.91 |
| E 143 | 3.23 | 2.72 | 0.53 | 4.23 | AF 32 | AF 41 | 1.97 | 0.91 |

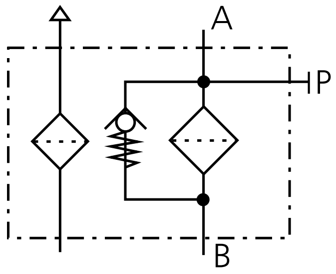
* Corresponds to $1^5/_{16}$-12 UN-2B

## Symbols

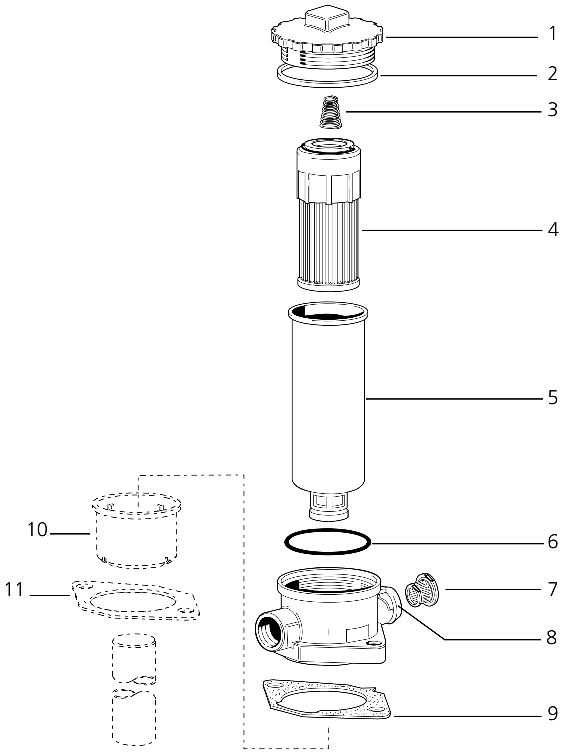
1




2




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Screw-on cap | E 103.0201 |
| 2 | Flat gasket | N031.0841 |
| 3 | Compression spring | N015.3703 |
| 4 | Replacement filter element | see Chart / col. 9 |
| 5 | Filter bowl E094* | E 094.0903 |
| 5 | Filter bowl E103* | E 103.0912 |
| 5 | Filter bowl E143* | E 143.0903 |
| 6 | O-ring<br>69.5 x 3.5 mm<br>2.74 x 0.14 inch | N007.0703 |
| 7 | Replacement ventilating filter | L1.0503-03K |
| 8 | Housing (for pos. 7) | L1.0503.0801 |
| 9 | Flat gasket (for versions without oil separator) | E 103.0147 |
| 10 | Oil separator (incl. pos. 11) | E 103.1702 |
| 11 | Flat gasket (for versions with oil separator) | E 103.0148 |

*Specify mounting depth (EV) in mm

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

# RFT 103 · RFT 143

Tank top mounting · Connection G1 / -16 SAE · Nominal flow rate up to 175 l/min / 46 gpm

M

Return Filter RFT 103

## Description

### Application

In the return line circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

### Special features

- Bypass valve:
  The location close to the inlet port prevents dirt particles retained by the filter element from entering into the clean oil side.
- Removable bowl:
  In case of maintenance the filter bowl is removed together with the filter element – therefore dirt particles are not flushed back into the tank.
- Extension pipe:
  A correct extension pipe length ensures oil outlet below minimum oil level and prevents foaming.

### Filter elements

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

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

### Ventilating filter

Ventilation of the reservoir by an integral star-shape pleated filter element:

- removable (replace annually!)
- splash-proof
- fineness 2 µm

### Filter maintenance

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

### Materials

| | |
|---|---|
| Screw-on cap: | Polyester, GF-reinforced |
| Filter head: | Aluminum alloy |
| Filter bowl: | Polyamide, CF-reinforced |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®Light - inorganic multi-layer microfiber web |
| | Paper - cellulose web, impregnated with resin |

### Accessories

Electrical and optical clogging indicators are available on request. For technical data and dimensions see datasheet 60.20.

An optional oil separator (Part No. E 103.1702) is available on request.

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

## Characteristics

### Nominal flow rate

Up to 175 l/min / 46 gpm (see Selection Chart, page 3).
The nominal flow rates indicated by ARGO-HYTOS lightline are based on the following features:

- closed by-pass valve at $\nu \leq 150$ mm²/s / 698 SUS
- element service life > 500 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines ≤ 6 m/s / ≤ 20 ft/s

### Connection

Threaded ports according to

- ISO 228 or DIN 13 and
- SAE standard J514

Sizes see Selection Chart, page 3
(other port threads on request).

### Filter fineness

10 µm(c) ... 30 µm(c)
β-values according to ISO 16889 (see diagrams).

### 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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS

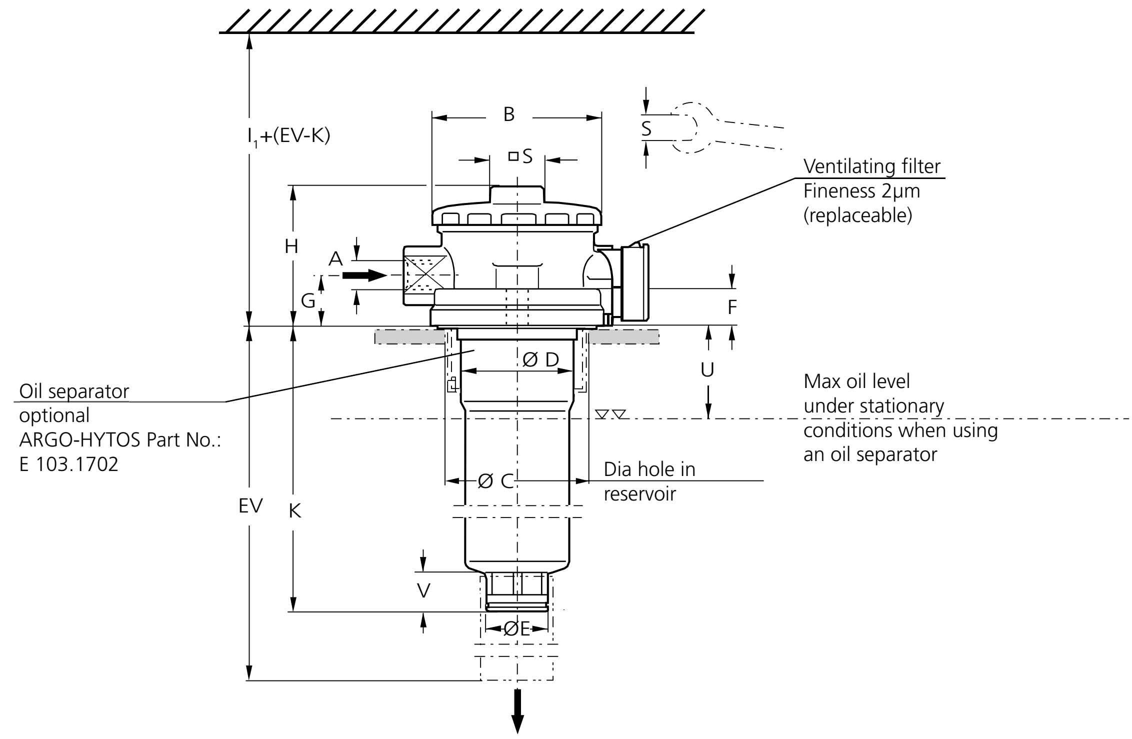
### Operating pressure

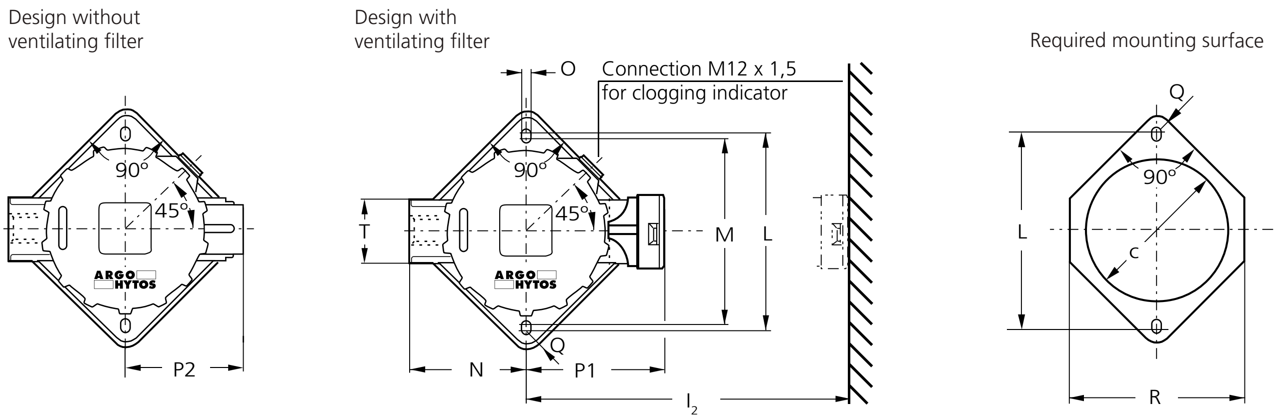
Max. 10 bar / 145 psi

### Mounting position

Preferably vertical, outlet downwards.

## Dimensions




## Measurements in mm

| Type [mm] | A | B | C min/max | D | E | F | G | H | $l_1$ | $l_2$ | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RFT 103 | G1 or | 105 | 87/91 | 73.5 | 38 | 20.5 | 30 | 88.5 | 300 | 125 | 177 | 115 | 110 | 70 |
| RFT 143 | -16 SAE* | 105 | 87/91 | 73.5 | 38 | 20.5 | 30 | 88.5 | 400 | 125 | 278 | 115 | 110 | 70 |

| Type [mm] | O | $P_1$ | $P_2$ | Q | R | S | T | U | V |
|---|---|---|---|---|---|---|---|---|---|
| RFT 103 | 11 | 82 | 69 | 13.5 | 107.5 | AF 32 | AF 41 | 50 | 23 |
| RFT 143 | 11 | 82 | 69 | 13.5 | 107.5 | AF 32 | AF 41 | 50 | 23 |

* Corresponds to $1^{5}/_{16}$-12 UN-2B

## Measurements in inch

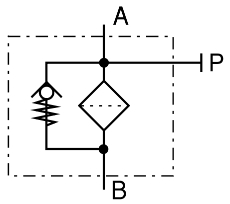
| Type [inch] | A | B | C min/max | D | E | F | G | H | $l_1$ | $l_2$ | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RFT 103 | G1 or | 4.13 | 3.43 / 3.58 | 2.9 | 1.5 | 0.81 | 1.18 | 3.48 | 11.81 | 4.92 | 6.97 | 4.53 | 4.33 | 2.76 |
| RFT 143 | -16 SAE* | 4.13 | 3.43 / 3.58 | 2.9 | 1.5 | 0.81 | 1.18 | 3.48 | 15.75 | 4.92 | 10.94 | 4.53 | 4.33 | 2.76 |

| Type [inch] | O | $P_1$ | $P_2$ | Q | R | S mm | T mm | U | V | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RFT 103 | 0.43 | 3.23 | 2.72 | 0.53 | 4.23 | AF 32 | AF 41 | 1.97 | 0.91 | | | | | |
| RFT 143 | 0.43 | 3.23 | 2.72 | 0.53 | 4.23 | AF 32 | AF 41 | 1.97 | 0.91 | | | | | |

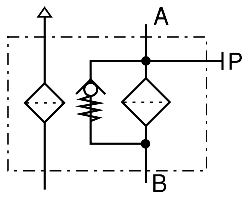
*Corresponds to 1 $^5/_{16}$ - 12 UN - 2B

## Symbols

Without air breather




With air breather



## Ordering Code

### Filter assembly

RFT - ___ - ___ - ___ - ___ - ___

| Type of filter | Code |
|---|---|
| Return Filter, tank mounted | RFT |

| Flow rate, max. | Code |
|---|---|
| 125 l/min / 33 gpm | 103 |
| 175 l/min / 46 gpm | 143 |

| Connection thread | Code |
|---|---|
| G1 | GD |
| -16 SAE | UD |

| Filter fineness | Code |
|---|---|
| 10 µm (10EL) | G2 |
| 16 µm (16EL) | I2 |
| 30 µm (30P) | N3 |

| Bypass setting | Code |
|---|---|
| 2.5 bar / 36 psi (for 10EL, 16EL) | OM |
| 1.5 bar / 22 psi (for 30P) | KM |

| Air breather | Code |
|---|---|
| Without air breather | 100 |
| With air breather | 101 |

Filters delivered with plugged connection M12 x 1.5 for clogging indicator.

**Order example:**
RFT - 103 - GD - N3 - KM - 101

### Spare filter element

___ 3 . 0 ___ - 5 ___

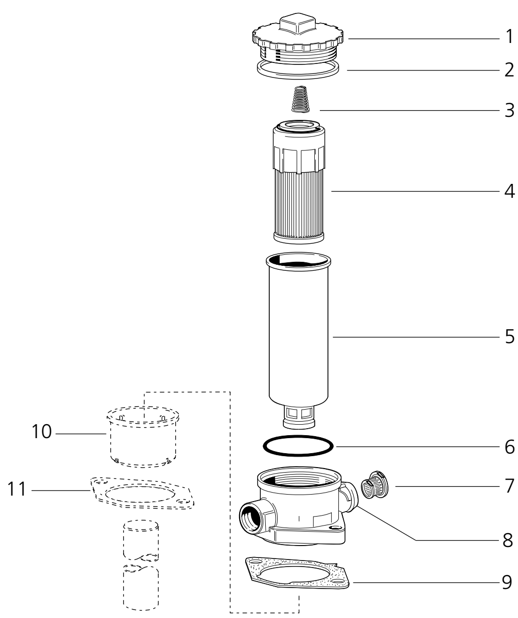
| Filter media | Code |
|---|---|
| EXAPOR®Light | F |
| Paper | P |

| Length | Code |
|---|---|
| for RFT 103 | 620 |
| for RFT 143 | 730 |

| Filter fineness | Code |
|---|---|
| 10EL | 6 |
| 16EL | 8 |
| 30P | 1 |

**Order example:**
P3.0620-51

## Spare parts



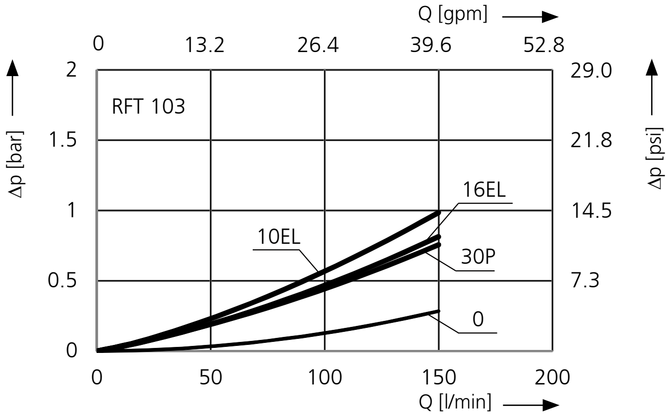

| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Screw-on cap | E 103.0201 |
| 2 | Flat Gasket | N031.0841 |
| 3 | Compression spring | N015.3703 |
| 4 | Replacement filter element | see above |
| 5 | Filter bowl RFT 103 | E 103.0912 |
| 5 | Filter bowl RFT 143 | E 143.0903 |
| 6 | O-ring 69.5 x 3.5 mm / 2.74 x 0.14 inch | N007.0703 |
| 7 | Replacement air breather | L1.0503-03K |
| 8 | Housing (for Pos. 7) | L1.0503.0801 |
| 9 | Flat gasket (for versions without breather / oil separator) | E 103.0147 |
| 10 | Oil separator | E 103.1702 |
| 11 | Flat gasket (for versions with breather / oil separator) | E 103.0148 |

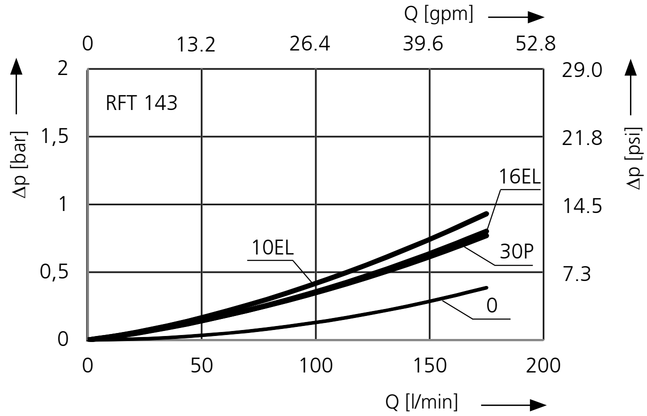
The functions of the complete filters as well as the outstanding features of the filter elements assured by ARGO-HYTOS can only be guaranteed if original ARGO-HYTOS spare parts are used.

## Diagrams

### Δp-curves for complete filters

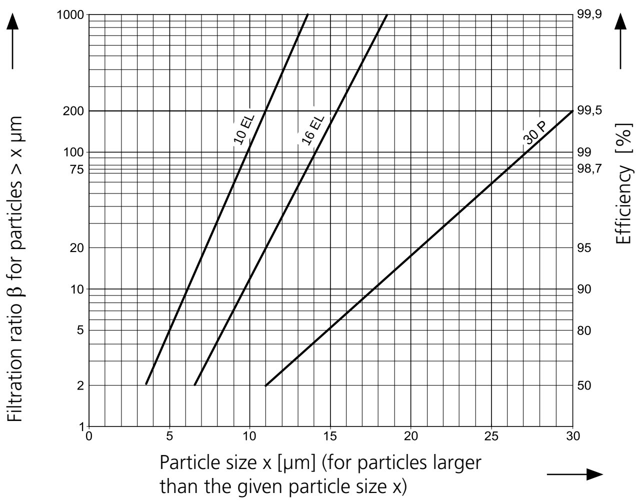
**D1** Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s / 162 SUS (0 = housing empty)




### Filter fineness curves

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®Light and Paper elements:**

10 EL = $\overline{\beta}_{10\,(c)}$ = 200 EXAPOR®Light
16 EL = $\overline{\beta}_{16\,(c)}$ = 200 EXAPOR®Light
30 P = $\beta_{30(c)}$ = 200 Paper

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

**For ventilating filter elements:**

2 CL = 99.5% efficiency for particles of size 2 μm

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

## Quality Assurance

### Quality management according to DIN EN ISO 9001

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

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

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

## Return Filters

# E 212 · E 222

Tank top mounting · Connection up to G1¼ / -20 SAE · Nominal flow rate up to 220 l/min / 58.1 gpm

Return Filter E 222

## Description

### Application

In the return line circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

### Special features

› By-pass valve:
The location close to the inlet port prevents dirt particles retained by the filter element from entering into the clean oil side.

› Removable bowl:
In case of maintenance the filter bowl is removed together with the filter element - therefore dirt particles are not flushed back into the tank.

› Filling filter / By-pass protection strainer:
The filling filter is integrated in the filter element and prevents coarse particles from entering during filling or re-filling due to maintenance or repair reasons. Filling can be carried out at the filter. Therefore the cover must be removed. In operation, the filling filter functions as a by-pass protection strainer and prevents dirt from entering into the tank when the by-pass valve is open.

› Port for ventilating filter:
The ventilating filter thread connection M42 x 2 allows assembly of a ventilating filter, which assumes ventilation of the tank. The ventilating filter has to be ordered separately.

### Filter elements

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

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

### Filter maintenance

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

### Materials

| | |
|---|---|
| Screw-on cap: | Polyester, GF-reinforced |
| Filter head: | Aluminum alloy |
| Filter bowl: | Polyamide, CF-reinforced, electrically conducting |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web<br>Paper - cellulose web, impregnated with resin |
| Filling filter: | Polyamide, reinforced; Polyester web |

### Accessories

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

Ventilating filters with connection thread M42 x 2 have to be ordered separately. Dimensions and technical data see catalogue sheet 50.20 and 50.30.

Extension pipes or diffusors on the bowl outlet are available on request.

### Extension pipe

A correct extension pipe length ensures oil outlet below minimum oil level and prevents foaming.

## Characteristics

### Nominal flow rate

Return filter:
Up to 220 l/min / 58.1 gpm (see Selection Chart, column 2).
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines ≤ 4.5 m/s / 14.8 ft/s

Filling filter:
Up to 20 l/min / 5.3 gpm (see Selection Chart, column 3).

### Connection

Threaded ports according to

- ISO 228 or DIN 13
- SAE standard J514

Sizes see Selection Chart, column 9,
(other port threads on request).

### Filter fineness

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

### Dirt-holding capacity

Values in g test dust ISO MTD according to ISO 16889
(see Selection Chart, column 6).

### Hydraulic fluids

Mineral oil and biodegradable fluids
(HEES and HETG, see info-sheet 00.20).
With high filling conditions we recommend an electrical conductivity ≥ 500 pS/m at 20 °C / 68 °F.

### Temperature range

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

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Operating pressure

Max. 10 bar / 145 psi

### Mounting position

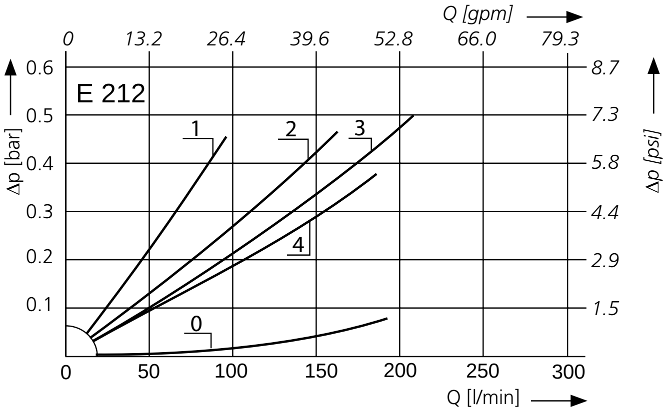
Preferably vertical, outlet downwards.

## Diagrams

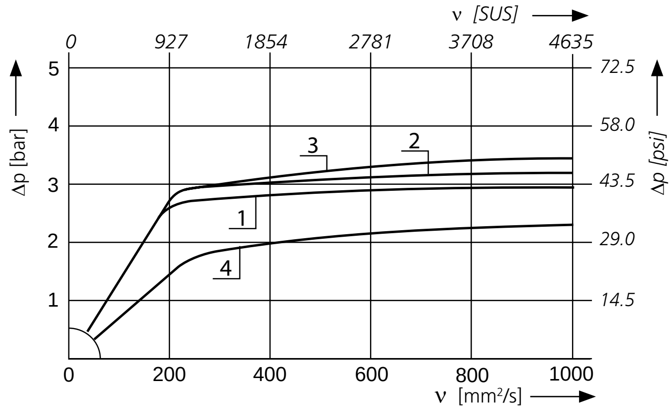
**Δp-curves for complete filters in Selection Chart, column 4**

### Types w/o filling filter

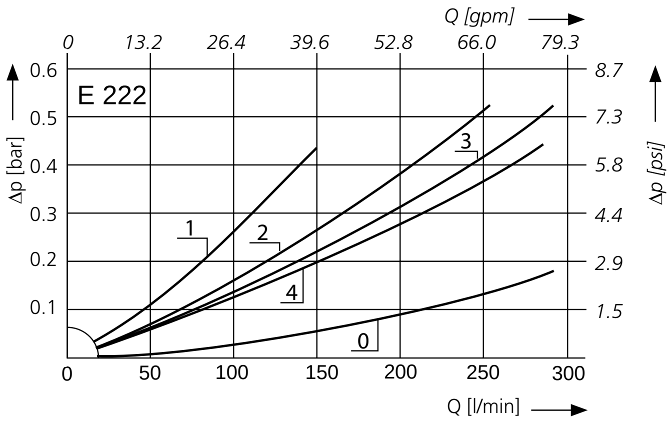
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



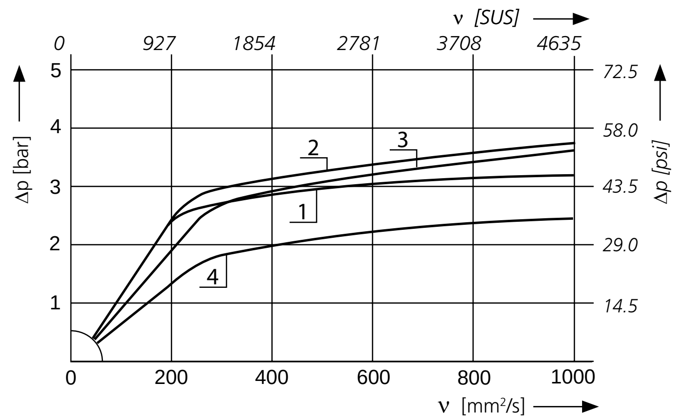

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

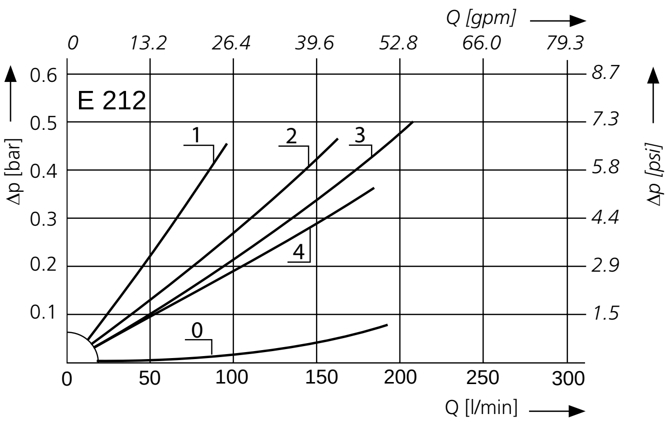



Pressure drop as a function of the **kinematic viscosity** at nominal flow

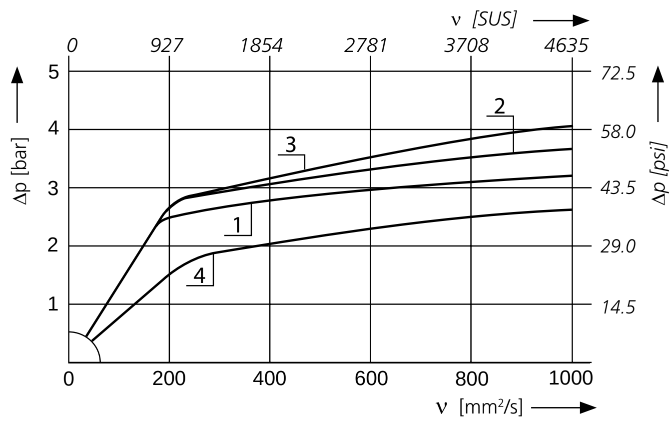



### Types with filling filter

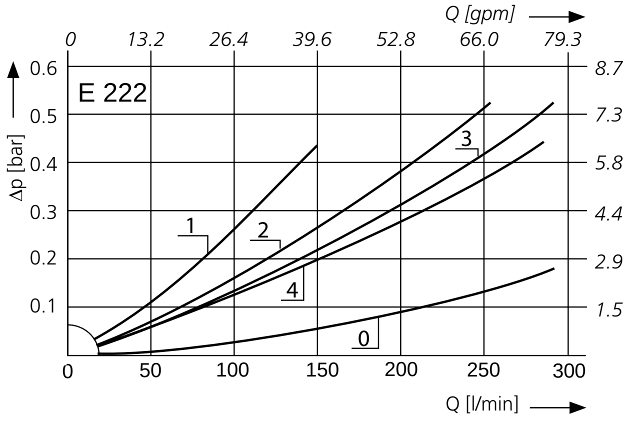
**D3** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



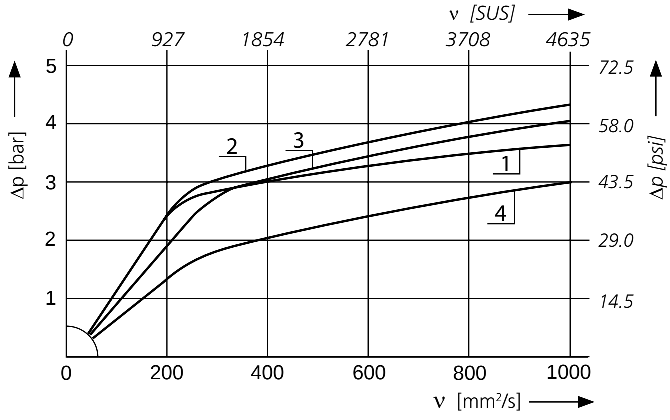

Pressure drop as a function of the **kinematic viscosity** at nominal flow



**D4** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

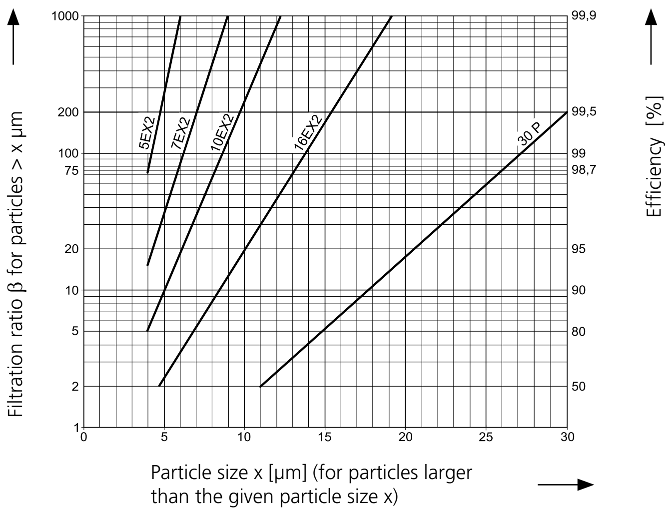



Pressure drop as a function of the **kinematic viscosity** at nominal flow




**Filter fineness curves in Selection Chart, column 5**

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




The abbreviations represent the following ß-values resp. finenesses:

**For EXAPOR®MAX 2- and Paper elements:**

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

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

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189.

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

## Selection Chart

| Part No. | Nominal flow rate Return filter | Nominal flow rate Filling filter[2] | Pressure drop see Diagram **D**/curve No. | Filter fineness see diagr. **Dx** | Dirt-holding capacity | Filter fineness filling filter / by-pass protection strainer | Filter surface filling filter / by-pass protection strainer | Connection A | Cracking pressure of by-pass | Symbol | Replacement filter element Part No. | Ventilating filter thread connection M42 x 2 | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | l/min | | | g | µm | cm² | | bar | | | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| E 212-159 | 80 | - | **D1**/1 | 5EX2 | 29 | - | - | G1¼ | 2.5 | 1 | V7.0820-03 | - | 1.7 | |
| **E 212-156**[1] | 140 | - | **D1**/2 | 10EX2 | 43 | - | - | G1¼ | 2.5 | 1 | V7.0820-06 | - | 1.7 | |
| **E 212-158**[1] | 190 | - | **D1**/3 | 16EX2 | 43 | - | - | G1¼ | 2.5 | 1 | V7.0820-08 | - | 1.7 | |
| E 212-151 | 160 | - | **D1**/4 | 30 P | 21 | - | - | G1¼ | 1.5 | 1 | P7.0820-11[3] | - | 1.7 | |
| E 212-359 | 80 | 20 | **D3**/1 | 5EX2 | 29 | 450 | 85 | G1¼ | 2.5 | 3 | K7.0820-03 | • | 2.0 | [4] |
| **E 212-356**[1] | 140 | 20 | **D3**/2 | 10EX2 | 43 | 450 | 85 | G1¼ | 2.5 | 3 | K7.0820-06 | • | 2.0 | [4] |
| **E 212-358**[1] | 190 | 20 | **D3**/3 | 16EX2 | 43 | 450 | 85 | G1¼ | 2.5 | 3 | K7.0820-08 | • | 2.0 | [4] |
| E 212-351 | 160 | 20 | **D3**/4 | 30 P | 21 | 450 | 85 | G1¼ | 1.5 | 3 | K7.0820-11[3] | • | 2.0 | [4] |
| E 222-159 | 130 | - | **D2**/1 | 5EX2 | 50 | - | - | G1¼ | 2.5 | 1 | V7.0833-03 | - | 2.1 | |
| **E 222-156**[1] | 220 | - | **D2**/2 | 10EX2 | 74 | - | - | G1¼ | 2.5 | 1 | V7.0833-06 | - | 2.1 | |
| **E 222-158**[1] | 220 | - | **D2**/3 | 16EX2 | 76 | - | - | G1¼ | 2.5 | 1 | V7.0833-08 | - | 2.1 | |
| E 222-151 | 220 | - | **D2**/4 | 30 P | 35 | - | - | G1¼ | 1.5 | 1 | P7.0833-11[3] | - | 2.1 | |
| E 222-359 | 130 | 20 | **D4**/1 | 5EX2 | 50 | 450 | 85 | G1¼ | 2.5 | 3 | K7.0833-03 | • | 2.4 | [4] |
| **E 222-356**[1] | 220 | 20 | **D4**/2 | 10EX2 | 74 | 450 | 85 | G1¼ | 2.5 | 3 | K7.0833-06 | • | 2.4 | [4] |
| **E 222-358**[1] | 220 | 20 | **D4**/3 | 16EX2 | 76 | 450 | 85 | G1¼ | 2.5 | 3 | K7.0833-08 | • | 2.4 | [4] |
| E 222-351 | 220 | 20 | **D4**/4 | 30 P | 35 | 450 | 85 | G1¼ | 1.5 | 3 | K7.0833-11[3] | • | 2.4 | [4] |

[1] Preferred type, no minimum order quantity required
[2] At 200 mm²/s (ISO VG46 at ca. 15°C / 59 °F)
[3] Paper media supported with metal gauze
[4] Open connection for ventilating filter. Please assemble ventilating filter before operating.

All filters are delivered with a plugged clogging indicator connection M12 x 1.5. As clogging indicators either manometers or electrical pressure switches can be used. Optional extension pipes adapt the filter length to various tank depths.
For ordering of accessories please use the below mentioned codes.

**Order example: The filter E 222-151 has to be supplied with an extension pipe for a mounting depth of 500 mm.**

**Order description:** **E 222-151** / **EV 500**

**Part No. (Basic unit)**

**Extension pipe (4 various lengths are available on request)**

E 212: EV 300, EV 366, EV 400, EV 466
E 222: EV 434, EV 500, EV 534, EV 600

**For the appropriate ventilating filters with M42 x 2 thread connection see catalogue sheet 50.20 and 50.30, for the appropriate clogging indicators see catalog sheet 60.20.**

**Remarks:**

- The switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 10).
- Clogging indicators are optional and always delivered detached from the filter.
- The filters listed in this chart are standard filters. Other designs available on request.

## Selection Chart

| Part No. | Nominal flow rate Return filter | Nominal flow rate Filling filter[2] | Pressure drop see Diagram **D**/curve No. | Filter fineness see diagr. **Dx** | Dirt-holding capacity | Filter fineness filling filter / by-pass protection strainer | Filter surface filling filter / by-pass protection strainer | Connection A / $A_1$ | Cracking pressure of by-pass | Symbol | Replacement filter element Part No. | Ventilating filter thread connection M42 x 2 | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | gpm | gpm | | | g | µm | inch² | SAE | psi | | | | lbs | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| E 212-769 | 21.1 | - | **D1**/1 | 5EX2 | 29 | - | - | -20[3]/-16[4] | 36 | 2 | V7.0820-03 | - | 3.7 | |
| **E 212-766[1]** | 37.0 | - | **D1**/2 | 10EX2 | 43 | - | - | -20[3]/-16[4] | 36 | 2 | V7.0820-06 | - | 3.7 | |
| **E 212-768[1]** | 50.2 | - | **D1**/3 | 16EX2 | 43 | - | - | -20[3]/-16[4] | 36 | 2 | V7.0820-08 | - | 3.7 | |
| E 212-761 | 42.3 | - | **D1**/4 | 30 P | 21 | - | - | -20[3]/-16[4] | 21 | 2 | P7.0820-11[5] | - | 3.7 | |
| E 212-869 | 21.1 | 5.3 | **D2**/1 | 5EX2 | 29 | 450 | 13 | -20[3]/-16[4] | 36 | 4 | K7.0820-03 | • | 4.4 | [6] |
| **E 212-866[1]** | 37.0 | 5.3 | **D2**/2 | 10EX2 | 43 | 450 | 13 | -20[3]/-16[4] | 36 | 4 | K7.0820-06 | • | 4.4 | [6] |
| **E 212-868[1]** | 50.2 | 5.3 | **D2**/3 | 16EX2 | 43 | 450 | 13 | -20[3]/-16[4] | 36 | 4 | K7.0820-08 | • | 4.4 | [6] |
| E 212-861 | 42.3 | 5.3 | **D2**/4 | 30 P | 21 | 450 | 13 | -20[3]/-16[4] | 21 | 4 | K7.0820-11[5] | • | 4.4 | [6] |
| E 222-769 | 34.3 | - | **D3**/1 | 5EX2 | 50 | - | - | -20[3]/-16[4] | 36 | 2 | V7.0833-03 | - | 4.6 | |
| **E 222-766[1]** | 58.1 | - | **D3**/2 | 10EX2 | 74 | - | - | -20[3]/-16[4] | 36 | 2 | V7.0833-06 | - | 4.6 | |
| **E 222-768[1]** | 58.1 | - | **D3**/3 | 16EX2 | 76 | - | - | -20[3]/-16[4] | 36 | 2 | V7.0833-08 | - | 4.6 | |
| E 222-761 | 58.1 | - | **D3**/4 | 30 P | 35 | - | - | -20[3]/-16[4] | 21 | 2 | P7.0833-11[5] | - | 4.6 | |
| E 222-869 | 34.3 | 5.3 | **D4**/1 | 5EX2 | 50 | 450 | 13 | -20[3]/-16[4] | 36 | 4 | K7.0833-03 | • | 5.3 | [6] |
| **E 222-866[1]** | 58.1 | 5.3 | **D4**/2 | 10EX2 | 74 | 450 | 13 | -20[3]/-16[4] | 36 | 4 | K7.0833-06 | • | 5.3 | [6] |
| **E 222-868[1]** | 58.1 | 5.3 | **D4**/3 | 16EX2 | 76 | 450 | 13 | -20[3]/-16[4] | 36 | 4 | K7.0833-08 | • | 5.3 | [6] |
| E 222-861 | 58.1 | 5.3 | **D4**/4 | 30 P | 35 | 450 | 13 | -20[3]/-16[4] | 21 | 4 | K7.0833-11[5] | • | 5.3 | [6] |

[1] Preferred type, no minimum order quantity required
[2] At 927 SUS (ISO VG46 at approx. 15 °C / 59 °F)
[3] Corresponds to $1^5/_8$-12 UN-2B
[4] Corresponds to $1^5/_{16}$-12 UN-2B, plugged with locking screw
[5] Paper media supported with metal gauze
[6] Open connection for ventilating filter, please assemble ventilating filter before operating

All filters are delivered with a plugged clogging indicator connection M12 x 1.5 mm. As clogging indicators either manometers or electrical pressure switches can be used. Optional extension pipes adapt the filter length to various tank depths.
For ordering of accessories please use the below mentioned codes.

**Order example: The filter E 222-761 has to be supplied with an extension pipe for a mounting depth of 500 mm (resp. 19.69 inch).**

**Order description:** **E 222-761** **/** **EV 500**

**Part No. (Basic unit)**

**Extension pipe (4 various lengths are available on request)**

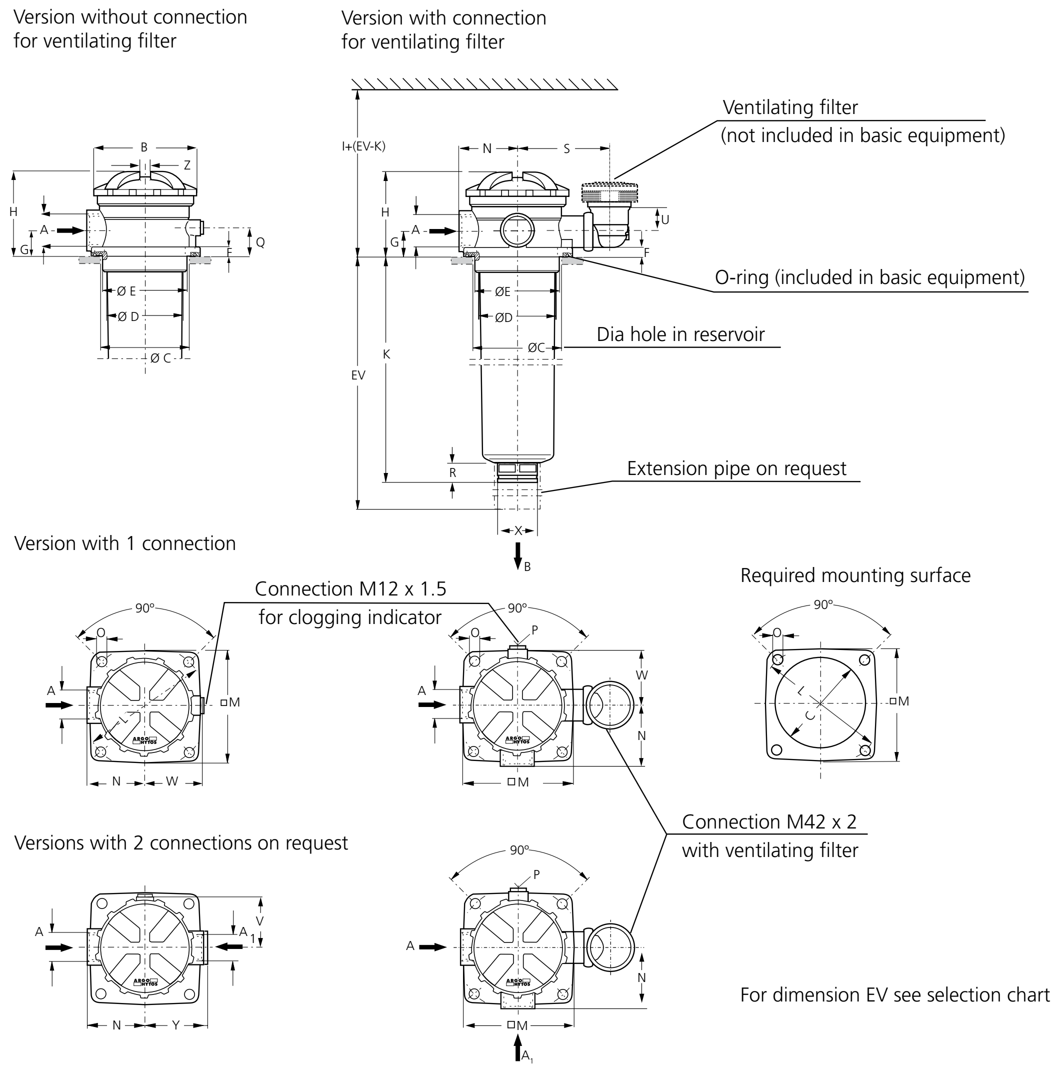
E 212: EV 300 (11.81 inch), EV 366 (14.41 inch), EV 400 (15.74 inch), EV 466 (18.35 inch)
E 222: EV 434 (17.09 inch), EV 500 (19.69 inch), EV 534 (21.02 inch), EV 600 (23.62 inch)

**For the appropriate ventilating filters with M42 x 2 thread connection see catalog sheet 50.20 and 50.30, for the appropriate clogging indicators see catalog sheet 60.20.**

**Remarks:**

- The switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 10).
- Clogging indicators are optional and always delivered detached from the filter.
- The filters listed in this chart are standard filters. Other designs available on request.

## Dimensions




## Measurements in mm

| Type | A | A1 | B | C min./max. | D | E | F | G | H | I | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 212 | G1¼ | G1 | 126 | 118/121 | 95 | 110 | 11.5 | 32 | 105 | 325 | 213 | 165 | 141 | 76 | 11 |
| E 222 | G1¼ | G1 | 126 | 118/121 | 95 | 110 | 11.5 | 32 | 105 | 455 | 347 | 165 | 141 | 76 | 11 |

| Type | Q | R | S | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|
| E 212 | 35 | 23 | 113 | 28.5 | 68 | 74 | 44 | 83 | 13 |
| E 222 | 35 | 23 | 113 | 28.5 | 67 | 74 | 44 | 83 | 13 |

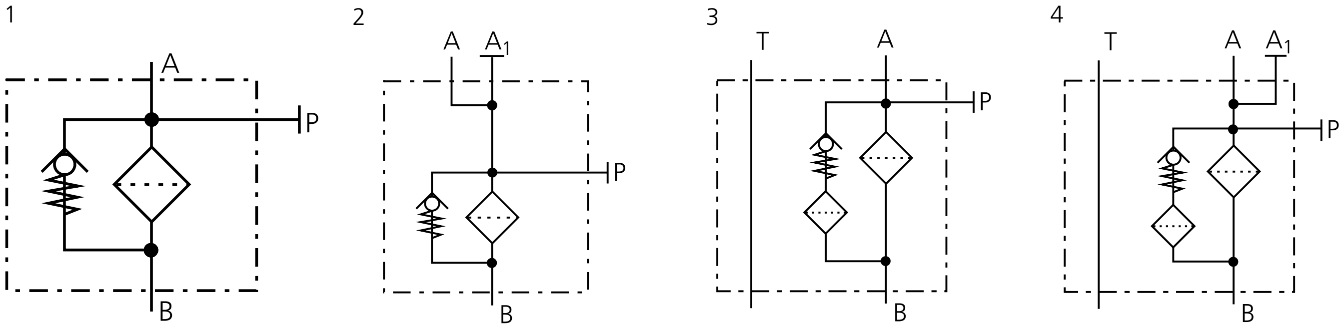
## Measurements in inch

| Type | A | $A_1$ | B | C min./max. | D | E | F | G | H | I | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 212 | -20[1] | -16[2] | 4.96 | 4.65/4.76 | 3.74 | 4.29 | 0.45 | 1.26 | 4.13 | 12.80 | 8.39 | 6.50 | 5.55 | 2.99 | 0.43 |
| E 222 | -20[1] | -16[2] | 4.96 | 4.65/4.76 | 3.74 | 4.29 | 0.45 | 1.26 | 4.13 | 17.91 | 13.66 | 6.50 | 5.55 | 2.99 | 0.43 |

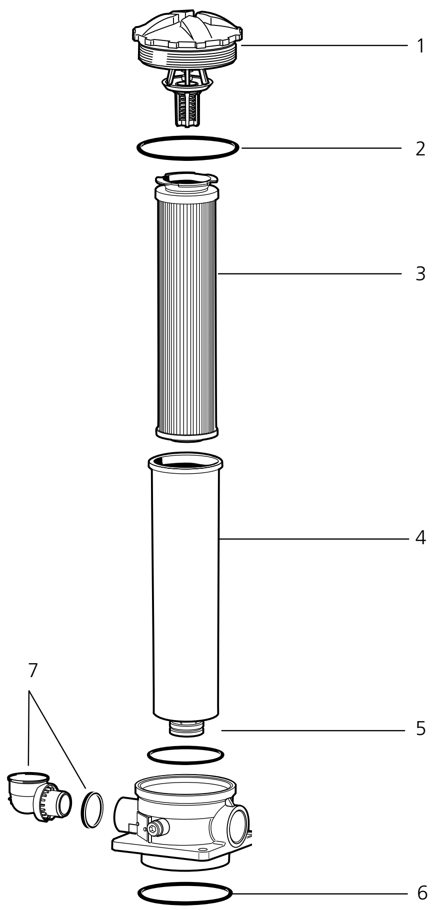
| Type | Q | R | S | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|
| E 212 | 1.38 | 0.91 | 4.45 | 1.12 | 2.67 | 2.91 | 1.73 | 3.27 | 0.51 |
| E 222 | 1.38 | 0.91 | 4.45 | 1.12 | 2.67 | 2.91 | 1.73 | 3.27 | 0.51 |

[1] Corresponds to $1\frac{5}{8}$-12 UN-2B [2] Corresponds to $1\frac{5}{16}$-12 UN-2B

## Symbols




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Screw-on cap with valve (2.5 bar / 36 psi) and Pos. 2 | E 221.1200 |
| 1 | Screw-on cap with valve (1.5 bar / 21 psi) and Pos. 2 | E 221.1210 |
| 2 | O-ring 100 x 4 mm 3.94 x 0.16 inch | N007.1004 |
| 3 | Replacement filter element | see Chart / col. 12 |
| 4 | Filter bowl E 212* | E 212.0901 |
| 4 | Filter bowl E 222* | E 222.0901 |
| 5 | O-ring 90 x 4 mm 3.54 x 0.16 inch | N007.0904 |
| 6 | O-ring 126 x 4 mm 4.96 x 0.16 inch | N007.1264 |
| 7 | Connection for ventilating filter (incl. O-ring 31 x 4 mm / 1.22 x 0.16 inch) | E 222.1900 |

*Specify mounting depth (EV) in mm

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

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

# RFT 222

Tank top mounting · Connection G1¼ / -20 SAE · Nominal flow rate up to 270 l/min / 71 gpm

M

Return Filter RFT 222

## Description

### Application

In the return line circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

### Special features

- Bypass valve:
  The location close to the inlet port prevents dirt particles retained by the filter element from entering into the clean oil side.
- Removable bowl:
  In case of maintenance the filter bowl is removed together with the filter element - therefore dirt particles are not flushed back into the tank.
- Filling filter / Bypass protection strainer:
  The filling filter is integrated in the filter element and prevents coarse particles from entering during filling or refilling due to maintenance or repair reasons. Filling can be carried out at the filter. Therefore the cover must be removed. In operation, the filling filter functions as a bypass protection strainer and prevents dirt from entering into the tank when the bypass valve is open.

### Filter elements

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

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

### Filter maintenance

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

### Materials

| | |
|---|---|
| Screw-on cap: | Polyester, GF-reinforced |
| Filter head: | Aluminum alloy |
| Filter bowl: | Polyamide, CF-reinforced |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®Light - inorganic multi-layer microfiber web<br>Paper - cellulose web, impregnated with resin |

### Accessories

Electrical and optical clogging indicators are available on request. For technical data and dimensions see datasheet 60.20.

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

## Characteristics

### Nominal flow rate

Up to 270 l/min / 71 gpm (see Selection Chart, page 3).
The nominal flow rates indicated by ARGO-HYTOS lightline are based on the following features:

- closed bypass valve at $\nu \leq 150$ mm²/s / 698 SUS
- element service life > 500 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines ≤ 6 m/s / 20 ft/s

### Connection

Threaded ports according to

- ISO 228 or DIN 13 and
- SAE standard J514

Sizes see Selection Chart, page 3
(other port threads on request).

### Filter fineness

10 µm(c) ... 30 µm(c)
β-values according to ISO 16889 (see diagram).

### 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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS

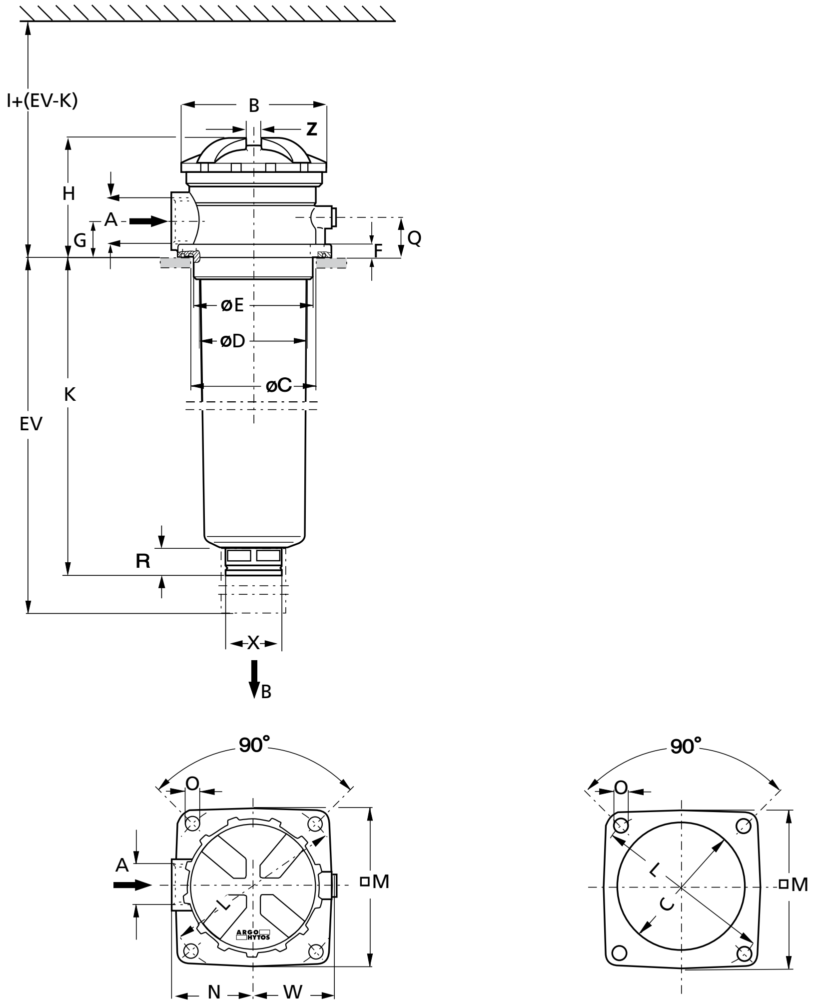
### Operating pressure

Max. 10 bar / 145 psi

### Mounting position

Preferably vertical, outlet downwards.

## Dimensions




## Measurements

| Type [mm] | A | B | C min/max | D | E | F | G | H | I | K | L | M | N | O | Q | R | W | X | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RFT 222 | G1¼ | 126 | 118/121 | 95 | 110 | 11.5 | 32 | 105 | 455 | 347 | 165 | 141 | 76 | 11 | 35 | 23 | 74 | 44 | 13 |

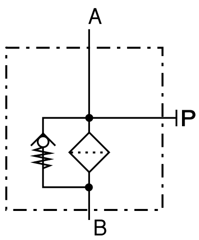
| Type [inch] | A | B | C min/max | D | E | F | G | H | I | K | L | M | N | O | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RFT 222 | -20 SAE* | 4.98 | 4.65/4.76 | 3.74 | 4.33 | 0.45 | 1.26 | 4.18 | 17.92 | 13.67 | 6.50 | 5.56 | 2.99 | 0.43 | 1.38 |

| Type [inch] | R | W | X | Z |
|---|---|---|---|---|
| RFT 222 | 0.91 | 2.92 | 1.74 | 0.51 |

*Corresponds to 1 $^{5}/_{8}$ - 12 UN-2B

## Symbol

1



## Ordering Code

### Filter assembly

**Order example:**
RFT - 222 - GE - G2 - OM - 100

**RFT - 222 - ___ - ___ - ___ - 100**

| Type of filter | Code |
|---|---|
| Return Filter, tank mounted | RFT |

| Flow rate, max. | Code |
|---|---|
| 270 l/min / 71 gpm | 222 |

| Connection thread | Code |
|---|---|
| G1¼ | GE |
| -20 SAE | UE |

| Filter fineness | Code |
|---|---|
| 10 µm (10EL) | G2 |
| 16 µm (16EL) | I2 |
| 30 µm (30P) | N3 |

| Air breather | Code |
|---|---|
| Without air breather | 100 |

| Bypass setting | Code |
|---|---|
| 2.5 bar / 36 psi (for 10EL, 16EL) | OM |
| 1.5 bar / 22 psi (for 30P) | KM |

Filters delivered with plugged connection M12 x 1.5 for clogging indicator.

### Spare filter element

**Order example:**
F7.0833-06

**___ 7 . 08 33 - ___ ___**

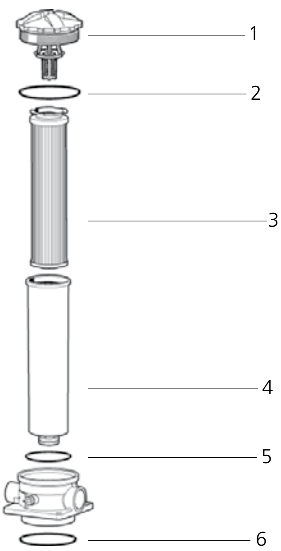
| Filter media | Code |
|---|---|
| EXAPOR®Light | F |
| Paper | P |

| Length | Code |
|---|---|
| for RFT 222 | 33 |

| Filter fineness (2nd digit) | Code |
|---|---|
| 10EL | 6 |
| 16EL | 8 |
| 30P | 1 |

| Filter fineness (1st digit) | Code |
|---|---|
| for RFT 222, 10EL & 16EL | 0 |
| for RFT 222, 30P | 1 |

## Spare parts



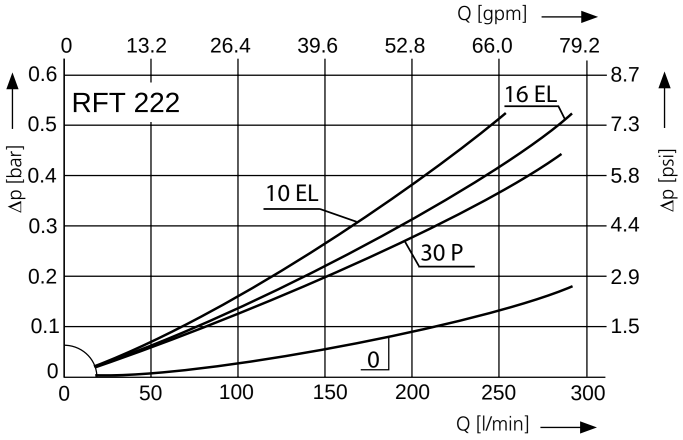

| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Screw-on cap with valve (2.5 bar / 36 psi) and Pos. 2 | E 221.1200 |
| 1 | Screw-on cap with valve (1.5 bar / 22 psi) and Pos. 2 | E 221.1210 |
| 2 | O-ring 100 x 4 mm / 3.94 x 0.16 inch | N007.1004 |
| 3 | Replacement filter element | see above |
| 4 | Filter bowl RFT 222 | E 222.0901 |
| 5 | O-ring 90 x 4 mm / 3.54 x 0.16 inch | N007.0904 |
| 6 | O-ring 126 x 4 mm / 4.96 x 0.16 inch | N007.1264 |

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.

## Diagrams

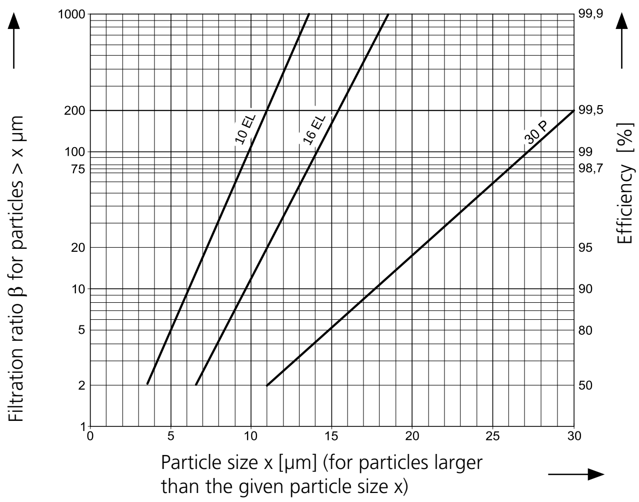
### Δp-curves for complete filters

**D1** Pressure drop as a function of the
**flow volume** at $\nu = 35\ mm^2/s$ / 162 SUS (0 = housing empty)




### Filter fineness curves

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®Light and Paper elements:**

10 EL = $\bar{\beta}_{10\,(c)}$ = 200 EXAPOR®Light
16 EL = $\bar{\beta}_{16\,(c)}$ = 200 EXAPOR®Light
30 P = $\beta_{30(c)}$ = 200 Paper

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

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

## Quality Assurance

### Quality management according to DIN EN ISO 9001

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

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

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

Return Filters

# E 444 · E 454 · E 464 · E 644

Tank top mounting · Connection up to SAE 2 · Nominal flow rate up to 680 l/min / 179.7 gpm


Return Filter E 454

## Description

### Application

In the return line circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

### Special features

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

### Filter elements

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

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

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

### Filter maintenance

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

### Materials

| | |
|---|---|
| Filter head cover: | Aluminum alloy |
| Filter head: | Aluminum alloy |
| Housing: | Steel, phosphated |
| Housing bottom: | Polyamide, GF reinforced |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web<br>Paper - cellulose web, impregnated with resin, stainless steel wire mesh (1.4301) |

### Accessories

Extension pipes or diffusers on the bowl outlet are available on request. Even the combination of both options is possible.

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

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

## Characteristics

### Nominal flow rate

Up to 680 l/min / 179.7 gpm (see Selection Chart, column 2). The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines ≤ 4.5 m/s / 14.8 ft/s

### Connection

Threaded ports according to

- ISO 228 or DIN 13
- SAE standard J514 and
- SAE-flange (3000 psi)

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

### Filter fineness

5 µm(c) ... 60 µm(c)
β-values according to ISO 16889
(see Selection Chart, column 4 and diagram Dx)

### Dirt-holding capacity

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

### Hydraulic fluids

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

### Temperature range

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

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Operating pressure

Max. 10 bar / 145 psi

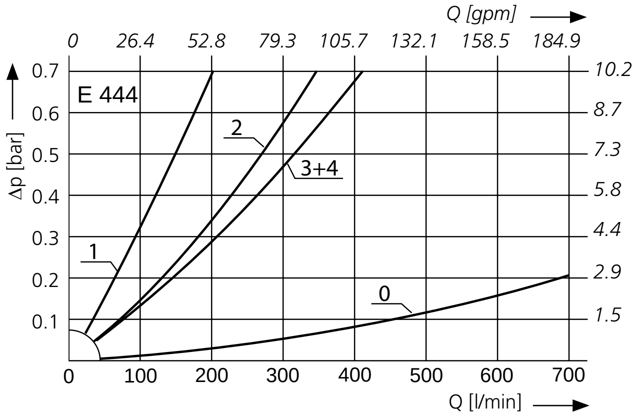
### Mounting position

Preferably vertical, outlet downwards.

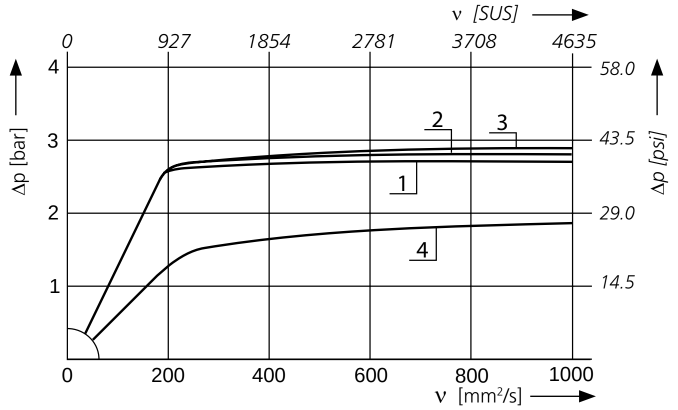
## Diagrams

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

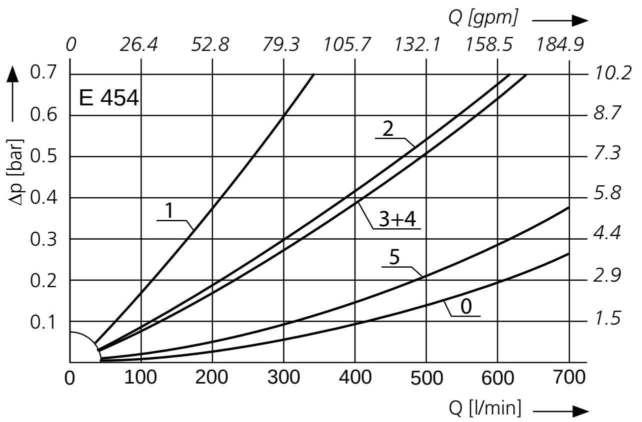
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



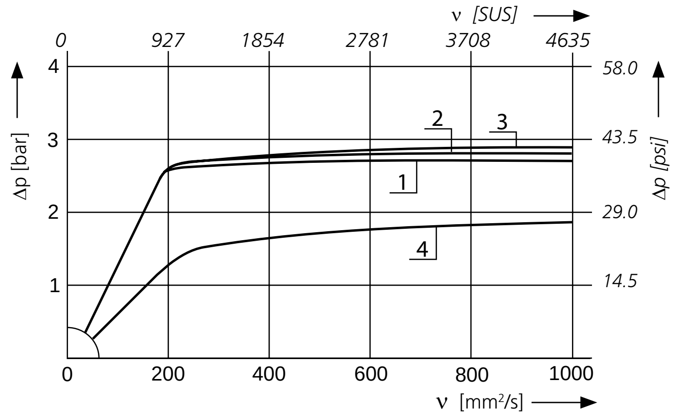

Pressure drop as a function of the **kinematic viscosity** at nominal flow



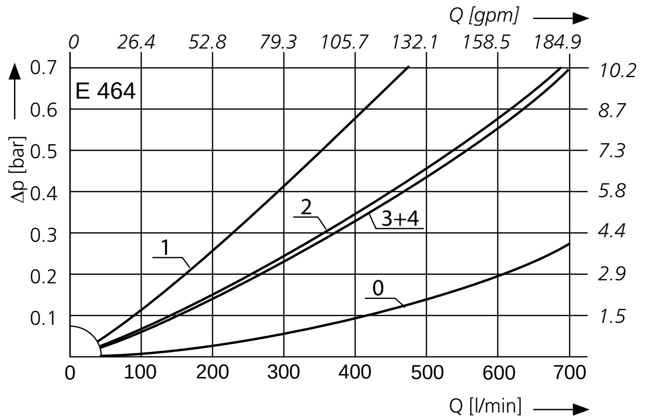

**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



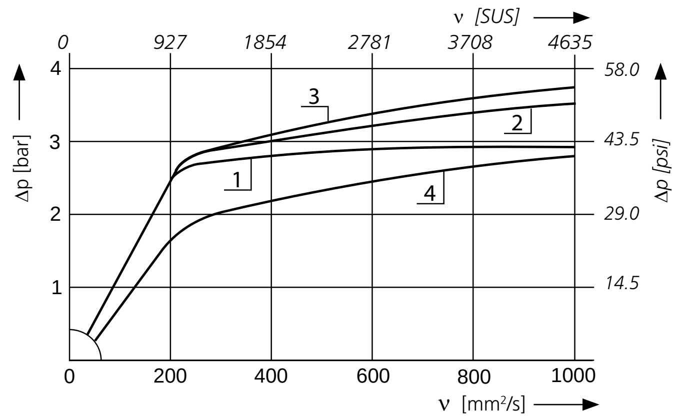

Pressure drop as a function of the **kinematic viscosity** at nominal flow



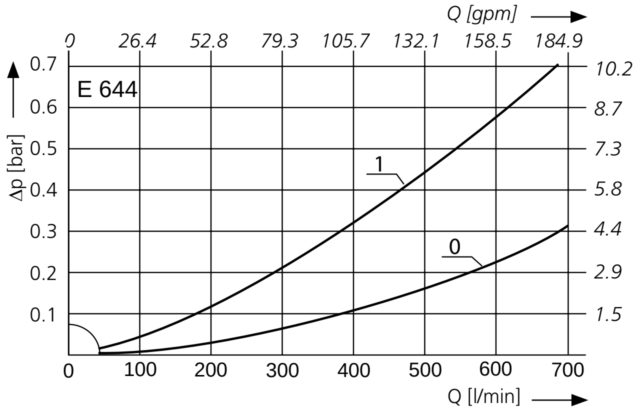

**D3** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



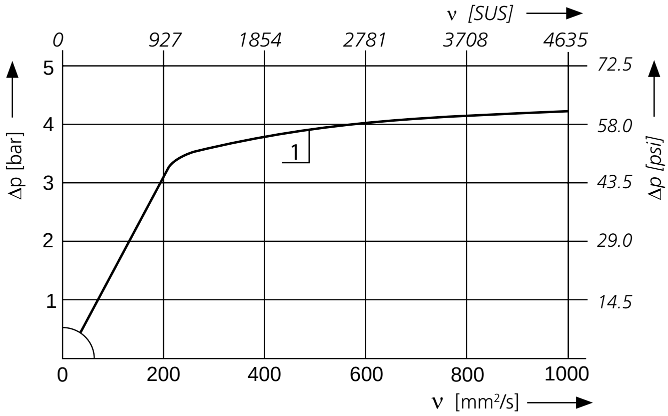

Pressure drop as a function of the **kinematic viscosity** at nominal flow



**D4** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

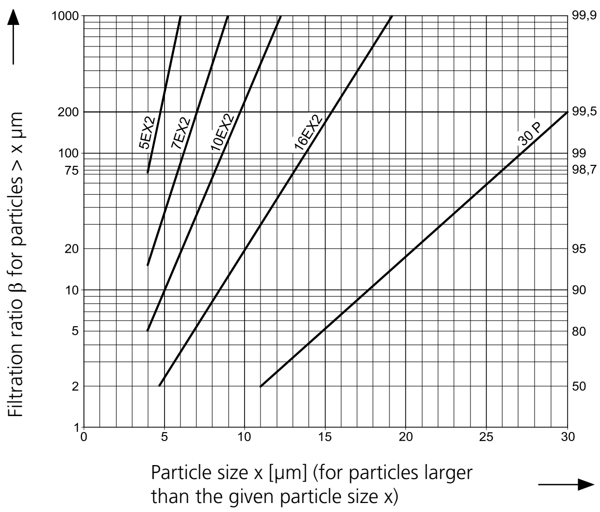



Pressure drop as a function of the **kinematic viscosity** at nominal flow




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

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX 2 and Paper elements:**

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

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

**Screen elements:**

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

Tolerances for mesh size according to DIN 4189

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

## Selection Chart

| Part No. | Nominal flow rate[2] | Pressure drop see diagram **D**/curve no. | Filter fineness see Diagr. **Dx** | Dirt-holding capacity Filter surface in ( ) | Connection ($A_1$ ... $A_4$) SAE (3000 psi) | Cracking pressure of by-pass | Symbol | Replacement filter element Part No. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| E 444-459 | 115 | **D1**/1 | 5EX2 | 45 | 2 x G1¼ / SAE1½, G¾ + G1 | 2.5 | 3 | V2.1217-53 | 4.4 | - |
| **E 444-456**[1] | 200 | **D1**/2 | 10EX2 | 61 | 2 x G1¼ / SAE1½, G¾ + G1 | 2.5 | 3 | V2.1217-56 | 4.4 | - |
| **E 444-468**[1] | 270 | **D1**/3 | 16EX2 | 62 | 2 x G1¼ / SAE1½, G¾ + G1 | 2.5 | 3 | V2.1217-58 | 4.4 | - |
| E 444-481 | 175 | **D1**/4 | 30P | 29 | 2 x G1¼ / SAE1½, G¾ + G1 | 1.5 | 3 | P2.1217-51[3] | 4.4 | - |
| E 454-459 | 220 | **D2**/1 | 5EX2 | 93 | 2 x G1¼ / SAE1½, G¾ + G1 | 2.5 | 3 | V2.1234-23 | 6.1 | - |
| **E 454-456**[1] | 375 | **D2**/2 | 10EX2 | 130 | 2 x G1¼ / SAE1½, G¾ + G1 | 2.5 | 3 | V2.1234-26 | 6.1 | - |
| **E 454-468**[1] | 480 | **D2**/3 | 16EX2 | 124 | 2 x G1¼ / SAE1½, G¾ + G1 | 2.5 | 3 | V2.1234-28 | 6.1 | - |
| E 454-453 | 350 | **D2**/4 | 30P | 63 | 2 x G1¼ / SAE1½, G¾ + G1 | 1.5 | 3 | P2.1234-41[3] | 6.1 | - |
| E 454-400 | 525 | **D2**/5 | 60S | (3600 cm²) | 2 x G1¼ / SAE1½, G¾ + G1 | 1.5 | 6 | S2.1234-00 | 6.4 | with magnetic system |
| E 464-459 | 300 | **D3**/1 | 5EX2 | 140 | 2 x G1¼ / SAE1½, G¾ + G1 | 2.5 | 3 | V2.1250-03 | 7.8 | - |
| **E 464-456**[1] | 500 | **D3**/2 | 10EX2 | 200 | 2 x G1¼ / SAE1½, G¾ + G1 | 2.5 | 3 | V2.1250-06 | 7.8 | - |
| **E 464-468**[1] | 600 | **D3**/3 | 16EX2 | 200 | 2 x G1¼ / SAE1½, G¾ + G1 | 2.5 | 3 | V2.1250-08 | 7.8 | - |
| E 464-453 | 480 | **D3**/4 | 30P | 95 | 2 x G1¼ / SAE1½, G¾ + G1 | 1.5 | 3 | P2.1250-11[3] | 7.8 | - |
| **E 644-476**[1] | 680 | **D4**/1 | 10EX2 | 250 | 2 x G1¼ / SAE1½, G¾ + G1 | 3.0 | 3 | V2.1260-46 | 9.5 | - |

[1] Preferred type, no minimum order quantity required
[2] The individual flow rates must match the connections
[3] Paper media supported with metal gauze

All filters are delivered with a plugged clogging indicator connection M12 x 1.5 (mounting holes for differential pressure switches on request). As clogging indicators either manometers or electrical pressure switches can be used. Two different head pieces with three various connecting options are available. All filters can also be supplied with an outlet diffuser. Optional extension pipes adapt the filter length to various tank depths. For ordering of accessories please use the below mentioned codes.

**Order example: The filter E 454 has to be supplied with 2 connections (A and $A_3$), an outlet diffuser and an extension pipe for 564 mm (22.2 inch) length.**

**Order description:** **E 454- 256 / VD / EV 564**

**Connections:**

3 various options are available
one connection (A) - G1½ / SAE 2 — 1
two connections[2] (A und A3) - G1½ / SAE 2 und G¾ — 2
four connections[2] (A1, A2, A3 und A4) - 2 x G1¼ / SAE 1½, G¾ und G1 — 4

[2] The individual flow rates must match the connections

**Options (bowl outlet):**

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

**Extension pipe:**

5 various lengths are available.
EV = K + 87 (3.43 inch) / + 142 (5.59 inch) / + 202 (7.95 inch) / + 237 (9.33 inch) / + 362 (14.25 inch)
(see section dimensions and measurements)
**For the appropriate clogging indicators see catalog sheet 60.20.**

## Selection Chart

| Part No. | Nominal flow rate [2] | Pressure drop see diagram **D**/curve no. | Filter fineness see Diagr. **Dx** | Dirt-holding capacity Filter surface in ( ) | Connection $A_1$ und $A_3$ SAE (3000 psi) | Cracking pressure of by-pass | Symbol | Replacement filter element Part No. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | gpm | | | g | | psi | | | lbs | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| **E 444-756**[1] | 52.9 | **D1**/2 | 10EX2 | 61 | -24[3] / SAE2, -16[4] | 36 | 3 | V2.1217-56 | 9.7 | - |
| **E 444-768**[1] | 71.3 | **D1**/3 | 16EX2 | 62 | -24[3] / SAE2, -16[4] | 36 | 3 | V2.1217-58 | 9.7 | - |
| | | | | | | | | | | |
| **E 454-756**[1] | 99.1 | **D2**/2 | 10EX2 | 130 | -24[3] / SAE2, -16[4] | 36 | 3 | V2.1234-26 | 13.5 | - |
| **E 454-768**[1] | 126.8 | **D2**/3 | 16EX2 | 124 | -24[3] / SAE2, -16[4] | 36 | 3 | V2.1234-28 | 13.5 | - |
| | | | | | | | | | | |
| **E 464-756**[1] | 132.1 | **D3**/2 | 10EX2 | 200 | -24[3] / SAE2, -16[4] | 36 | 3 | V2.1250-06 | 17.2 | - |
| **E 464-768**[1] | 158.6 | **D3**/3 | 16EX2 | 200 | -24[3] / SAE2, -16[4] | 36 | 3 | V2.1250-08 | 17.2 | - |
| | | | | | | | | | | |
| **E 644-776**[1] | 179.6 | **D4**/1 | 10EX2 | 250 | -24[3] / SAE2, -16[4] | 44 | 3 | V2.1260-46 | 20.9 | - |

[1] Preferred type, no minimum order quantity required
[2] The individual flow rates must match with the connections
[3] Corresponds to 1 7/8-12 UN-2B
[4] Corresponds to 1 5/16-12 UN-2B

All filters are delivered with a plugged clogging indicator connection M12 x 1.5.
(Mounting holes for differential pressure switches on request).
As clogging indicators either manometers or electrical pressure switches can be used.

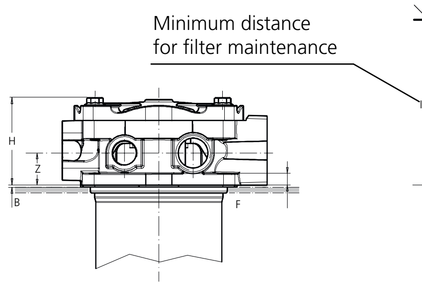
**For the appropriate clogging indicators see catalog sheet 60.20.**

**Remarks:**

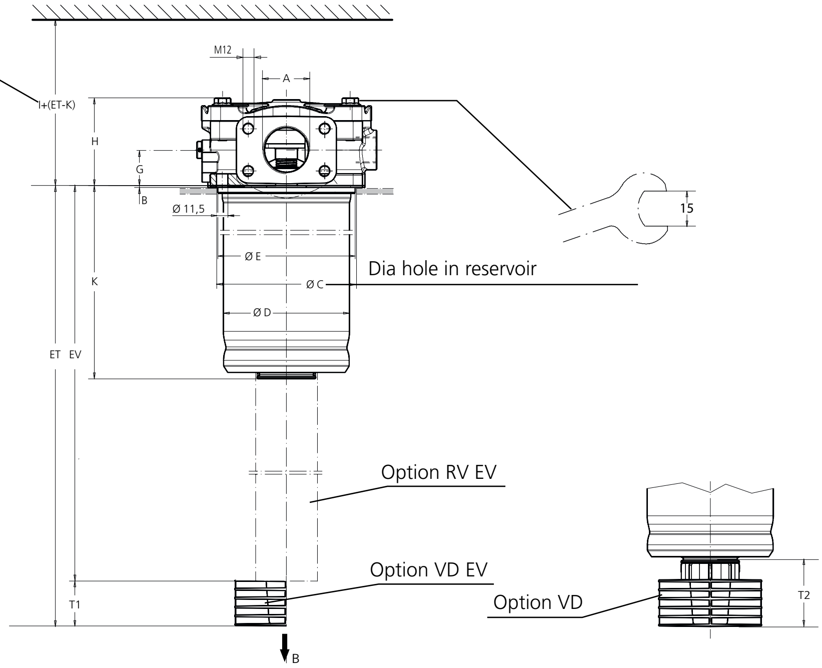
› The switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
› Clogging indicators are optional and always delivered detached from the filter.
› The filters listed in this chart are standard filters.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

## Dimensions

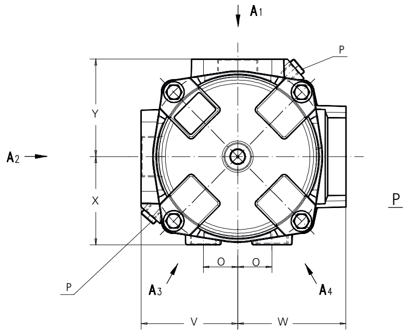
Version with 4 connections

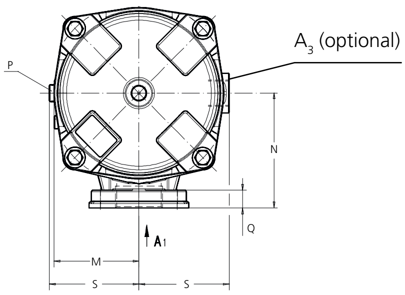


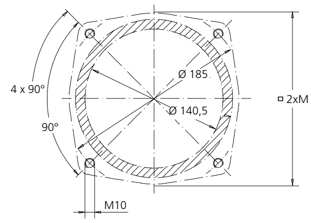

Version with 1 or 2 connections




Tank surface sealing either
with flat gasket E 442.0103
or O-ring N007.1375
(both items included in basic equipment)




Connection M12 x 1.5 for
clogging indicator standard
(mounting holes for differential
pressure switches on request)

For calculation of dimension EV see selection chart

## Measurements in mm

| Type | A | B | C | D | E | F | G | H | I | K | M | N | O | Q | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 444 | see | 2 | 141 | 128.5 | 139.9 | 12 | 36/35* | 90 | 315 | 195 | 86.5 | 116 | 35 | 18 | 92 |
| E 454 | Selec- | 2 | 141 | 128.5 | 139.9 | 12 | 36/35* | 90 | 485 | 362 | 86.5 | 116 | 35 | 18 | 92 |
| E 464 | tion | 2 | 141 | 128.5 | 139.9 | 12 | 36/35* | 90 | 650 | 530 | 86.5 | 116 | 35 | 18 | 92 |
| E 644 | Chart | 2 | 141 | 128.5 | 139.9 | 12 | 36/35* | 90 | 750 | 630 | 86.5 | 116 | 35 | 18 | 92 |

| Type | $T_1$ | $T_2$ | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|
| E 444 | 47.5 | 64 | 98.5 | 110.5 | 89 | 98.5 | 32.5 |
| E 454 | 47.5 | 64 | 98.5 | 110.5 | 89 | 98.5 | 32.5 |
| E 464 | 47.5 | 64 | 98.5 | 110.5 | 89 | 98.5 | 32.5 |
| E 644 | 47.5 | 64 | 98.5 | 110.5 | 89 | 98.5 | 32.5 |

## Measurements in inch

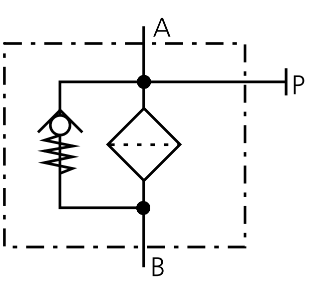
| Type | A | B | C | D | E | F | G | H | I | K | M | N | O | Q | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 444 | see | 0.08 | 5.65 | 5.06 | 5.51 | 0.47 | 1.42/1.38* | 3.54 | 12.40 | 7.67 | 3.40 | 4.57 | 1.38 | 0.71 | 3.62 |
| E 454 | Selec- | 0.08 | 5.65 | 5.06 | 5.51 | 0.47 | 1.42/1.38* | 3.54 | 19.09 | 14.25 | 3.40 | 4.57 | 1.38 | 0.71 | 3.62 |
| E 464 | tion | 0.08 | 5.65 | 5.06 | 5.51 | 0.47 | 1.42/1.38* | 3.54 | 25.59 | 20.87 | 3.40 | 4.57 | 1.38 | 0.71 | 3.62 |
| E 644 | Chart | 0.08 | 5.65 | 5.06 | 5.51 | 0.47 | 1.42/1.38* | 3.54 | 29.52 | 24.80 | 3.40 | 4.57 | 1.38 | 0.71 | 3.62 |

| Type | $T_1$ | $T_2$ | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|
| E 444 | 1.87 | 2.52 | 3.88 | 4.35 | 3.50 | 3.88 | 1.28 |
| E 454 | 1.87 | 2.52 | 3.88 | 4.35 | 3.50 | 3.88 | 1.28 |
| E 464 | 1.87 | 2.52 | 3.88 | 4.35 | 3.50 | 3.88 | 1.28 |
| E 644 | 1.87 | 2.52 | 3.88 | 4.35 | 3.50 | 3.88 | 1.28 |

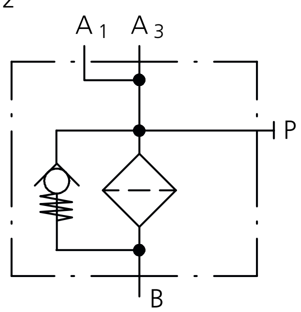
* For design with 4 connections

## Symbols

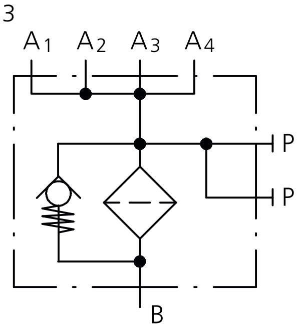
1



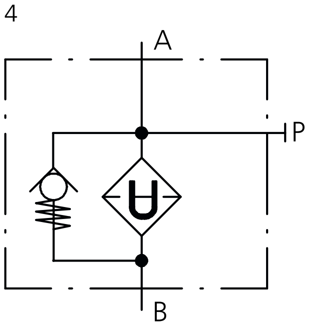

2



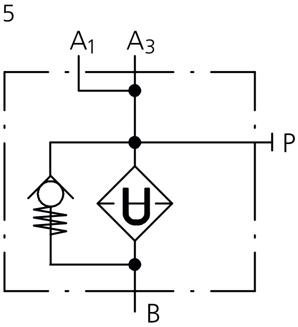

3



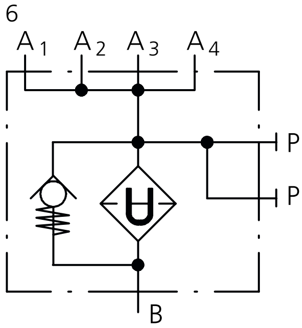

4



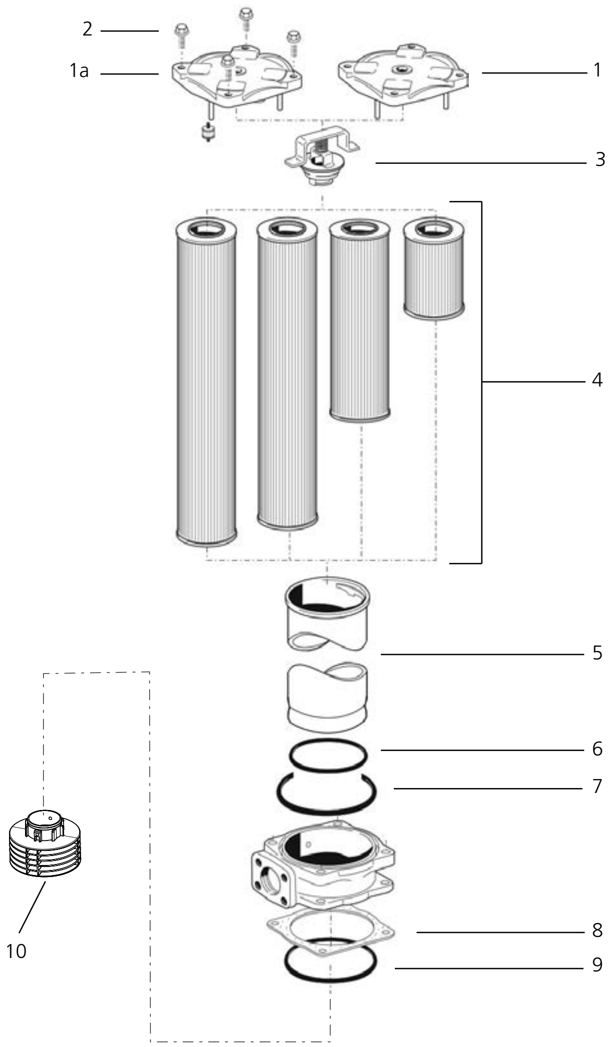

5




6



## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Cover | E 443.1200 |
| 1a | Cover<br>with magnetic system | E 443.1210 |
| 2 | Hexagon screw M10 x 35 | 28213600 |
| 3 | By-pass (1.5 bar / 21 psi) | E 440.1500 |
| 3 | By-pass (2.5 bar / 36 psi) | E 460.1520 |
| 3 | By-pass (3.0 bar / 44 psi) | E 640.1510 |
| 4 | Replacement filter elements | s. Chart / col. 9 |
| 5 | Filter bowl E 444* | E 441.1900 |
| 5 | Filter bowl E 454* | E 451.1900 |
| 5 | Filter bowl E 464* | E 461.1900 |
| 5 | Filter bowl E 644* | E 641.1900 |
| 6 | O-ring<br>125 x 6 mm<br>4.92 x 0.24 inch | N007.1256 |
| 7 | O-ring<br>151.76 x 5.33 mm<br>5.97 x 0.21 inch | N007.1525 |
| 8 | Flat gasket | E 442.0103 |
| 9 | O-ring<br>136.5 x 5.34 mm<br>5.37 x 0.21 inch | N007.1375 |
| 10 | Diffusor (version VD) | E 441.0701 |

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

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

Return Filters - Lightline

# RFT 454 · RFT 464

Tank top mounting · Connection up to SAE 2 · Nominal flow rate up to 650 l/min / 172 gpm

Return Filter RFT 454

## Description

### Application

In the return line circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

### Special features

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

### Filter elements

Flow direction from outside to center.
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 thus the optimum utilization of the filter life is guaranteed.

### Materials

| | |
|---|---|
| Filter head cover: | Aluminum alloy |
| Filter head: | Aluminum alloy |
| Housing: | Steel, phosphated |
| Housing bottom: | Polyamide, GF reinforced |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®Light - inorganic multi-layer microfiber web<br>Paper - cellulose web, impregnated with resin |

### Accessories

Electrical and optical clogging indicators are available on request. For technical data and dimensions see datasheet 60.20.

Extension pipes or diffusers on the bowl outlet are available in several lengths on request. Even the combination of both options is possible.

- Extension pipe:
  A correct extension pipe length ensures oil outlet below minimum oil level and prevents foaming.
- Diffuser:
  Diffusers reduce oil velocity and direct the oil to 90° outlet flow. This function prevents also oil foaming and whirling up of solid particles settled at the tank bottom.

## Characteristics

### Nominal flow rate

Up to 650 l/min / 172 gpm (see Selection Chart, page 3).
The nominal flow rates indicated by ARGO-HYTOS lightline are based on the following features:

- closed by-pass valve at $\nu \leq 150\ mm^2/s$ / ≤ 698 SUS
- element service life > 500 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines ≤ 6 m/s / ≤ 20 ft/s

### Connection

Threaded ports according to

- ISO 228 or DIN 13 and
- SAE standard J514
- SAE flange (3000 psi)

Sizes see Selection Chart, page 3
(other port threads on request).

### Filter fineness

10 µm(c) ... 30 µm(c)
β-values according to ISO 16889 (see diagrams).

### 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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60\ mm^2/s$ / < 280 SUS
- as starting viscosity: $\nu_{max} = 1200\ mm^2/s$ / = 5560 SUS

### Operating pressure

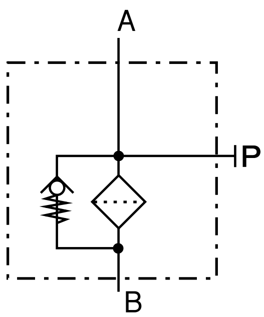
Max. 10 bar / max. 145 psi

### Mounting position

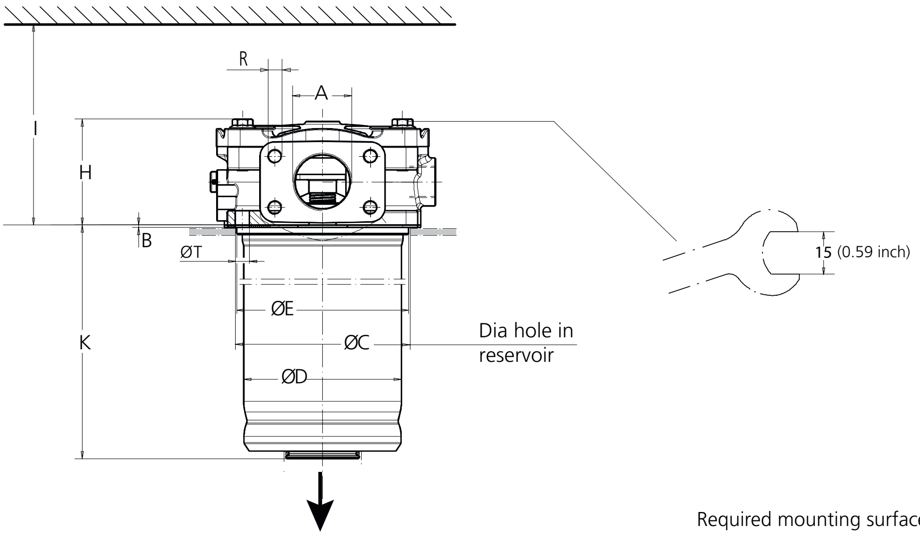
Preferably vertical, outlet downwards.

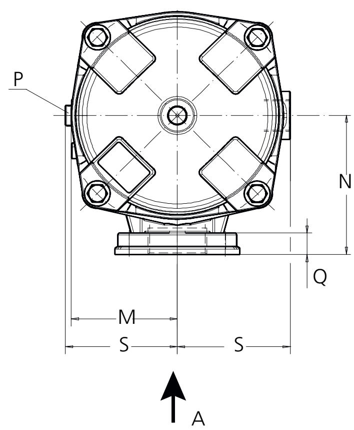
## Symbol

1

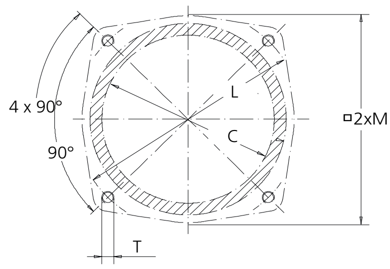


## Dimensions




Required mounting surface




## Measurements

| Type [mm] | A | B | C | D | E | H | I | K | L | M | N | O | Q | R | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RFT 454 | G1½ / SAE 2 | 2 | 141 | 128.5 | 139.9 | 90 | 485 | 362 | 185 | 86.5 | 116 | 35 | 18 | M12 | 92 | 11.5 |
| RFT 464 | G1½ / SAE 2 | 2 | 141 | 128.5 | 139.9 | 90 | 650 | 530 | 185 | 86.5 | 116 | 35 | 18 | M12 | 92 | 11.5 |

| Type [inch] | A | B | C | D | E | H | I | K | L | M | N | O | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RFT 454 | -24 SAE* / SAE 2 | 0.08 | 5.55 | 5.06 | 5.51 | 3.54 | 19.09 | 14.25 | 7.29 | 3.41 | 4.57 | 1.38 | 0.71 | ½ -13 UNC |
| RFT 464 | -24 SAE* / SAE 2 | 0.08 | 5.55 | 5.06 | 5.51 | 3.54 | 25.59 | 20.87 | 7.29 | 3.41 | 4.57 | 1.38 | 0.71 | ½ -13 UNC |

| Type [inch] | S | T |
|---|---|---|
| RFT 454 | 3.62 | 0.45 |
| RFT 464 | 3.62 | 0.45 |

*Corresponds to 1 ⁷/₈ - 12 UN-2B

## Ordering Code

### Filter assembly

RFT - ___ - ___ - ___ - ___ - 100

| Type of filter | Code |
|---|---|
| Return Filter, tank mounted | RFT |

| Flow rate, max. | Code |
|---|---|
| 500 l/min / 132 gpm | 454 |
| 650 l/min / 172 gpm | 464 |

| Connection thread | Code |
|---|---|
| G 1½ / SAE 2 | GF |
| -24 SAE / SAE 2 | UF |

| Filter fineness | Code |
|---|---|
| 10 µm (10EL) | G2 |
| 16 µm (16EL) | I2 |
| 30 µm (30P) | N3 |

**Order example:**
RFT - 454 - UF - I2 - OM - 100

| Air breather | Code |
|---|---|
| without air breather | 100 |

| Bypass setting | Code |
|---|---|
| 2.5 bar / 36 psi (for 10EL, 16EL) | OM |
| 1.5 bar / 22 psi (for 30P) | KM |

Filters delivered with plugged connection M12 x 1.5 for clogging indicator.

### Spare filter element

___ 2.12 ___ - ___ ___

| Filter media | Code |
|---|---|
| EXAPOR®Light | F |
| Paper | P |

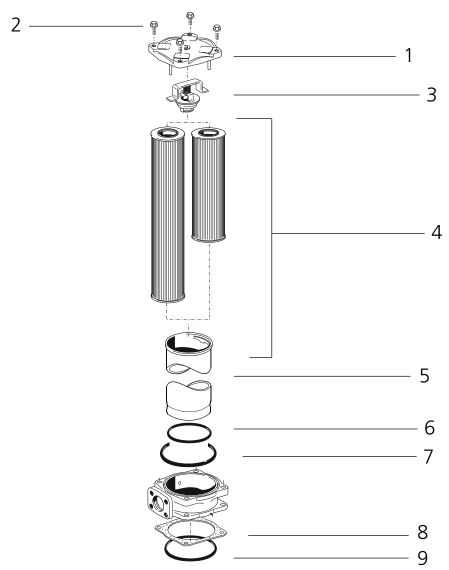
| Length | Code |
|---|---|
| for RFT 454 | 34 |
| for RFT 464 | 50 |

**Order example:**
F2.1234-26

| Filter fineness (2nd digit) | Code |
|---|---|
| 10EL | 6 |
| 16EL | 8 |
| 30P | 1 |

| Filter fineness (1st digit) | Code |
|---|---|
| for RFT 454, 10EL & 16EL | 2 |
| for RFT 454, 30P | 4 |
| for RFT 464, 10EL & 16EL | 0 |
| for RFT 464, 30P | 1 |

## Spare parts



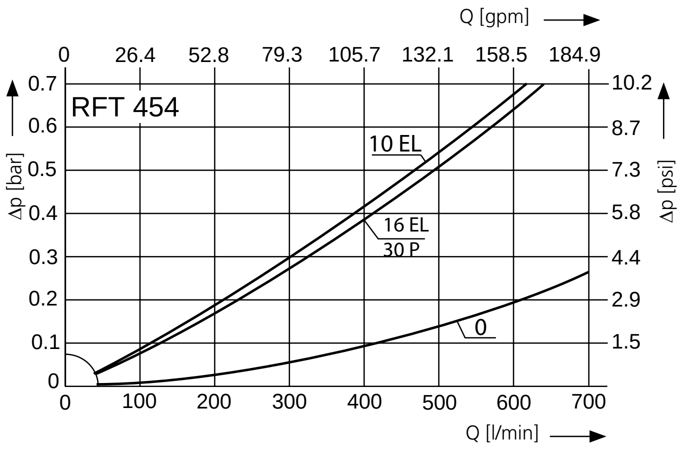

| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Cover | E 443.1200 |
| 2 | Hexagon screw M10 x 35 | 28213600 |
| 3 | Bypass valve (1.5 bar / 22 psi) | E 440.1500 |
| 3 | Bypass valve (2.5 bar / 36 psi) | E 460.1520 |
| 4 | Replacement filter element | see above |
| 5 | Filter bowl RFT 454 | E 451.1900 |
| 5 | Filter bowl RFT 464 | E 461.1900 |
| 6 | O-ring 125 x 6 mm / 4.92 x 0.24 inch | N007.1256 |
| 7 | O-ring 151.76 x 5.33 mm / 5.98 x 0.21 inch | N007.1525 |
| 8 | Flat gasket | E 442.0103 |
| 9 | O-ring 136.5 x 5.34 mm / 5.37 x 0.21 inch | N007.1375 |

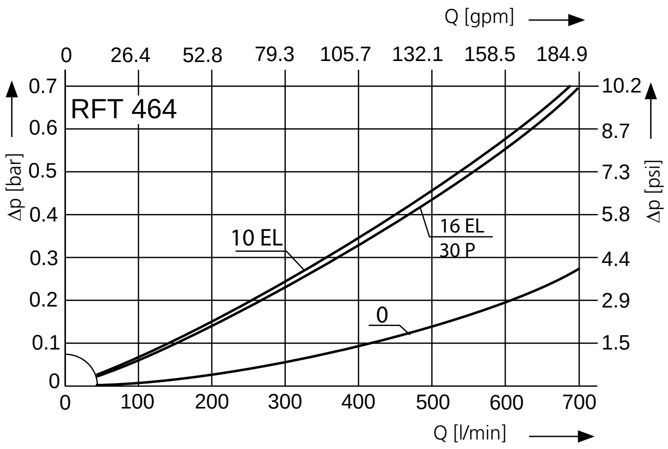
The functions of the complete filters as well as the outstanding features of the filter elements assured by ARGO-HYTOS can only be guaranteed if original ARGO-HYTOS spare parts are used.

## Diagrams

### Δp-curves for complete filters

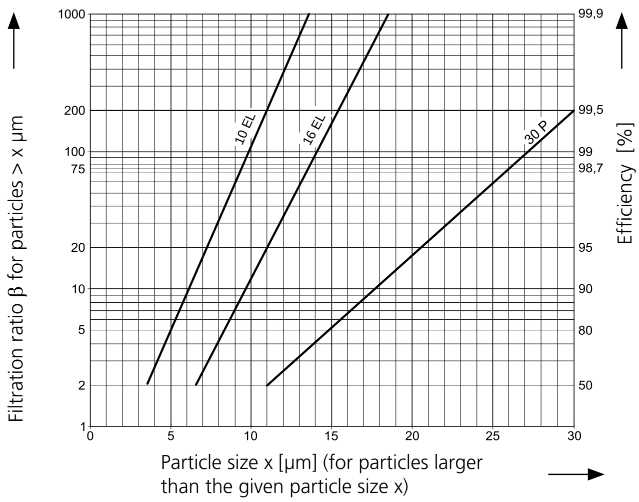
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = housing empty)




### Filter fineness curves

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®Light and Paper elements:**

10 EL = $\overline{\beta}_{10\,(c)}$ = 200 EXAPOR®Light
16 EL = $\overline{\beta}_{16\,(c)}$ = 200 EXAPOR®Light
30 P = $\beta_{30(c)}$ = 200 Paper

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

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

## Quality Assurance

### Quality management according to DIN EN ISO 9001

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

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

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

Return Filters

# E 441 · E 451 · E 461 · E 641 · E 700

Tank mounting · Nominal flow rate up to 800 l/min / 211.4 gpm

Return Filter E 461

## Description

### Application

In the return line circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

### Special features

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

### Filter elements

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

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

### Filter maintenance

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

### Materials

| | |
|---|---|
| Filter bowl: | Steel, phosphated |
| Housing bottom: | Polyamide, GF reinforced |
| (for E 700: | Steel, phosphated) |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web |
| | Paper - cellulose web, impregnated with resin |

### Accessories

Extension pipes or diffusers on the bowl outlet are available on request. Even the combination of both options is possible.

*Extension pipe:*
A correct extension pipe length ensures oil outlet below minimum oil level and prevents foaming.

*Diffusers:*
Diffusers reduce oil velocity and direct the oil to 90° outlet flow. This function prevents also oil foaming and whirling up of solid particles settled at the tank bottom.

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

## Characteristics

### Nominal flow rate

Up to 800 l/min / 211.4 gpm (see Selection Chart, column 2). The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines ≤ 4.5 m/s / 14.8 ft/s

### Installation

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

### Filter fineness

10 µm(c) ... 30 µm(c)
β-values according to ISO 16889
(see Selection Chart, column 4 and diagram Dx)

### Dirt-holding capacity

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

### Hydraulic fluids

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

### Temperature range

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

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% Δp of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the Δp curve at a point. Read this point on the horizontal axis for the viscosity.

### Operating pressure

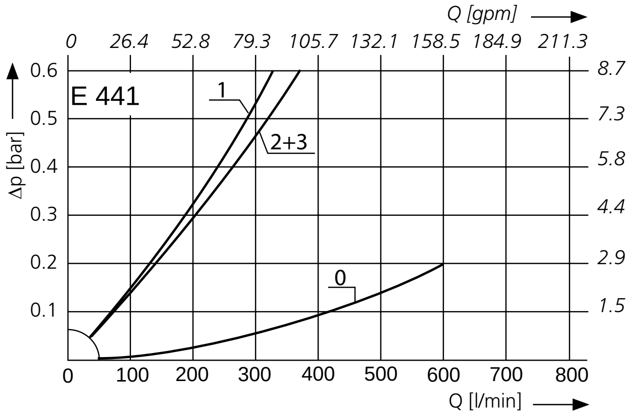
Max. 10 bar / 145 psi

### Mounting position

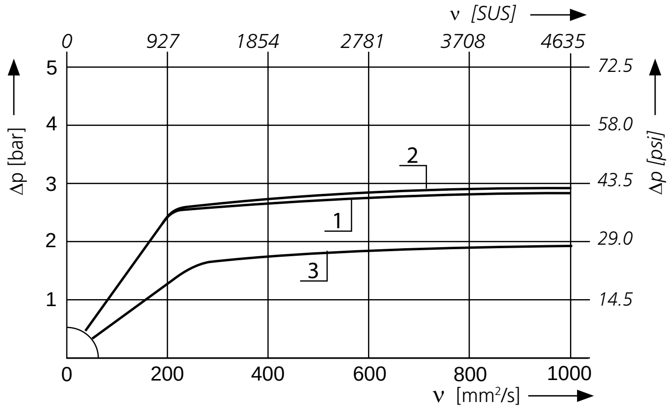
Preferably vertical, outlet downwards.

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

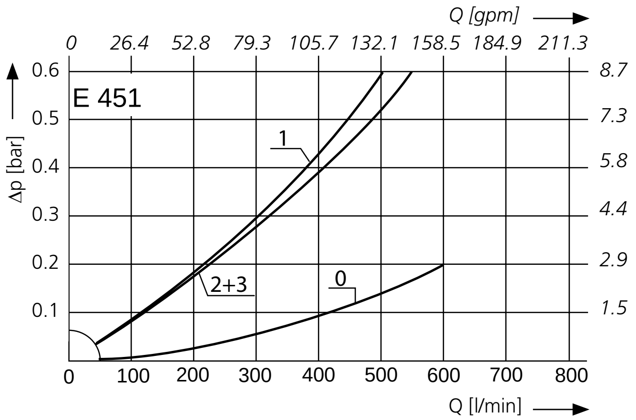
**D1** Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s / 162 SUS (0 = casing empty)



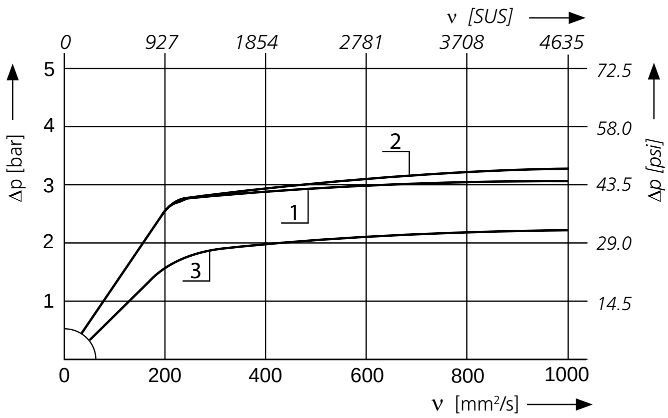

Pressure drop as a function of the
**kinematic viscosity** at nominal flow



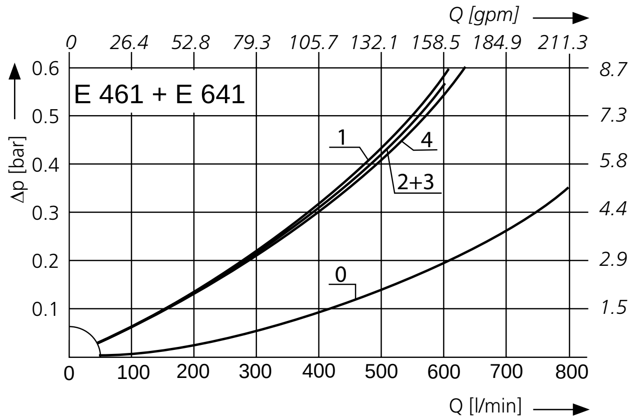

**D2** Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s / 162 SUS (0 = casing empty)



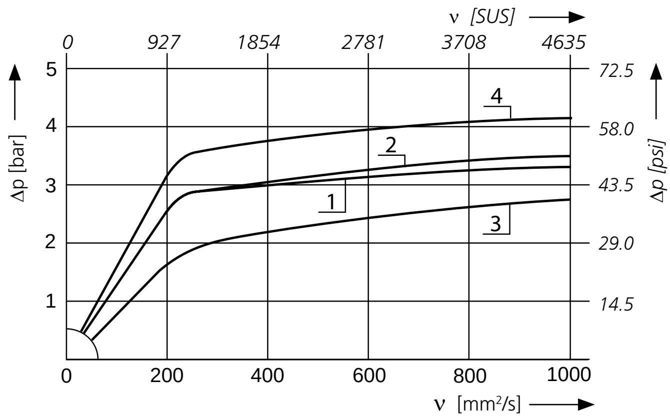

Pressure drop as a function of the
**kinematic viscosity** at nominal flow



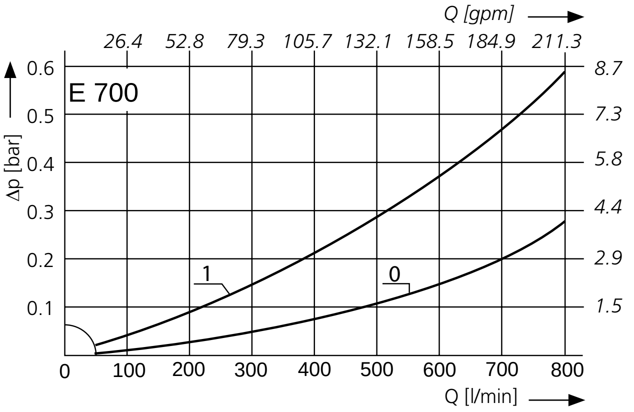

**D3** Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s / 162 SUS (0 = casing empty)



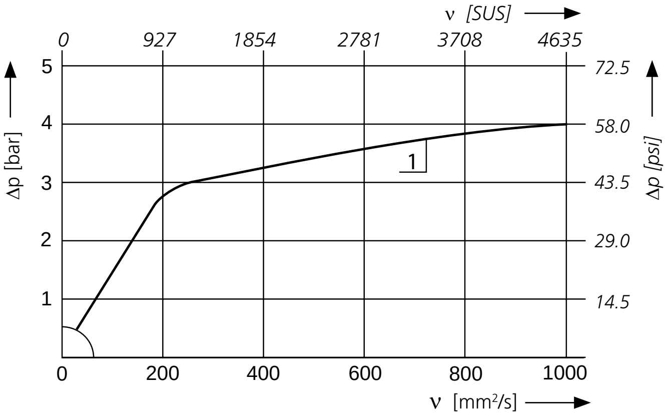

Pressure drop as a function of the
**kinematic viscosity** at nominal flow



**D4** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

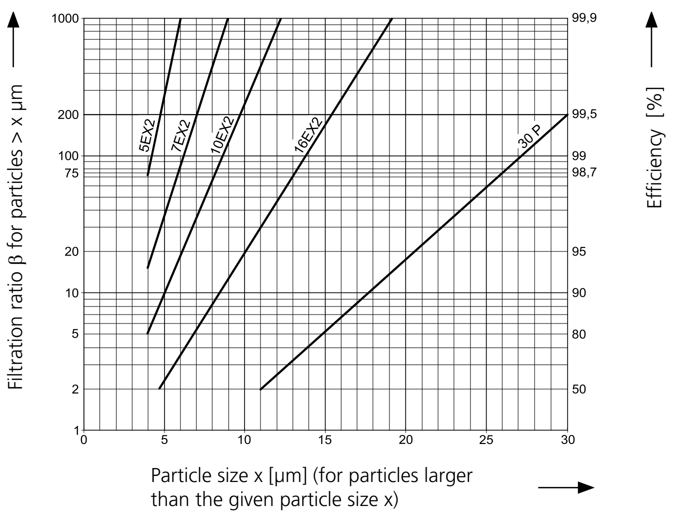



Pressure drop as a function of the **kinematic viscosity** at nominal flow




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

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX 2 and Paper elements:**

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

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

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189.

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

## Selection Charts

| Part No. | Nominal flow rate | | Pressure drop see diagram D/curve no. | Filter fineness see Diagr. Dx | Dirt-holding capacity | Connection A | Cracking pressure of by-pass | | Symbol | Replacement filter element Part No. | Weight | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | gpm | | | g | | bar | psi | | | kg | lbs | |
| 1 | 2 | | 3 | 4 | 5 | 6 | 7 | | 8 | 9 | 10 | | 11 |
| **E 441-156**[1] | 200 | 53 | **D1**/1 | 10EX2 | 61 | - | 2.5 | 36 | 1 | V2.1217-56 | 2.4 | 5.3 | - |
| **E 441-168**[1] | 270 | 71 | **D1**/2 | 16EX2 | 62 | - | 2.5 | 36 | 1 | V2.1217-58 | 2.4 | 5.3 | - |
| E 441-153 | 175 | 46 | **D1**/3 | 30P | 29 | - | 1.5 | 21 | 1 | P2.1217-51[2] | 2.4 | 5.3 | - |
| **E 451-156**[1] | 375 | 99 | **D2**/1 | 10EX2 | 130 | - | 2.5 | 36 | 1 | V2.1234-26 | 4.1 | 9.0 | - |
| **E 451-168**[1] | 480 | 127 | **D2**/2 | 16EX2 | 124 | - | 2.5 | 36 | 1 | V2.1234-28 | 4.1 | 9.0 | - |
| E 451-153 | 350 | 92 | **D2**/3 | 30P | 63 | - | 1.5 | 21 | 1 | P2.1234-41[2] | 4.1 | 9.0 | - |
| **E 461-156**[1] | 500 | 132 | **D3**/1 | 10EX2 | 200 | - | 2.5 | 36 | 1 | V2.1250-06 | 5.8 | 12.8 | - |
| **E 461-168**[1] | 600 | 180 | **D3**/2 | 16EX2 | 200 | - | 2.5 | 36 | 1 | V2.1250-08 | 5.8 | 12.8 | - |
| E 461-153 | 480 | 127 | **D3**/3 | 30P | 95 | - | 1.5 | 21 | 1 | P2.1250-11[2] | 5.8 | 12.8 | - |
| **E 641-76**[1] | 680 | 180 | **D3**/4 | 10EX2 | 250 | - | 3.0 | 43 | 1 | V2.1260-46 | 7.5 | 16.5 | - |
| **E 700-156**[1] | 800 | 211 | **D4**/1 | 10EX2 | 300 | - | 2.5 | 36 | 1 | V2.1460-26 | 12.4 | 27.3 | - |

[1] Preferred type, no minimum order quantity required
[2] Paper media supported with metal gauze

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

**Order example: The filter E 451-156 has to be supplied with an outlet diffuser and an extension pipe (EV) for 580 mm (22.83 inch) length.**

**Order description:** **E 451-156 / VD / EV 580**

**Part No. (Basic unit)**

**Options:**

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

**Extension pipes:**

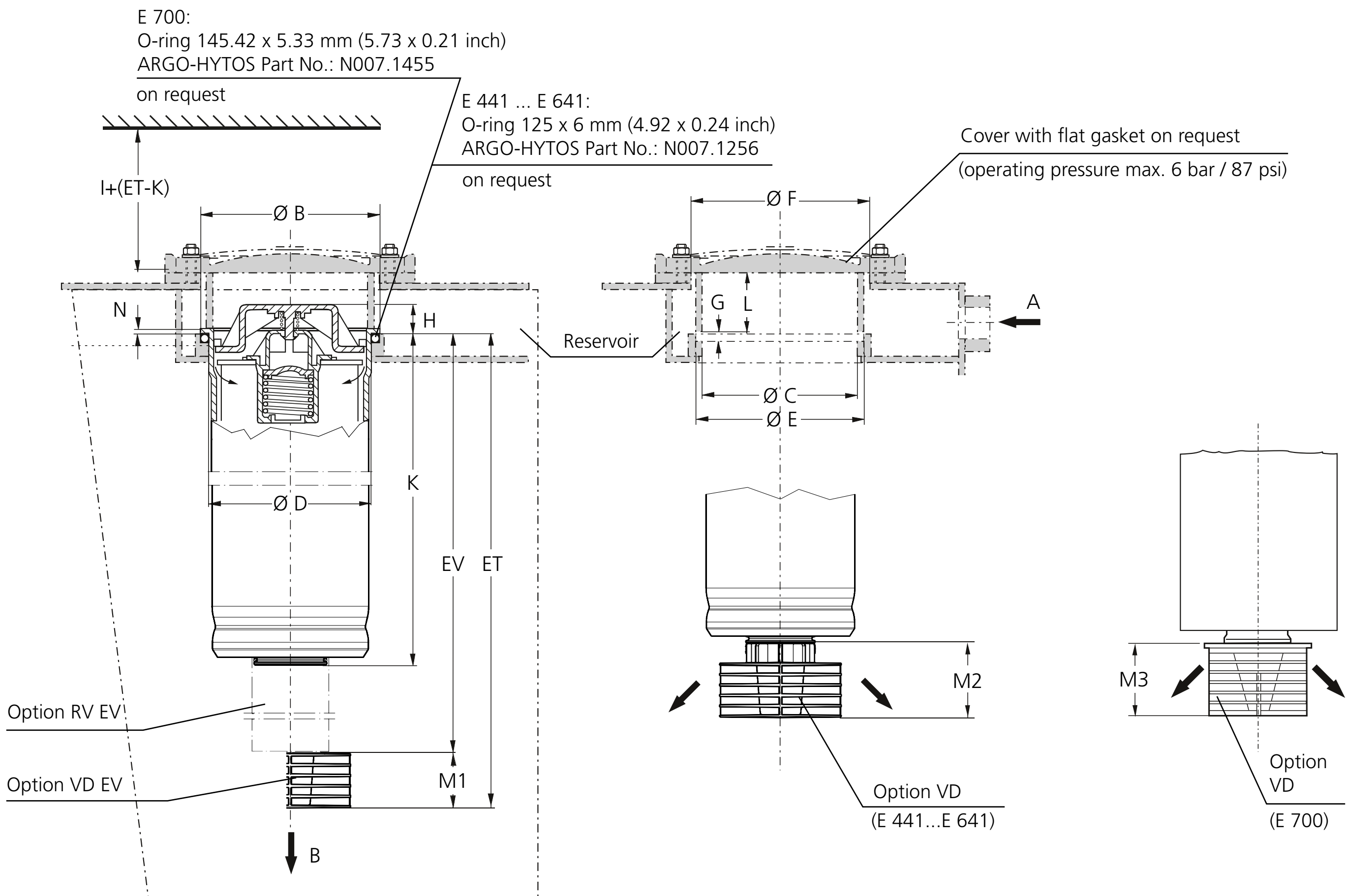
5 various lengths are available
E 441 / E 451 / E 461 / E 641:
EV = K + 87 (3.43 inch) / + 142 (5.59 inch) / + 202 (7.95 inch) / + 237 (9.33 inch) / + 362 (14.25 inch) (see sect. dimensions / measurements)
E 700: EV on request.

**For the appropriate clogging indicators see catalog sheet 60.20.**

**Remarks:**

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

## Dimensions




For calculation of dimension EV see data in Selection Chart

## Measurements in mm

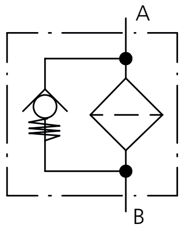
| Type | A | B | C | D | E | F | G | H | I | K | L | $M_1$ | $M_2$ | $M_3$ | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 441 | - | $142^{+2/-0,5}$ | 132 | 131 | 145 | >145 | 6.5 | 26 | 250 | 211 | 48 | 47.5 | 62 | - | 1.5 |
| E 451 | - | $142^{+2/-0,5}$ | 132 | 131 | 145 | >145 | 6.5 | 26 | 410 | 378 | 48 | 47.5 | 62 | - | 1.5 |
| E 461 | - | $142^{+2/-0,5}$ | 132 | 131 | 145 | >145 | 6.5 | 26 | 580 | 546 | 48 | 47.5 | 62 | - | 1.5 |
| E 641 | - | $142^{+2/-0,5}$ | 132 | 131 | 145 | >145 | 6.5 | 26 | 680 | 644 | 48 | 47.5 | 62 | - | 1.5 |
| E 700 | - | $167^{+2}$ | 155 | 155 | 170 | >170 | 6.5 | 27 | 700 | 651 | 82 | - | - | 58 | 1.5 |

## Measurements in inch

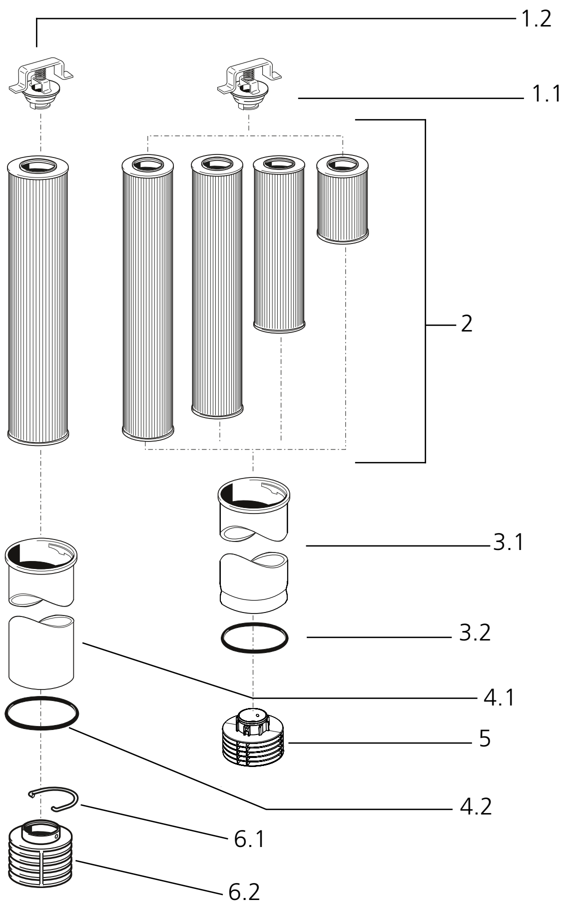
| Type | A | B | C | D | E | F | G | H | I | K | L | $M_1$ | $M_2$ | $M_3$ | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 441 | - | $5.59^{+0.08}$ | 5.20 | 5.16 | 5.71 | >5.71 | 0.26 | 1.02 | 9.84 | 8.31 | 1.89 | 1.87 | 2.44 | - | 0.06 |
| E 451 | - | $5.59^{+0.08}$ | 5.20 | 5.16 | 5.71 | >5.71 | 0.26 | 1.02 | 16.14 | 14.88 | 1.89 | 1.87 | 2.44 | - | 0.06 |
| E 461 | - | $5.59^{+0.08}$ | 5.20 | 5.16 | 5.71 | >5.71 | 0.26 | 1.02 | 22.83 | 21.50 | 1.89 | 1.87 | 2.44 | - | 0.06 |
| E 641 | - | $5.59^{+0.08}$ | 5.20 | 5.16 | 5.71 | >5.71 | 0.26 | 1.02 | 26.77 | 25.35 | 1.89 | 1.87 | 2.44 | - | 0.06 |
| E 700 | - | $6.57^{+0.08}$ | 6.10 | 6.10 | 6.69 | >6.69 | 0.26 | 1.06 | 27.56 | 25.63 | 3.23 | - | - | 2.28 | 0.06 |

## Symbol

1




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1.1 | By-pass (1.5 bar / 22 psi) | E 440.1500 |
| 1.1 | By-pass (2.5 bar / 36 psi) | E 460.1520 |
| 1.1 | By-pass (3.0 bar / 43 psi) | E 640.1510 |
| 1.2 | By-pass (2.5 bar / 36 psi) for E 700 | E 703.1510 |
| 2 | Replacement filter elements | s. Chart / col. 9 |
| 3.1 | Filter bowl E 441[1] | E 441.1900 |
| 3.1 | Filter bowl E 451[1] | E 451.1900 |
| 3.1 | Filter bowl E 461[1] | E 461.1900 |
| 3.1 | Filter bowl E 641[1] | E 641.1900 |
| 3.2 | O-ring [2]<br>125 x 6 mm<br>4.92 x 0.24 inch | N007.1256 |
| 4.1 | Filter bowl E 700 | E 700.1900 |
| 4.2 | O-ring [2]<br>145.42 x 5.33 mm (for E 700)<br>5.73 x 0.21 inch (for E 700) | N007.1455 |
| 5 | Diffusor | E 441.0701 |
| 6.1 | Clip (version VD for E 700) | N 026.0311 |
| 6.2 | Diffusor (version VD for E 700) | E 703.0701 |

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

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

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

Return Filters

# E 303 · E 503 · E 703

Tank top mounting · Connection up to SAE 2½ · Nominal flow rate up to 900 l/min / 237.8 gpm

Return Filters E 503

## Description

### Application

In the return line circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

### Special features

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

### Filter elements

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

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

### Filter maintenance

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

### Materials

| | |
|---|---|
| Filter head cover: | Steel |
| Filter head: | Aluminum alloy |
| Filter bowl: | Steel |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web |

### Materials

| | |
|---|---|
| Filter head cover: | Steel |
| Filter head: | Aluminum alloy |
| Filter bowl: | Steel |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web |

### Clogging indicator

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

### Accessories

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

*Extension pipe:*
A correct extension pipe length ensures oil outlet below minimum oil level and prevents foaming.

*Diffuser:*
Diffusers reduce oil velocity and direct the oil to 90° outlet flow. This function prevents also oil foaming and whirling up of solid particles settled at the tank bottom.

## Characteristics

### Nominal flow

Up to 900 l/min / 237.8 gpm (see Selection Chart, column 2).
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines $\leq 4.5$ m/s / 14.8 ft/s

### Connection

- SAE standard J514
- SAE-flange (3000 psi)

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

### Filter fineness

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

### Dirt-holding capacity

Values in g test dust 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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Operating pressure

Max. 10 bar / 145 psi

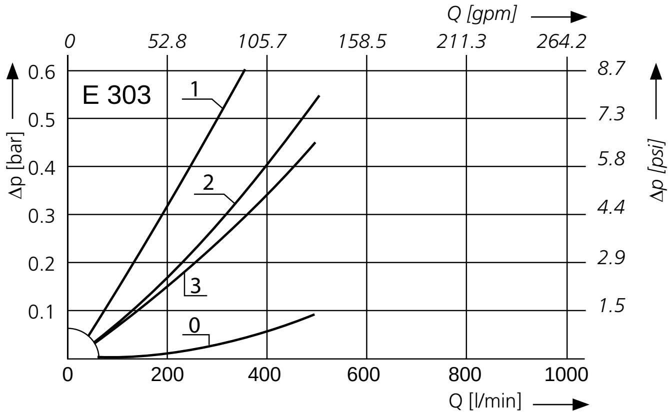
### Mounting position

Preferably vertical, outlet downwards.

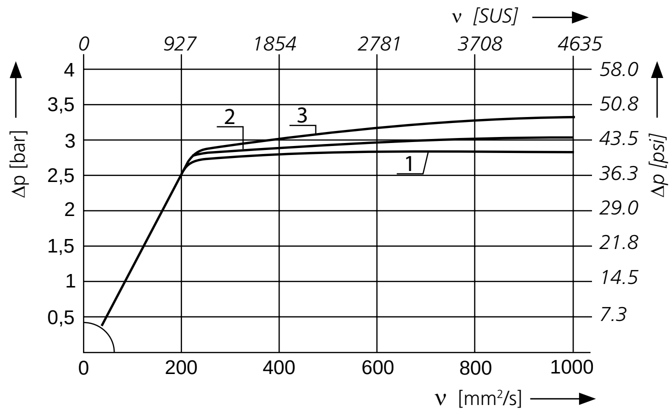
## Diagrams

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

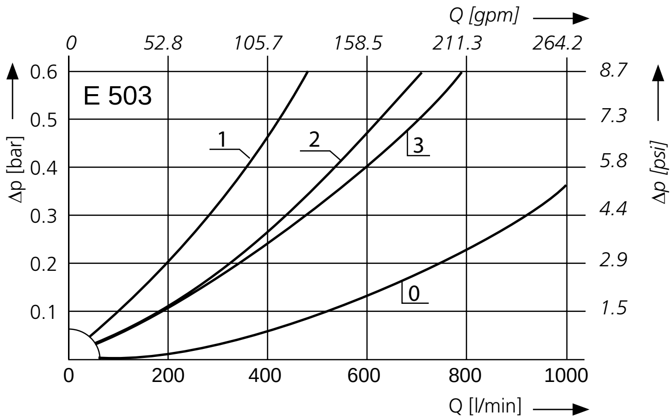
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



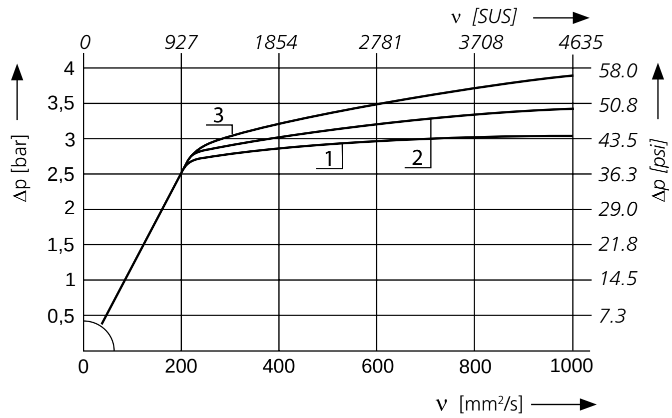

Pressure drop as a function of the **kinematic viscosity** at nominal flow



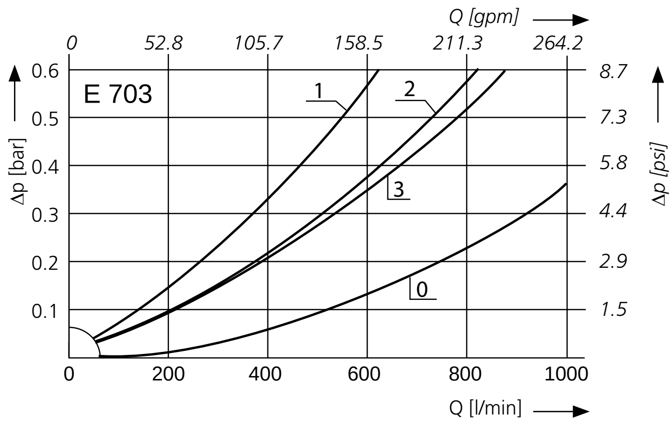

**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



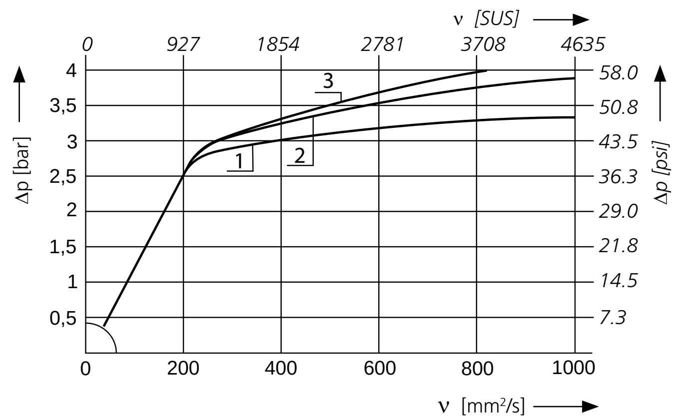

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D3** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

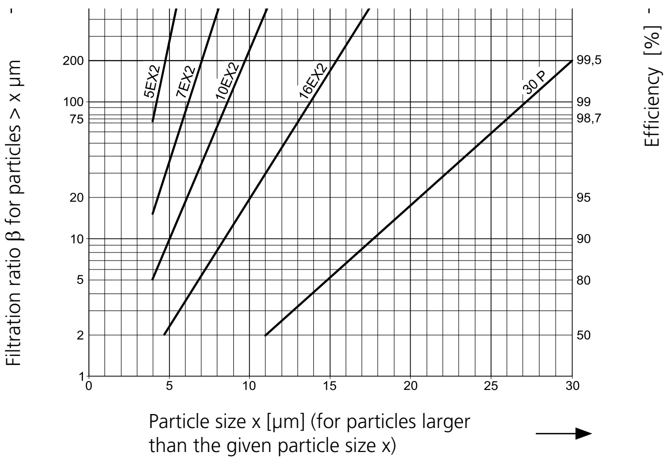



Pressure drop as a function of the **kinematic viscosity** at nominal flow



## Filter fineness curves in Selection Chart, column 4

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX 2 and Paper elements:**

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

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

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189.

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

## Selection Chart

| Part No. | Nominal flow rate[2] | Pressure drop diagram D/curve no. | Filter fineness see Diagr. Dx | Dirt-holding capacity | Connection A ($A_1$... $A_4$)[3] SAE (3000 psi) | Cracking Pressure of by-pass | Symbol | Replacement filter element Part no. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| E 303-453 | 220 | **D1**/1 | 5EX2 | 91 | 2 x G1¼ / SAE1½, G¾ + G1 | 2.5 | 2 | V2.1425-23 | 8.9 | - |
| **E 303-456**[1] | 350 | **D1**/2 | 10EX2 | 120 | 2 x G1¼ / SAE1½, G¾ + G1 | 2.5 | 2 | V2.1425-26 | 8.9 | - |
| **E 303-458**[1] | 500 | **D1**/3 | 16EX2 | 130 | 2 x G1¼ / SAE1½, G¾ + G1 | 2.5 | 2 | V2.1425-28 | 8.9 | - |
| | | | | | | | | | | |
| E 503-453 | 350 | **D2**/1 | 5EX2 | 150 | 2 x G1¼ / SAE1½, G¾ + G1 | 2.5 | 2 | V2.1440-23 | 11.7 | - |
| **E 503-456**[1] | 540 | **D2**/2 | 10EX2 | 200 | 2 x G1¼ / SAE1½, G¾ + G1 | 2.5 | 2 | V2.1440-26 | 11.7 | - |
| **E 503-458**[1] | 750 | **D2**/3 | 16EX2 | 200 | 2 x G1¼ / SAE1½, G¾ + G1 | 2.5 | 2 | V2.1440-28 | 11.7 | - |
| | | | | | | | | | | |
| E 703-453 | 500 | **D3**/1 | 5EX2 | 230 | 2 x G1¼ / SAE1½, G¾ + G1 | 2.5 | 2 | V2.1460-23 | 15.4 | - |
| **E 703-456**[1] | 740 | **D3**/2 | 10EX2 | 300 | 2 x G1¼ / SAE1½, G¾ + G1 | 2.5 | 2 | V2.1460-26 | 15.4 | - |
| **E 703-458**[1] | 900 | **D3**/3 | 16EX2 | 310 | 2 x G1¼ / SAE1½, G¾ + G1 | 2.5 | 2 | V2.1460-28 | 15.4 | - |

[1] Preferred type, no minimum order quantity required
[2] The individual flow rates must be matched to the connections
[3] Connection G1 ($A_4$) with locking screw
[4] On request an outlet diffuser can be combined with an extension pipe

All filters are delivered with a plugged clogging indicator connection M12 x 1.5 (mounting holes for differential pressure switches on request). As clogging indicators either manometers or electrical pressure switches can be used. Two different head pieces with three various connecting options are available. All filters can also be supplied with an outlet diffuser. Optional extension pipes adapt the filter length to various tank depths. For ordering of accessories please use the below mentioned codes.

**Order example: The filter E 703-256 has to be supplied with 2 connections (A and $A_4$) and an extension pipe for 800 m (31.5 inch) length**

**Order description:** **E 703- 256 / RV / EV 800**

**Connections:**

two various options are available
two connections[2] (A und $A_4$)[3] - SAE2½ und G1 — 2
four connections[2] ($A_1$, $A_2$, $A_3$ und $A_4$) - 2 x G1¼ / SAE1½, G¾ und G1 — 4

**Bowl outlet[4]:**

two various options are available
VD - Outlet diffuser, RV - extension pipe

**Extension pipe[4]:**

four various lengths are available
EV = K + 64 (2.52 inch) / + 164 (6.46 inch) / + 264 (10.39 inch) / + 454 (17.87 inch)
(see section dimensions and measurements)

**For the appropriate clogging indicators see catalog sheet 60.20.**

**Remarks:**

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

## Selection Chart

| Part No. | Nominal flow rate [2] | Pressure drop diagram **D**/curve no. | Filter fineness see Diagr. **Dx** | Dirt-holding capacity | Connection A and $A_4$ SAE (3000 psi) | Cracking Pressure of by-pass | Symbol | Replacement filter element Part no. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | gpm | | | g | | psi | | | lbs | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| E 303-753 | 58.1 | **D1**/1 | 5EX2 | 91 | SAE 2½, - 16[3] | 36 | 1 | V2.1425-23 | 19.6 | - |
| **E 303-766**[1] | 92.5 | **D1**/2 | 10EX2 | 120 | SAE 2½, - 16[3] | 36 | 1 | V2.1425-26 | 19.6 | - |
| **E 303-768**[1] | 132.1 | **D1**/3 | 16EX2 | 130 | SAE 2½, - 16[3] | 36 | 1 | V2.1425-28 | 19.6 | - |
| | | | | | | | | | | |
| E 503-753 | 92.5 | **D2**/1 | 5EX2 | 150 | SAE 2½, - 16[3] | 36 | 1 | V2.1440-23 | 25.8 | - |
| **E 503-766**[1] | 142.7 | **D2**/2 | 10EX2 | 200 | SAE 2½, - 16[3] | 36 | 1 | V2.1440-26 | 25.8 | - |
| **E 503-768**[1] | 198.1 | **D2**/3 | 16EX2 | 200 | SAE 2½, - 16[3] | 36 | 1 | V2.1440-28 | 25.8 | - |
| | | | | | | | | | | |
| E 703-753 | 132.1 | **D3**/1 | 5EX2 | 230 | SAE 2½, - 16[3] | 36 | 1 | V2.1460-23 | 34.0 | - |
| **E 703-766**[1] | 195.5 | **D3**/2 | 10EX2 | 300 | SAE 2½, - 16[3] | 36 | 1 | V2.1460-26 | 34.0 | - |
| **E 703-768**[1] | 237.8 | **D3**/3 | 16EX2 | 310 | SAE 2½, - 16[3] | 36 | 1 | V2.1460-28 | 34.0 | - |

[1] Preferred type, no minimum order quantity required
[2] The individual flow rates must be matched to the connections
[3] Corresponds to 1⁵⁄₁₆-12 UN-2B / connection plugged with locking screw

All filters are delivered with a plugged clogging indicator connection M12 x 1.5 mm (mounting holes for differential pressure switches on request). As clogging indicators either manometers or electrical pressure switches can be used. Two different head pieces with three various connecting options are available. All filters can also be supplied with an outlet diffuser. Optional extension pipes adapt the filter length to various tank depths.

**For the appropriate clogging indicators see catalog sheet 60.20.**

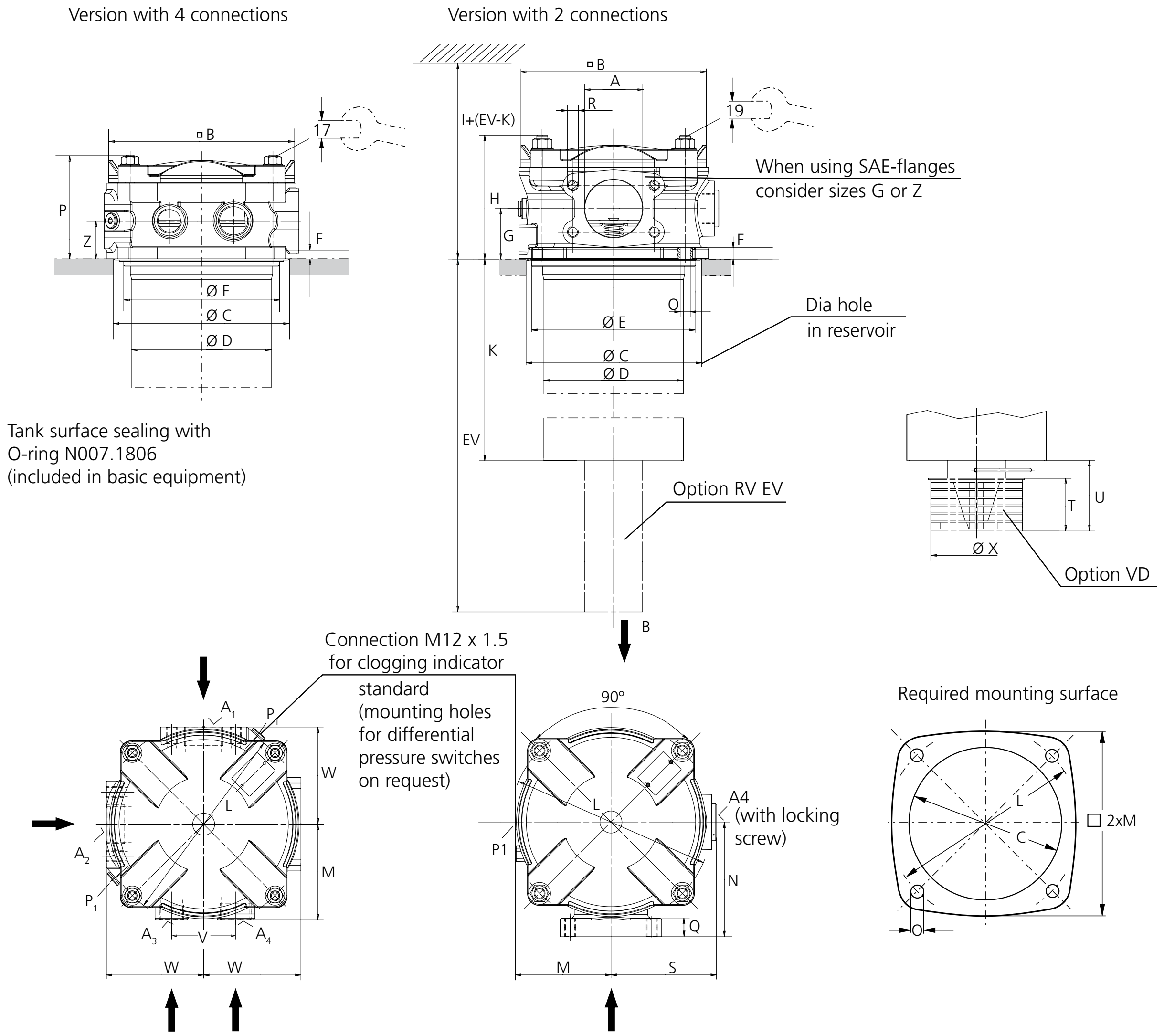
**Remarks:**

› The switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).

› Clogging indicators are optional and always delivered detached from the filter.

› The filters listed in this chart are standard filters. Other designs available on request.

## Dimensions in mm

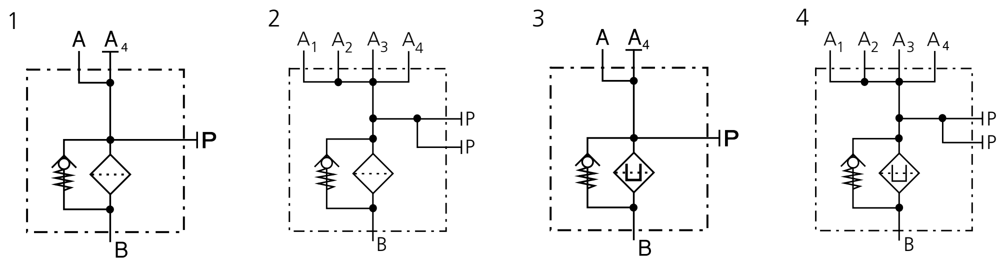



## Measurements in mm

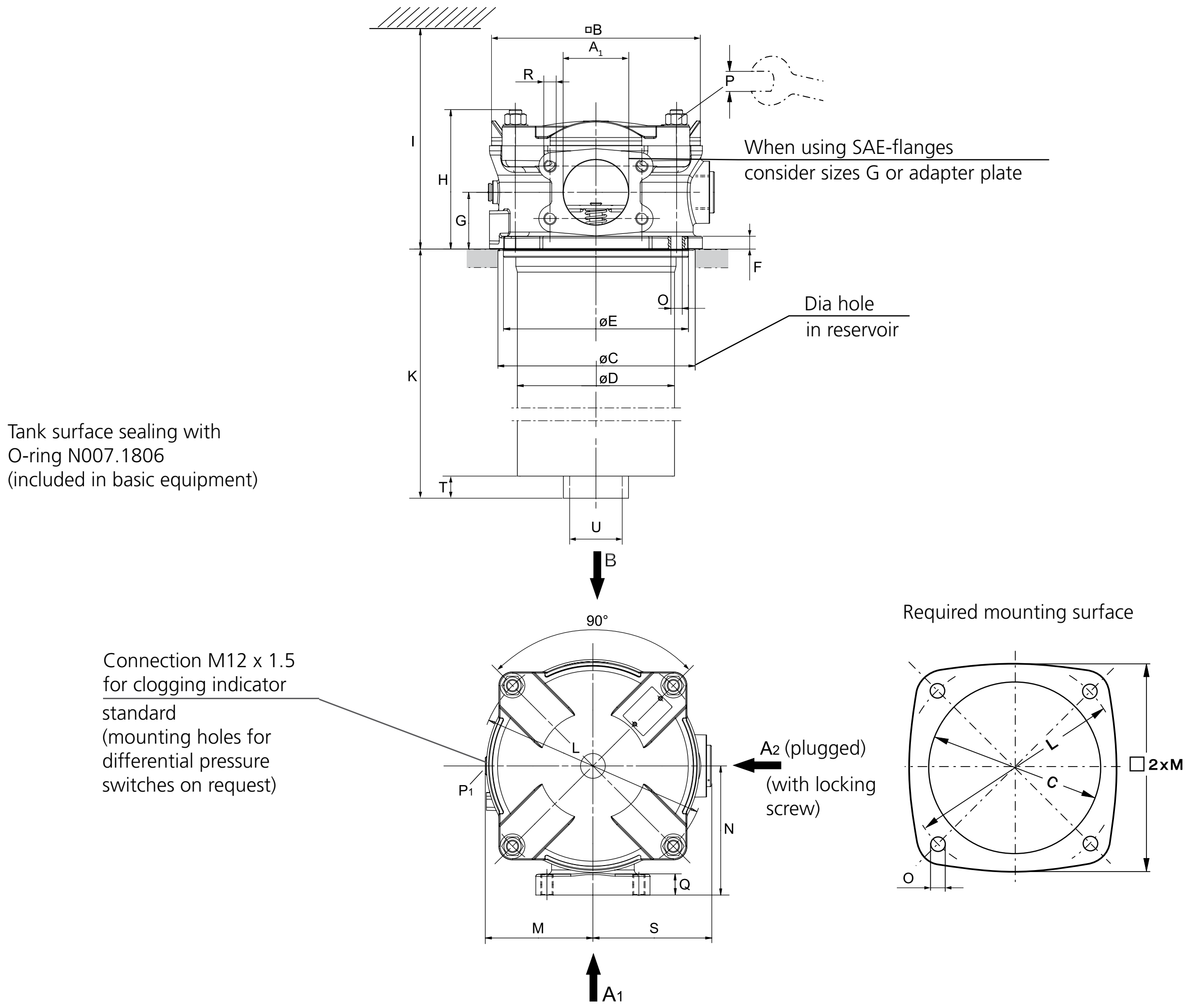
| Type | A | B | C | D | E | F | G | H | I | K | L | M | N | O | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 303 | see | 182 | 180 | 152 | 179 | 12 | 55 | 133 | 400 | 276 | 220 | 104 | 125 | 11.5* | 113 |
| E 503 | Selection | 182 | 180 | 152 | 179 | 12 | 55 | 133 | 550 | 430 | 220 | 104 | 125 | 11.5* | 113 |
| E 703 | Chart | 182 | 180 | 152 | 179 | 12 | 55 | 133 | 810 | 636 | 220 | 104 | 125 | 11.5* | 113 |
| Type | Q | R | S | T | U | V | W | X | Z | | | | | | |
| E 303 | 20 | M12 | 115 | 58 | 79 | 70 | 106 | 100 | 41.5 | | | | | | |
| E 503 | 20 | M12 | 115 | 58 | 79 | 70 | 106 | 100 | 41.5 | | | | | | |
| E 703 | 20 | M12 | 115 | 58 | 79 | 70 | 106 | 100 | 41.5 | | | | | | |

* For M10

## Symbols



## Dimensions in inch




## Measurements in inch

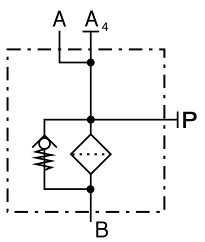
| Type | $A_1$ / $A_2$ | B | C | D | E | F | G | H | I | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 303 | see | 7.17 | 7.09 | 5.98 | 7.05 | 0.47 | 2.17 | 5.24 | 15.75 | 10.87 | 8.66 | 4.09 | 4.92 |
| E 503 | Selection | 7.17 | 7.09 | 5.98 | 7.05 | 0.47 | 2.17 | 5.24 | 21.65 | 16.93 | 8.66 | 4.09 | 4.92 |
| E 703 | Chart | 7.17 | 7.09 | 5.98 | 7.05 | 0.47 | 2.17 | 5.24 | 31.89 | 25.04 | 8.66 | 4.09 | 4.92 |

| Type | O | P mm | Q | R | S | T | U | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 303 | 0.45* | AF 19 | 0.79 | M12 | 4.53 | 2.28 | 2½-8NPT | | | | | | |
| E 503 | 0.45* | AF 19 | 0.79 | M12 | 4.53 | 2.28 | 2½-8NPT | | | | | | |
| E 703 | 0.45* | AF 19 | 0.79 | M12 | 4.53 | 2.28 | 2½-8NPT | | | | | | |

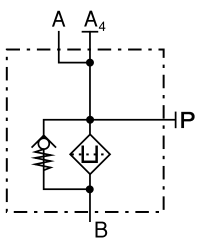
* For M10

## Symbols

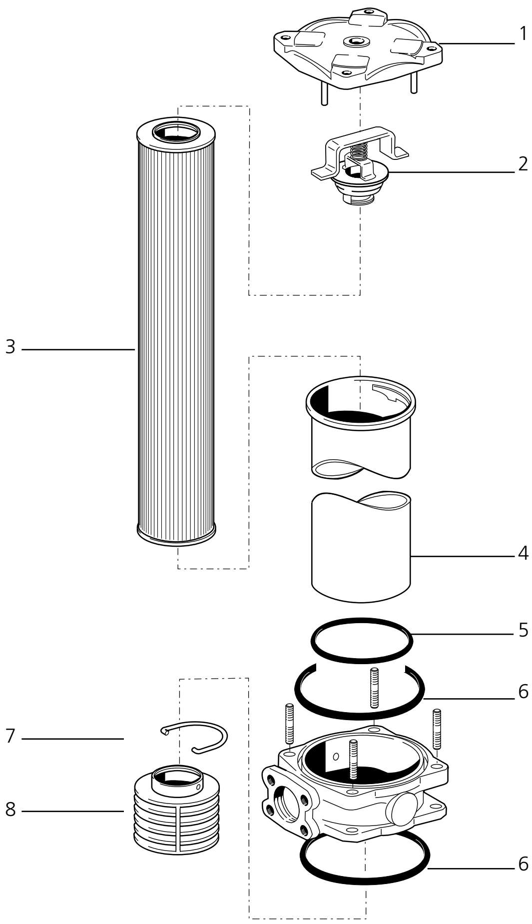
1




3



## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Cover assy (2 connections) | E 303.1200 |
| 1 | Cover assy (4 connections) | E 703.2202 |
| 2 | By-pass (2.5 bar / 36 psi) | E 703.1510 |
| 3 | Replacement filter elements | see Chart. / col. 9 |
| 4 | Filter bowl E 303* | E 303.1900 |
| 4 | Filter bowl E 503* | E 503.1910 |
| 4 | Filter bowl E 703* | E 703.1900 |
| 5 | O-ring<br>145.42 x 5.33 mm<br>5.73 x 0.21 inch | N007.1455 |
| 6 | O-ring<br>180 x 6 mm<br>7.09 x 0.24 inch | N007.1806 |
| 7 | Clip (only option VD) | N026.0311 |
| 8 | Diffuser (only option VD) | E 703.0701 |

*Please indicate options (VD, VDEV and RVEV respectively)

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

# E 068 · E 088

In-line mounting · Connection G¾ / -12 SAE · Nominal flow rate up to 100 l/min / 26.4 gpm


In-line Return-Suction Filter E 088

## Description

### Application

For operation in mobile units with hydrostatic drives, when the return flow is under all operating conditions higher than the oil flow of the feed pump.

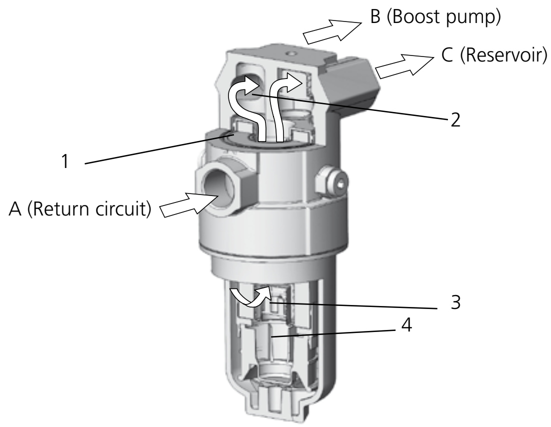
### Performance features

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

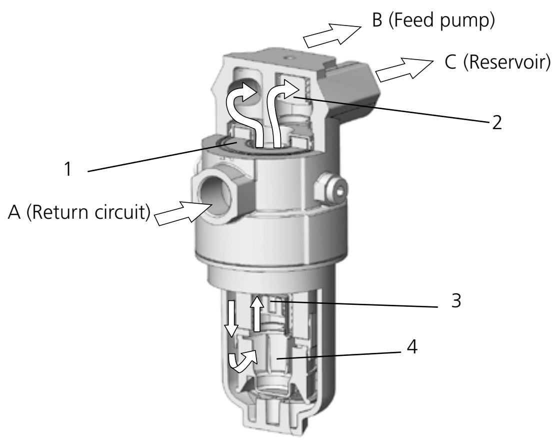
*Suction filter function:*
Because of the 100%-filtration of the suction flow, no dirt can get into the feed pump.

*Return filter function:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

**Function (normal operation):**




**Function with response of the by-pass valve (3):**




### Functional characteristics

The hydraulic oil returning from the circuit (A) passes the filter element (1), is pressurized by a 0.5 bar / 7.3 psi check valve (2) and supplied to the feed pump (B). The surplus oil flows filtered over the integral check valve into the reservoir (C).
As the feed pump is always fed with pressurized oil, the risk of cavitation is minimized and full performance is available even during the critical cold start phase.

An integral by-pass valve (3) in the filter element (1) prevents too high back pressure (cold start, element contaminates).
A by-pass valve with a 125 µm protection strainer (4) guarantees that only filtered oil can get into the feed pump.

### Start-up / de-aeration

Deaerating instructions published by the manufacturers of hydraulic drives must be observed.

### Filter elements

Flow direction from outside to the center.
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 indicated and guarantees therefore the optimum utilization of the filter elements.
In case of maintenance the filter bowl is removed together with the filter element – therefore dirt particles are not flushed back into the tank.

### Accessories

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

## Layout

### General

In machines with a hydrostatic drive and combined working hydraulic system, return-suction filters replace the suction or pressure filters previously required for the feed pump of the closed-loop hydrostatic drive circuit as well as the return filter for the open-loop working hydraulic circuit.
While each circuit operates independently with separate filters, the combination of the two circuits via the return-suction filter causes interaction between the circuits.
If the design criteria described below are taken into account, you can take full advantage of the benefits provided by the return-suction filter concept, thus making sure that your system performs reliably even under extreme operating conditions.

### Required return flow in the system

In order to maintain a pre-charge pressure of approx. 0.5 bar / 7.3 psi at the intake of the feed pump, the return flow must exceed the suction flow under any operating condition.

### Permitted feed pump flow rate

- at operating temperature
  ($\nu$ < 60 mm²/s / 280 SUS, rpm = max):
  feed pump flow rate < 0.8 x rated return flow according to column 2 of selection table
- at cold start-up
  ($\nu$ < 1000 mm²/s / 4635 SUS, rpm = 1000 min$^{-1}$):
  feed pump flow rate < 0.8 x rated return flow

Please contact us if your system operates with higher flow rates than stated above.

### Flow velocity in the connecting lines

- Flow velocity in the return lines ≤ 4.5 m/s / 14.8 ft/s
- Flow velocity in the suction lines ≤ 1.5 m/s / 4.9 ft/s

### Permitted pressure in the suction lines

At cold start up ($\nu$ < 1000 mm²/s / 4635 SUS, rpm = 1000 min$^{-1}$): feed pump flow rate < 0.8 x rated return flow. The pressure loss in the suction lines must not exceed 0.4 bar / 5.8 psi.

### Backpressures in system return lines

If drain oil from the hydrostatic drive is routed across the filter in addition to the flow of the open-loop circuit, the following has to be observed in order to protect the shaft seals:

- permitted leakage oil pressure for a given viscosity and speed (manufacturer's specifications!)
- pressure loss caused by the leakage oil pipes
- pressure loss caused by the oil cooler used
- backpressure of the filter for a given flow rate or kinematic viscosity (refer to pressure loss diagrams)

Depending on the application, the use of a cooler by-pass valve is recommended.
Generously sized drain oil pipes are also of advantage.

### Filter fineness grades

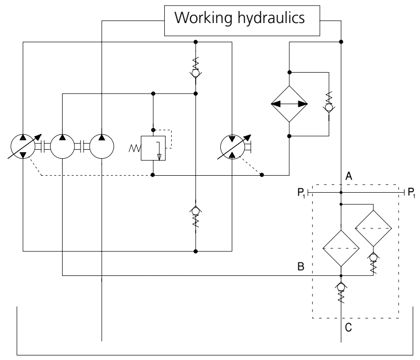
With the filter fineness grades available, the following oil cleanliness according to ISO 4406 can be achieved:

- 10EX2: 18/15/11 ... 14/11/7
- 16EX2: 20/17/12 ... 17/14/10

Even with the 16EX2 filter fineness grade, the requirements specified by manufacturers of hydrostatic drives are sometimes exceeded significantly. If components requiring a still better oil purity are used, we recommend the 10EX2 filter fineness grade.

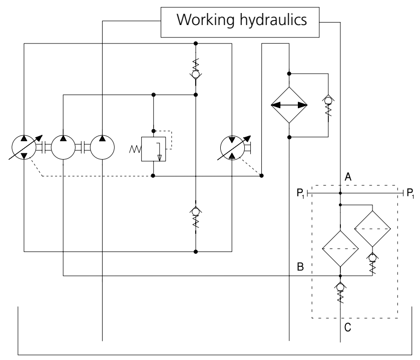
### Suggested circuit layouts

A) The leakage oil of the hydrostatic drive is routed across the filter.




The entire dirt produced in the hydrostatic drive by abrasion is filtered out immediately and is thus not taken in by the pump of the open-loop circuit.
This circuit layout is always recommended if the return flow only slightly exceeds the suction flow, i.e. if there is a risk that the 0.5 bar / 7.3 psi pre-charge pressure cannot be maintained.

B) The drain oil of the hydrostatic drive is not routed across the filter but is discharged directly into the tank.




This circuit layout has the advantage that drain oil pressures are comparatively low.

## Characteristics

### Nominal flow rate

Up to 100 l/min / 26.4 gpm in return line
(see Selection Chart, column 2).
Up to 80 l/min / 21.1 gpm feed pump flow rate (see Layout).
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the return lines ≤ 4.5 m/s / 14.8 ft/s
- flow velocity in the suction lines ≤ 1.5 m/s / 4.9 ft/s

### Connection

Threaded ports according to

- ISO 228 or DIN 13
- SAE standard J514

Sizes see Selection Chart, column 6 and 7
(other port threads on request).

### Filter fineness

10 µm(c) ... 16 µm(c)
β-values according to ISO 16889
(see Selection Chart, column 4 and diagram Dx)

### Dirt-holding capacity

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

### Hydraulic fluids

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

### Temperature range

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

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1000$ mm²/s / 4635 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Operating pressure

Max. 10 bar / 145 psi

### Materials

| | |
|---|---|
| Filter head: | Aluminum alloy |
| Filter bowl: | Polyamide, GF-reinforced |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web |

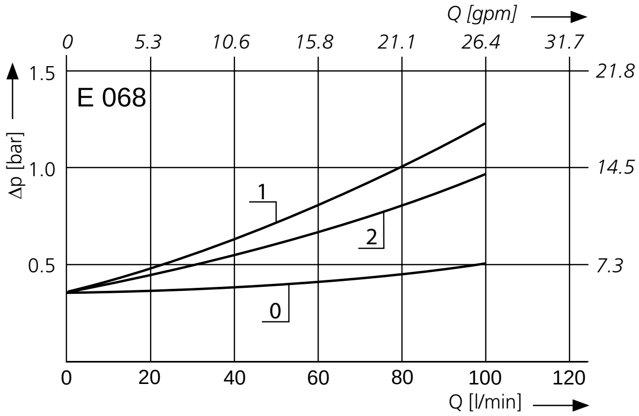
### Fitting position

Preferably vertical, filter head on top.

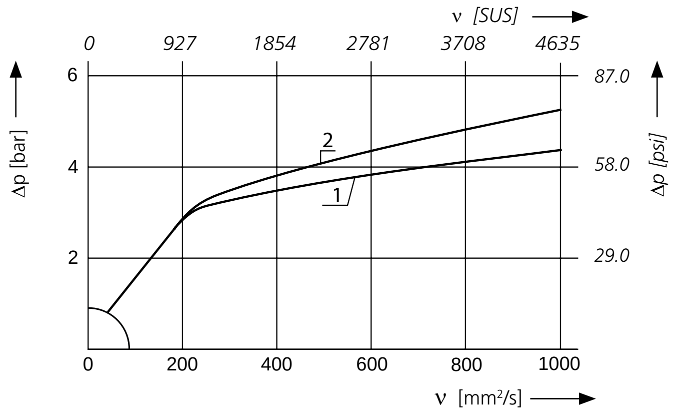
## Diagrams

### Δp-curves for complete filters in Selection Chart, column 3 (80% of the nominal flow volume via connection B)

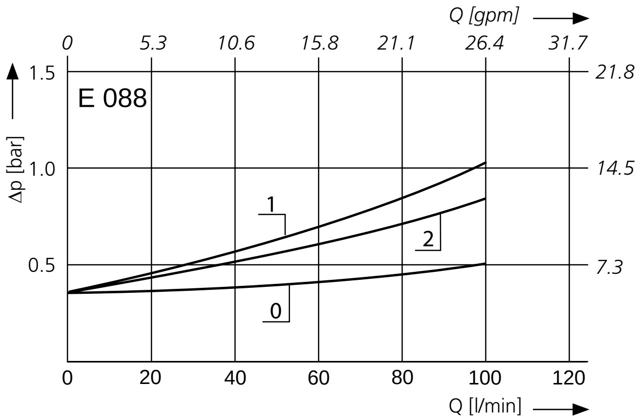
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



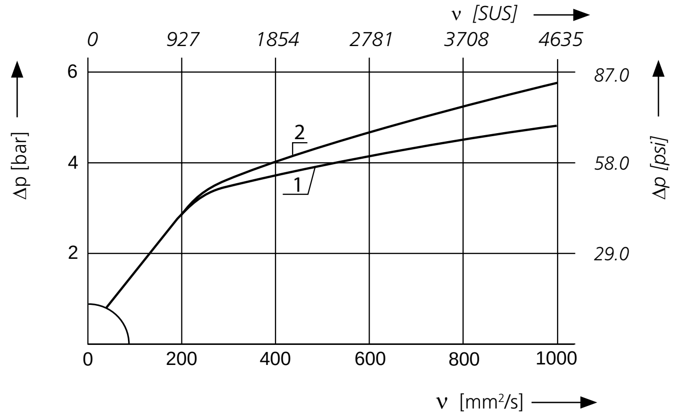

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

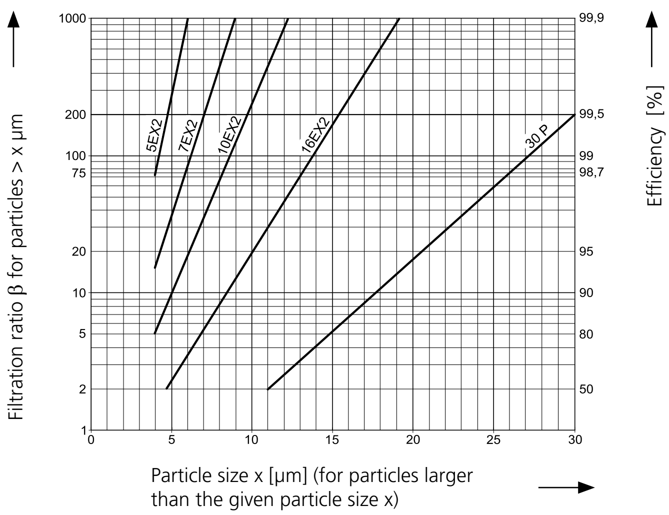



Pressure drop as a function of the **kinematic viscosity** at nominal flow




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

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX 2 and Paper elements:**

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

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

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

## Selection Chart

| Part No. | Nominal return flow | Pressure drop see diagram **D**/curve no. | Filter fineness see Diagr. **Dx** | Dirt-holding capacity | Connection A | Connection B/C | Cracking Pressure of CV[1] | Cracking Pressure of BPV[2] | Symbol | Replacement filter element Part No. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | | bar | bar | | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| E 068-156 | 50 | **D1**/1 | 10EX2 | 15 | G¾ | G¾ | 0.5 | 2.5 | 1 | K3.0718-56 | 1.3 | - |
| E 068-158 | 80 | **D1**/2 | 16EX2 | 15 | G¾ | G¾ | 0.5 | 2.5 | 1 | K3.0718-58 | 1.3 | - |
| | | | | | | | | | | | | |
| E 088-156 | 65 | **D2**/1 | 10EX2 | 20 | G¾ | G¾ | 0.5 | 2.5 | 1 | K3.0721-56 | 1.4 | - |
| E 088-158 | 100 | **D2**/2 | 16EX2 | 20 | G¾ | G¾ | 0.5 | 2.5 | 1 | K3.0721-58 | 1.4 | - |

| | gpm | | | g | SAE | SAE | psi | psi | | | lbs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| E 068-756 | 13.2 | **D1**/1 | 10EX2 | 15 | -12[3] | -12[3] | 7.3 | 36 | 1 | K3.0718-56 | 2.9 | - |
| E 068-758 | 21.1 | **D1**/2 | 16EX2 | 15 | -12[3] | -12[3] | 7.3 | 36 | 1 | K3.0718-58 | 2.9 | - |
| | | | | | | | | | | | | |
| E 088-756 | 17.2 | **D2**/1 | 10EX2 | 20 | -12[3] | -12[3] | 7.3 | 36 | 1 | K3.0721-56 | 3.1 | - |
| E 088-758 | 26.4 | **D2**/2 | 16EX2 | 20 | -12[3] | -12[3] | 7.3 | 36 | 1 | K3.0721-58 | 3.1 | - |

[1] Cracking pressure of check valve
[2] Cracking pressure of by-pass valve
[3] Corresponds to $1^1/_{16}$-12 UN-2B

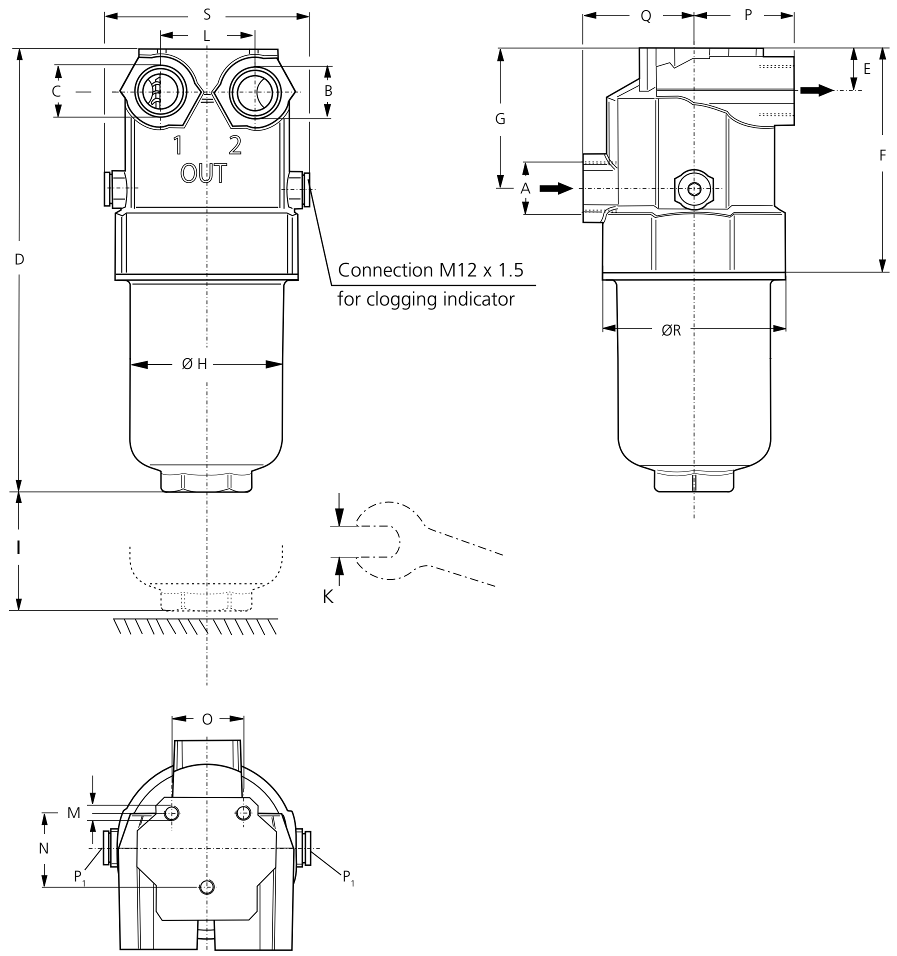
All filters are delivered with two plugged clogging indicator connections M12 x 1.5. As clogging indicators on the return side ($P_1$) either manometers or electrical pressure switches can be used.

**For the appropriate clogging indicators see catalog sheet 60.20.**

**Remarks:**

- The start of the red area respectively the switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the pressure relief valve (see Selection Chart, column 9).
- Clogging indicators are optional and always delivered detached from the filter.
- The filters listed in this chart are standard filters. If modifications are required, we kindly ask for your request.
- For de-aeration, a bleed screw (for connection $P_1$) with Part No. SV 0112.15 is available.

## Dimensions




## Measurements in mm

| Type | A | B | C | D | E | F | G | H | I | K | L | M Ø/depth | N | O | P | Q | R | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 068 | G¾ | G¾ | G¾ | 234 | 23.3 | 119 | 74.2 | 80 | 75 | AF 41 | 50 | M8 / 15 | 40 | 38.1 | 53.5 | 57.5 | 95 | 108 |
| E 088 | G¾ | G¾ | G¾ | 268 | 23.3 | 119 | 74.2 | 80 | 75 | AF 41 | 50 | M8 / 15 | 40 | 38.1 | 53.5 | 57.5 | 95 | 108 |

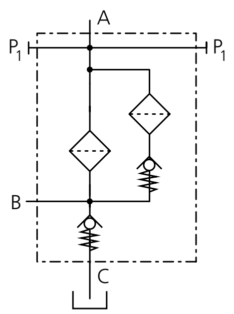
## Measurements in inch

| Type | A SAE | B SAE | C SAE | D | E | F | G | H | I | K mm | L | M Ø / depth | N | O | P | Q | R | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 068 | -12* | -12* | -12* | 9.21 | 0.92 | 4.69 | 2.92 | 3.15 | 2.95 | AF 41 | 1.97 | M8/0.59 | 1.57 | 1.50 | 2.11 | 2.26 | 3.74 | 4.25 |
| E 088 | -12* | -12* | -12* | 10.55 | 0.92 | 4.69 | 2.92 | 3.15 | 2.95 | AF 41 | 1.97 | M8/0.59 | 1.57 | 1.50 | 2.11 | 2.26 | 3.74 | 4.25 |

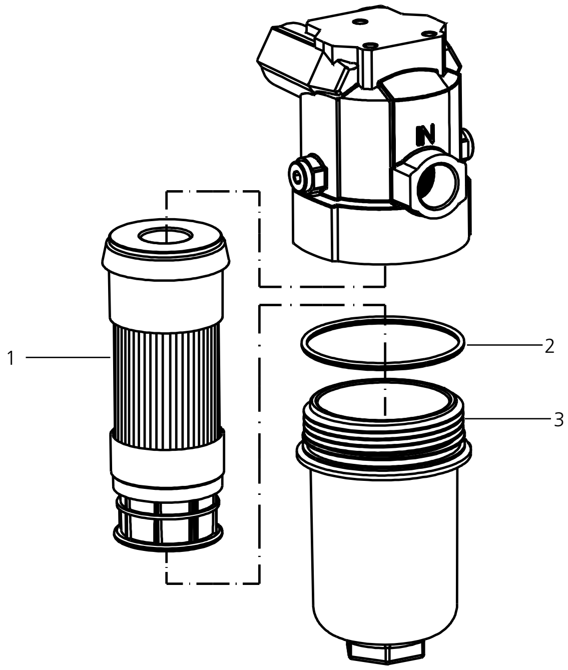
* Corresponds to 1 1/16-12 UN-2B

## Symbol

1



## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Replacement filter element | see Chart / col. 11 |
| 2 | O-ring<br>82.14 x 3.53 mm<br>3.23 x 0.14 inch | N007.0824 |
| 3 | Filter bowl E 068 | E 068.0101 |
| 3 | Filter bowl E 088 | E 068.0102 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

ARGO HYTOS



# E 178 · E 258

In-line mounting · Connection G1 / -16 SAE · Nominal flow rate up to 250 l/min / 66 gpm

M


In-line Return-Suction Filter E 178

## Description

### Application

For operation in units with hydrostatic drives, when the return flow is under all operating conditions higher than the oil flow of the feed pump.

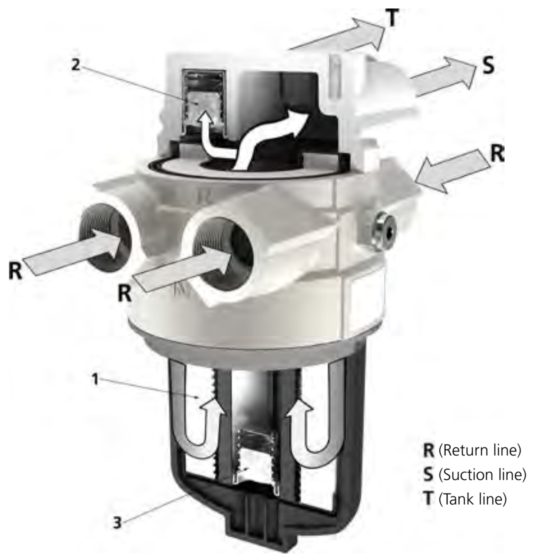
### Performance features

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

*Suction filter function:*
Because of the 100%-filtration of the suction flow, no dirt can get into the feed pump.

*Return filter function:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

**Function (normal operation):**




### Functional characteristics

The hydraulic oil returning from the circuit (R) passes the filter element (1), is pressurized by a 0.5 bar / 7.3 psi check valve (2) and supplied to the feed pump (S). The surplus oil flows filtered over the integral check valve into the reservoir (T).
As the feed pump is always fed with pressurized oil, the risk of cavitation is minimized and full performance is available even during the critical cold start phase.

An integral by-pass valve (3) in the filter element (1) prevents too high back pressure (cold start, element contaminates).
A by-pass valve with a 200 µm protection strainer guarantees that only filtered oil can get into the feed pump.

### Start-up / De-aeration

Deaerating instructions published by the manufacturers of hydraulic drives must be observed.

### Filter elements

Flow direction from outside to the center.
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 indicated and guarantees therefore the optimum utilization of the filter elements.
In case of maintenance the filter bowl is removed together with the filter element – therefore dirt particles are not flushed back into the tank.

### Accessories

Electrical and / or optical clogging indicators are available.
Dimensions and technical data see catalog sheet 60.20.

## Layout

### General

In machines with a hydrostatic drive and combined working hydraulic system, return-suction filters replace the suction or pressure filters previously required for the feed pump of the closed-loop hydrostatic drive circuit as well as the return filter for the open-loop working hydraulic circuit.
While each circuit operates independently with separate filters, the combination of the two circuits via the return-suction filter causes interaction between the circuits.
If the design criteria described below are taken into account, you can take full advantage of the benefits provided by the return-suction filter concept, thus making sure that your system performs reliably even under extreme operating conditions.

### Required return flow in the system

In order to maintain a pre-charge pressure of approx. 0.5 bar / 7.3 psi at the intake of the feed pump, the return flow must exceed the suction flow under any operating condition.

### Permitted feed pump flow rate

- at operating temperature
  (ν < 60 mm²/s / ν < 280 SUS, rpm=max):
  feed pump flow rate < 0.8 x rated return flow according to column 2 of selection table
- at cold start-up
  (ν < 1000 mm²/s / ν < 4630 SUS, rpm = 1000 $min^{-1}$):
  feed pump flow rate < 0.8 x rated return flow

Please contact us if your system operates with higher flow rates than stated above.

### Flow velocity in the connecting lines

- Flow velocity in the return lines ≤ 4.5 m/s / 14.8 ft/s
- Flow velocity in the suction lines ≤ 1.5 m/s / 4.9 ft/s

### Permitted pressure in the suction lines

At cold start up
(ν < 1000 mm²/s / ν < 4630 SUS, rpm = 1000 $min^{-1}$):
feed pump flow rate < 0.8 x rated return flow. The pressure loss in the suction lines must not exceed 0.4 bar / 5.8 psi.

### Backpressures in system return lines

If drain oil from the hydrostatic drive is routed across the filter in addition to the flow of the open-loop circuit, the following has to be observed in order to protect the shaft seals:

- permitted leakage oil pressure for a given viscosity and speed (manufacturer's specifications!)
- pressure loss caused by the leakage oil pipes
- pressure loss caused by the oil cooler used
- backpressure of the filter for a given flow rate or kinematic viscosity (refer to pressure loss diagrams)

Depending on the application, the use of a cooler by-pass valve is recommended.
Generously sized drain oil pipes are also of advantage.

### Filter fineness grades

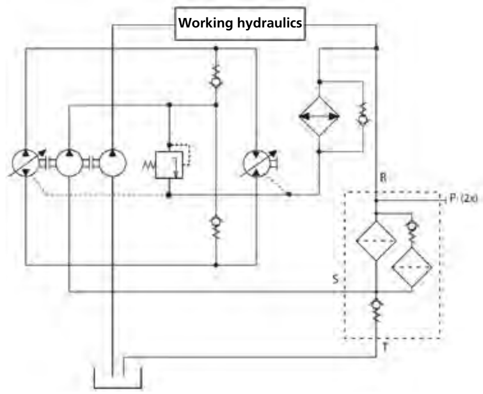
With the filter fineness grades available, the following oil cleanliness according to ISO 4406 can be achieved:

- 10EX2: 18/15/11 ... 14/11/7
- 16EX2: 20/17/12 ... 17/14/10

Even with the 16EX2 filter fineness grade, the requirements specified by manufacturers of hydrostatic drives are sometimes exceeded significantly. If components requiring a still better oil purity are used, we recommend the 10EX2 filter fineness grade.

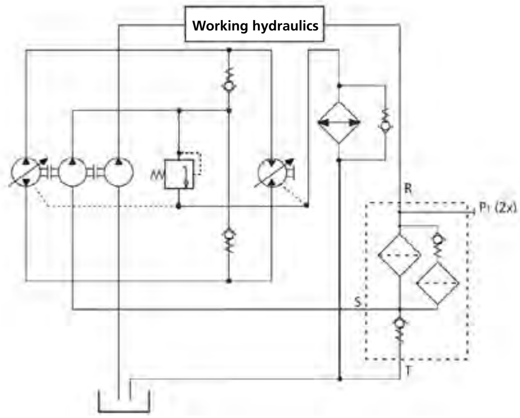
### Suggested circuit layouts

A) The leakage oil of the hydrostatic drive is routed across the filter.




The entire dirt produced in the hydrostatic drive by abrasion is filtered out immediately and is thus not taken in by the pump of the open-loop circuit.
This circuit layout is always recommended if the return flow only slightly exceeds the suction flow, i.e. if there is a risk that the 0.5 bar / 7.3 psi pre-charge pressure cannot be maintained.

B) The drain oil of the hydrostatic drive is not routed across the filter but is discharged directly into the tank.




This circuit layout has the advantage that drain oil pressures are comparatively low.

## Characteristics

### Nominal flow rate
Up to 250 l/min / 66 gpm in return line
(see Selection Chart, column 2).
Up to 200 l/min / 52.8 g per gpm feed pump flow rate
(see Layout).
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / $\nu \leq 927$ SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the return lines ≤ 4.5 m/s / 14.8 ft/s
- flow velocity in the suction lines ≤ 1.5 m/s / 4.9 ft/s

### Connection
Threaded ports according to

- ISO 228 or DIN 13
- SAE standard J514.

Sizes see Selection Chart, column 6 and 7
(other port threads on request).

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

### Dirt-holding capacity
Values in g test dust ISO MTD according to ISO 16889
(see Selection Chart, column 5).

### Hydraulic fluids
Mineral oil and biodegradable fluids
(HEES and HETG, see info-service 00.20).

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

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / $\nu < 280$ SUS
- as starting viscosity: $\nu_{max} = 1000$ mm²/s / $\nu_{max} = 4635$ SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Operating pressure
Max. 10 bar / 145 psi

### Materials

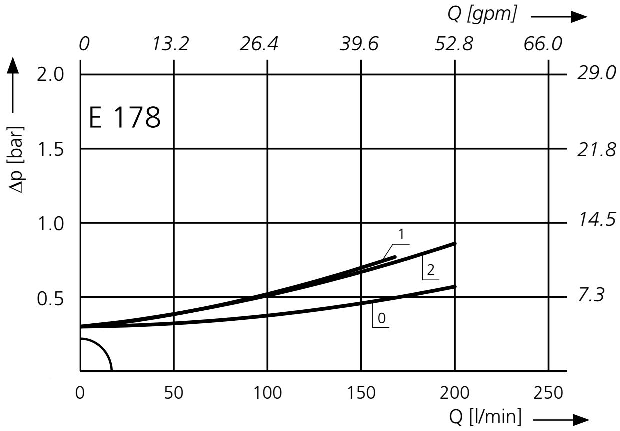
| | |
|---|---|
| Filter head: | Aluminum alloy |
| Filter bowl: | Polyamide, GF-reinforced |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web |

### Fitting position
Preferably vertical, filter head on top.

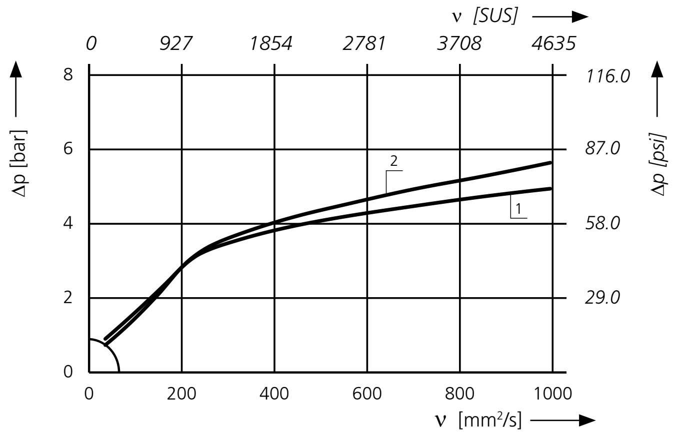
## Diagrams

### Δp-curves for complete filters in Selection Chart, column 3 (80% of the nominal flow volume via connection B)

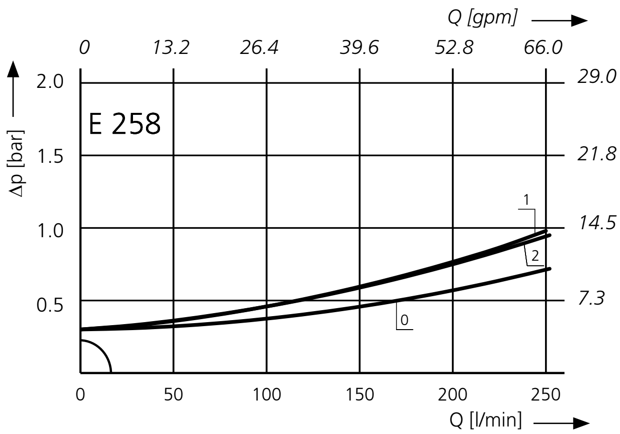
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



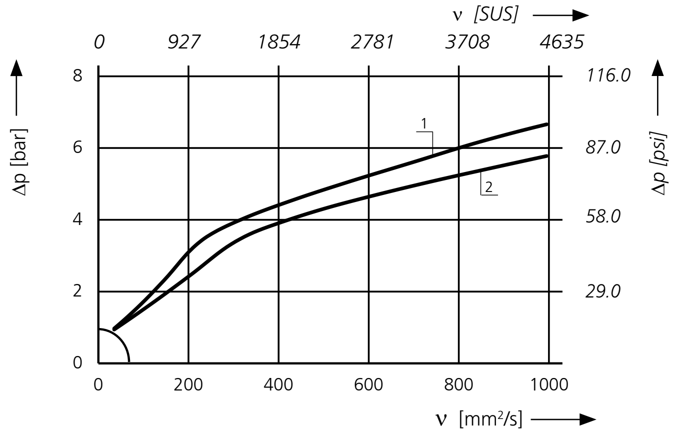

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

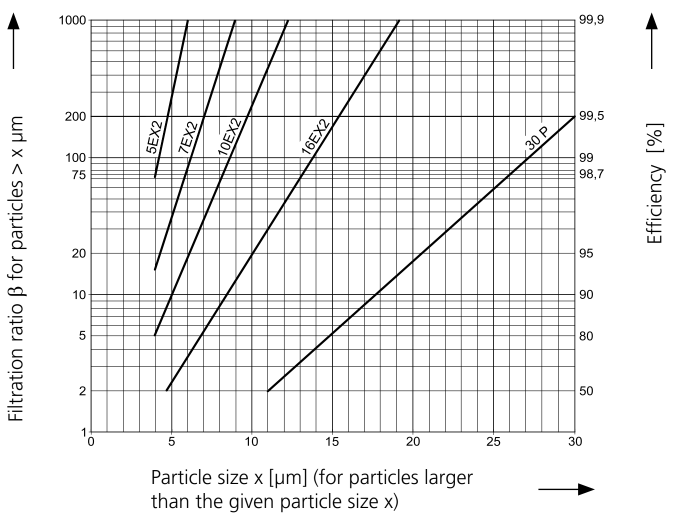



Pressure drop as a function of the **kinematic viscosity** at nominal flow




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

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX 2 and Paper elements:**

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

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

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

## Selection Chart

| Part No. | Nominal return flow | Pressure drop see diagram D/curve no. | Filter fineness see diagr. Dx | Dirt-holding capacity | Connection R | Connections S/T | Cracking pressure of CV [1] | Cracking pressure of BPV [2] | Symbol | Replacement filter element Part no. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | | bar | bar | | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| E 178-166 | 160 | **D1**/1 | 10EX2 | 60 | G1 | G1 | 0.5 | 2.5 | 1 | K3.1019-56 | 3.0 | - |
| E 178-168 | 210 | **D1**/2 | 16EX2 | 59 | G1 | G1 | 0.5 | 2.5 | 1 | K3.1019-58 | 3.0 | - |
| | | | | | | | | | | | | |
| E 258-166 | 250 | **D2**/1 | 10EX2 | 95 | G1 | G1 | 0.5 | 2.5 | 1 | K3.1030-56 | 3.5 | - |
| E 258-168 | 250 | **D2**/2 | 16EX2 | 94 | G1 | G1 | 0.5 | 2.5 | 1 | K3.1030-58 | 3.5 | - |

| | gpm | | | g | SAE | SAE | psi | psi | | | lbs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| E 178-766 | 42.3 | **D1**/1 | 10EX2 | 60 | -16[3] | -16[3] | 7.3 | 36 | 1 | K3.1019-56 | 6.6 | - |
| E 178-768 | 55.5 | **D1**/2 | 16EX2 | 59 | -16[3] | -16[3] | 7.3 | 36 | 1 | K3.1019-58 | 6.6 | - |
| | | | | | | | | | | | | |
| E 258-766 | 66.0 | **D2**/1 | 10EX2 | 95 | -16[3] | -16[3] | 7.3 | 36 | 1 | K3.1030-56 | 6.6 | - |
| E 258-768 | 66.0 | **D2**/2 | 16EX2 | 94 | -16[3] | -16[3] | 7.3 | 36 | 1 | K3.1030-58 | 6.6 | - |

[1] Cracking pressure of check valve
[2] Cracking pressure of by-pass valve
[3] Corresponds to 1$^5/_{16}$-12 UN-2B

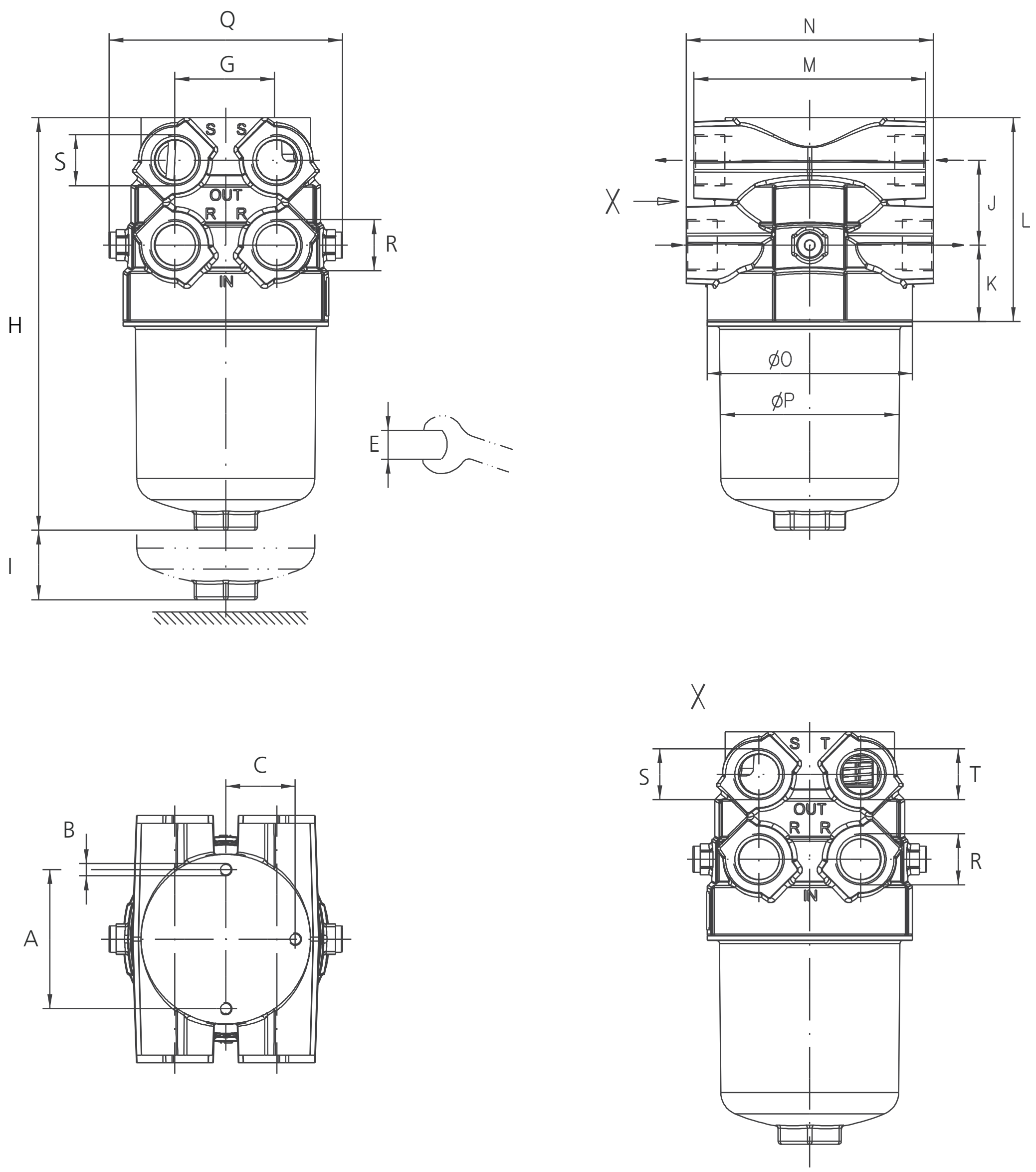
All filters are delivered with two plugged clogging indicator connections M12 x 1.5. As clogging indicators on the return side ($P_1$) either manometers or electrical pressure switches can be used.

**For the appropriate clogging indicators see catalog sheet 60.20.**

**Remarks:**

- The start of the red area respectively the switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the pressure relief valve (see Selection Chart, column 9).
- Clogging indicators are optional and always delivered detached from the filter.
- The filters listed in this chart are standard filters. If modifications are required, we kindly ask for your request.
- For de-aeration a bleed screw (for connection $P_1$) with Part No. SV 0112.15 is available.

## Dimensions




## Measurements in mm

| Type | A | B<br>Ø / depth | C | E | G | H | I | J | K | L | M | N | O<br>Ø | P<br>Ø | Q | R | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 178 | 90 | M8 x 18 | 45 | AF 41 | 66 | 268 | 95 | 55 | 49.5 | 132 | 150 | 160 | Ø133 | Ø117 | 151 | G1 | G1 | G1 |
| E 258 | 90 | M8 x 18 | 45 | AF 41 | 66 | 378 | 95 | 55 | 49.5 | 132 | 150 | 160 | Ø133 | Ø117 | 151 | G1 | G1 | G1 |

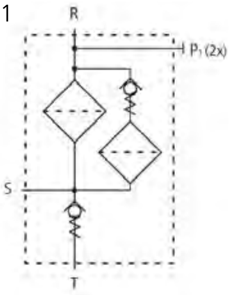
## Measurements in inch

| Type | A | B<br>Ø / depth | C | E<br>mm | G | H | I | J | K | L | M | N | O<br>Ø | P<br>Ø | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 178 | 3.54 | M8/0.71 | 1.77 | AF 41 | 2.60 | 10.55 | 3.74 | 2.17 | 1.95 | 5.20 | 5.91 | 6.30 | 5.24 | 4.61 | 5.94 |
| E 258 | 3.54 | M8/0.71 | 1.77 | AF 41 | 2.60 | 14.88 | 3.74 | 2.17 | 1.95 | 5.20 | 5.91 | 6.30 | 5.24 | 4.61 | 5.94 |
| **Type** | **R**<br>**SAE** | **S**<br>**SAE** | **T**<br>**SAE** | | | | | | | | | | | | |
| E 178 | -16* | -16* | -16* | | | | | | | | | | | | |
| E 258 | -16* | -16* | -16* | | | | | | | | | | | | |

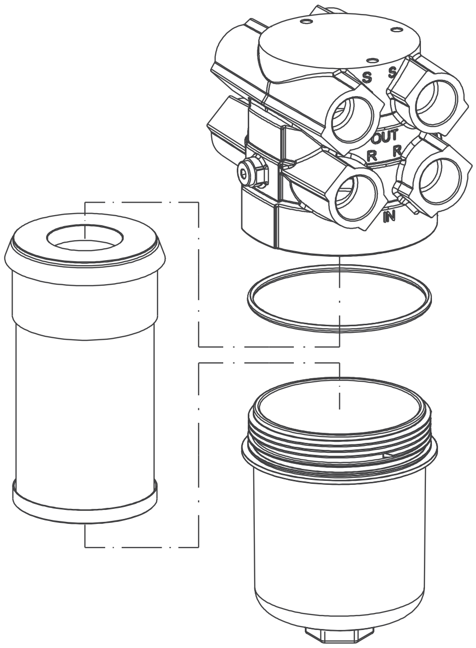
* Corresponds to $1^5/_{16}$-12 UN-2B

## Symbol

1




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Replacement filter element | see Selection Chart / col. 11 |
| 2 | O-ring<br>115.00 x 4.5 mm<br>4.53 x 0.18 inch | N007.1155 |
| 3 | Filter bowl E 178 | D 230.0102 |
| 3 | Filter bowl E 258 | D 230.0101 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

Return-Suction Filters

# E 084

Tank top mounting · Connection up to G1 / -16 SAE · Nominal flow rate up to 80 l/min / 21.1 gpm

M

Return-Suction-Filter E 084

## Description

### Application

For operation in units with hydrostatic drives, when the return flow is under all operating conditions higher than the oil flow of the feed pump.

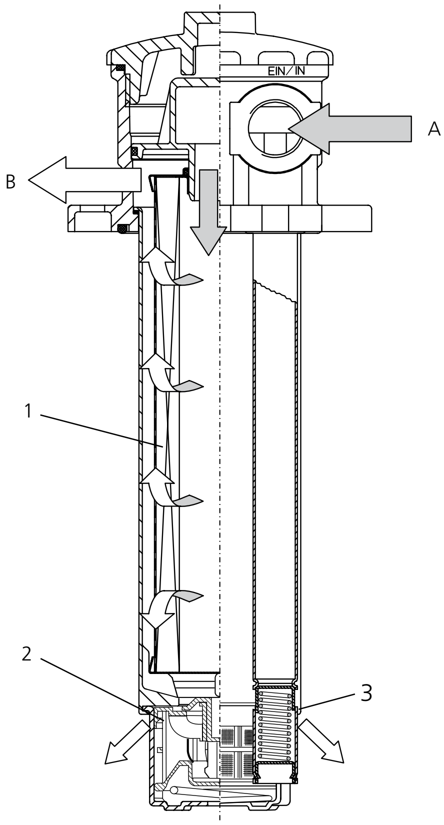
### Performance features

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

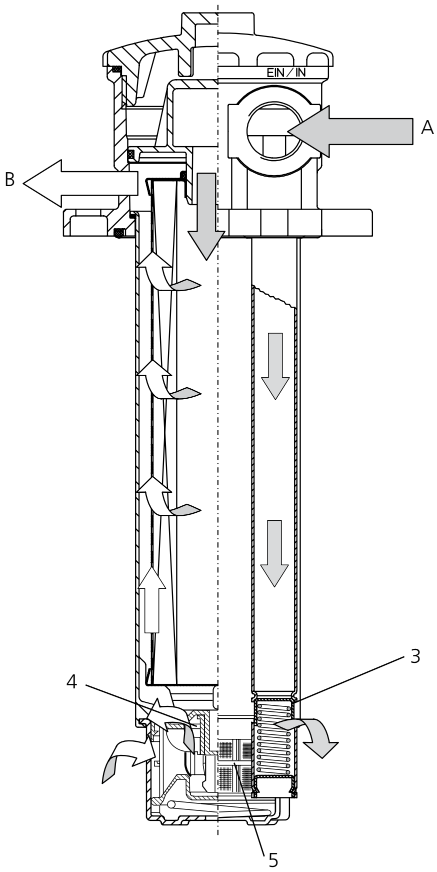
*Suction filter function:*
Because of the 100%-filtration of the suction flow, no dirt can get into the feed pump.

*Return filter function:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

**Function (schematic):**




**Emergency-suction (schematic)**




## Functional characteristics

The hydraulic oil returning from the circuit (A) passes the filter element (1), is pressurized by a 0.5 bar / 7.3 psi check valve (2) and supplied to the feed pump (B). The surplus oil flows filtered over the integral check valve into the reservoir.
As the feed pump is always fed with pressurized oil, the risk of cavitation is minimized and full performance is available even during the critical cold start phase.
An integral pressure relief valve (3) prevents too high back pressure and protects the shaft seals against damages. As this valve leads the oil directly into the tank there is no direct connection between the return line (A) and the connection of the feed pump (B) (no by-pass valve function).

The emergency-suction valve (4) with 125 µm protection strainer (5) supplies the feed pump in case of a short term of lack of oil. During normal operation, a lack of oil may definitely not occur (refer to „Design" section).

## Start-up / De-aeration

For units with emergency-suction valve and protection strainer the start up set E 084.1710 can be used to de-aerate the hydraulic system at first start up or at start-up after repair; hereby the immediate supply of the feed pump with hydraulic oil is guaranteed.
For all other types, deaerating instructions published by the manufacturers of hydraulic drives must be observed.

## Filter maintenance

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

## Filter elements

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

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

Dirt deposits are entirely removed when the element is changed and cannot re-enter the tank.

## Accessories

Electrical and / or optical clogging indicators are available.
Dimensions and technical data see catalog sheet 60.20.

## Layout

### General

In machines with a hydrostatic drive and combined working hydraulic system, return-suction filters replace the suction or pressure filters previously required for the feed pump of the closed-loop hydrostatic drive circuit as well as the return filter for the open-loop working hydraulic circuit.
While each circuit operates independently with separate filters, the combination of the two circuits via the return-suction filter causes interaction between the circuits.
If the design criteria described below are taken into account, you can take full advantage of the benefits provided by the return-suction filter concept, thus making sure that your system performs reliably even under extreme operating conditions.

### Required return flow in the system

In order to maintain a pre-charge pressure of approx. 0.5 bar / 7.3 psi at the intake of the feed pump, the return flow must exceed the suction flow under any operating condition:

*Special feature:*

- Versions with hole (Ø 4 mm / 0.16 inch) in the pressurizing valve: at least 10 l/min / 2.6 gpm of excess flow

### Permitted feed pump flow rate

- at operating temperature
  ($\nu$ < 60 mm²/s / 280 SUS, rpm=max):
  feed pump flow rate < 0.5 x rated return flow according to column 2 of selection table
- at cold start-up
  ($\nu$ < 1000 mm²/s / 4635 SUS, rpm = 1000 $min^{-1}$):
  feed pump flow rate < 0.2 x rated return flow according to column of selection table

Please contact us if your system operates with higher flow rates than stated above.

### Flow velocity in the connecting lines

- Flow velocity in the return lines ≤ 4.5 m/s / 14.8 ft/s
- Flow velocity in the suction lines ≤ 1.5 m/s / 4.9 ft/s

### Permitted pressure in the suction lines

At cold start up
($\nu$ < 1000 mm²/s / 4635 SUS, rpm = 1.000 $min^{-1}$):
feed pump flow rate ≤ 0.2 x rated return flow. The pressure loss in the suction lines must not exceed 0.4 bar / 5.8 psi.

### Backpressures in system return lines

If drain oil from the hydrostatic drive is routed across the filter in addition to the flow of the open-loop circuit, the following has to be observed in order to protect the shaft seals:

- permitted leakage oil pressure for a given viscosity and speed (manufacturer's specifications!)
- pressure loss caused by the leakage oil pipes
- pressure loss caused by the oil cooler used
- backpressure of the filter for a given flow rate or kinematic viscosity (refer to pressure loss diagrams)

Depending on the application, the use of a cooler by-pass valve is recommended.
Generously sized drain oil pipes are also of advantage.

### Filter fineness grades

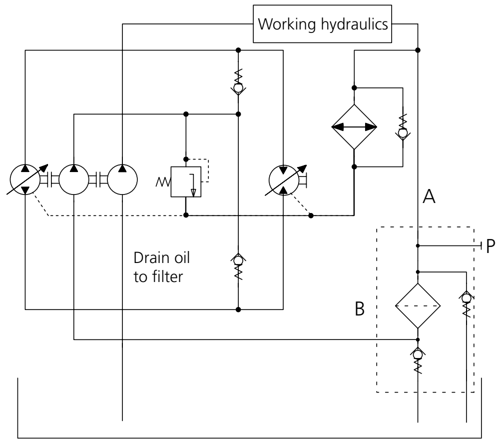
With the filter fineness grades available, the following oil cleanliness according to ISO 4406 can be achieved:

- 10EX2: 18/15/11 ... 14/11/7
- 16EX2: 20/17/12 ... 17/14/10

Even with the 16EX2 fineness grade, the requirements specified by manufacturers of hydrostatic drives are sometimes exceeded significantly.
If components requiring a still better oil purity are used, we recommend the 10EX2 filter fineness grade.

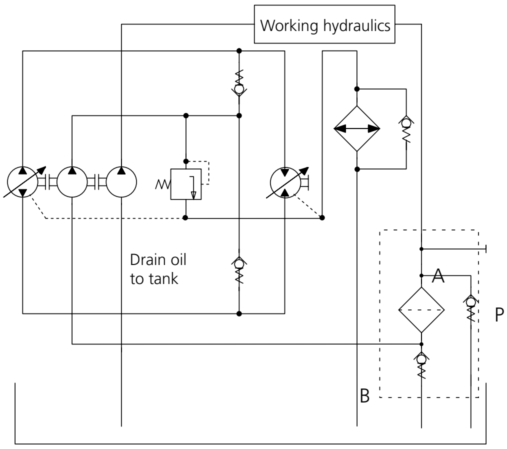
### Suggested circuit layouts

A) The leakage oil of the hydrostatic drive is routed across the filter.




The entire dirt produced in the hydrostatic drive by abrasion is filtered out immediately and is thus not taken in by the pump of the open-loop circuit.
This circuit layout is always recommended if the return flow only slightly exceeds the suction flow, i.e. if there is a risk that the 0.5 bar / 7.3 psi pre-charge pressure cannot be maintained.

B) The drain oil of the hydrostatic drive is not routed across the filter but is discharged directly into the tank.




This circuit layout has the advantage that drain oil pressures are comparatively low.

## Characteristics

### Nominal flow rate

Up to 80 l/min / 21.1 gpm in return line
(see Selection Chart, column 2).
Up to 40 l/min / 10.6 gpm feed pump flow rate (see Layout).
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the return lines ≤ 4.5 m/s / 14.8 ft/s
- flow velocity in the suction lines ≤ 1.5 m/s / 4.9 ft/s

### Connection

Threaded ports according to

- ISO 228 or DIN 13
- SAE standard J514.

Sizes see Selection Chart, column 6 and 7
(other port threads on request).

### Filter fineness

10 µm(c) ... 16 µm(c)
ß-Werte nach 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-service 00.20).

### Temperature range

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

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1000$ mm²/s / 4635 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Operating pressure

Max. 10 bar / 145 psi

### Materials

| | |
|---|---|
| Screw-on cap: | Polyamide, GF-reinforced |
| Filter head: | Aluminum alloy |
| Filter bowl: | Aluminum alloy |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web |

### Fitting position

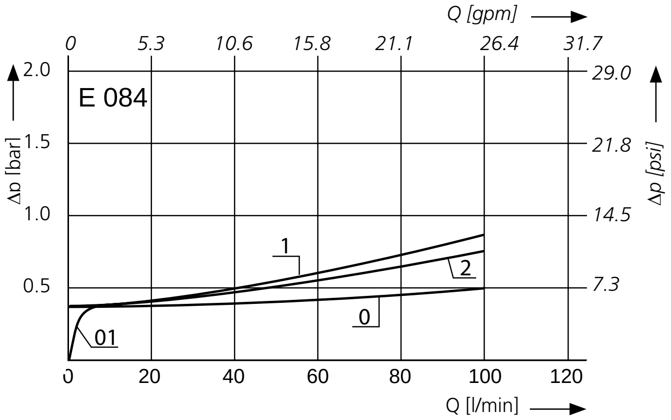
- Standard type no restriction, preferably vertical
- Models with emergency-suction valve can vary up to 15° from the vertical
- Models with hole ∅ 4 mm / 0.16 inch in the check valve can vary up to 45° from the vertical

Even under unfavorable operating conditions (min. oil level, max. sloping) the oil outlet resp. emergency suction has to be below the oil level.
Special designs are available for horizontal assembly.

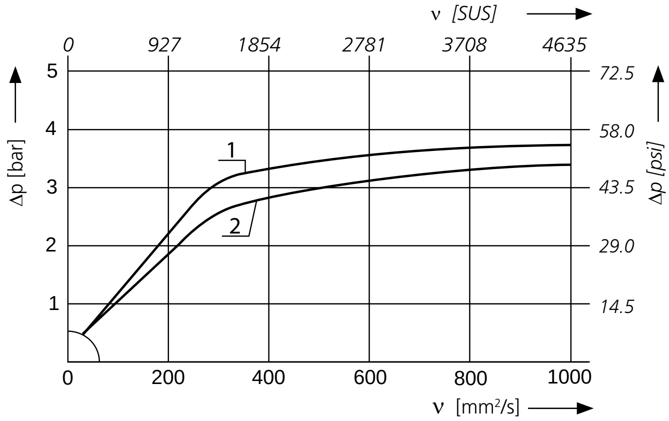
## Diagrams

**Δp-curves for complete filters in Selection Chart, column 3 (50 % of the nominal flow volume via connection B)**

**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (00/01 = casing empty without / with hole Ø 4 mm / 0.16 inch)

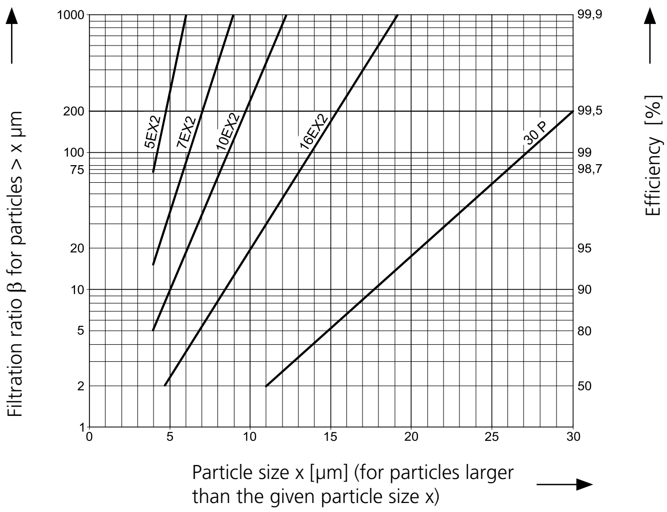



Pressure drop as a function of the **kinematic viscosity** at nominal flow




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

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




The abbreviations represent the following ß-values resp. finenesses:

**For EXAPOR®MAX 2 and Paper elements:**

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

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

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

## Selection Chart

| Part No. | Nominal return flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see Diagr. **Dx** | Dirt-holding capacity | Connection A | Connection B | Cracking pressure of CV[2] | Cracking pressure of PRV[3] | Symbol | Suction valve | Replacement filter element Part No. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | | bar | bar | | | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| **E 084-56**[1] | 75 | **D1**/1 | 10EX2 | 32 | G1 | G¾ | 0.5 | 3.0 | 2 | | V3.0724-06 | 1.7 | 4 |
| **E 084-77**[1] | 80 | **D1**/2 | 16EX2 | 31 | G1 | G¾ | 0.5 | 2.5 | 2 | | V3.0724-08 | 1.7 | 4 |
| E 084-88 | 80 | **D1**/2 | 16EX2 | 31 | G¾ | G¾ | 0.5 | 2.5 | 2 | | V3.0724-08 | 1.7 | 4 |
| E 084-78 | 80 | **D1**/2 | 16EX2 | 31 | G1 | G¾ | 0.5 | 2.5 | 1 | | V3.0724-08 | 1.7 | - |
| E 084-87 | 80 | **D1**/2 | 16EX2 | 31 | G¾ | G¾ | 0.5 | 2.5 | 1 | | V3.0724-08 | 1.7 | - |
| **E 084-277**[1] | 80 | **D1**/2 | 16EX2 | 31 | G1 | G¾ | 0.5 | 2.5 | 4 | • | V3.0724-08 | 1.8 | 5 |
| E 084-288 | 80 | **D1**/2 | 16EX2 | 31 | G¾ | G¾ | 0.5 | 2.5 | 4 | • | V3.0724-08 | 1.8 | 5 |
| E 084-287 | 80 | **D1**/2 | 16EX2 | 31 | G1 | G¾ | 0.5 | 2.5 | 3 | • | V3.0724-08 | 1.8 | 5+6 |

[1] Preferred type, no minimum order quantity required
[2] Cracking pressure of check valve
[3] Cracking pressure of pressure relief valve
[4] With hole Ø 4 mm / 0.16 inch in the check valve for oil drain when opening the filter cover
[5] With emergency-suction valve and protection strainer (mesh size 125 µm)
[6] Suitable for horizontal assembly

All filters are delivered with a plugged clogging indicator connection M12 x 1.5 (connection $P_1$).
As clogging indicators either manometers or electrical pressure switches can be used.

**For the appropriate clogging indicators see catalog sheet 60.20.**

**Remarks:**

› The start of the red area respectively the switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the pressure relief valve (see Selection Chart, column 9).
› 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. for horizontal assembly or with integrated suction valve integrated into the pressure relief valve (see section symbols, symbol no. 5) to guarantee the emergency steering feature for vehicles with official road use, we kindly ask for your request.
› For de-aeration a bleed screw (for connection $P_1$) with Part No. SV 0112.15 is available.

## Selection Chart

| Part No. | Nominal return flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see Diagr. **Dx** | Dirt-holding capacity | Connection A | Connection B | Cracking pressure of CV [1] | Cracking pressure of PRV [2] | Symbol | Suction valve | Replacement filter element Part No. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | gpm | | | g | SAE | SAE | psi | psi | | | | lbs | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| E 084-756 | 19.8 | **D1**/1 | 10EX2 | 32 | -16[3] | -12[4] | 7.3 | 44 | 4 | • | V3.0724-06 | 4.0 | [5] |
| E 084-757 | 21.1 | **D1**/2 | 16EX2 | 31 | -16[3] | -12[4] | 7.3 | 36 | 2 | | V3.0724-08 | 3.8 | [6] |
| E 084-758 | 21.1 | **D1**/2 | 16EX2 | 31 | -16[3] | -12[4] | 7.3 | 36 | 4 | • | V3.0724-08 | 4.0 | [5] |

[1] cracking pressure of check valve
[2] cracking pressure of pressure relief valve
[3] corresponds to 1 5/16 -12 UN
[4] corresponds to 1 1/16 -12 UN
[5] with emergency-suction valve and protection strainer (mesh size 125 µm)
[6] with hole Ø 0.16 inch / 4 mm in the check valve for oil drain when opening the filter cover

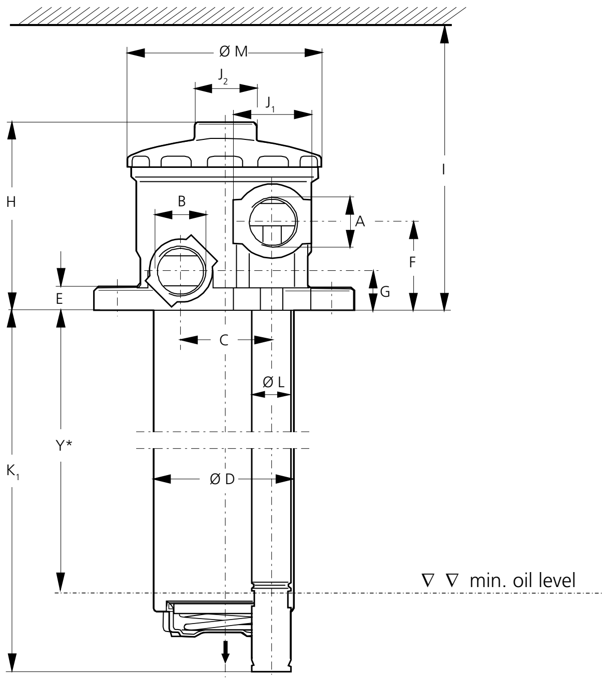
All filters are delivered with a plugged clogging indicator connection M12 x 1.5 mm (connection $P_1$).
As clogging indicators either manometers or electrical pressure switches can be used.

**For the appropriate clogging indicators see catalog sheet 60.20.**

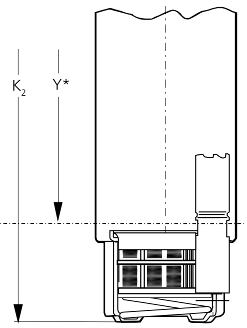
**Remarks:**

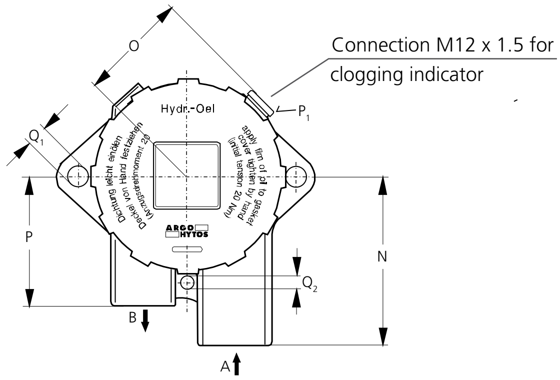
- The start of the red area respectively the switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the pressure relief valve (see Selection Chart, column 9).
- Clogging indicators are optional and always delivered detached from the filter.
- The filters listed in this chart are standard filters. If modifications are required, e.g. for horizontal assembly or with integrated suction valve integrated into the pressure relief valve (see section symbols, symbol no. 5) to guarantee the emergency steering feature for vehicles with official road use, we kindly ask for your request.
- For de-aeration a bleed screw (for connection $P_1$) with Part No. SV 0112.15 is available.

## Dimensions

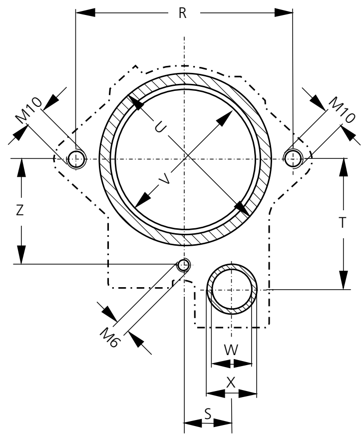



Versions with emergency-suction valve and protection strainer




Port sizes and mounting surface




## Measurements in mm

| Type | A | B | C | D | E | F | G | H | I | $J_1$ | $J_2$ | $K_1$ | $K_2$ | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 084 | G¾,G1 | G¾ | 48 | 73.5 | 12 | 47 | 21 | 102 | 315 | AF 41 | AF 32 | 254 | 268 | 20.5 | 104.5 | 90 |

| Type | O | P | $Q_1$ | $Q_2$ | R | S | T | U | V | W | X | Y* | Z | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 084 | 60 | 69 | 11 | 6.6 | 115 | 25 | 65 | 100 | 79 | 21 | 38 | 224 | 55 | | | |

## Measurements in inch

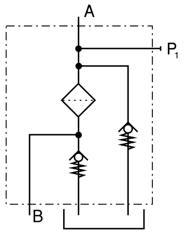
| Type | A SAE | B SAE | C | D | E | F | G | H | I | $J_1$ mm | $J_2$ mm | $K_1$ | $K_2$ | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 084 | -16 | -12 | 1.89 | 2.89 | 0.47 | 1.85 | 0.83 | 4.02 | 12.40 | AF 41 | AF 32 | 10.0 | 10.55 | 0.81 | 4.11 | 3.54 |

| Type | O | P | $Q_1$ | $Q_2$ | R | S | T | U | V | W | X | Y* | Z | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 084 | 2.36 | 2.72 | 0.43 | 0.26 | 4.53 | 0.98 | 2.56 | 3.94 | 3.11 | 0.83 | 1.50 | 8.82 | 2.17 | | | |

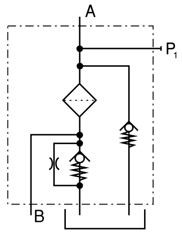
* Oil outlet resp. emergency suction has to be under all operating cond. below min. oil level (given by Y)

## Symbols

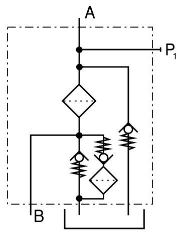
1



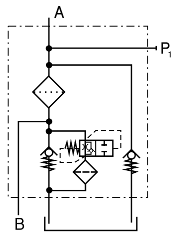

2



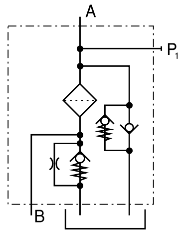

3



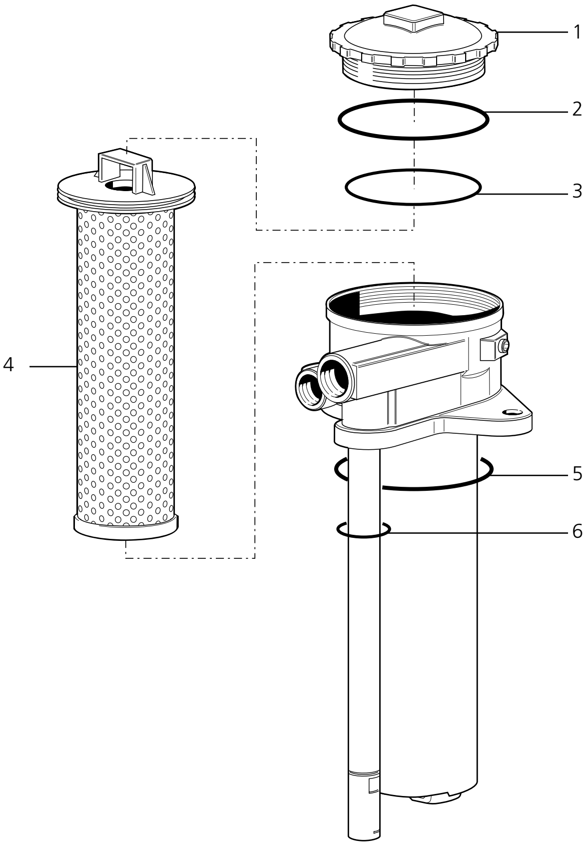

4




5




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Screw-on cap | E 103.0201 |
| 2 | Flat gasket | N031.0841 |
| 3 | O-ring<br>72 x 3 mm<br>2.84 x 0.12 inch | N007.0723 |
| 4 | Replacement filter element | see Chart / col. 12 |
| 5 | O-ring<br>84 x 4 mm<br>3.31 x 0.16 inch | N007.0844 |
| 6 | O-ring<br>23 x 4 mm<br>0.91 x 0.16 inch | N007.0231 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

Return-Suction Filters

# E 158 · E 198 · E 248

Tank top mounting · Connection up to G1¼ / -20 SAE · Nominal flow rate up to 250 l/min / 66 gpm

M

Return-Suction Filter E 198

## Description

### Application

For operation in units with hydrostatic drives, when the return flow is under all operating conditions higher than the oil flow of the feed pump.

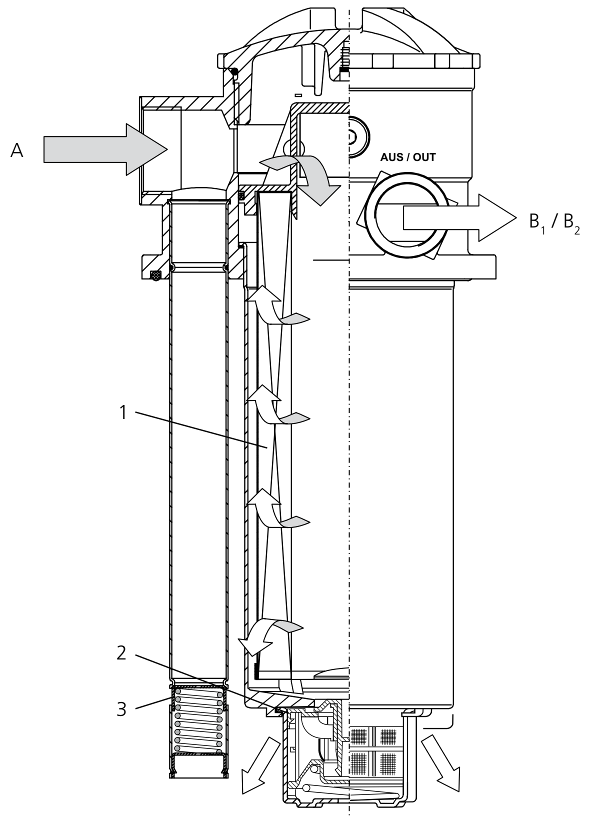
### Performance features

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

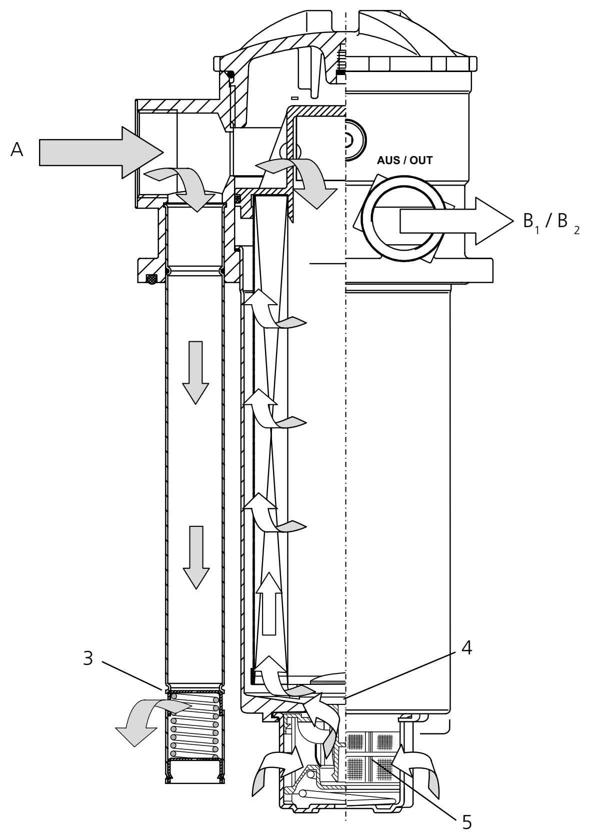
*Suction filter function:*
Because of the 100%-filtration of the suction flow, no dirt can get into the feed pump.

*Return filter function:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

**Function (schematic):**




**Emergency-suction (schematic):**




### Functional characteristics

The hydraulic oil returning from the circuit (A) passes the filter element (1), is pressurized by a 0.5 bar / 7.3 psi check valve (2) and supplied to the feed pump (B). The surplus oil flows filtered over the integral check valve into the reservoir.
As the feed pump is always fed with pressurized oil, the risk of cavitation is minimized and full performance is available even during the critical cold start phase.
An integral pressure relief valve (3) prevents too high back pressure and protects the shaft seals against damages. As this valve leads the oil directly into the tank there is no direct connection between the return line (A) and the connection of the feed pump (B) (no bypass valve function).

The emergency-suction valve (4) with 125 µm protection strainer (5) supplies the feed pump in case of a short term of lack of oil. During normal operation, a lack of oil may definitely not occur (refer to "Design" section).

### Start-up / De-aeration

For units with emergency-suction valve and protection strainer the start up set E 198.1710 can be used to de-aerate the hydraulic system at first start-up or at start up after repair; hereby the immediate supply of the feed pump with hydraulic oil is guaranteed.
For all other types, deaerating instructions published by the manufacturers of hydraulic drives must be observed.

### Filter maintenance

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

### Filter elements

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

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

Dirt deposits are entirely removed when the element is changed and cannot re-enter the tank.

### Accessories

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

## Layout

### General

In machines with a hydrostatic drive and combined working hydraulic system, return-suction filters replace the suction or pressure filters previously required for the feed pump of the closed-loop hydrostatic drive circuit as well as the return filter for the open-loop working hydraulic circuit.
While each circuit operates independently with separate filters, the combination of the two circuits via the return-suction filter causes interaction between the circuits.
If the design criteria described below are taken into account, you can take full advantage of the benefits provided by the return-suction filter concept, thus making sure that your system performs reliably even under extreme operating conditions.

### Required return flow in the system

In order to maintain a pre-charge pressure of approx. 0.5 bar / 7.3 psi at the intake of the feed pump, the return flow must exceed the suction flow under any operating condition:
Special feature:

- Versions with hole (Ø 4 mm / 0.16 inch) in the pressurizing valve: at least 20 l/min / 5.3 gpm of excess flow

### Permitted feed pump flow rate

- at operating temperature ($\nu$ < 60 mm²/s / 280 SUS, rpm=max): feed pump flow rate < 0.5 x rated return flow according to column 2 of selection table
- at cold start-up ($\nu$ < 1000 mm²/s / 4635 SUS, rpm = 1000 min$^{-1}$): feed pump flow rate < 0.2 x rated return flow according to column of selection table

Please contact us if your system operates with higher flow rates than stated above.

### Flow velocity in the connecting lines

- Flow velocity in the return lines ≤ 4.5 m/s / 14.8 ft/s
- Flow velocity in the suction lines ≤ 1.5 m/s / 4.9 ft/s

### Permitted pressure in the suction lines

At cold start up ($\nu$ < 1000 mm²/s / 4635 SUS, rpm = 1000 min$^{-1}$): feed pump flow rate < 0.2 x rated return flow. The pressure loss in the suction lines must not exceed 0.4 bar / 5.8 psi.

### Backpressures in system return lines

If drain oil from the hydrostatic drive is routed across the filter in addition to the flow of the open-loop circuit, the following has to be observed in order to protect the shaft seals:

- permitted leakage oil pressure for a given viscosity and speed (manufacturer's specifications!)
- pressure loss caused by the leakage oil pipes
- pressure loss caused by the oil cooler used
- backpressure of the filter for a given flow rate or kinematic viscosity (refer to pressure loss diagrams)

Depending on the application, the use of a cooler by-pass valve is recommended.
Generously sized drain oil pipes are also of advantage.

### Filter fineness grades

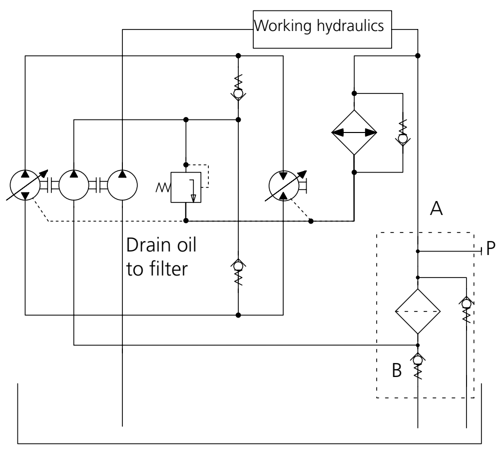
With the filter fineness grades available, the following oil cleanliness according to ISO 4406 can be achieved:

- 10EX2: 18/15/11 ... 14/11/7
- 16EX2: 20/17/12 ... 17/14/10

Even with the 16EX2 filter fineness grade, the requirements specified by manufacturers of hydrostatic drives are sometimes exceeded significantly. If components requiring a still better oil purity are used, we recommend the 10EX2 filter fineness grade.

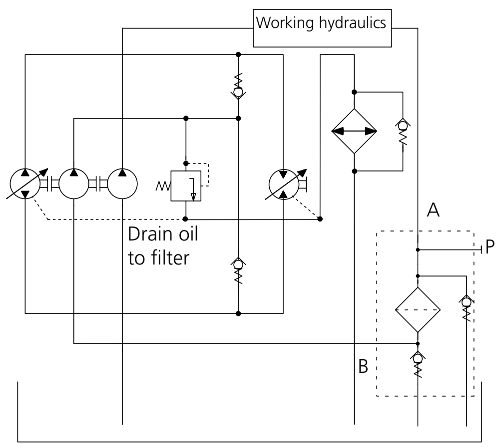
### Suggested circuit layouts

A) The leakage oil of the hydrostatic drive is routed across the filter.




The entire dirt produced in the hydrostatic drive by abrasion is filtered out immediately and is thus not taken in by the pump of the open-loop circuit.
This circuit layout is always recommended if the return flow only slightly exceeds the suction flow, i.e. if there is a risk that the 0.5 bar / 7.3 inch pre-charge pressure cannot be maintained.

B) The drain oil of the hydrostatic drive is not routed across the filter but is discharged directly into the tank.




This circuit layout has the advantage that drain oil pressures are comparatively low.

### Nominal flow rate

- Up to 250 l/min / 66 gpm in return line (see Selection Chart, column 2).
- Up to 125 l/min / 33 gpm feed pump flow rate (see Layout). The nominal flow rates indicated by ARGO-HYTOS are based on the following features:
- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the return lines ≤ 4.5 m/s / 14.8 ft/s
- flow velocity in the suction lines ≤ 1.5 m/s / 4.9 ft/s

### Connection

Threaded ports according to

- ISO 228 or DIN 13
- SAE standard J514.

Sizes see Selection Chart, column 6 and 7 (other port threads on request).

### Filter fineness

10 µm(c) ... 16 µm(c)
β-values according to ISO 16889
(see Selection Chart, column 4 and diagram Dx).

### Dirt-holding capacity

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

### Hydraulic fluids

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

### Temperature range

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

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1000$ mm²/s / 4635 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Operating pressure

Max. 10 bar / 145 psi

### Materials

| | |
|---|---|
| Screw-on cap: | Polyester, GF-reinforced |
| Filter head: | Aluminum alloy |
| Filter bowl: | Aluminum alloy |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web |

### Fitting position

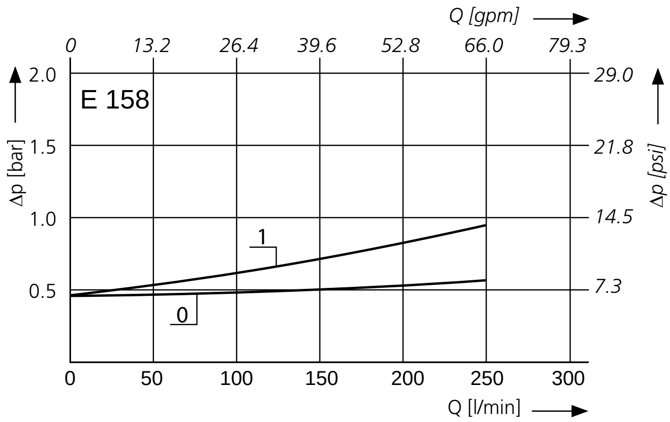
- Standard type no restriction, preferably vertical
- Models with emergency-suction valve can vary up to 15° from the vertical
- Models with hole Ø 4 mm / 0.16 inch in the check valve can vary up to 45° from the vertical

Even under unfavorable operating conditions (min. oil level, max. sloping) the oil outlet resp. emergency suction has to be below the oil level.
Special designs are available for horizontal assembly.

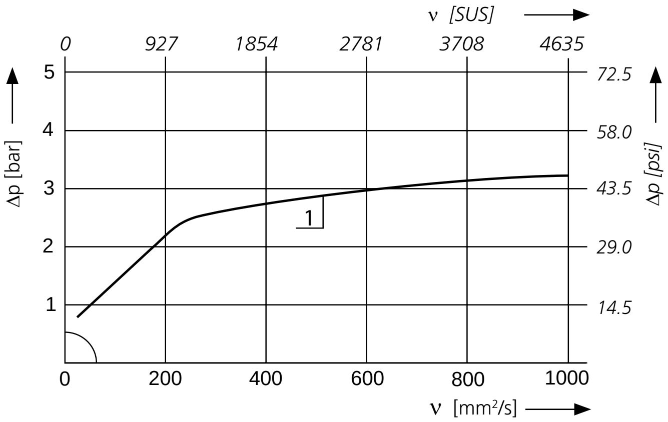
## Diagrams

**∆p-curves for complete filters in Selection Chart, column 3**
**(50 % of the nominal flow volume via connection B)**

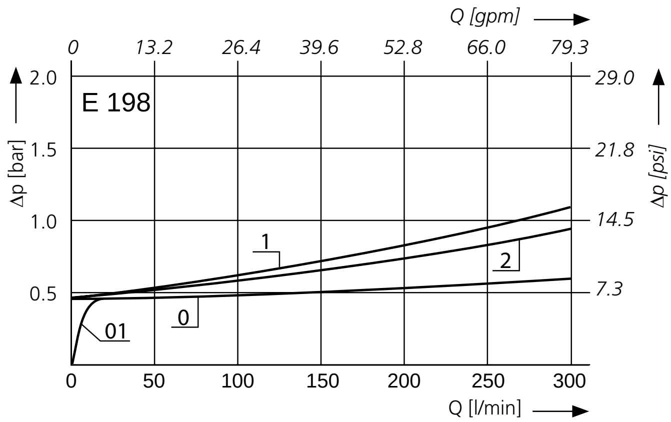
**D1** Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s / 162 SUS
(0 = casing empty with hole Ø 4 mm / 0.16 inch)



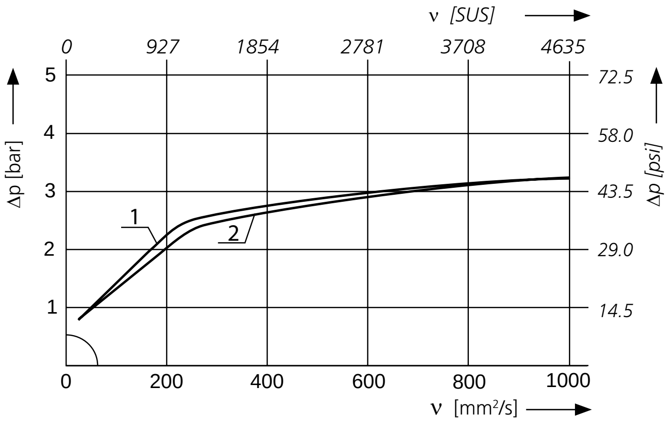

Pressure drop as a function of the
**kinematic viscosity** at nominal flow



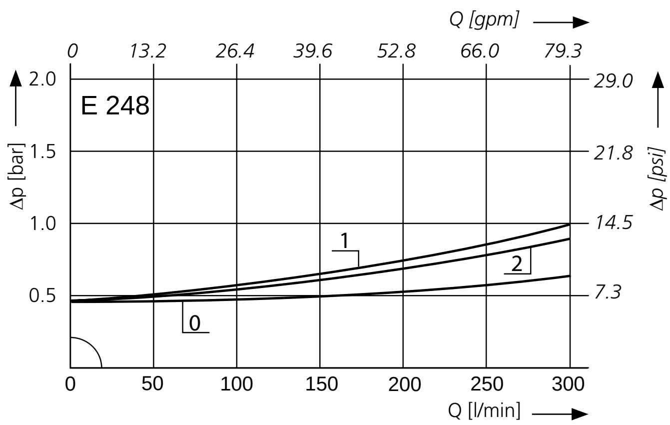

**D2** Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s / 162 SUS
(0 = casing empty with hole Ø 4 mm)



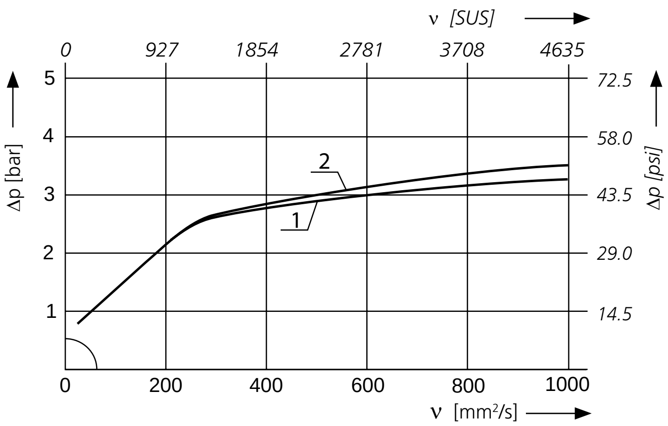

Pressure drop as a function of the
**kinematic viscosity** at nominal flow




**D3** Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s / 162 SUS
(0 = casing empty with hole Ø 4 mm)

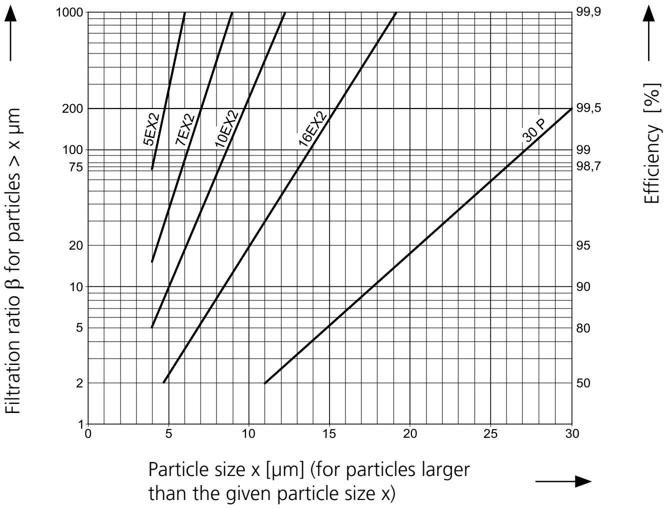



Pressure drop as a function of the
**kinematic viscosity** at nominal flow



## Filter fineness curves in Selection Chart, column 4

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




The abbreviations represent the following ß-values resp. finenesses:

**For EXAPOR®MAX 2 and Paper elements:**

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

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

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

## Selection Chart

| Part No. | Nominal return flow rate | Pressure dop see diagram **D**/curve no. | Filter fineness see Diagr. **Dx** | Dirt-holding capacity | Connection A | Connection $B_1$ / $B_2$ | Cracking pressure of CV[2] | Cracking pressure of PRV[3] | Symbol | Suction valve | Replacement filter element Part No. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | | bar | bar | | | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| **E 158-168**[1] | 180 | **D1**/1 | 16EX2 | 53 | G1¼ | G1 | 0.5 | 2.5 | 4 | • | V3.0924-08 | 3.0 | [5] |
| | | | | | | | | | | | | | |
| **E 198-156**[1] | 180 | **D2**/1 | 10EX2 | 73 | G1¼ | G1 | 0.5 | 2.5 | 1 | | V3.0934-06 | 3.7 | - |
| **E 198-186**[1] | 180 | **D2**/1 | 10EX2 | 73 | G1¼ | G1 | 0.5 | 2.5 | 4 | • | V3.0934-06 | 3.8 | [5] |
| E 198-158 | 200 | **D2**/2 | 16EX2 | 73 | G1¼ | G1 | 0.5 | 2.5 | 1 | | V3.0924-08 | 3.7 | - |
| **E 198-168**[1] | 200 | **D2**/2 | 16EX2 | 73 | G1¼ | G1 | 0.5 | 2.5 | 2 | | V3.0934-08 | 3.7 | [4] |
| **E 198-188**[1] | 200 | **D2**/2 | 16EX2 | 73 | G1¼ | G1 | 0.5 | 2.5 | 4 | • | V3-0934-08 | 3.8 | [5] |
| E 198-468 | 200 | **D2**/2 | 16EX2 | 73 | G1¼ | G1 | 0.5 | 2.5 | 3 | • | V3.0934-08 | 3.8 | [5+6] |
| | | | | | | | | | | | | | |
| **E 248-156**[1] | 190 | **D3**/1 | 10EX2 | 89 | G1¼ | G1 | 0.5 | 2.5 | 4 | • | V3.0941-06 | 4.3 | [5] |
| **E 248-158**[1] | 250 | **D3**/2 | 16EX2 | 90 | G1¼ | G1 | 0.5 | 2.5 | 4 | • | V3.0941-08 | 4.3 | [5] |
| E 248-258 | 250 | **D3**/2 | 16EX2 | 90 | G1¼ | G1 | 0.5 | 2.5 | 1 | | V3.0941-08 | 4.2 | - |

[1] Preferred type, no minimum order quantity required
[2] Cracking pressure of check valve
[3] Cracking pressure of pressure relief valve
[4] With hole Ø 4 mm / 0.16 inch in the check valve for oil drain when opening the filter cover
[5] With emergency-suction valve and protection strainer (mesh size 125 µm)
[6] Suitable for horizontal assembly

All filters are delivered with three plugged clogging indicator connections M12 x 1.5. As clogging indicators on the return side ($P_1$) either manometers or electrical pressure switches can be used. The monitoring of the vacuum on the suction side ($P_2$) is additionally possible. A second return port $A_2$ can be opened on request.

**For the appropriate clogging indicators see catalog sheet 60.20.**

**Remarks:**

- The start of the red area respectively the switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the pressure relief valve (see Selection Chart, column 9).
- 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 integrated suction valve (integrated into the pressure relief valve) to guarantee the emergency steering feature for vehicles with official road use, we kindly ask for your request.
- For de-aeration a bleed screw (for connection $P_1$) with Part No. SV 0112.15 is available.

## Selection Chart

| Part No. | Nominal return flow rate | Pressure dop see diagram **D**/curve no. | Filter fineness see Diagr. **Dx** | Dirt-holding capacity | Connection A | Connection $B_1$ / $B_2$ | Cracking pressure of CV [1] | Cracking pressure of PRV [2] | Symbol | Suction valve | Replacement filter element Part No. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | gpm | | | g | SAE | SAE | psi | psi | | | | lbs | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| E 158-766 | 39.6 | **D1**/1 | 10EX2 | 50 | -20[3] | -16[4] | 7.3 | 36 | 4 | • | V3.0924-06 | 6.6 | [6] |
| E 158-768 | 47.6 | **D1**/1 | 16EX2 | 53 | -20[3] | -16[4] | 7.3 | 36 | 4 | • | V3.0924-08 | 6.6 | [5] |
| | | | | | | | | | | | | | |
| E 198-786 | 47.6 | **D2**/1 | 10EX2 | 73 | -20[3] | -16[4] | 7.3 | 36 | 4 | • | V3.0934-06 | 8.4 | [5] |
| E 198-788 | 52.8 | **D2**/2 | 16EX2 | 73 | -20[3] | -16[4] | 7.3 | 36 | 4 | • | V3.0934-08 | 8.4 | [5] |
| | | | | | | | | | | | | | |
| E 248-756 | 50.2 | **D3**/1 | 10EX2 | 89 | -20[3] | -16[4] | 7.3 | 36 | 4 | • | V3.0941-06 | 9.5 | [5] |
| E 248-758 | 66.0 | **D3**/2 | 16EX2 | 90 | -20[3] | -16[4] | 7.3 | 36 | 4 | • | V3.0941-08 | 9.5 | [5] |

[1] Cracking pressure of check valve
[2] Cracking pressure of pressure relief valve
[3] Corresponds to 1 5/8-12 UN
[4] Corresponds to 1 5/16-12 UN
[5] With emergency-suction valve and protection strainer (mesh size 125 µm)

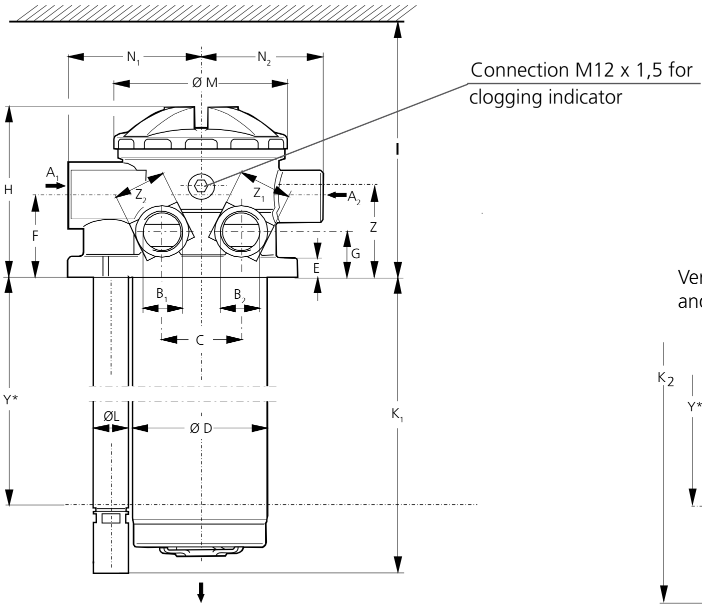
All filters are delivered with three plugged clogging indicator connections M12 x 1.5 mm.
As clogging indicators on the return side ($P_1$) either manometers or electrical pressure switches can be used.
The monitoring of the vacuum on the suction side ($P_2$) is additionally possible.
A second return port $A_2$ can be opened on request.

**For the appropriate clogging indicators see catalog sheet 60.20.**

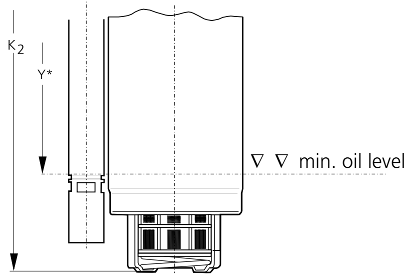
**Remarks:**

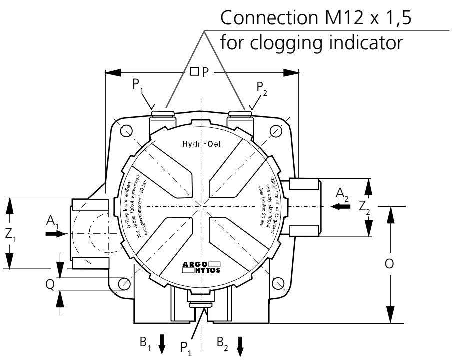
- The start of the red area respectively the switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the pressure relief valve (see Selection Chart, column 9).
- Clogging indicators are optional and always delivered detached from the filter.
- The filters listed in this chart are standard filters. If modifications are required, e.g. with integrated suction valve (integrated into the pressure relief valve) to guarantee the emergency steering feature for vehicles with official road use, we kindly ask for your request.
- For de-aeration a bleed screw (for connection $P_1$) with Part No. SV 0112.15 is available.

## Dimensions

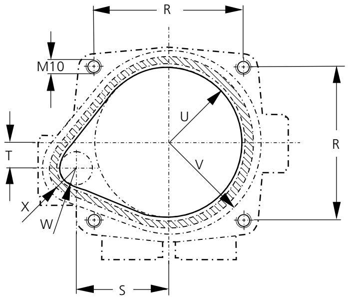



Versions with emergency-suction valve
and protection strainer




Port sizes and mounting surface




## Measurements in mm

| Type | $A_1$ | $A_2$ | $B_{1/2}$ | C | D | E | F | G | H | I | $K_1$ | $K_2$ | L | M | $N_1$ | $N_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 158 | G1¼ | – | G1 | 56 | 100 | 11.5 | 61.5 | 30.5 | 130 | 430 | 238 | 250 | 28.5 | 126.5 | 97 | 81.5 |
| E 198 | G1¼ | – | G1 | 56 | 100 | 11.5 | 61.5 | 30.5 | 130 | 530 | 338 | 354 | 28.5 | 126.5 | 97 | 81.5 |
| E 248 | G1¼ | – | G1 | 56 | 100 | 11.5 | 61.5 | 30.5 | 130 | 600 | 404 | 417 | 28.5 | 126.5 | 97 | 81.5 |

| Type | O | P | Q | R | S | T | U | V | W | X | Y* | Z | $Z_1$ | $Z_2$ | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 158 | 85.5 | 141 | 11 | 116.5 | 68 | 19.5 | 51 | 64 | 14.5 | 27 | 185 | 68 | AF55 | AF41 | | |
| E 198 | 85.5 | 141 | 11 | 116.5 | 68 | 19.5 | 51 | 64 | 14.5 | 27 | 285 | 68 | AF55 | AF41 | | |
| E 248 | 85.5 | 141 | 11 | 116.5 | 68 | 19.5 | 51 | 64 | 14.5 | 27 | 350 | 68 | AF55 | AF41 | | |

## Measurements in inch

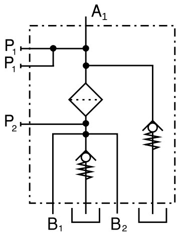
| Type | $A_1$ SAE | $A_2$ SAE | $B_{1/2}$ SAE | C | D | E | F | G | H | I | $K_1$ | $K_2$ | L | M | $N_1$ | $N_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 158 | -20 | – | -16 | 2.20 | 3.94 | 0.45 | 2.42 | 1.20 | 5.12 | 16.93 | 9.37 | 9.84 | 1.12 | 4.98 | 3.82 | 3.21 |
| E 198 | -20 | – | -16 | 2.20 | 3.94 | 0.45 | 2.42 | 1.20 | 5.12 | 20.87 | 13.31 | 13.94 | 1.12 | 4.98 | 3.82 | 3.21 |
| E 248 | -20 | – | -16 | 2.20 | 3.94 | 0.45 | 2.42 | 1.20 | 5.12 | 23.62 | 15.91 | 16.42 | 1.12 | 4.98 | 3.82 | 3.21 |

| Type | O | P | Q | R | S | T | U | V | W | X | Y* | Z | $Z_1$ mm | $Z_2$ mm | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 158 | 3.37 | 5.55 | 0.43 | 4.59 | 2.68 | 0.77 | 2.01 | 2.52 | 0.57 | 1.06 | 7.28 | 2.68 | AF 55 | AF 41 | | |
| E 198 | 3.37 | 5.55 | 0.43 | 4.59 | 2.68 | 0.77 | 2.01 | 2.52 | 0.57 | 1.06 | 11.22 | 2.68 | AF 55 | AF 41 | | |
| E 248 | 3.37 | 5.55 | 0.43 | 4.59 | 2.68 | 0.77 | 2.01 | 2.52 | 0.57 | 1.06 | 13.78 | 2.68 | AF 55 | AF 41 | | |

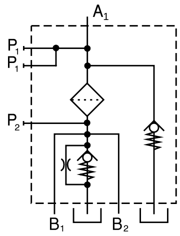
* Oil outlet resp. emergency suction has to be under all operating cond. below min. oil level (given by Y)

## Symbols

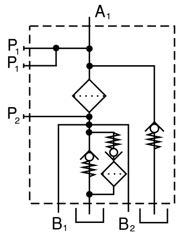
1



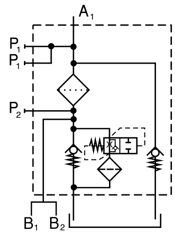

2



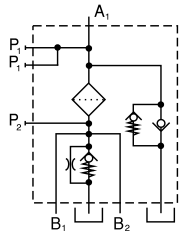

3



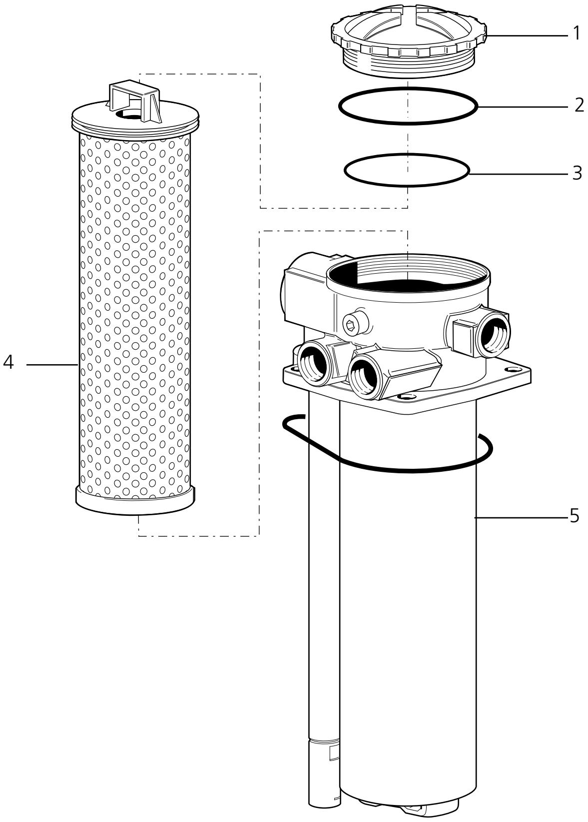

4




5




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Screw-on cap | ES 074.0206 |
| 2 | O-ring<br>100 x 4 mm<br>3.94 x 0.16 inch | N007.1004 |
| 3 | O-ring<br>98 x 3 mm<br>3.86 x 0.12 inch | N007.0983 |
| 4 | Replacement filter element | see Chart / col. 12 |
| 5 | O-ring<br>124 x 4.5 mm<br>4.88 x 0.18 inch | N007.1245 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

# E 328 · E 498

Tank top mounting · Connection up to G1½ / -24 SAE and SAE 2 · Nominal flow rate up to 600 l/min / 158.5 gpm

M

Return Suction Filter E 498

## Description

### Application

For operation in units with hydrostatic drives, when the return flow is under all operating conditions higher than the oil flow of the feed pump.

### Performance features

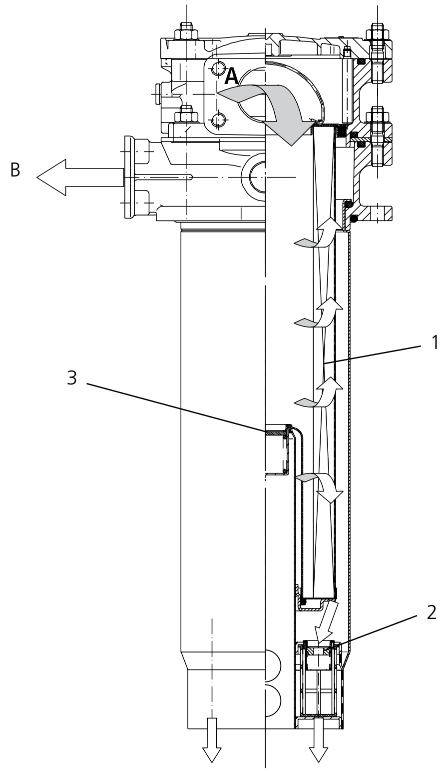
*Protection against wear:*
By means of filter elements that even in full-flow filtration meet the highest demands regarding cleanliness classes.

*Suction filter function:*
Because of the 100%-filtration of the suction flow, no dirt can get into the feed pump.

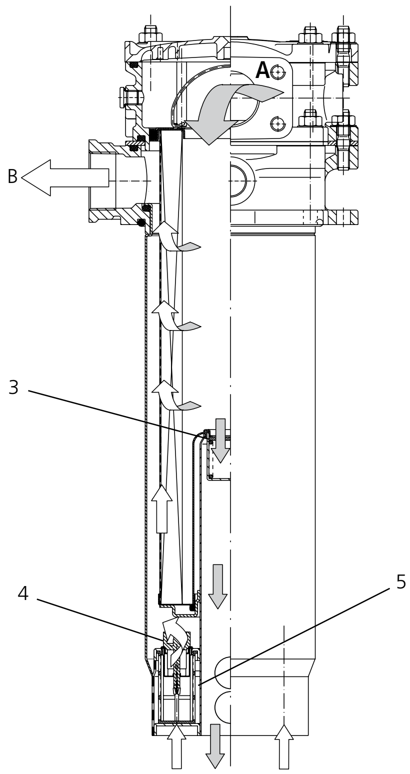
*Return filter function:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

## Description

**Function (schematic):**




**Emergency-suction (schematic):**




### Functional characteristics

The hydraulic oil returning from the circuit (A) passes the filter element (1), is pressurized by three 0.5 bar / 7.3 psi check valves (2) and supplied to the feed pump (B). The surplus oil flows filtered over the integral check valve into the reservoir.
As the feed pump is always fed with pressurized oil, the risk of cavitation is minimized and full performance is available even during the critical cold start phase.
An integral pressure relief valve (3) prevents too high back pressure and protects the shaft seals against damages. As this valve leads the oil directly into the tank there is no direct connection between the return line (A) and the connection of the feed pump (B) (no by-pass valve function).

Two emergency-suction valves (4) with 300 µm protection strainer (5) supply the feed pump in case of a short term of lack of oil.
During normal operation, a lack of oil may definitely not occur (refer to “Design“ section).

### Start-up / De-aeration

For units with emergency-suction valve and protection strainer the start up set E 328.1700 can be used to de-aerate the hydraulic system at first start-up or at start up after repair; hereby the immediate supply of the feed pump with hydraulic oil is guaranteed.
For all other types, deaerating instructions published by the manufacturers of hydraulic drives must be observed.

### Filter maintenance

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

### Filter elements

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

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

### Accessories

Electrical and / or optical clogging indicators are available.
Dimensions and technical data see catalog sheet 60.20.

### General

In machines with a hydrostatic drive and combined working hydraulic system, return-suction filters replace the suction or pressure filters previously required for the feed pump of the closed-loop hydrostatic drive circuit as well as the return filter for the open-loop working hydraulic circuit.
While each circuit operates independently with separate filters, the combination of the two circuits via the return-suction filter causes interaction between the circuits. If the design criteria described below are taken into account, you can take full advantage of the benefits provided by the return-suction filter concept, thus making sure that your system performs reliably even under extreme operating conditions.

### Required return flow in the system

In order to maintain a pre-charge pressure of approx. 0.5 bar / 7.3 psi at the intake of the feed pump, the return flow must exceed the suction flow under any operating conditions:

- Versions with hole (Ø 8 mm / 0.32 inch) in the pressurizing valve: at least 30 l/min / 7.9 gpm of excess flow

### Permitted feed pump flow rate

- at operating temperature
  ($\nu$ < 60 mm²/s / 280 SUS, rpm = max):
  feed pump flow rate < 0.5 x rated return flow according to column 2 of selection table
- at cold start-up
  ($\nu$ < 1000 mm²/s / 4635 SUS, rpm=1000 min$^{-1}$):
  feed pump flow rate < 0.2 x rated return flow according to column 2 of selection table

Please contact us if your system operates with higher flow rates than stated above.

### Flow velocity in the connecting lines

- Flow velocity in the return lines ≤ 4.5 m/s / 14.8 ft/s
- Flow velocity in the suction lines ≤ 1.5 m/s / 4.9 ft/s

### Permitted pressure in the suction lines

At cold start up ($\nu$ < 1000 mm²/s / 4635 SUS, rpm = 1000 min$^{-1}$): feed pump flow rate ≤ 0.2 x rated return flow. The pressure loss in the suction lines must not exceed 0.4 bar / 5.8 psi.

### Backpressures in system return lines

If drain oil from the hydrostatic drive is routed across the filter in addition to the flow of the open-loop circuit, the following has to be observed in order to protect the shaft seals:

- permitted leakage oil pressure for a given viscosity and speed (manufacturer's specifications!)
- pressure loss caused by the leakage oil pipes
- pressure loss caused by the oil cooler used
- backpressure of the filter for a given flow rate or kinematic viscosity (refer to pressure loss diagrams)

Depending on the application, the use of a cooler by-pass valve is recommended.
Generously sized drain oil pipes are also of advantage.

### Filter fineness grades

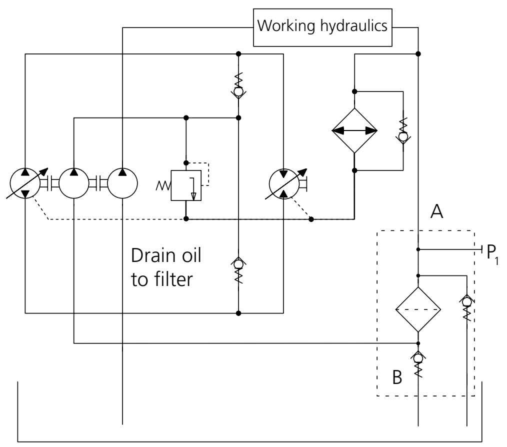
With the filter fineness grades available, the following oil cleanliness according to ISO 4406 can be achieved:

- 10EX2: 18/15/11 ... 14/11/7
- 16EX2: 20/17/12 ... 17/14/10

Even with the 16EX2 filter fineness grade, the requirements specified by manufacturers of hydrostatic drives are sometimes exceeded significantly. If components requiring a still better oil purity are used, we recommend the 10EX2 filter fineness grade.

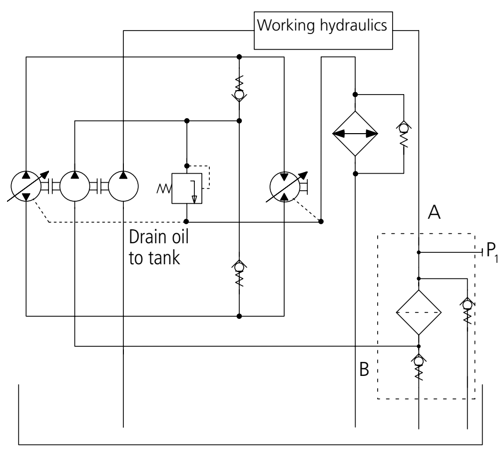
### Suggested circuit layouts

A) The leakage oil of the hydrostatic drive is routed across the filter.




The entire dirt produced in the hydrostatic drive by abrasion is filtered out immediately and is thus not taken in by the pump of the open-loop circuit.
This circuit layout is always recommended if the return flow only slightly exceeds the suction flow, i.e. if there is a risk that the 0.5 / 7.3 psi bar pre-charge pressure cannot be maintained.

B) The drain oil of the hydrostatic drive is not routed across the filter but is discharged directly into the tank




This circuit layout has the advantage that drain oil pressures are comparatively low.

## Characteristics

### Nominal flow rate

Up to 600 l/min / 158.5 gpm in return line
(see Selection Chart, column 2).
Up to 300 l/min / 79.3 gpm feed pump flow rate (see Layout).
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the return lines ≤ 4.5 m/s / 14.8 ft/s
- flow velocity in the suction lines ≤ 1.5 m/s / 4.9 ft/s

### Connection

Threaded ports according to

- ISO 228 or DIN 13
- SAE standard J514 and
- SAE flange (3000 psi).

Sizes see Selection Chart, column 6
(other port threads on request).
Please consider the connection size regarding max. flow volumes.

### Filter fineness

10 µm(c) ... 16 µm(c)
β-values according to ISO 16889
(see Selection Chart, column 4 and diagram Dx).

### Dirt-holding capacity

Values in g test dust 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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Operating pressure

Max. 10 bar / 145 psi

### Materials

| | |
|---|---|
| Screw-on cap: | Aluminum alloy |
| Filter head: | Aluminum alloy |
| Filter bowl: | Steel |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web |

### Fitting position

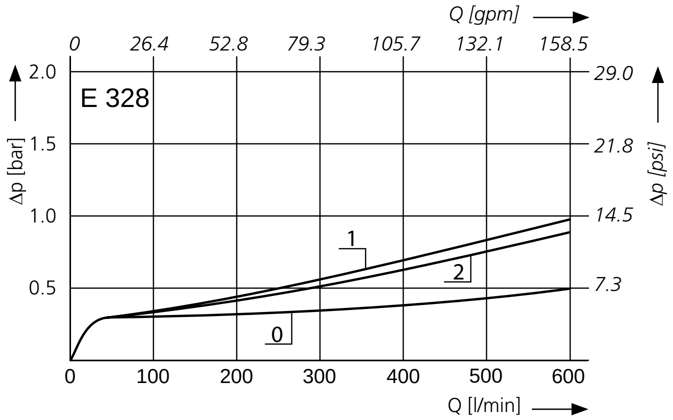
Up to 15° from the vertical, preferably vertical.

Even under unfavorable operating conditions (min. oil level, max. sloping) the oil outlet resp. emergency suction has to be below the oil level.

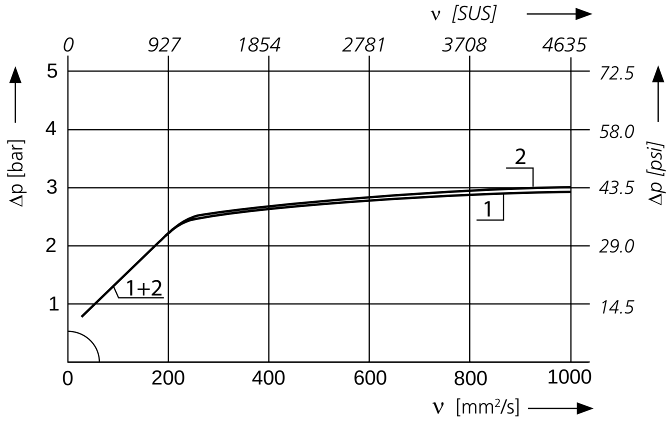
## Diagrams

**Δp-curves for complete filters in Selection Chart, column 3**
**(50 % of the nominal flow volume via connection B)**

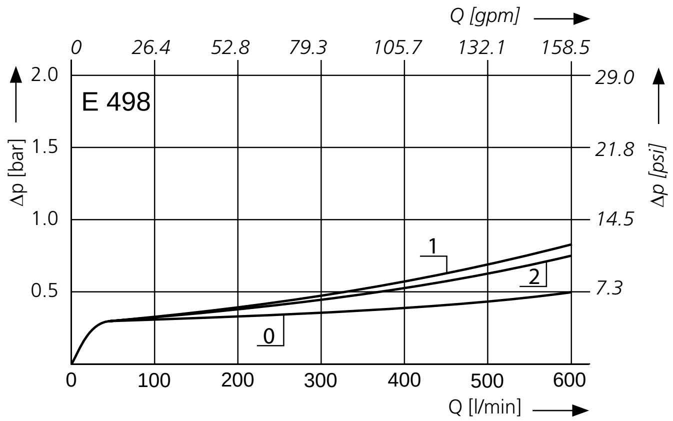
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



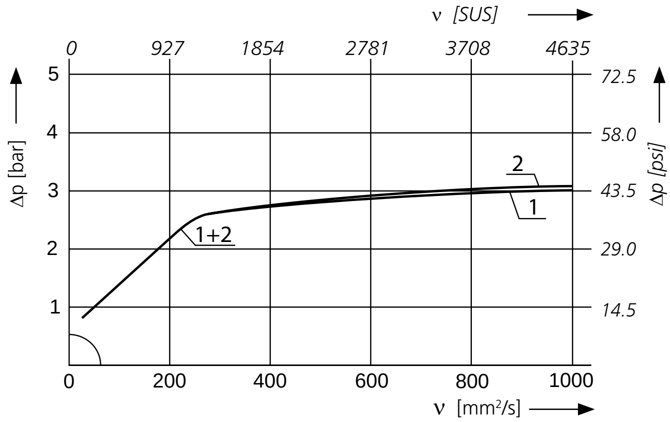

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

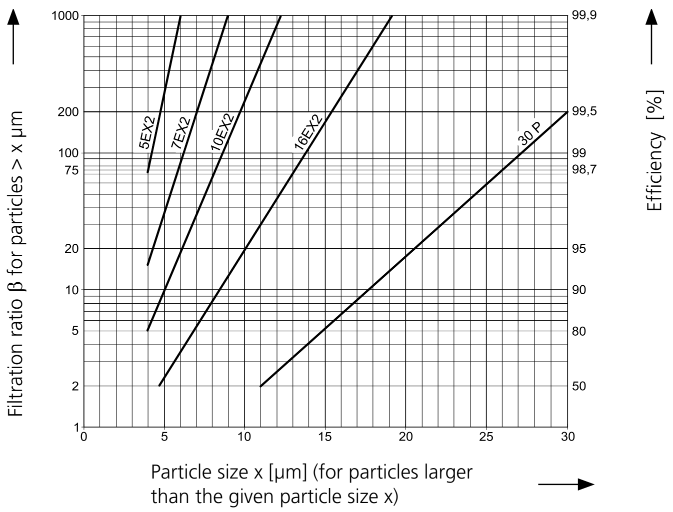



Pressure drop as a function of the **kinematic viscosity** at nominal flow




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

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX 2 and Paper elements:**

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

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

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

## Selection Chart

| Part No. | Nominal return flow rate[1] | Pressure drop see diagram **D**/curve no. | Filter fineness see Diagr. **DX** | Dirt-holding capacity | Connection A/B SAE (3000 psi) | Cracking pressure of CV[1] | Cracking pressure of PRV[2] | Symbol | Suction valve | Replacement filter element Part No. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | bar | | | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| E 328-156 | 360 | **D1**/1 | 10EX2 | 140 | G1½ / SAE2 + G1 | 0.5 | 2.5 | 1 | • | V5.1240-06 | 8.6 | 4+5 |
| E 328-158 | 470 | **D1**/2 | 16EX2 | 140 | G1½ / SAE2 + G1 | 0.5 | 2.5 | 1 | • | V5.1240-07 | 8.6 | 4+5 |
| E 498-156 | 480 | **D2**/1 | 10EX2 | 200 | G1½ / SAE2 + G1 | 0.5 | 2.5 | 1 | • | V5.1260-06 | 10.4 | 4+5 |
| E 498-158 | 600 | **D2**/2 | 16EX2 | 200 | G1½ / SAE2 + G1 | 0.5 | 2.5 | 1 | • | V5.1260-07 | 10.4 | 4+5 |

[1] The individual flow rates must be matched to the connections
[2] Cracking pressure of check valve
[3] Cracking pressure of pressure relief valve
[4] With hole Ø 8 mm / 0.32 inch in the check valve for oil drain when opening the filter cover
[5] With emergency-suction valves and protection strainers (mesh size 300 µm)

All filters are delivered with plugged clogging indicator connections M12 x 1.5.
As clogging indicators on the return side ($P_1$) either manometers or electrical pressure switches can be used.
The monitoring of the vacuum on the suction side ($P_2$) is additionally possible.

**Order example: The filter E 328-156 has to be supplied with 2 x 4 connections ($A_1$ ... $A_4$, $B_1$ ... $B_4$).**

**Order description:** **E 328-256**

**Connections:**

2 various options are available:

2 x 2 connections (A und $A_4$, B und $B_4$) - G1½ / SAE 2 + G1 (with locking screw) —— 1
2 x 4 connections ($A_1$ ... $A_4$, $B_1$ ... $B_4$) - 2 x G1¼ / SAE 1½, G¾ + G1 —— 2
(SAE 2 on request)

**For the appropriate clogging indicator see catalog sheet 60.20.**

**Remarks:**

- The start of the red area respectively the switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the pressure relief valve (see Selection Chart, column 9).
- Clogging indicators are optional and always delivered detached from the filter.
- The filters listed in this chart are standard filters. If modifications are required, we kindly ask for your request.
- For de-aeration a bleed screw (for connecting $P_1$) with Part No. SV 0112.15 is available.

## Selection Chart

| Part No. | Nominal return flow rate [1] | Pressure drop see diagram **D**/curve no. | Filter fineness see Diagr. **DX** | Dirt-holding capacity | Connection A/B SAE (3000 psi) | Cracking pressure of CV [2] | Cracking pressure of PRV [3] | Symbol | Suction valve | Replacement filter element Part No. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | gpm | | | g | SAE | psi | psi | | | | lbs | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| E 328-756 | 95.1 | **D1**/1 | 10EX2 | 140 | -24[4] / SAE2 + -16[5] | 7.3 | 36 | 1 | • | V5.1240-06 | 19.0 | 6+7 |
| E 328-758 | 124.2 | **D1**/2 | 16EX2 | 140 | -24[4] / SAE2 + -16[5] | 7.3 | 36 | 1 | • | V5.1240-07 | 19.0 | 6+7 |
| E 498-756 | 126.8 | **D2**/1 | 10EX2 | 200 | -24[4] / SAE2 + -16[5] | 7.3 | 36 | 1 | • | V5.1260-06 | 22.9 | 6+7 |
| E 498-758 | 158.5 | **D2**/2 | 16EX2 | 200 | -24[4] / SAE2 + -16[5] | 7.3 | 36 | 1 | • | V5.1260-07 | 22.9 | 6+7 |

[1] The individual flow rates must be matched to the connections
[2] Cracking pressure of check valve
[3] Cracking pressure of pressure relief valve
[4] Corresponds to $1\,^{7}/_{18}$-12 UN
[5] Corresponds to $1\,^{5}/_{16}$-12 UN
[6] With hole Ø 0.32 inch / 8 mm in the check valve for oil drain when opening the filter cover
[7] With emergency-suction valves and protection strainers (mesh size 300 µm)

All filters are delivered with plugged clogging indicator connections M12 x 1.5 mm.
As clogging indicators on the return side ($P_1$) either manometers or electrical pressure switches can be used.
The monitoring of the vacuum on the suction side ($P_2$) is additionally possible.

**Order example: The filter E 328-756 has to be supplied with 2 x 4 connections ($A_1$ ... $A_4$, $B_1$ ... $B_4$).**

**Order description:** **E 328-856**

**Connections:**

2 various options are available:

| | | | | |
|---|---|---|---|---|
| 2 x 2 connections | (A und $A_4$, B und $B_4$) | - | -24 SAE / SAE 2 + -16 SAE (with locking screw) | 7 |
| 2 x 4 connections | ($A_1$ ... $A_4$, $B_1$ ... $B_4$) | - | 2 x -20 SAE / SAE 1½, -12 SAE + -16 SAE (SAE 2 on request) | 8 |

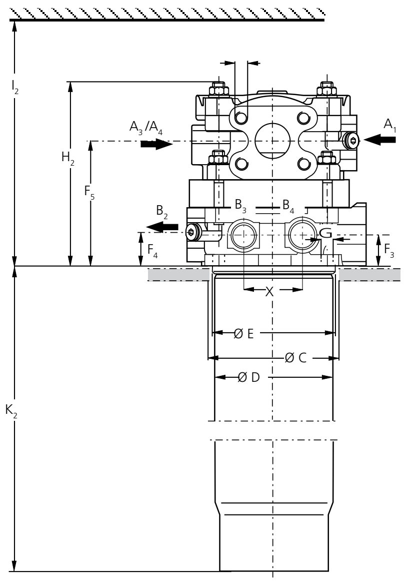
**For the appropriate clogging indicator see catalog sheet 60.20.**

**Remarks:**

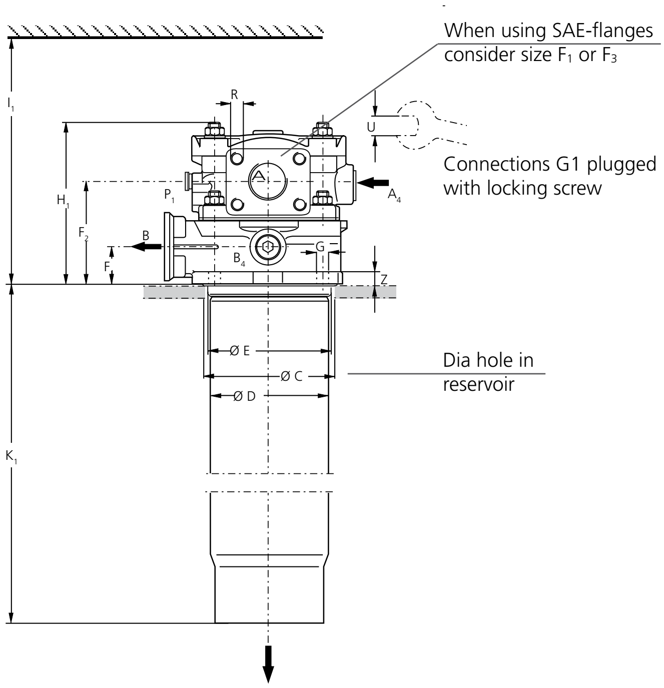
- The start of the red area respectively the switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the pressure relief valve (see Selection Chart, column 9).
- Clogging indicators are optional and always delivered detached from the filter.
- The filters listed in this chart are standard filters. If modifications are required, we kindly ask for your request.
- For de-aeration a bleed screw (for connecting $P_1$) with Part No. SV 0112.15 is available.

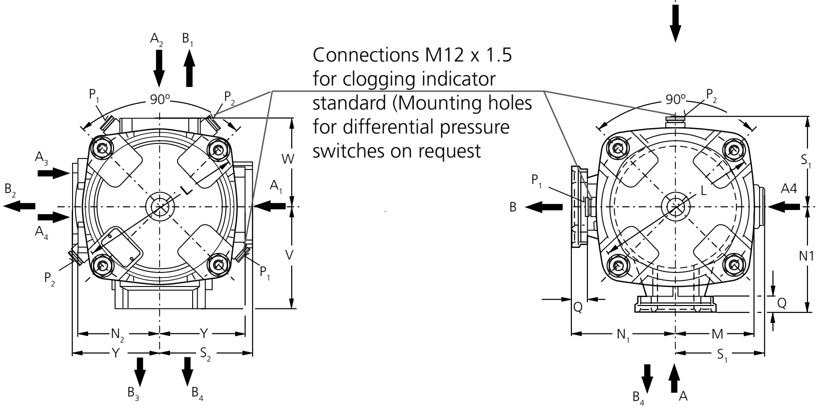
## Dimensions

Version with 2 x 4 connections

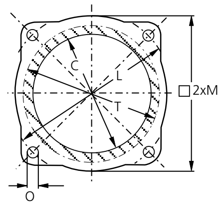


Version with 2 x 2 connections




Port sizes and mounting surface (O-ring area of support hatched)



Tank surface sealing with O-ring N007.1375 (included in basic equipment)

## Measurements in mm

| Type | A | B | C | D | E | $F_1$* | $F_2$* | $F_3$* | $F_4$ | $F_5$ | G | $H_1$ | $H_2$ | $I_1$ | $I_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 328 | s. Selection Chart | s. Selection Chart | 140.5 | 138 | 139.9 | 36 | 104.5 | 32 | 35 | 126 | 11.5 | 165 | 185 | 540 | 565 |
| E 498 | s. Selection Chart | s. Selection Chart | 140.5 | 138 | 139.9 | 36 | 104.5 | 32 | 35 | 126 | 11.5 | 165 | 185 | 750 | 780 |

| Type | $K_1$ | $K_2$ | L | M | $N_1$ | $N_2$ | O | Q | R | $S_1$ | $S_2$ | T | U | V | W | X | Y | Z | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 328 | 425 | 403 | 185 | 86.5 | 116 | 89 | M10 | 18 | M12 | 99 | 109 | 160 | AF 17 | 106 | 102 | 70 | 98 | 12 | |
| E 498 | 630 | 605 | 185 | 86.5 | 116 | 89 | M10 | 18 | M12 | 99 | 109 | 160 | AF 17 | 106 | 102 | 70 | 98 | 12 | |

## Measurements in inch

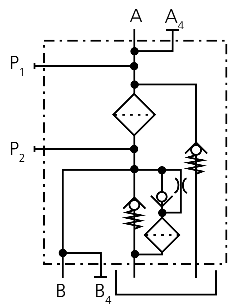
| Type | A | B | C | D | E | $F_1$* | $F_2$* | $F_3$* | $F_4$ | $F_5$ | G | $H_1$ | $H_2$ | $I_1$ | $I_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 328 | s. Selection Chart | s. Selection Chart | 5.53 | 5.43 | 5.51 | 1.42 | 4.11 | 1.26 | 1.38 | 4.96 | 0.45 | 6.50 | 7.28 | 21.26 | 22.24 |
| E 498 | s. Selection Chart | s. Selection Chart | 5.53 | 5.43 | 5.51 | 1.42 | 4.11 | 1.26 | 1.38 | 4.96 | 0.45 | 6.50 | 7.28 | 29.53 | 30.71 |

| Type | $K_1$ | $K_2$ | L | M | $N_1$ | $N_2$ | O | Q | R | $S_1$ | $S_2$ | T | U mm | V | W | X | Y | Z | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 328 | 16.73 | 15.87 | 7.28 | 3.41 | 4.57 | 3.50 | M10 | 0.71 | M12 | 3.90 | 4.29 | 6.30 | AF17 | 4.17 | 4.02 | 2.76 | 3.86 | 0.47 | |
| E 498 | 24.80 | 23.82 | 7.28 | 3.41 | 4.57 | 3.50 | M10 | 0.71 | M12 | 3.90 | 4.29 | 6.30 | AF17 | 4.17 | 4.02 | 2.76 | 3.86 | 0.47 | |

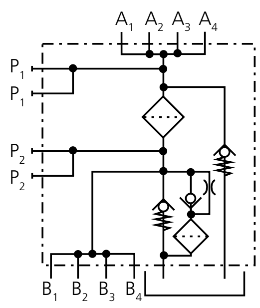
*For use of SAE-flanges see this measurement

## Symbols

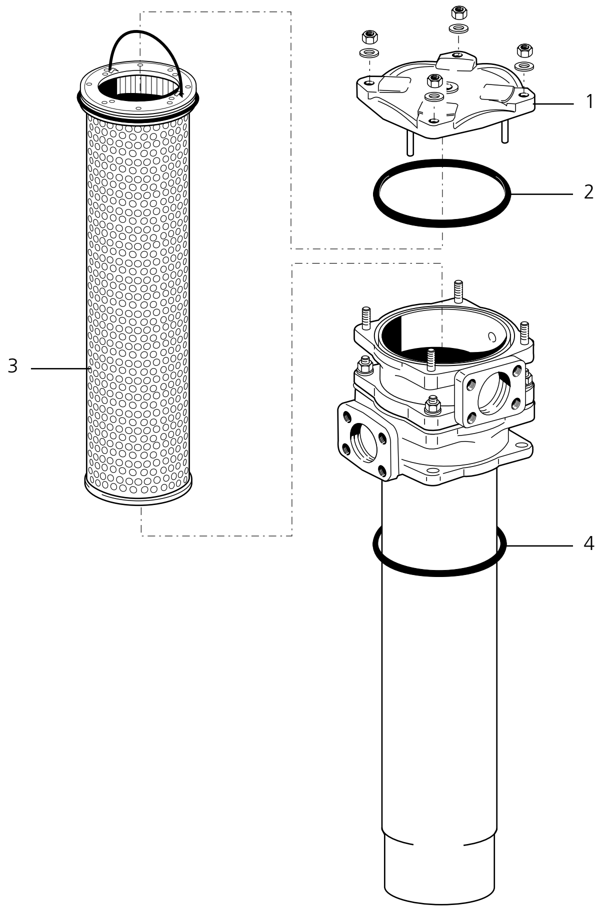
1




2




## Spare Parts




| Pos. | Designation | Part. No. |
|---|---|---|
| 1 | Cover | E 443.1225 |
| 2 | O-ring<br>151.76 x 5.33 mm<br>5.98 x 0.21 inch | N007.1525 |
| 3 | Replacement filter element | see Chart / col. 11 |
| 4 | O-ring<br>136.5 x 5.34 mm<br>5.37 x 0.21 inch | N007.1375 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

Return-Suction Filters

# E 598 · E 998

Tank top mounting · Connection up to -24 SAE and SAE 2½ · Nominal flow rate up to 850 l/min / 224.6 gpm

M

Return Suction Filter E 998

## Description

### Application

For operation in units with hydrostatic drives, when the return flow is under all operating conditions higher than the oil flow of the boost pump.

### Performance features

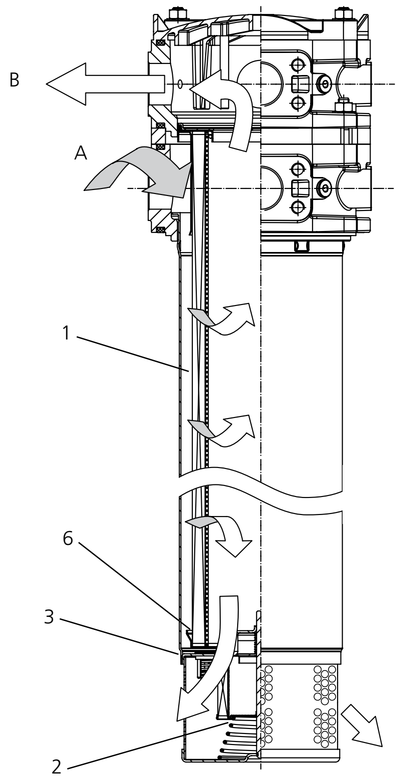
*Protection against wear:*
By means of filter elements that even in full-flow filtration meet the highest demands regarding cleanliness classes.

*Suction filter function:*
Because of the 100%-filtration of the suction flow, no dirt can get into the boost pump.

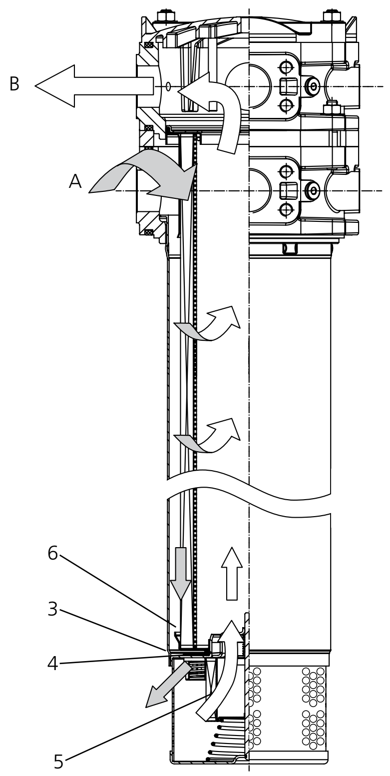
*Return filter function:*
By means of full-flow filtration in the system return, the pumps above all are protected from dirt particles remaining in the system after assembly, repairs, or which are generated by wear or enter the system from outside.

## Description

### Function (schematic):




### Emergency-suction (schematic):




### Functional characteristics

The hydraulic oil returning from the circuit (A) passes the filter element (1), is pressurized by a 0.5 bar / 7.3 psi check valve (2) and supplied to the boost pump (B). The surplus oil flows filtered over the integral check valve into the reservoir.
As the boost pump is always fed with pressurized oil, the risk of cavitation is minimized and full performance is available even during the critical cold start phase.
Six integral pressure relief valves (3) prevent too high back pressure and protects the shaft seals against damages. As this valves lead the oil directly into the tank there is no direct connection between the return line (A) and the connection of the boost pump (B) (no by-pass valve function).

The emergency-suction valve (4) with 200 μm protection strainer (5) supplies the boost pump in case of a short term of lack of oil. During normal operation, a lack of oil may definitely not occur (refer to "Design" section).

### Start-up / De-aeration

At first start-up or at start up after repair, deaerating instructions published by the manufacturers of hydraulic drives must be observed.

### Filter maintenance

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

### Filter elements

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

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

The dirt collection bowl (6) prevents dirt particles accumulated at the filter element from entering into the tank during maintenance.

### Accessories

Electrical and / or optical clogging indicators are available.
Dimensions and technical data see catalog sheet 60.20.

### General

In machines with a hydrostatic drive and combined working hydraulic system, return-suction filters replace the suction or pressure filters previously required for the feed pump of the closed-loop hydrostatic drive circuit as well as the return filter for the open-loop working hydraulic circuit.
While each circuit operates independently with separate filters, the combination of the two circuits via the return-suction filter causes interaction between the circuits. If the design criteria described below are taken into account, you can take full advantage of the benefits provided by the return-suction filter concept, thus making sure that your system performs reliably even under extreme operating conditions.

### Required return flow in the system

- In order to maintain a pre-charge pressure of approx. 0.5 bar / 7.3 psi at the intake of the feed pump, the return flow must exceed the suction flow under any operating conditions:
- Versions with hole (Ø 8 mm / 0.32 inch) in the pressurizing valve: at least 30 l/min / 7.9 gpm of excess flow

### Permitted feed pump flow rate

- at operating temperature
  ($\nu$ < 60 mm²/s / 280 SUS, rpm = max):
  feed pump flow rate < 0.5 x rated return flow according to column 2 of selection table
- at cold start-up
  ($\nu$ < 1000 mm²/s / 4635 SUS, rpm = 1.000 min$^{-1}$):
  feed pump flow rate < 0.2 x rated return flow according to column 2 of selection table.

Please contact us if your system operates with higher flow rates than stated above.

### Flow velocity in the connecting lines

- Flow velocity in the return lines ≤ 4.5 m/s / 14.8 ft/s
- Flow velocity in the suction lines ≤ 1.5 m/s / 4.9 ft/s

### Permitted pressure in the suction lines

At cold start up ($\nu$ < 1000 mm²/s / 4635 SUS, rpm = 1.000 min$^{-1}$): feed pump flow rate ≤ 0.2 x rated return flow. The pressure loss in the suction lines must not exceed 0.4 bar / 5.8 psi.

### Backpressures in system return lines

If drain oil from the hydrostatic drive is routed across the filter in addition to the flow of the open-loop circuit, the following has to be observed in order to protect the shaft seals:

- permitted leakage oil pressure for a given viscosity and speed (manufacturer's specifications!)
- pressure loss caused by the leakage oil pipes
- pressure loss caused by the oil cooler used
- backpressure of the filter for a given flow rate or kinematic viscosity (refer to pressure loss diagrams)

Depending on the application, the use of a cooler by-pass valve is recommended.
Generously sized drain oil pipes are also of advantage.

### Filter fineness grades

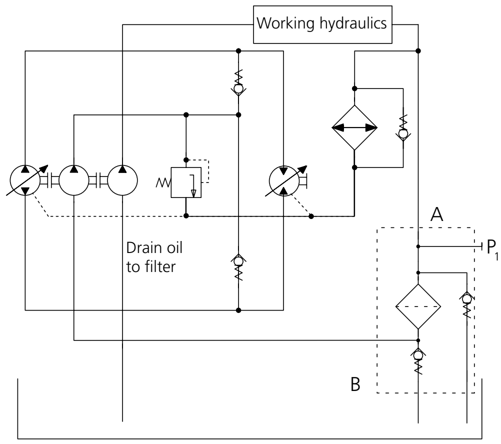
With the filter fineness grades available, the following oil cleanliness according to ISO 4406 can be achieved:

- 10EX2: 18/15/11 ... 14/11/7
- 16EX2: 20/17/12 ... 17/14/10

Even with the 16EX2 filter fineness grade, the requirements specified by manufacturers of hydrostatic drives are sometimes exceeded significantly. If components requiring a still better oil purity are used, we recommend the 10EX2 filter fineness grade.

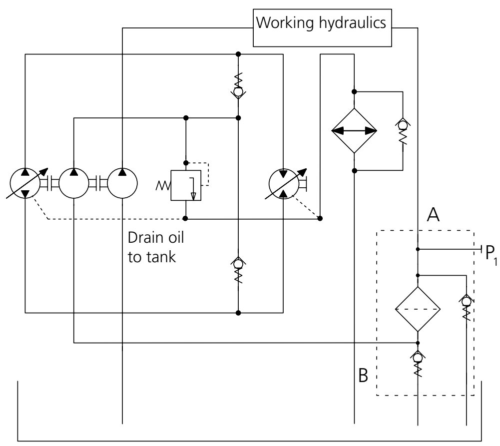
### Suggested circuit layouts

A) The leakage oil of the hydrostatic drive is routed across the filter.




The entire dirt produced in the hydrostatic drive by abrasion is filtered out immediately and is thus not taken in by the pump of the open-loop circuit.
This circuit layout is always recommended if the return flow only slightly exceeds the suction flow, i.e. if there is a risk that the 0.5 bar / 7.3 psi pre-charge pressure cannot be maintained.

B) The drain oil of the hydrostatic drive is not routed across the filter but is discharged directly into the tank.




This circuit layout has the advantage that drain oil pressures are comparatively low.

## Characteristics

### Nominal flow rate

Up to 850 l/min / 224.6 gpm in return line
(see Selection Chart, column 2).
Up to 425 l/min / 112.3 gpm feed pump flow rate (see Layout)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the return lines ≤ 4.5 m/s / 14.8 ft/s
- flow velocity in the suction lines ≤ 1.5 m/s / 4.9 ft/s

### Connection

Threaded ports according to

- ISO 228 or DIN 13
- SAE standard J514
- SAE flange (3.000 psi)

Sizes see Selection Chart, column 6
(other port threads on request).
Please consider the connection size regarding max. flow volumes.

### Filter fineness

10 µm(c) ... 16 µm(c)
β-values according to ISO 16889
(see Selection Chart, column 4 and diagram Dx).

### Dirt-holding capacity

Values in g test dust 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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s
- as starting viscosity: $\nu_{max} = 1200$ mm²/s
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Operating pressure

Max. 10 bar / 145 psi

### Materials

| | |
|---|---|
| Screw-on cap: | Aluminum alloy |
| Filter head: | Aluminum alloy |
| Filter bowl: | Steel |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 – inorganic multi-layer microfiber web |

### Fitting position

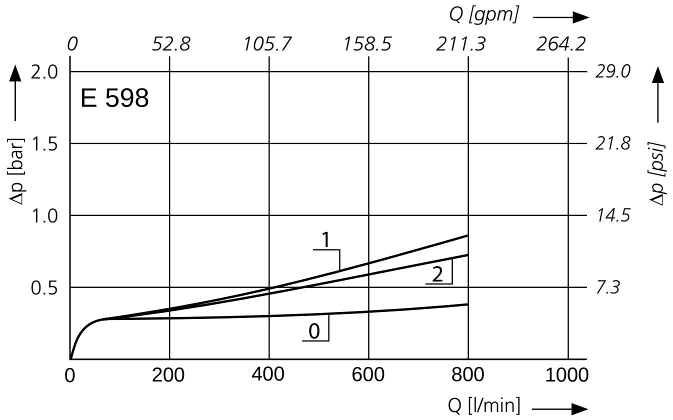
Up to 15° from the vertical, preferably vertical.

Even under unfavorable operating conditions (min. oil level, max. sloping) the oil outlet resp. emergency suction has to be below the oil level.

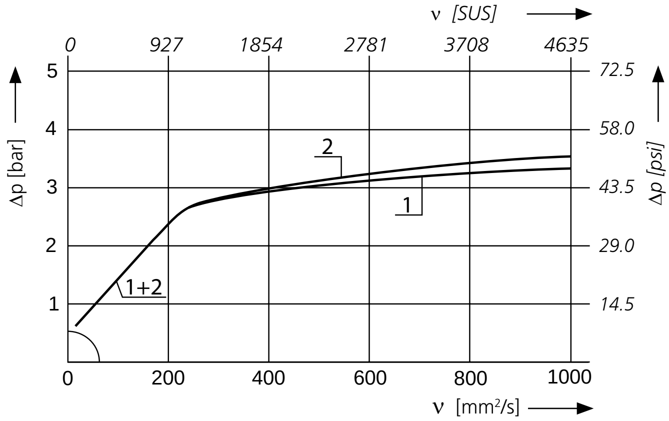
## Diagrams

### Δp-curves for complete filters in Selection Chart, column 3 (50 % of the nominal flow volume via connection B)

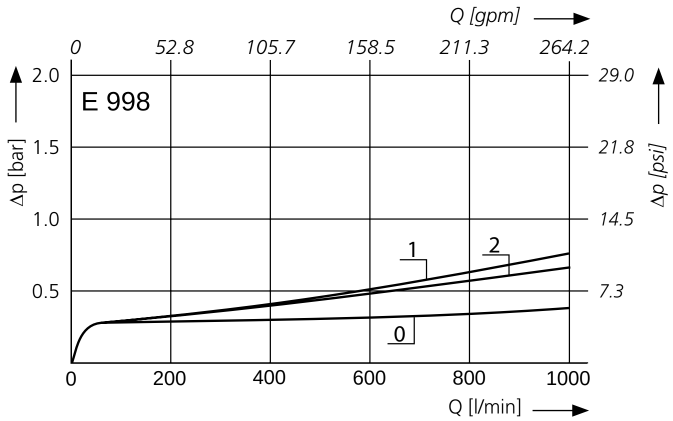
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



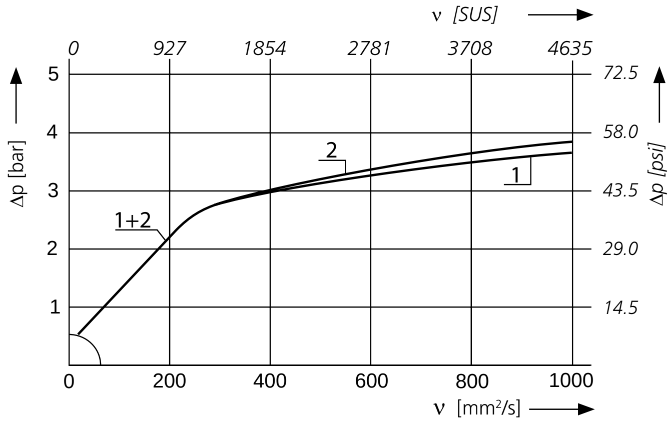

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

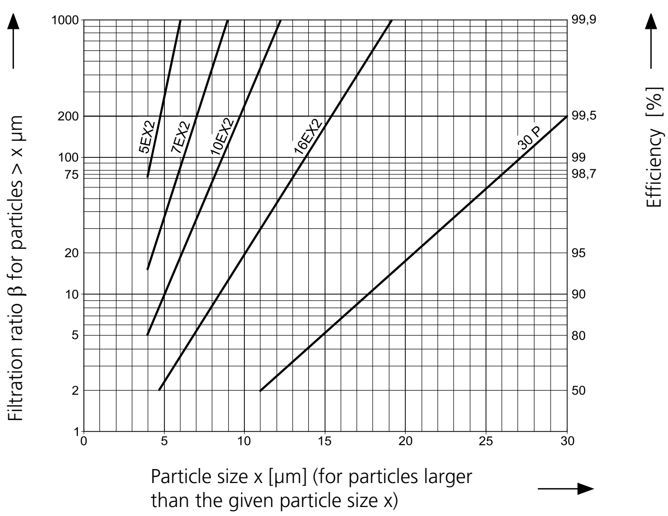



Pressure drop as a function of the **kinematic viscosity** at nominal flow




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

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX 2 and Paper elements:**

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

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

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

## Selection Chart

| Part No. | Nominal return flow rate[1] | Pressure drop see diagram **D**/curve no. | Filter fineness see Diagr. **DX** | Dirt-holding capacity | Connections SAE (3000 psi) | Cracking pressure of CV[2] | Cracking pressure of PRV[3] | Symbol | Suction valve | Replacement filter element Part No. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | bar | | | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| E 598-256 | 470 | **D1**/1 | 10EX2 | 170 | 2 + 5 connections | 0.5 | 2.5 | 1 | • | V7.1440-06 | 11.5 | 4+5 |
| E 598-257 | 630 | **D1**/2 | 16EX2 | 180 | 2 + 5 connections | 0.5 | 2.5 | 1 | • | V7.1440-07 | 11.5 | 4+5 |
| E 998-256 | 680 | **D2**/1 | 10EX2 | 270 | 2 + 5 connections | 0.5 | 2.5 | 1 | • | V7.1460-06 | 13.8 | 4+5 |
| E 998-257 | 850 | **D2**/2 | 16EX2 | 280 | 2 + 5 connections | 0.5 | 2.5 | 1 | • | V7.1460-07 | 13.8 | 4+5 |

[1] The individual flow rates must be matched to the connections
[2] Cracking pressure of check valve
[3] Cracking pressure of pressure relief valve
[4] With hole Ø 8 mm / 0.32 inch in the check valve for oil drain when opening the filter cover
[5] With emergency-suction valve and protection strainer (mesh size 200 µm)
[6] Connection G1 ($A_2$) with locking screw

All filters are delivered with plugged clogging indicator connections M12 x 1.5.
As clogging indicators on the return side ($P_1$) either manometers or electrical pressure switches can be used.
The monitoring of the vacuum on the suction side ($P_2$) is additionally possible.

**Order example: The filter E 598-256 has to be supplied with 5 + 5 connections ($A_1$ ... $A_5$, $B_1$ ... $B_5$ ).**

**Order description:** **E 598-556**

**Connections:**

2 various options are available:

| Option | $A_1$ | $A_2$ | $A_3$ | $A_4$ | $A_5$ | $B_1$ | $B_2$ | $B_3$ | $B_4$ | $B_5$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 + 5 connections | SAE 2½ | G1[6] | - | - | - | G1¼ / SAE 1½ | | G1 | G¾ | G1½ / SAE 2 | 2 |
| 5 + 5 connections | G1¼ / SAE 1½ | | G1 | G¾ | G1½ / SAE 2 | G1¼ / SAE 1½ | | G1 | G¾ | G1½ / SAE 2 | 5 |

**For the appropriate clogging indicator see catalog sheet 60.20.**

**Remarks:**

- The start of the red area of the manometer respectively the switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the pressure relief valve (see Selection Chart, column 8).
- Clogging indicators are optional and always delivered detached from the filter.
- The filters listed in this chart are standard filters. If modifications are required, we kindly ask for your request.
- For de-aeration a bleed valve (for connection $P_1$) with Part No. SV 0112.15 is available.

## Selection Chart

| Part No. | Nominal return flow rate [1] | Pressure drop see diagram **D**/curve no. | Filter fineness see Diagr. **DX** | Dirt-holding capacity | Connections SAE (3000 psi) | Cracking pressure of CV [2] | Cracking pressure of PRV [3] | Symbol | Suction valve | Replacement filter element Part No. | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | gpm | | | g | | psi | psi | | | | lbs | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| E 598-756 | 124.2 | **D1**/1 | 10EX2 | 170 | 2 + 5 connections | 7.3 | 36 | 1 | • | V7.1440-06 | 25.4 | 4+5 |
| E 598-757 | 166.4 | **D1**/2 | 16EX2 | 180 | 2 + 5 connections | 7.3 | 36 | 1 | • | V7.1440-07 | 25.4 | 4+5 |
| E 998-756 | 179.6 | **D2**/1 | 10EX2 | 270 | 2 + 5 connections | 7.3 | 36 | 1 | • | V7.1460-06 | 30.4 | 4+5 |
| E 998-757 | 224.6 | **D2**/2 | 16EX2 | 280 | 2 + 5 connections | 7.3 | 36 | 1 | • | V7.1460-07 | 30.4 | 4+5 |

[1] The individual flow rates must be matched to the connections
[2] Cracking pressure of check valve
[3] Cracking pressure of pressure relief valve
[4] With hole Ø 0.32 inch / 8 mm in the check valve for oil drain when opening the filter cover
[5] With emergency-suction valve and protection strainer (mesh size 200 µm)
[6] Connection -16 SAE ($A_2$) with locking screw
[7] Corresponds to 1⁵/₈ -12 UN-2B
[8] Corresponds to 1¹/₁₆ -12 UN-2B
[9] Corresponds to 1⁷/₈ -12 UN-2B

All filters are delivered with plugged clogging indicator connections M12 x 1.5 mm.
As clogging indicators on the return side ($P_1$) either manometers or electrical pressure switches can be used.
The monitoring of the vacuum on the suction side ($P_2$) is additionally possible.

**Order example: The filter E 598-756 has to be supplied with 5 + 5 connections ($A_1$ ... $A_5$, $B_1$ ... $B_5$ ).**

**Order description:** **E 598-856**

**Connections:**

2 various options are available:

| Option | $A_1$ | $A_2$ | $A_3$ | $A_4$ | $A_5$ | $B_1$ | $B_2$ | $B_3$ | $B_4$ | $B_5$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 + 5 connections | SAE 2½ | -16SAE[6] | - | - | - | -20SAE[7] / SAE 1½ | | -16 SAE[6] | -12 SAE[8] | -24 SAE[9]/SAE 2 | 7 |
| 5 + 5 connections | - 20SAE[7] / SAE 1½ | | -16 SAE[6] | -12 SAE[8] | -24 SAE[9] / SAE 2 | -20SAE[7] / SAE 1½ | | -16 SAE[6] | -12 SAE[8] | -24 SAE[9]/SAE 2 | 8 |

**For the appropriate clogging indicator see catalog sheet 60.20.**

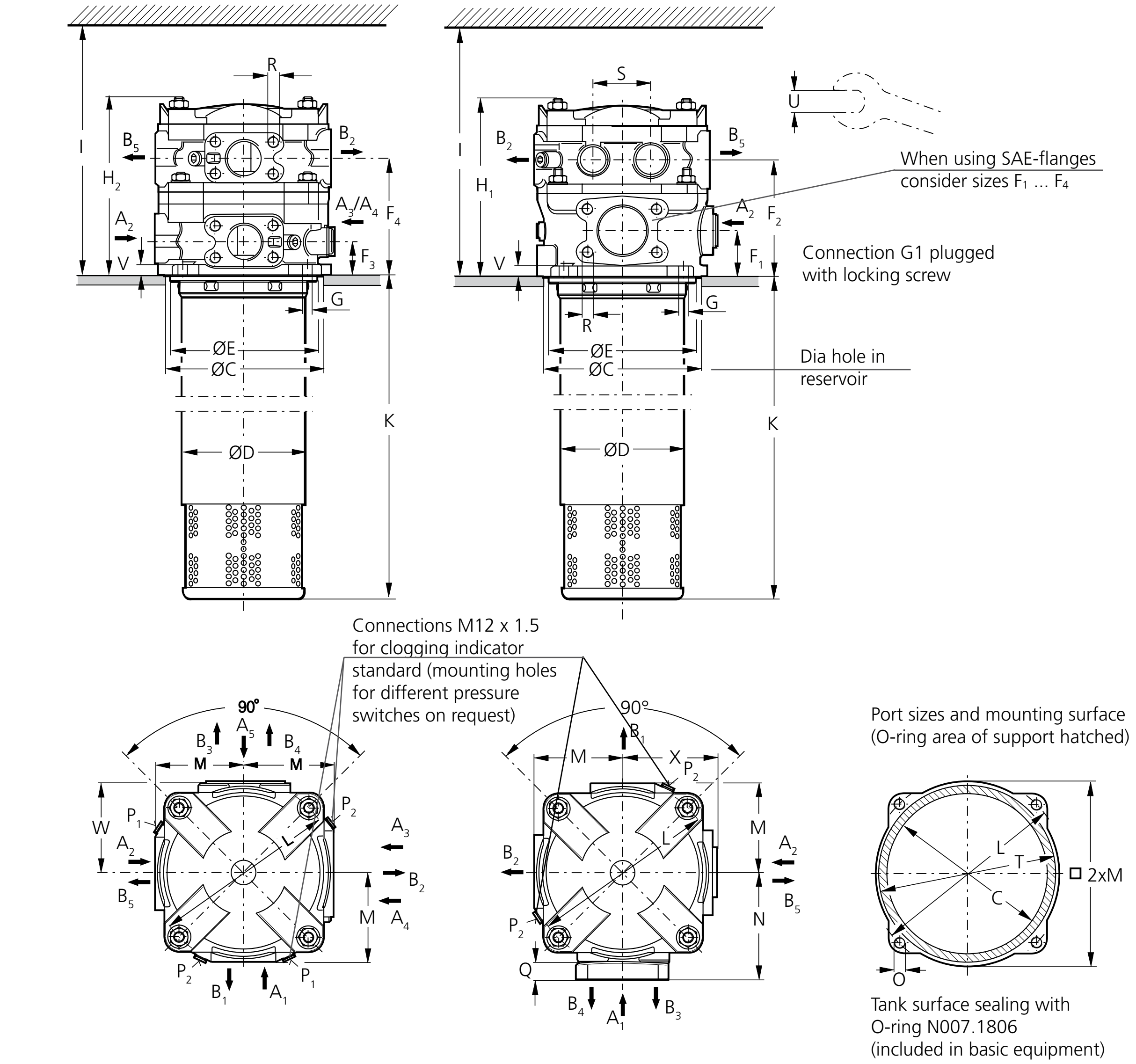
**Remarks:**

- The start of the red area of the manometer respectively the switching pressure of the electrical pressure switch has always to be lower than the cracking pressure of the pressure relief valve (see Selection Chart, column 8).
- Clogging indicators are optional and always delivered detached from the filter.
- The filters listed in this chart are standard filters. If modifications are required, we kindly ask for your request.
- For de-aeration a bleed valve (for connection $P_1$) with Part No. SV 0112.15 is available.

## Dimensions

Version with 5 + 5 connections

Version with 2 + 5 connections




## Measurements in mm

| Type | A | B | C | D | E | $F_1$* | $F_2$* | $F_3$* | $F_4$* | G | $H_1$ | $H_2$ | I |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 598 | s. Selection | s. Selection | 180 | 152 | 179 | 55 | 141.5 | 41.5 | 139.5 | 11.5 | 216 | 214 | 660 |
| E 998 | Chart | Chart | 180 | 152 | 179 | 55 | 141.5 | 41.5 | 139.5 | 11.5 | 216 | 214 | 860 |

| Type | K | L | M | N | O | Q | R | S | T | U | V | W | X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 598 | 406 | 220 | 106 | 125 | M10 | 20 | M12 | 70 | 200 | AF 17 | 12 | 104 | 115 |
| E 998 | 612 | 220 | 106 | 125 | M10 | 20 | M12 | 70 | 200 | AF 17 | 12 | 104 | 115 |

## Measurements in inch

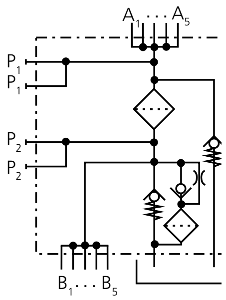
| Type | A | B | C | D | E | $F_1$* | $F_2$* | $F_3$* | $F_4$* | G | $H_1$ | $H_2$ | I |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 598 | s. Selection | s. Selection | 7.09 | 5.98 | 7.05 | 2.17 | 5.57 | 1.63 | 5.49 | 0.45 | 8.50 | 8.43 | 25.98 |
| E 998 | Chart | Chart | 7.09 | 5.98 | 7.05 | 2.17 | 5.57 | 1.63 | 5.49 | 0.45 | 8.50 | 8.43 | 33.86 |

| Type | K | L | M | N | O | Q | R | S | T | U mm | V | W | X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 598 | 15.98 | 8.66 | 4.17 | 4.92 | M10 | 0.79 | M12 | 2.76 | 7.87 | AF 17 | 0.47 | 4.09 | 4.53 |
| E 998 | 24.09 | 8.66 | 4.17 | 4.92 | M10 | 0.79 | M12 | 2.76 | 7.87 | AF 17 | 0.47 | 4.09 | 4.53 |

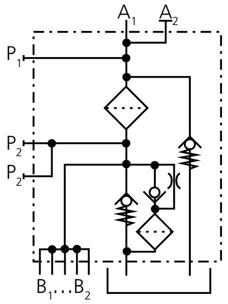
* For use of SAE-flanges see this measurement

## Symbols

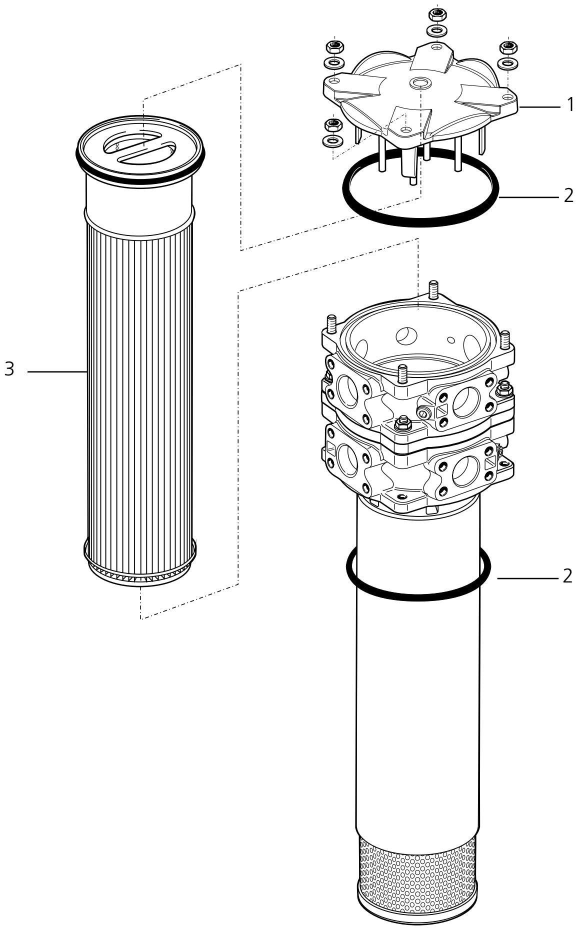
1




2




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Cover assy | E 998.1200 |
| 2 | O-ring<br>180 x 6 mm<br>7.09 x 0.24 inch | N007.1806 |
| 3 | Replacement filter element | see Chart. / col. 11 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

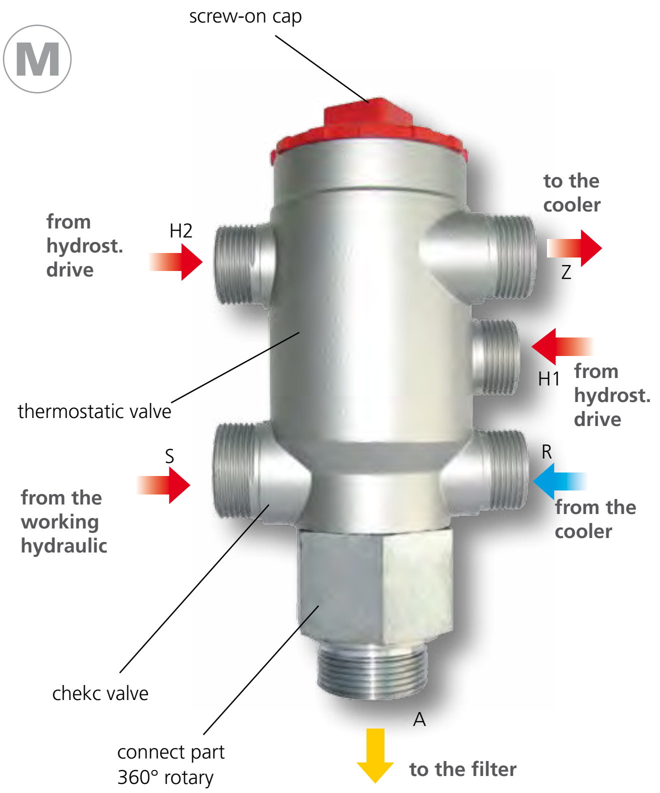
Illustrations may sometimes differ from the original. ARGO-HYTOS is not responsible for any unintentional mistake in this specification sheet.

## Multifunctional Unit

# MFE 200

Filter mounting · Connection up to G1¼ · Nominal flow rate up to 200 l/min / 52.8 gpm

M




## Description

### Application

In particular for mobile machines with hydrostatic drives (closed circuit) and working hydraulic (open circuit), equipped with an oil cooler.

The multifunction unit can be used as collector with integrated check valve and thermostatic valve in combination with ARGO-HYTOS return-suction filters of the series E 084 / E 198 / E 498 / E 998.

Also separate drain oil-/cooler-circuits can be realized by the help of suitable return filters.

### Function

Drain oil (H1, H2) from the hydrostatic drive (pump and drive motor) is routed either through a thermostatic cooler-by-pass directly to the filter (A), or at higher operating temperatures, through the cooler (Z → R), then the filter, and then into the tank.

Bypassing the cooler at cold start-up maintains the back pressure of the drain lines within the permitted range, and allowing the operating temperature of the hydraulic system to be reached more quickly.

The return oil from the working hydraulic (S) flows, optionally pressurized by a check valve, through the filter (A) and into the tank.

## Characteristics

### Nominal flow rate
Up to 200 l/min / 52.8 gpm (total supply).
Splitting: H1+H2 = 80 l/min / 21.1 gpm,
S = 120 l/min / 31.7 gpm.

### Connection
All connections for drain oil, return oil, cooler and filter are equipped with external threaded ports (direct installation of hose- / pipelines with union nut).

| | |
|---|---|
| H1, H2, R, Z | M30 x 2 (DKOL* Ø 22) |
| S | M36 x 2 (DKOL* Ø 28) |
| A | G1¼ or G1 (see dimensions) |

* acc. to ISO 8433-1 (24° cutting ring)

### Hydraulic fluids
Mineral oil and biodegradable fluids (HEES or HETG, see info-sheet 00.20).

### Temperature range
-20 °C … +100 °C (short intervals -30 °C … +120 °C)
-4 °F … +212 °F (short intervals -22 °F … +248 °F)

### Operating pressure
Max. 10 bar / 145 psi

### Thermostatic valve
Operating range +50 °C … +70 °C / +122 °F … +158 °F

### Check valve
Opening pressure 1 bar / 14.5 psi

### Materials

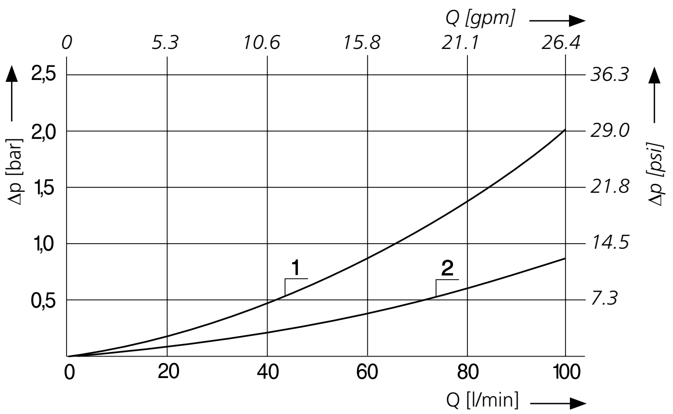
| | |
|---|---|
| Screw-on cap: | Polyester, GF-reinforced |
| Housing: | Aluminum alloy |
| Connection: | Steel |
| Seals: | NBR (FPM on request) |
| Thermostatic valve: | Polyamide, GF-reinforced |

### Mounting position
As desired, directly screwed into the filter.

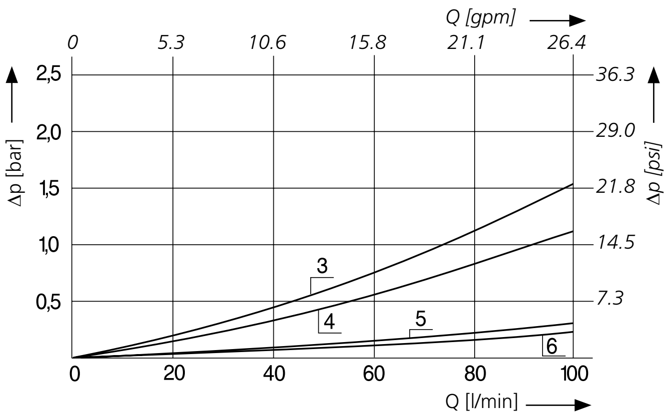
## Diagrams

**Δp-curves for complete multifunctional units MFE 200-01 (1, 2, 4 and 6) and MFE 200-02 (1, 2, 3 and 5)**
**Pressure measurement at connection H2** (supply through H1 und H2, S closed, Z hot wired after R)

**D1** Pressure drop as a function of the **volume flow**
at ν= 40 mm²/s / 186 SUS (1) and
ν = 20 mm²/s / 93 SUS (2)
Thermostatic valve open




Pressure drop as a function of the **volume flow**
at ν = 1000 mm²/s / 4635 SUS (3 and 4)
and ν = 200 mm²/s / 927 SUS (5 and 6)
Thermostatic valve closed



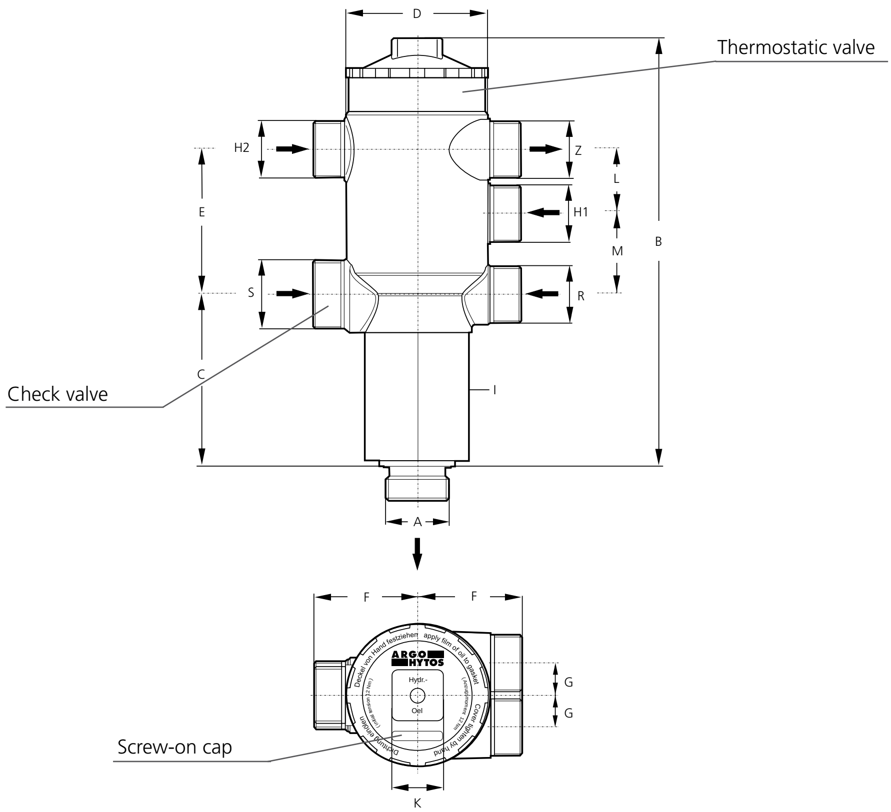

### Note
The pressure drop produced by the pipelines, cooler and filter must be added to those of the multifunctional unit.

### Order no.
*MFE 200-01*
with G1¼ (connection A)

*MFE 200-02*
with G1 (connection A)

### Note
Other types e.g. with alternative temperature range or without check valve, on request.

## Dimensions




## Measurements in mm

| Type | A | B | C | D | E | F | G | $H_1$ | $H_2$ | I | K | L | M | R | S | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MFE 200-01 | G1¼ | 200 | 62 | 75 | 77 | 56 | 17 | M30 x 2 | M30 x 2 | AF 55 | AF 27 | 34 | 43 | M30 x 2 | M36 x 2 | M30 x 2 |
| MFE 200-02 | G1 | 230 | 92 | 75 | 77 | 56 | 17 | M30 x 2 | M30 x 2 | AF 55 | AF 27 | 34 | 43 | M30 x 2 | M36 x 2 | M30 x 2 |

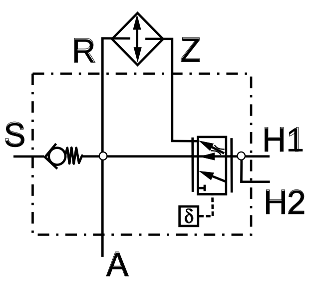
## Measurements in inch

| Type | A | B | C | D | E | F | G | $H_1$ | $H_2$ | I mm | K mm | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MFE 200-01 | G1¼ | 7.87 | 2.44 | 2.95 | 3.03 | 2.20 | 0.67 | M30 x 2 | M30 x 2 | AF 55 | AF 27 | 1.34 | 1.69 |
| MFE 200-02 | G1 | 9.06 | 3.62 | 2.95 | 3.03 | 2.20 | 0.67 | M30 x 2 | M30 x 2 | AF 55 | AF 27 | 1.34 | 1.69 |

| Type | R | S | Z |
|---|---|---|---|
| MFE 200-01 | M30 x 2 | M36 x 2 | M30 x 2 |
| MFE 200-02 | M30 x 2 | M36 x 2 | M30 x 2 |

## Symbol

1



Filter Cooling Units

# FNK 050 · FNK 100

Operating pressure up to 10 bar / 145 psi · Nominal flow rate up to 125 l/min / 33 gpm · Cooling capacity up to 45 kW

Filter-Cooling-Unit FNK 050

## Description

### Application

Return-flow or off-line filter in hydraulic systems with water cooling.

### General

High power densities in modern hydraulic systems require on one hand excellent cleanliness classes of the oil and on the other hand powerful cooling systems. The ARGO-HYTOS filter cooling unit FNK meets both demands on smallest installation space.

### Performance features

*Protection against wear:*
By means of filter elements that even meet the highest demands regarding cleanliness classes.

*Cooling:*
Efficient discharge of large heat flow volumes by means of a powerful cooler.

### Assembly and operating mode

Oil that has to be cooled is first cleaned over a fine filter element and then flows – through a check-valve and the high-performance tubular cooler – in cooled-down condition into the tank. Monitoring of filter clogging is effected by an optionally available differential pressure indicator. The integrated by-pass valve protects the filter element in cold start against increasing differential pressures.

### Special design features

By combination of fine filter and cooler in one unit the necessary space is considerably reduced compared to conventional solutions. This also results in less assembling and piping.
The filter element is hooked to the cover and is pulled upwards when it has to be changed. Because of the cover design the filter element can be changed almost without losing any oil.
An integrated check valve prevents draining of oil from the tank when assembling the filter cooling unit below the oil level.
With maintenance work at the cooler it simply can be removed from the housing after removing the water connections.

For in-line mounting, standalone versions are available.
These are also suitable for retrofitting existing hydraulic systems.
If you are interested, please send us your request.

### Filter elements

Flow direction from outside to center.
The star-shaped pleating of the filter 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.
The cooler is maintenance-free up to a large extent.
Unfavorable water qualities (e.g. high water hardness and PH-value) and high temperatures may lead to sediments in the water pipes and/or the cooler surface. The water quality therefore has to be controlled regularly and if necessary improved.
For cleaning of the water pipes the cover of the cooler can be removed.
The maintenance instructions give detailed information on the maintenance of the cooler.

### Materials

| | |
|---|---|
| Filter housing FNK 050: | GG, Filter head: Steel |
| Filter housing FNK 100: | Aluminum alloy |
| Filter cover: | GG |
| Cooler cover: | GG |
| Cooler catalyst tube: | Steel |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 – inorganic multi-layer microfiber web |

### Accessories

Electrical and / or optical clogging indicators are available.
Dimensions and technical data see catalog sheet 60.30.

## Characteristics

### Operating pressure

Max. 10 bar / 145 psi

### Cooling capacity

Up to 45 kW
(see Selection Chart, column 2).

### Nominal flow rate

Up to 125 l/min / 33 gpm
(see Selection Chart, column 3).

### Filter fineness

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

### Dirt-holding capacity

Values in g test dust ISO MTD according to ISO 16889
(see Selection Chart, column 6).

### Hydraulic fluids

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

### Temperature range of fluids

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

### Mounting position

Filter preferably vertical and/or cooler horizontal.

### Connection

Threaded ports according to ISO 228 or DIN 13.
Sizes see Selection Chart, column 7.

**In principle, the selection of the filter cooling unit requires the following steps:**

*1. Selection of the filter cooling unit according to the cooling performance chart*

The displayed performance curves are based on:

› Ratio flow rate water / oil 2:1
› Water inlet temperature 25 °C / 77 °F
› Oil discharge temperature 50 °C / 122 °F
› Oil viscosity 35 mm²/s / 162 SUS

For differing viscosity the correction factor A can be read off from the viscosity correction chart on the right hand.

With deviating oil discharge and/or oil entry temperatures and viscosities please calculate as shown in the following example:

### Given

| | | |
|---|---|---|
| Heat to be discharged (AW) | = | 17 kW |
| Oil flow (Q) | = | 80 l/min / 21.1 gpm |
| Oil discharge temperature ($T_{oil\ out}$) | = | 45 °C / 113 °F |
| Water entry temperature ($T_{water\ in}$) | = | 25 °C / 77 °F |
| Oil species | = | ISO VG 32 |

### Procedure

*Calculation of the temperature difference $\Delta T$*
Temperature difference $\Delta T$ (°C) = (AW x 34,1) / Q = 7.2

*Calculation of the middle oil temperature*
(2 x $T_{oil\ out}$ + $\Delta T$) / 2 ≅ 49 °C / 120 °F

*Calculation of the viscosity with middle oil temperature $\nu_{actual}$*
$\nu_{act.}$ from the oil manufacturer chart
for ISO VG 32 at 49 °C / 120 °F: 21 mm²/s / 97.3 SUS

*Viscosity factor "A"*
From the viscosity correction chart "A" at 21 mm²/s / 97.3 SUS: 0.88

*Determination of the necessary cooling performance*
Heat to be discharged
$AW_{eff.}$ = (AW x 27.5 x A) / ($T_{oil\ out}$ - $T_{water\ in}$)
= (17 x 27.5 x 0.88) / 20 = 20.6 kW

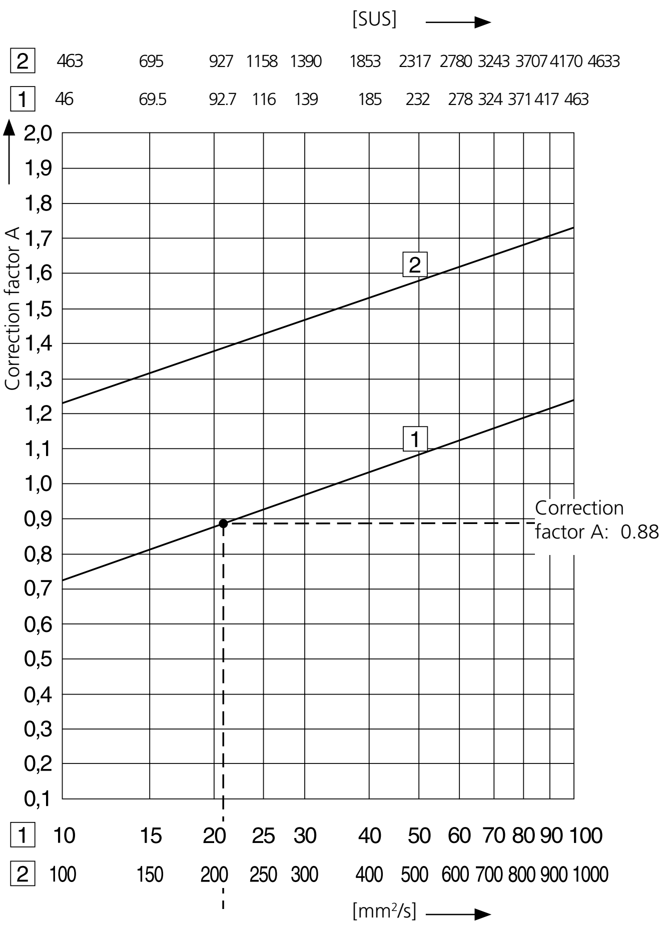
*Selection of the filter cooling unit*
The cooler performance chart shows
Q = 80 l/min and
$AW_{eff.}$ 20.6 kW the filter cooling unit: FNK 100-3153

*2. Controlling pressure drop*

To determine the pressure drop it is possible to interpolate within the given set of curves in the diagrams D1.1-D2.3 between 35 mm²/s / 162 SUS and 300 mm²/s / 1395 SUS.
Finally it has to be checked, if there is enough operating pressure for the determined pressure drop of the filter cooling units.
In case the pressure drop of the selected filter cooling unit should be too high, on the basis of the pressure drop curves an adequate version has to be chosen. If necessary the cooling performance has to be verified again.
With volume flows over 100 l/min / 26.4 gpm and operating viscosities from 200 mm²/s / 927 SUS on (e.g. at cold start) the by-pass valve can be open with a partially contaminated filter element (temporary poor filtration performance).

### Viscosity correction chart

For determination of the correction factor "A" with oil viscosities differing from 35 mm²/s / 162.2 SUS (in the displayed calculation example 21 mm²/s / 97.3 SUS).



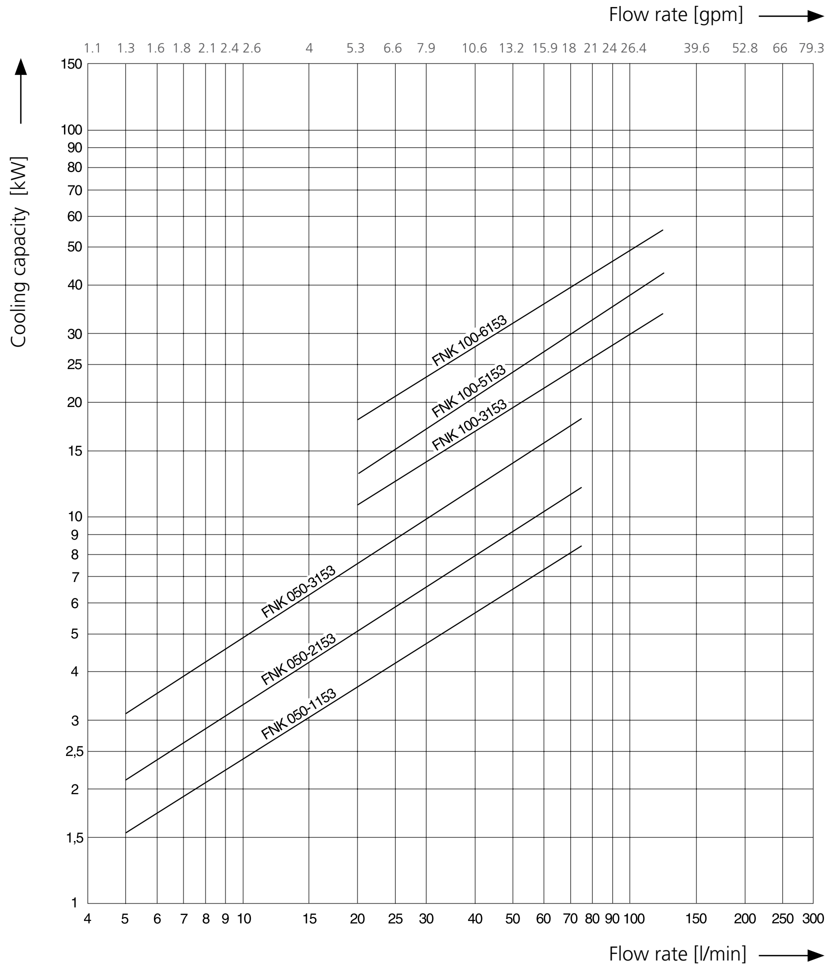

Oil viscosity 21 mm²/s or 97.3 SUS resp.

### Characteristic curves cooling capacity

Dk The displayed performance curves are based on:

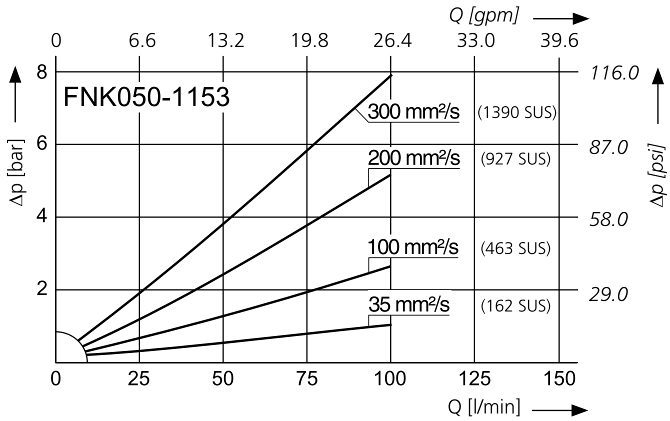
- Water inlet temperature +25 °C / +77 °F
- Oil discharge temperature +50 °C / +122 °F
- Oil viscosity 35 mm²/s / 162 SUS

For differing viscosities the correction factor A can be read off from the viscosity correction chart.

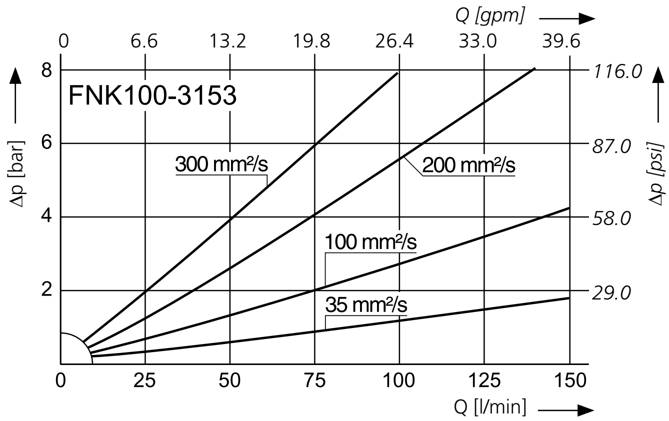


### Δp-curves for complete filters in Selection Chart, column 4

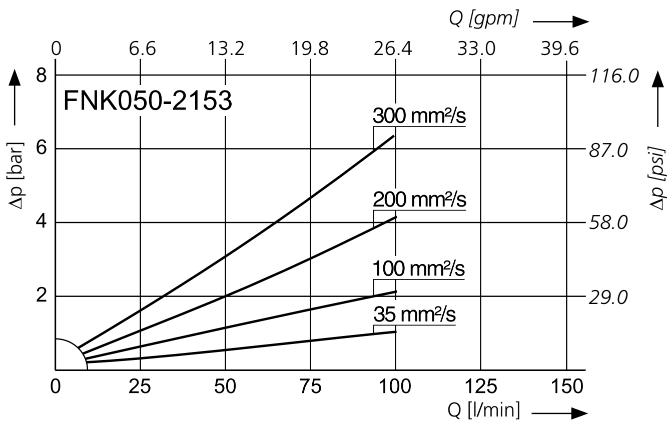
**D1.1** Pressure drop as a function of the **flow volume**



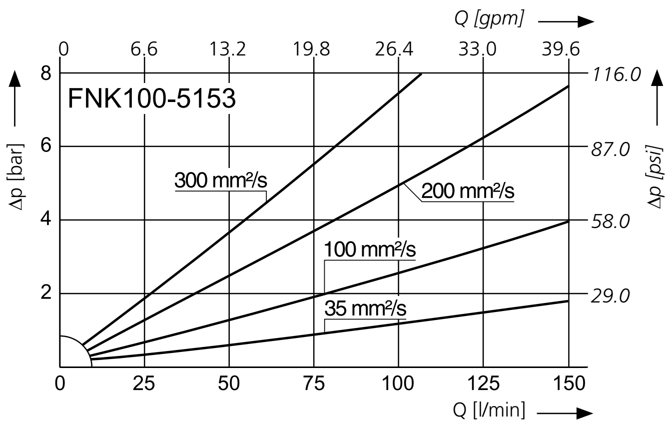

**D2.1** Pressure drop as a function of the **flow volume**



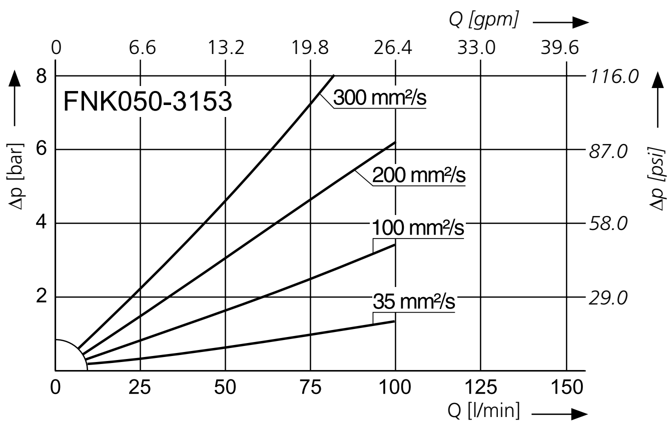

**D1.2** Pressure drop as a function of the **flow volume**



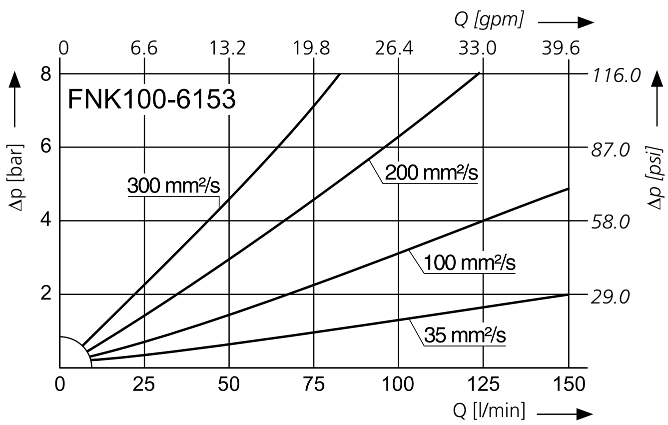

**D2.2** Pressure drop as a function of the **flow volume**




**D1.3** Pressure drop as a function of the **flow volume**




**D2.3** Pressure drop as a function of the **flow volume**




In general the pressure drop increases in line with a larger cooler length.

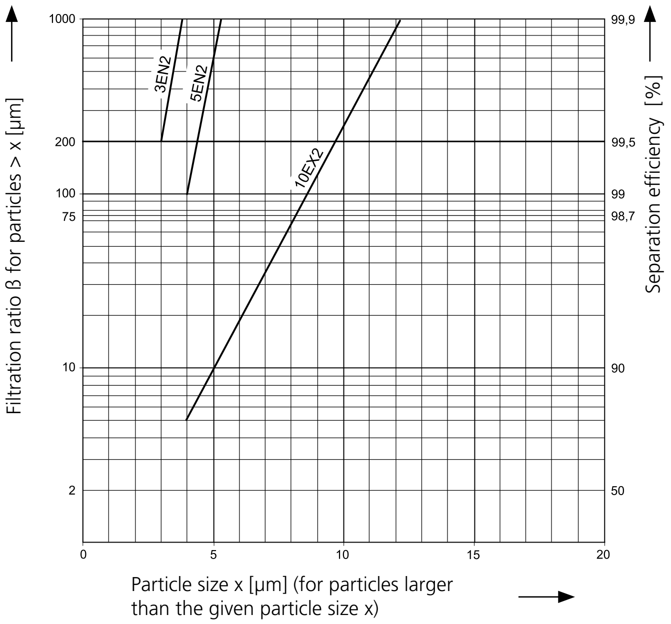
**Exception:**

Due to lower distances of the disk sheets in the cooler the pressure drop of the FNK 050-1153 is higher than the one of the larger FNK 050-2153.

Due to lower distances of the disk sheets in the cooler the pressure drop of the FNK 100-3153 is higher than the one of the larger FNK 100-5153.

## Filter fineness curves in Selection Chart, column 5

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




The abbreviations represent the following ß-values resp. finenesses:

**For EXAPOR®MAX 2-Elements:**

| | | | |
|---|---|---|---|
| 3EN2 | = | $\overline{\beta}_{3\,(c)} = 200$ | EXAPOR®MAX 2 |
| 5EN2 | = | $\overline{\beta}_{5\,(c)} = 200$ | EXAPOR®MAX 2 |
| 10EX2 | = | $\overline{\beta}_{10\,(c)} = 200$ | EXAPOR®MAX 2 |

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

## Selection Chart

| Part No. | Nominal cooling capacity | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt-holding capacity | Connection $A_1$ / $A_2$ inlet | Cracking pressure of by-pass | Replacement filter element Part No. | Clogging indicator | Weight | Cooler element |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | kW | l/min | | | g | | bar | | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| FNK 050-1153 | 5 | 75 | **D1.1** | 5EN2 | 190 | G1¼ | 3.5 | V7.1235-53 | optional | 23 | FNK 050.1700 |
| FNK 050-2153 | 8 | 75 | **D1.2** | 5EN2 | 190 | G1¼ | 3.5 | V7.1235-53 | optional | 24 | FNK 050.1710 |
| FNK 050-3153 | 13 | 75 | **D1.3** | 5EN2 | 190 | G1¼ | 3.5 | V7.1235-53 | optional | 26 | FNK 050.1720 |
| | | | | | | | | | | | |
| FNK 100-3153 | 33 | 125 | **D2.1** | 5EN2 | 150 | G1¼ | 3.5 | V7.1235-53 | optional | 15 | FNK 100.0703 |
| FNK 100-5153 | 40 | 125 | **D2.2** | 5EN2 | 150 | G1¼ | 3.5 | V7.1235-53 | optional | 16 | FNK 100.0705 |
| FNK 100-6153 | 45 | 125 | **D2.3** | 5EN2 | 150 | G1¼ | 3.5 | V7.1235-53 | optional | 17 | FNK 100.0706 |

| | kW | gpm | | | g | | psi | | | lbs | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| FNK 050-1153 | 5 | 19.8 | **D1.1** | 5EN2 | 190 | G1¼ | 50.8 | V7.1235-53 | optional | 50.7 | FNK 050.1700 |
| FNK 050-2153 | 8 | 19.8 | **D1.2** | 5EN2 | 190 | G1¼ | 50.8 | V7.1235-53 | optional | 52.9 | FNK 050.1710 |
| FNK 050-3153 | 13 | 19.8 | **D1.3** | 5EN2 | 190 | G1¼ | 50.8 | V7.1235-53 | optional | 57.3 | FNK 050.1720 |
| | | | | | | | | | | | |
| FNK 100-3153 | 33 | 33.0 | **D2.1** | 5EN2 | 150 | G1¼ | 50.8 | V7.1235-53 | optional | 33.1 | FNK 100.0703 |
| FNK 100-5153 | 40 | 33.0 | **D2.2** | 5EN2 | 150 | G1¼ | 50.8 | V7.1235-53 | optional | 35.3 | FNK 100.0705 |
| FNK 100-6153 | 45 | 33.0 | **D2.3** | 5EN2 | 150 | G1¼ | 50.8 | V7.1235-53 | optional | 37.5 | FNK 100.0706 |

Optical or electrical clogging indicators are available to monitor the clogging condition of the element. If the indicator should be already mounted use the abbreviation "M" behind the part number of the indicator. The printed order acknowledgements show both items separately. For optimal element utilization we recommend clogging indicators with a start-up pressure of 2.5 bar / 36 psi.

**Order example: The filter FNK 100-3153 has to be supplied with electrical clogging indicator - response pressure 2.5 bar / 36 psi.**

**Order description:** **FNK 100-3153 / DG 041-32 M**

**Part No. (Basic unit)**

**Clogging indicator**

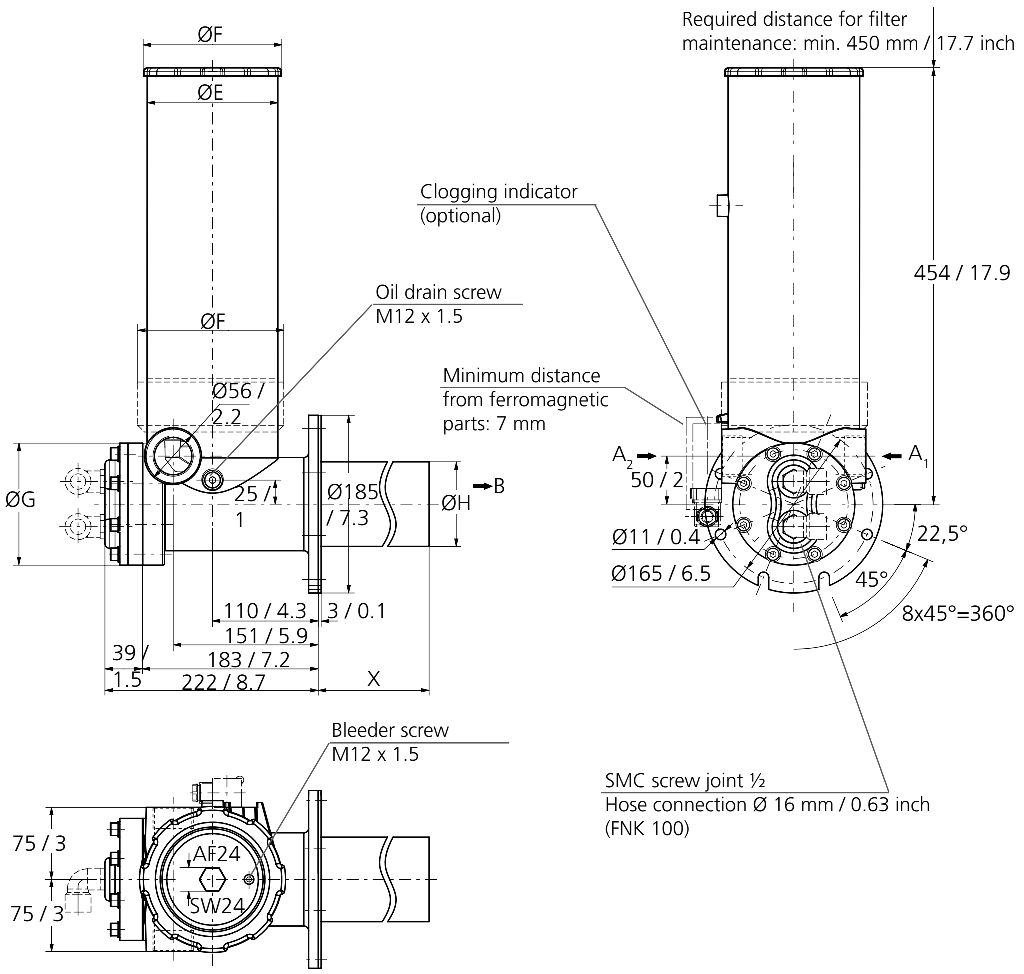
**Mounted**

**For the appropriate clogging indicator see catalog sheet 60.30.**

**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 8).
- The filter units listed in this chart are standard units. If modifications are required, we kindly ask for your request.

## Dimensions in mm




## Measurements in mm

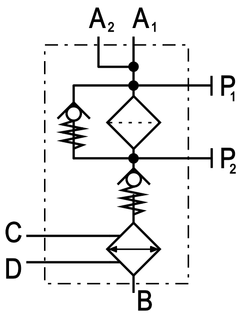
| Type | $A_1$ / $A_2$ | E | F | G | H | X | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| FNK 050-1153 | G1¼ | 133 | 152 | 105 | 65 | 203 | | | | |
| FNK 050-2153 | G1¼ | 133 | 152 | 105 | 65 | 203 | | | | |
| FNK 050-3153 | G1¼ | 133 | 152 | 105 | 65 | 457 | | | | |
| FNK 100-3153 | G1¼ | 145 | - | 127 | 88 | 330 | | | | |
| FNK 100-5153 | G1¼ | 145 | - | 127 | 88 | 480 | | | | |
| FNK 100-6153 | G1¼ | 145 | - | 127 | 88 | 785 | | | | |

## Measurements in inch

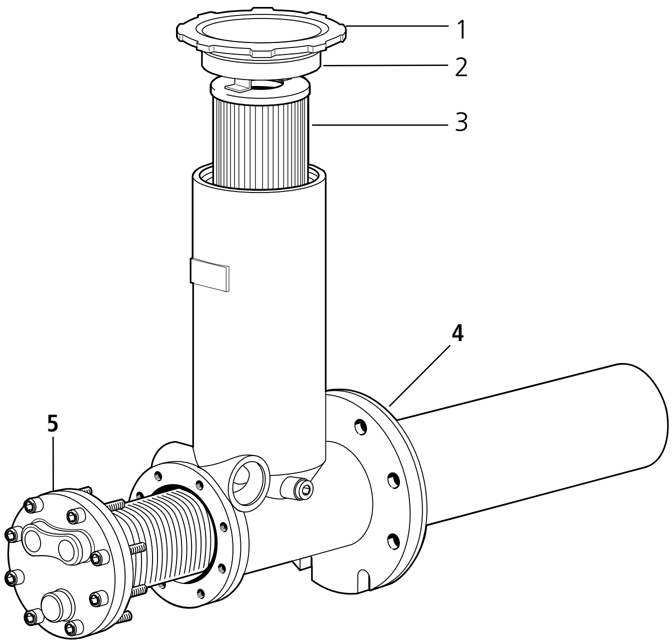
| Type | $A_1$ / $A_2$ | E | F | G | H | X | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| FNK 050-1153 | G1¼ | 5.24 | 5.98 | 4.13 | 2.56 | 7.99 | | | | |
| FNK 050-2153 | G1¼ | 5.24 | 5.98 | 4.13 | 2.56 | 7.99 | | | | |
| FNK 050-3153 | G1¼ | 5.24 | 5.98 | 4.13 | 2.56 | 17.99 | | | | |
| FNK 100-3153 | G1¼ | 5.71 | - | 5.00 | 3.46 | 12.99 | | | | |
| FNK 100-5153 | G1¼ | 5.71 | - | 5.00 | 3.46 | 18.90 | | | | |
| FNK 100-6153 | G1¼ | 5.71 | - | 5.00 | 3.46 | 30.91 | | | | |

## Symbol

1




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Cover complete (with pos. 2) | FNK 100.1210 |
| 2 | O-ring | N007.1245 |
| 3 | Replacement filter element | V7.1235-53 K27 |
| 4 | Flat seal | FNK 100.0113 |
| 5 | Cooler<br>(with water supply cover and seal) | s. Selection Chart /<br>column 12 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

## Pressure Filters

# D 042 · D 062

In-line mounting · Operating pressure up to 100 bar / 1450 psi · Nominal flow rate up to 90 l/min / 23.8 gpm

Pressure Filter D 042

## Description

### Application

In the pressure circuits of hydraulic and lubrication systems.

### Performance features

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

*Protection against malfunction:*
Through installation near to the control valves or other expensive components. The specific determined flow rate guarantees a closed by-pass valve even at $\nu \leq 200$ mm²/s / 927 SUS (cold start condition).

### Filter elements

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

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

### Filter maintenance

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

### Materials

| | |
|---|---|
| Filter head: | Aluminum alloy |
| Filter bowl: | Aluminum alloy |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web |
| | Paper - cellulose web, impregnated with resin |

### Clogging indicators

Electrical and / or optical clogging indicators can be integrated in the filter head if desired. For dimensions and technical data see catalog sheet 60.40.
Suitable retrofittable indicators - optionally with one or two switching points or temperature compensation - can be found in catalog sheet 60.30.

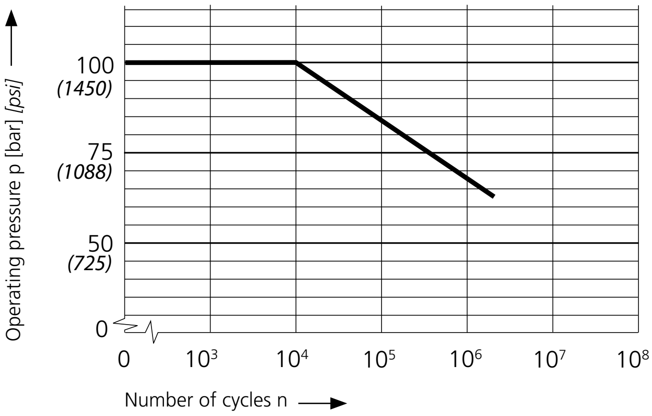
## Characteristics

### Operating pressure

0 ... 63 bar / 914 psi, min. 3 x $10^6$ pressure cycles
Nominal pressure according to DIN 24550

0 ... 100 bar / 1450 psi, min. $10^4$ pressure cycles
Quasi-static operating pressure

### Permissible pressures for other numbers of cycles




### Nominal flow rate

Up to 90 l/min / 23.7 gpm (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid
- contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines:
  up to 100 bar ≤ 6 m/s / 1450 psi ≤ 19.7 ft/s

### Filter fineness

5 µm(c) ... 30 µm(c)
β-values according to ISO 16889
(see Selection Chart, column 4 and diagram Dx).

### Dirt-holding capacity

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

### Hydraulic fluids

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

### Temperature range

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

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Mounting position

Preferably vertical, filter head on top.

### Connection

Threaded ports according to

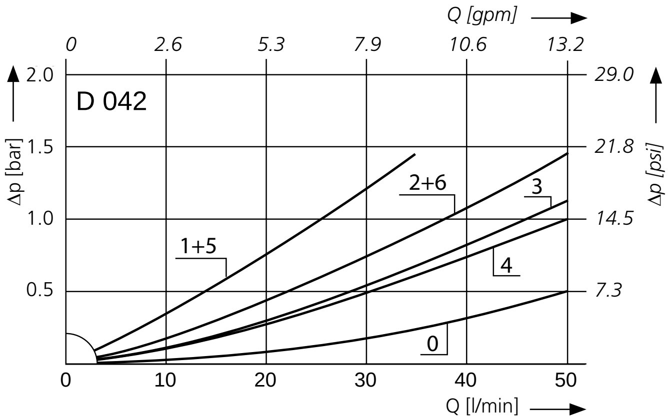
- ISO 228 or DIN 13
- SAE standard J514

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

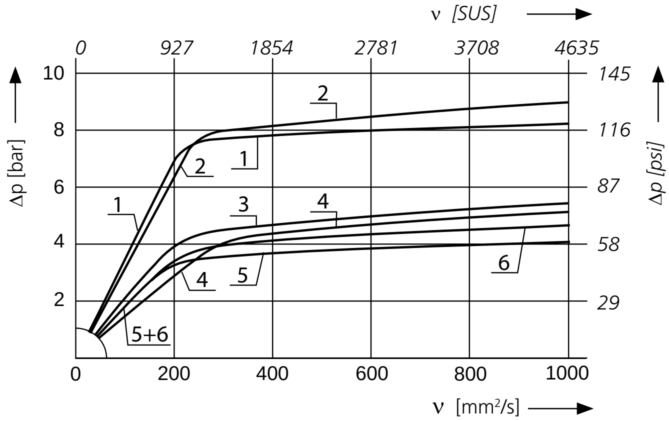
## Diagrams

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

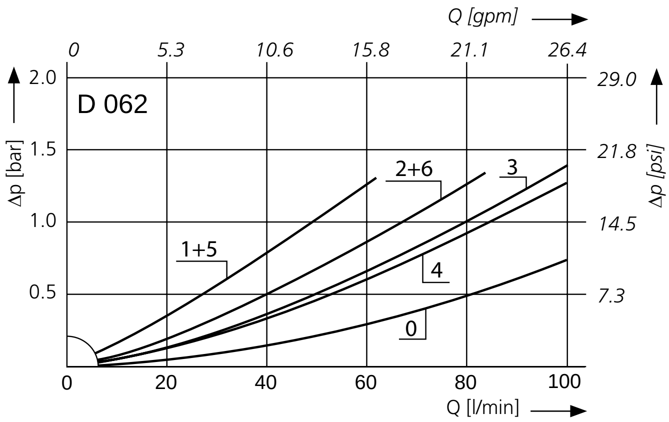
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



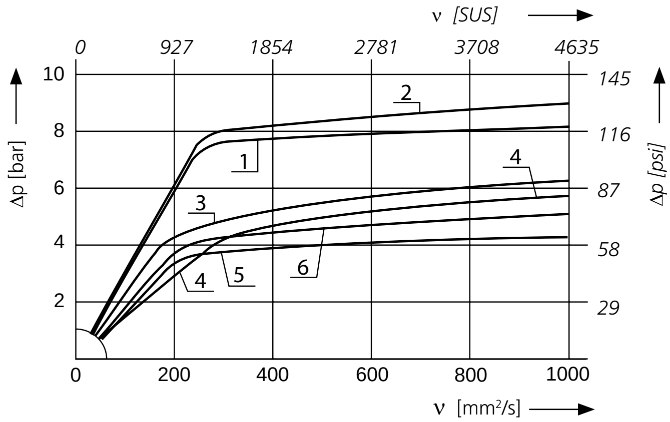

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

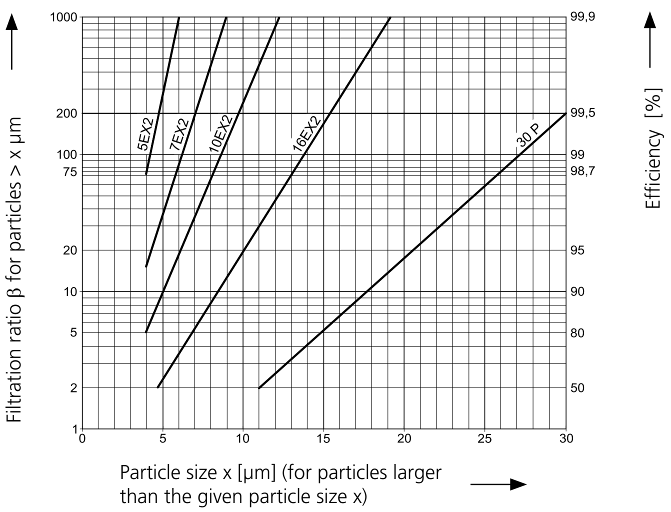



Pressure drop as a function of the **kinematic viscosity** at nominal flow




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

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX2 and Paper elements:**

| | | | |
|---|---|---|---|
| 5EX2 = | $\beta_{5\,(c)}$ | = 200 | EXAPOR®MAX 2 |
| 7EX2 = | $\beta_{7\,(c)}$ | = 200 | EXAPOR®MAX 2 |
| 10EX2 = | $\beta_{10\,(c)}$ | = 200 | EXAPOR®MAX 2 |
| 16EX2 = | $\beta_{16\,(c)}$ | = 200 | EXAPOR®MAX 2 |
| 30P = | $\beta_{30\,(c)}$ | = 200 | Paper |

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

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

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt-holding capacity | Connection A/B | Cracking pressure of by-pass | Symbol | Replacement filter element Part No. | Weight | Clogging indicator | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | | | kg | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| D 042-153 | 16 | **D1**/1 | 5EX2 | 4.9 | G½ | 3.5 | 1 | V3.0510-03 | 0.8 | retrofittable | - |
| **D 042-156**[1] | 27 | **D1**/2 | 10EX2 | 6.8 | G½ | 3.5 | 1 | V3.0510-06 | 0.8 | retrofittable | - |
| **D 042-158**[1] | 44 | **D1**/3 | 16EX2 | 6.9 | G½ | 3.5 | 1 | V3.0510-08 | 0.8 | retrofittable | - |
| | | | | | | | | | | | |
| D 042-151 | 40 | **D1**/4 | 30P | 3.6 | G½ | 3.5 | 1 | P3.0510-11[2] | 0.8 | retrofittable | - |
| | | | | | | | | | | | |
| D 042-183 | 30 | **D1**/5 | 5EX2 | 4.9 | G½ | 7 | 1 | V3.0510-03 | 0.8 | retrofittable | - |
| D 042-186 | 44 | **D1**/6 | 10EX2 | 6.8 | G½ | 7 | 1 | V3.0510-06 | 0.8 | retrofittable | - |
| | | | | | | | | | | | |
| D 062-153 | 32 | **D2**/1 | 5EX2 | 10 | G½ | 3.5 | 1 | V3.0520-03 | 1.1 | retrofittable | - |
| **D 062-156**[1] | 57 | **D2**/2 | 10EX2 | 14 | G¾ | 3.5 | 1 | V3.0520-06 | 1.1 | retrofittable | - |
| **D 062-158**[1] | 90 | **D2**/3 | 16EX2 | 15 | G¾ | 3.5 | 1 | V3.0520-08 | 1.1 | retrofittable | - |
| | | | | | | | | | | | |
| D 062-15[1] | 80 | **D2**/4 | 30P | 7.1 | G¾ | 3.5 | 1 | P3.0520-01[2] | 1.1 | retrofittable | - |
| | | | | | | | | | | | |
| D 062-183 | 48 | **D2**/5 | 5EX2 | 10 | G½ | 7 | 1 | V3.0520-03 | 1.1 | retrofittable | - |
| D 062-196 | 80 | **D2**/6 | 10EX2 | 14 | G¾ | 7 | 1 | V3.0520-06 | 1.1 | retrofittable | - |

[1] Preferred type, no minimum order quantity required
[2] Paper media supported with metal gauze

Optical or electrical clogging indicators are available to monitor the clogging condition of the element. When ordering filters with integrated monitoring, the abbreviation of the clogging indicator has to be added to the order code of the desired filter variant.

**For the appropriate clogging indicator see catalog sheet 60.40.**

**Oder example: The filter D 042-153 is to be supplied with an optical indicator with automatic reset.**
**Order code:** **D 042-153 OD1**
**Part No. (basic unit)**
**Clogging indicator**

From catalog sheet 60.30, you can see clogging indicators that can be retrofitted.

**Remarks:**

- The switching pressure of the clogging indicator has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- The filters listed in this chart are standard filters. Other designs available on request.
- For versions with electrical clogging indicator, the device socket is not included in the scope of delivery.
- For the electrical clogging indicator of type DIN EN 175301-803 (ED8 and ED9), a device socket with two LEDs is available, which additionally enables visual indication of the filter contamination (order no. DG 041.1200).

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt-holding capacity | Connection A/B | Cracking pressure of by-pass | Symbol | Replacement filter element Part No. | Weight | Clogging indicator | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | gpm | | | g | SAE | psi | | | lbs | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| D 042-753 | 4.2 | **D1**/1 | 5EX2 | 4.9 | -8[2] | 51 | 1 | V3.0510-03 | 1.8 | retrofittable | - |
| **D 042-756**[1] | 7.1 | **D1**/2 | 10EX2 | 6.8 | -8[2] | 51 | 1 | V3.0510-06 | 1.8 | retrofittable | - |
| **D 042-758**[1] | 11.6 | **D1**/3 | 16EX2 | 6.9 | -8[2] | 51 | 1 | V3.0510-08 | 1.8 | retrofittable | - |
| | | | | | | | | | | | |
| D 042-751 | 10.6 | **D1**/4 | 30P | 3.6 | -8[2] | 51 | 1 | P3.0510-11[4] | 1.8 | retrofittable | - |
| | | | | | | | | | | | |
| D 042-783 | 7.9 | **D1**/5 | 5EX2 | 4.9 | -8[2] | 102 | 1 | V3.0510-03 | 1.8 | retrofittable | - |
| D 042-786 | 11.6 | **D1**/6 | 10EX2 | 6.8 | -8[2] | 102 | 1 | V3.0510-06 | 1.8 | retrofittable | - |
| | | | | | | | | | | | |
| D 062-753 | 8.5 | **D2**/1 | 5EX2 | 10 | -8[2] | 51 | 1 | V3.0520-03 | 2.4 | retrofittable | - |
| **D 062-756**[1] | 15.1 | **D2**/2 | 10EX2 | 14 | -12[3] | 51 | 1 | V3.0520-06 | 2.4 | retrofittable | - |
| **D 062-758**[1] | 23.8 | **D2**/3 | 16EX2 | 15 | -12[3] | 51 | 1 | V3.0520-08 | 2.4 | retrofittable | - |
| | | | | | | | | | | | |
| D 062-751 | 21.1 | **D2**/4 | 30P | 7.1 | -12[3] | 51 | 1 | P3.0520-01[4] | 2.4 | retrofittable | - |
| | | | | | | | | | | | |
| D 062-783 | 12.7 | **D2**/5 | 5EX2 | 10 | -8[2] | 102 | 1 | V3.0520-03 | 2.4 | retrofittable | - |
| D 062-786 | 21.1 | **D2**/6 | 10EX2 | 14 | -12[3] | 102 | 1 | V3.0520-06 | 2.4 | retrofittable | - |

[1] Preferred type, no minimum order quantity required
[2] Corresponds to ¾-16 UNF-2B
[3] Corresponds to 1¹/₁₆-12 UN-2B
[4] Paper media supported with metal gauze

Optical or electrical clogging indicators are available to monitor the clogging condition of the element. When ordering filters with integrated monitoring, the abbreviation of the clogging indicator has to be added to the order code of the desired filter variant.

**For the appropriate clogging indicator see catalog sheet 60.40.**

**Oder example: The filter D 042-753 is to be supplied with an optical indicator with automatic reset.**

**Order code:** **D 042-753 OD1**

**Part No. (basic unit)**

**Clogging indicator**

From catalog sheet 60.30, you can see clogging indicators that can be retrofitted.

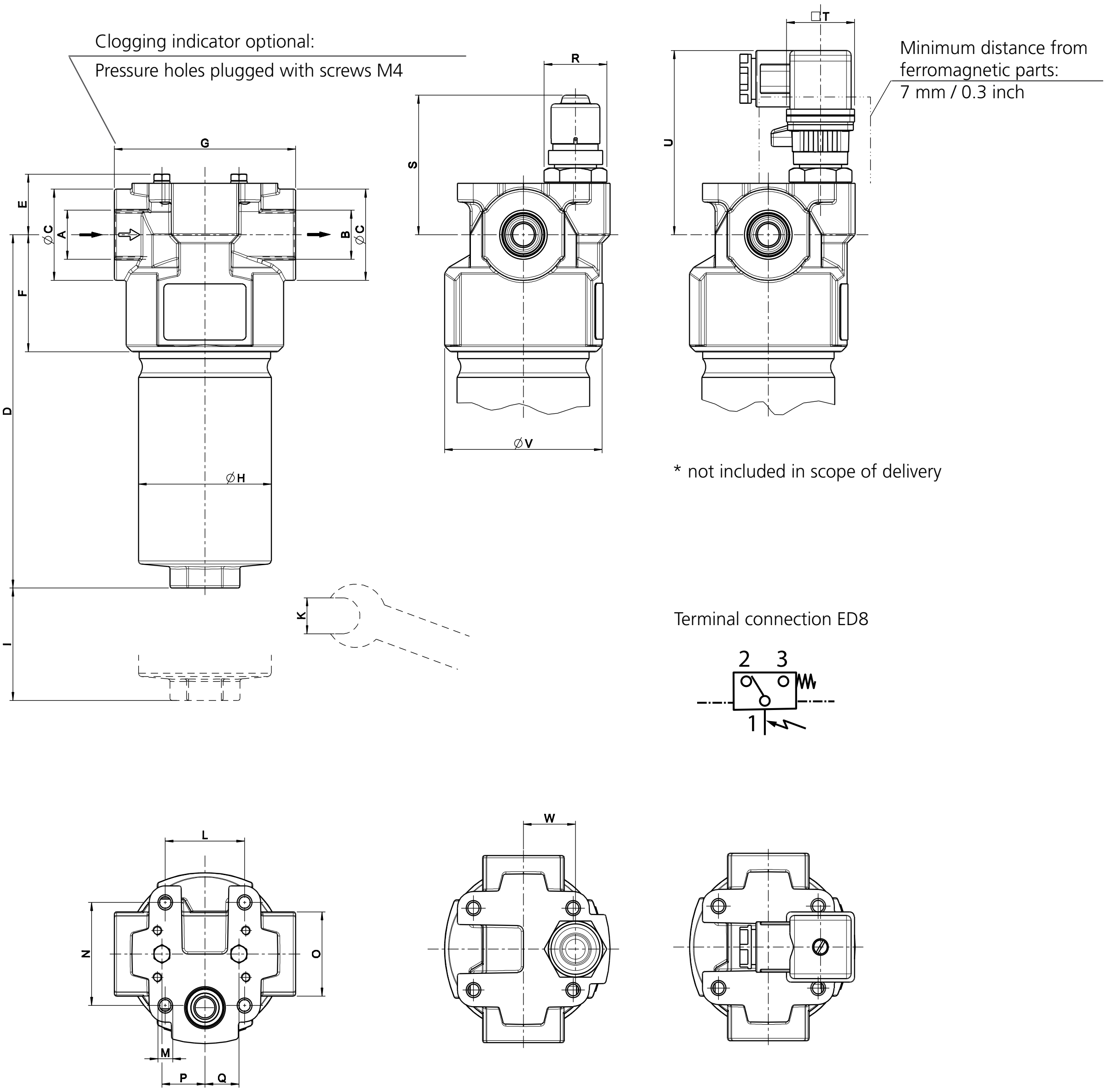
**Remarks:**

- The switching pressure of the clogging indicator has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- The filters listed in this chart are standard filters. Other designs available on request.
- For versions with electrical clogging indicator, the device socket is not included in the scope of delivery.
- For the electrical clogging indicator of type DIN EN 175301-803 (ED8 and ED9), a device socket with two LEDs is available, which additionally enables visual indication of the filter contamination (order no. DG 041.1200).

## Dimensions

Version with integrated optical clogging indicator (OD2)

Version with integrated electrical clogging indicator (ED8) and device socket*




## Measurements in mm

| Type | A/B | C | D | E | F | G | H | I | K | L | M Ø/depth | N | O | P | Q | R | S | T | U | V | W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D 042 | G½ | 39 | 153 | 27 | 50 | 80 | 58.5 | 55 | 27 | 35 | M6 / 8 | 44 | AF 36 | 19 | 15 | AF 24 | 60 | ☐ 30 | 79 | 70 | 23 |
| D 062 | G½, G¾ | 39 | 249 | 27 | 50 | 80 | 58.5 | 55 | 27 | 35 | M6 / 8 | 44 | AF 36 | 19 | 15 | AF 24 | 60 | ☐ 30 | 79 | 70 | 23 |

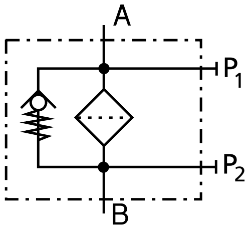
## Measurements in inch

| Type | A/B SAE | C | D | E | F | G | H | I | K | L | M Ø/depth | N | O mm | P | R mm | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D 042 | -8 | 1.54 | 6.02 | 1.06 | 1.97 | 3.15 | 2.30 | 2.17 | 1.06 | 1.38 | M6 / 0.32 | 1.73 | AF 36 | 0.75 | AF 24 | 2.36 |
| D 062 | -8 / -12 | 1.54 | 9.80 | 1.06 | 1.97 | 3.15 | 2.30 | 2.17 | 1.06 | 1.38 | M6 / 0.32 | 1.73 | AF 36 | 0.75 | AF 24 | 2.36 |

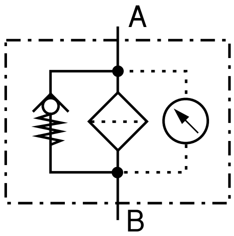
| Type | T | U | V | W |
|---|---|---|---|---|
| D 042 | ☐ 1.18 | 3.11 | 7.76 | 0.91 |
| D 062 | ☐ 1.18 | 3.11 | 7.76 | 0.91 |

## Symbols

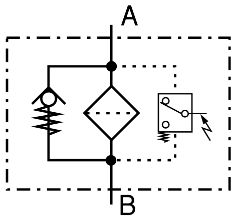
1



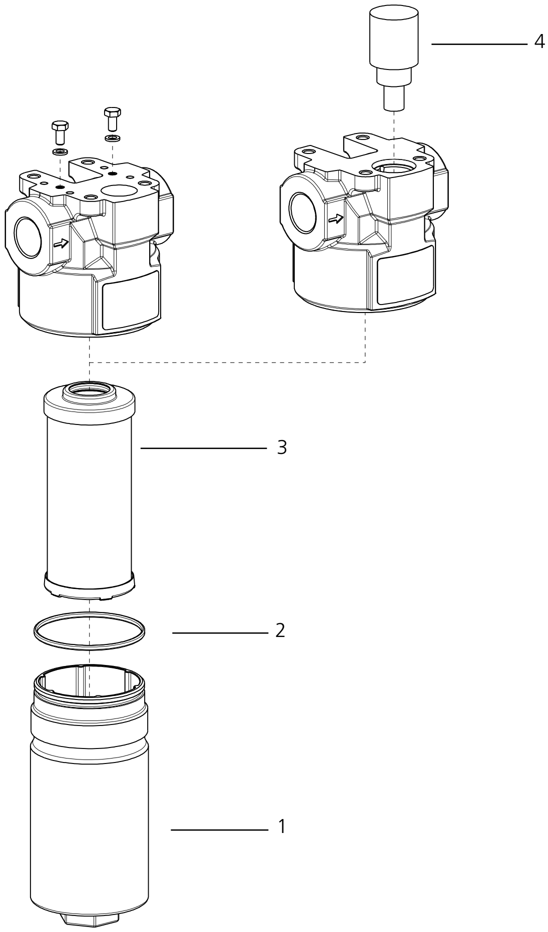

2




3




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Filter bowl D 042 | D 044.0101 |
| 1 | Filter bowl D 062 | D 064.0101 |
| 2 | O-ring<br>50 x 2 mm<br>1.97 x 0.08 inch | N007.0501 |
| 3 | Replacement filter element<br>(with seal) | s. Chart / col. 9 |
| 4 | Clogging indicator<br>(with seal) | s. catalog sheet<br>60.40 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

**Before release into the series production the filter casing is tested for fatigue strength in our pressure pulse test rig. Various quality controls during the production process guarantee the leakfree function and solidity of our filters.**

ARGO HYTOS

## Pressure Filters

# D 072 · D 112 · D 152

In-line mounting · Operating pressure up to 100 bar / 1450 psi · Nominal flow rate up to 170 l/min / 44.9 gpm

Pressure Filter D 072

## Description

### Application

In the pressure circuits of hydraulic and lubrication systems.

### Performance features

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

*Protection against malfunction:*
Through installation near to the control valves or other expensive components. The specific determined flow rate guarantees a closed by-pass valve even at $\nu \leq 200$ mm²/s / 927 SUS (cold start condition).

### Filter elements

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

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

### 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: | Aluminum alloy |
| Filter bowl: | Aluminum alloy |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2- inorganic multi-layer microfiber web |

### Clogging indicators

Electrical and / or optical clogging indicators can be integrated in the filter head if desired. For dimensions and technical data see catalog sheet 60.40.

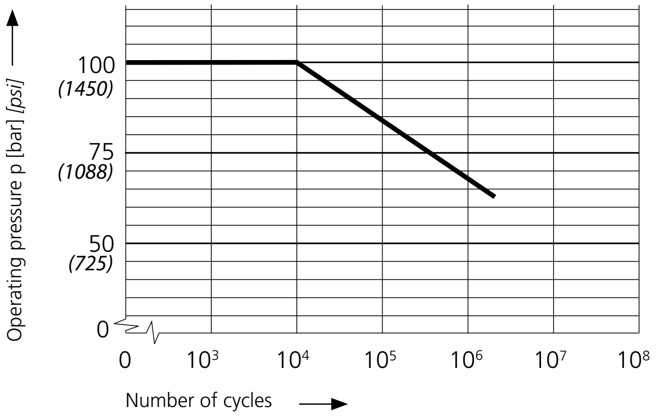
## Characteristics

### Operating pressure

0 ... 63 bar / 914 psi, min. 3 x $10^6$ pressure cycles
Nominal pressure according to DIN 24550

0 ... 100 bar, min. $10^4$ pressure cycles
Quasi-static operating pressure

### Permissible pressures for other numbers of cycles




### Nominal flow rate

Up to 170 l/min / 44.9 gpm (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines: up to 100 bar ≤ 6 m/s / 1450 psi ≤ 19.7 ft/s

### Filter fineness

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

### Dirt-holding capacity

Values in g test dust 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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Mounting position

Preferably vertical, filter head on top.

### Connection

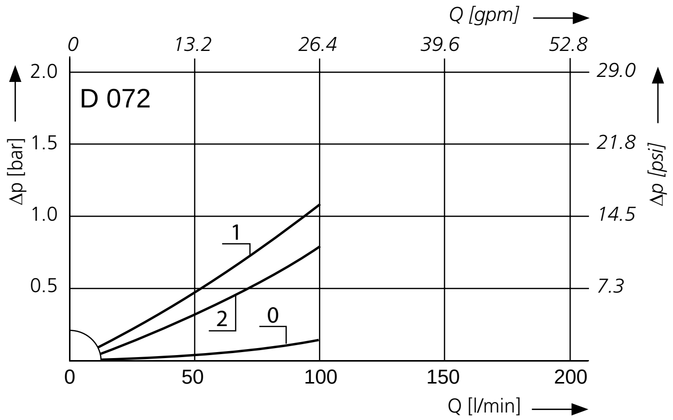
Threaded ports according to

- ISO 228 or DIN 13 /
- SAE standard J514.

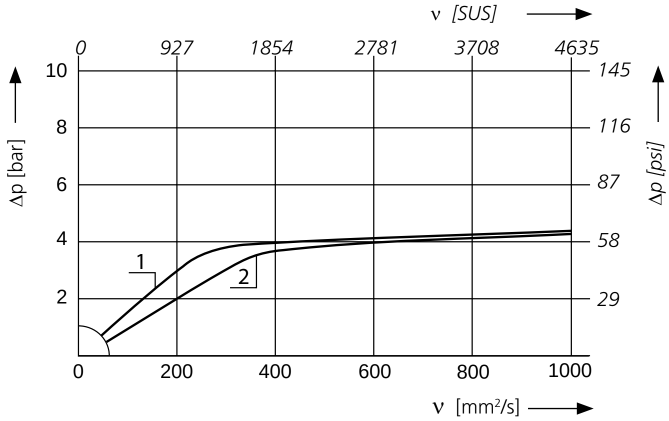
Sizes see Selection Chart, column 6
(other port threads on request).

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

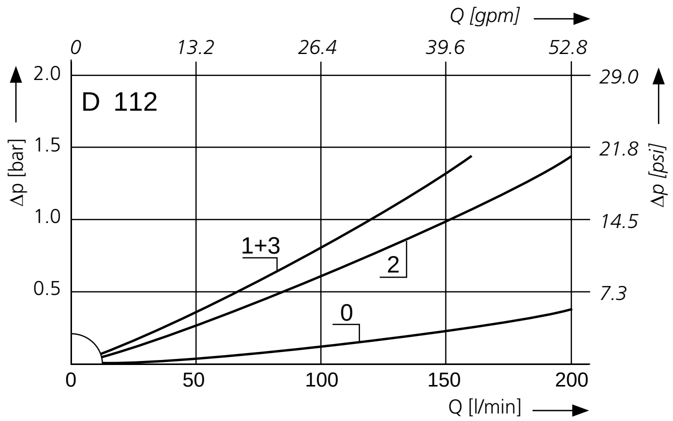
**D1** Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s / 162 SUS (0 = casing empty)



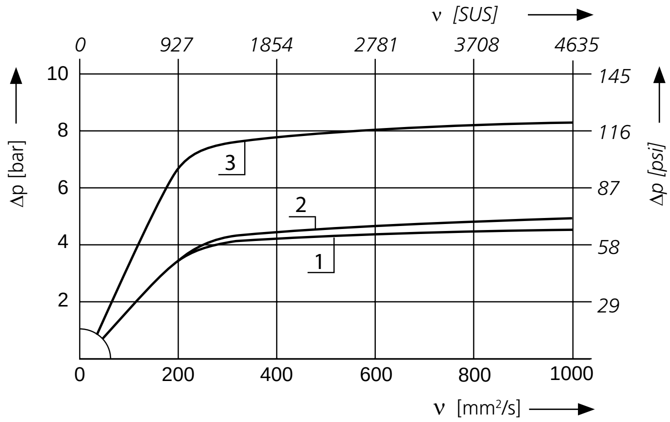

Pressure drop as a function of the
**kinematic viscosity** at nominal flow



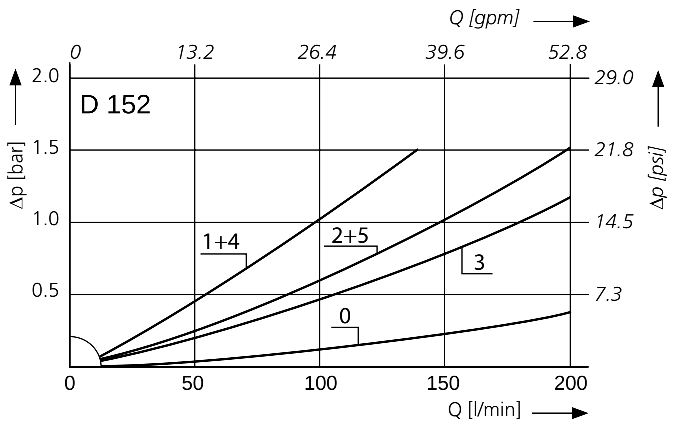

**D2** Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s / 162 SUS (0 = casing empty)



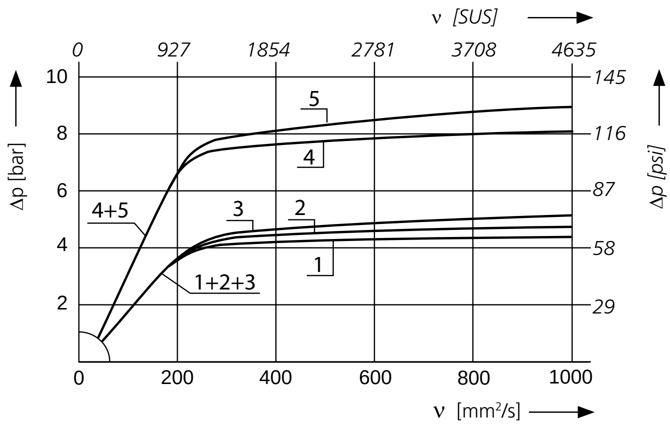

Pressure drop as a function of the
**kinematic viscosity** at nominal flow




**D3** Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s / 162 SUS (0 = casing empty)

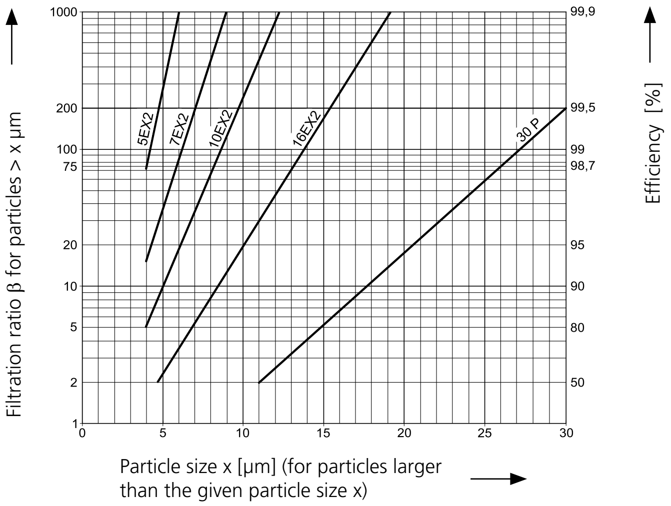



Pressure drop as a function of the
**kinematic viscosity** at nominal flow



## Filter fineness curves in Selection Chart, column 4

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX2 and Paper elements:**

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

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

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

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt-holding capacity | Connection A/B | Cracking pressure of by-pass | Symbol | Replacement filter element Part No. | Weight | Clogging indicator | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | | | kg | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| D 072-156 | 48 | **D1**/1 | 10EX2 | 12 | G½ | 3.5 | 1 | V3.0613-06 | 1.1 | - | - |
| D 072-158 | 48 | **D1**/2 | 16EX2 | 12 | G½ | 3.5 | 1 | V3.0613-08 | 1.1 | - | - |
| **D 112-156**[1] | 70 | **D2**/1 | 10EX2 | 17 | G¾ | 3.5 | 1 | V3.0617-06 | 1.4 | - | - |
| **D 112-158**[1] | 105 | **D2**/2 | 16EX2 | 17 | G1 | 3.5 | 1 | V3.0617-08 | 1.4 | - | - |
| D 112-186 | 130 | **D2**/3 | 10EX2 | 17 | G1 | 7.0 | 1 | V3.0617-06 | 1.4 | - | - |
| D 152-153 | 60 | **D3**/1 | 5EX2 | 17 | G¾ | 3.5 | 1 | V3.0623-03 | 1.7 | - | - |
| **D 152-156**[1] | 100 | **D3**/2 | 10EX2 | 23 | G¾ | 3.5 | 1 | V3.0623-06 | 1.7 | - | - |
| **D 152-158**[1] | 135 | **D3**/3 | 16EX2 | 25 | G1 | 3.5 | 1 | V3.0623-08 | 1.7 | - | - |
| D 152-183 | 110 | **D3**/4 | 5EX2 | 17 | G1 | 7.0 | 1 | V3.0623-03 | 1.7 | - | - |
| D 152-186 | 170 | **D3**/5 | 10EX2 | 23 | G1 | 7.0 | 1 | V3.0623-06 | 1.7 | - | - |

[1] Preferred type, no minimum order quantity required

Optical or electrical clogging indicators are available to monitor the clogging condition of the element. When ordering filters with integrated monitoring, the abbreviation of the clogging indicator has to be added to the order code of the desired filter variant.

**For the appropriate clogging indicator see catalog sheet 60.40.**

**Oder example: The filter D 072-156 is to be supplied with an optical indicator with automatic reset.**

**Order code:** **D 072-156 OD1**

**Part No. (basic unit)**

**Clogging indicator**

**Remarks:**

- The switching pressure of the clogging indicator has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- The filters listed in this chart are standard filters. Other designs available on request.
- For versions with electrical clogging indicator, the device socket is not included in the scope of delivery.
- For the electrical clogging indicator of type DIN EN 175301-803 (ED8 and ED9), a device socket with two LEDs is available, which additionally enables visual indication of the filter contamination (order no. DG 041.1200).

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt-holding capacity | Connection A/B | Cracking pressure of by-pass | Symbol | Replacement filter element Part No. | Weight | Clogging indicator | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | gpm | | | g | SAE | psi | | | lbs | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| D 072-756 | 12.7 | **D1**/1 | 10EX2 | 12 | -8[2] | 51 | 1 | V3.0613-06 | 2.4 | - | - |
| D 072-758 | 12.7 | **D1**/2 | 16EX2 | 12 | -8[2] | 51 | 1 | V3.0613-08 | 2.4 | - | - |
| **D 112-756**[1] | 18.5 | **D2**/1 | 10EX2 | 17 | -12[3] | 51 | 1 | V3.0617-06 | 3.1 | - | - |
| **D 112-758**[1] | 27.7 | **D2**/2 | 16EX2 | 17 | -16[4] | 51 | 1 | V3.0617-08 | 3.1 | - | - |
| D 112-786 | 34.3 | **D2**/3 | 10EX2 | 17 | -16[4] | 102 | 1 | V3.0617-06 | 3.1 | - | - |
| D 152-753 | 15.9 | **D3**/1 | 5EX2 | 17 | -12[3] | 51 | 1 | V3.0623-03 | 3.7 | - | - |
| **D 152-756**[1] | 26.4 | **D3**/2 | 10EX2 | 23 | -12[3] | 51 | 1 | V3.0623-06 | 3.7 | - | - |
| **D 152-758**[1] | 35.7 | **D3**/3 | 16EX2 | 25 | -16[4] | 51 | 1 | V3.0623-08 | 3.7 | - | - |
| D 152-783 | 29.1 | **D3**/4 | 5EX2 | 17 | -16[4] | 102 | 1 | V3.0623-03 | 3.7 | - | - |
| D 152-786 | 44.9 | **D3**/5 | 10EX2 | 23 | -16[4] | 102 | 1 | V3.0623-06 | 3.7 | - | - |

[1] Preferred type, no minimum order quantity required
[2] Corresponds to ¾-16 UNF-2B
[3] Corresponds to 1 1/16-12 UN-2B
[4] Corresponds to 1 5/16-12 UN-2B

Optical or electrical clogging indicators are available to monitor the clogging condition of the element. When ordering filters with integrated monitoring, the abbreviation of the clogging indicator has to be added to the order code of the desired filter variant.

**For the appropriate clogging indicator see catalog sheet 60.40.**

**Oder example: The filter D 072-756 is to be supplied with an optical indicator with automatic reset.**

**Order code:** **D 072-756 OD1**

**Part No. (basic unit)**

**Clogging indicator**

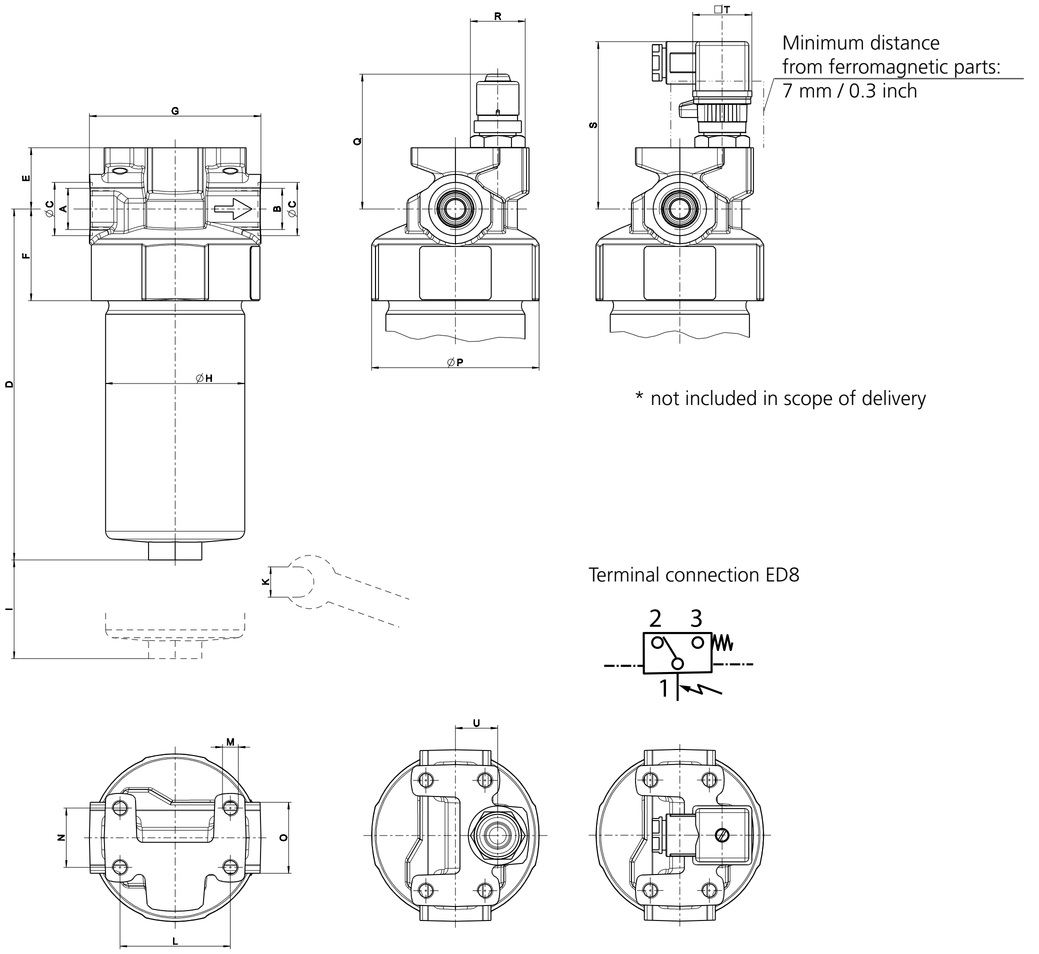
**Remarks:**

- The switching pressure of the clogging indicator has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- The filters listed in this chart are standard filters. Other designs available on request.
- For versions with electrical clogging indicator, the device socket is not included in the scope of delivery.
- For the electrical clogging indicator of type DIN EN 175301-803 (ED8 and ED9), a device socket with two LEDs is available, which additionally enables visual indication of the filter contamination (order no. DG 041.1200).

## Dimensions

Version with integrated optical clogging indicator (OD2)

Version with integrated electrical clogging indicator (ED8) and device socket*




## Measurements in mm

| Type | A/B | C | D | E | F | G | H | I | K | L | M Ø/depth | N | O | P | Q | R | S | T | U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D 072 | G½ | 27 | 178 | 31 | 46.5 | 84 | 70.5 | 60 | AF 27 | 56 | M8 / 8 | 30 | AF 36 | 85 | 69 | AF 24 | 80 | ☐ 30 | 21.5 |
| D 112 | G¾ , G1 | 33 | 219 | 37 | 51 | 95 | 70.5 | 60 | AF 27 | 56 | M8 / 8 | 30 | AF 44 | 85 | 75 | AF 24 | 86 | ☐ 30 | 24 |
| D 152 | G¾ , G1 | 41 | 283 | 37 | 51 | 95 | 70.5 | 60 | AF 27 | 56 | M8 / 8 | 30 | AF 44 | 85 | 75 | AF 24 | 86 | ☐ 30 | 24 |

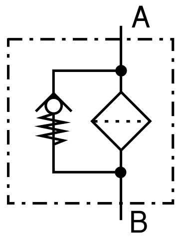
## Measurements in inch

| Type | A/B SAE | C | D | E | F | G | H | I | K mm | L | M Ø/depth | N | O mm | P | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D 072 | -8 | 1.06 | 7.01 | 1.22 | 1.83 | 3.31 | 2.78 | 2.36 | AF 27 | 2.20 | M8 / 0.32 | 1.18 | AF 36 | 3.35 | 2.72 |
| D 112 | -12, -16 | 1.30 | 8.62 | 1.46 | 2.01 | 3.74 | 2.78 | 2.36 | AF 27 | 2.20 | M8 / 0.32 | 1.18 | AF 44 | 3.35 | 2.95 |
| D 152 | -12, -16 | 1.61 | 11.14 | 1.46 | 2.01 | 3.74 | 2.78 | 2.36 | AF 27 | 2.20 | M8 / 0.32 | 1.18 | AF 44 | 3.35 | 2.95 |

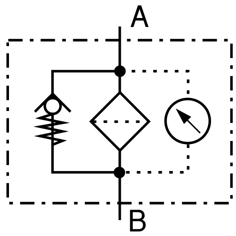
| Type | R | S | T | U |
|---|---|---|---|---|
| D 072 | AF 24 | 3.15 | ☐ 1.18 | 0.85 |
| D 112 | AF 24 | 3.39 | ☐ 1.18 | 0.94 |
| D 152 | AF 24 | 3.39 | ☐ 1.18 | 0.94 |

## Symbols

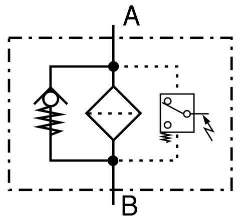
1



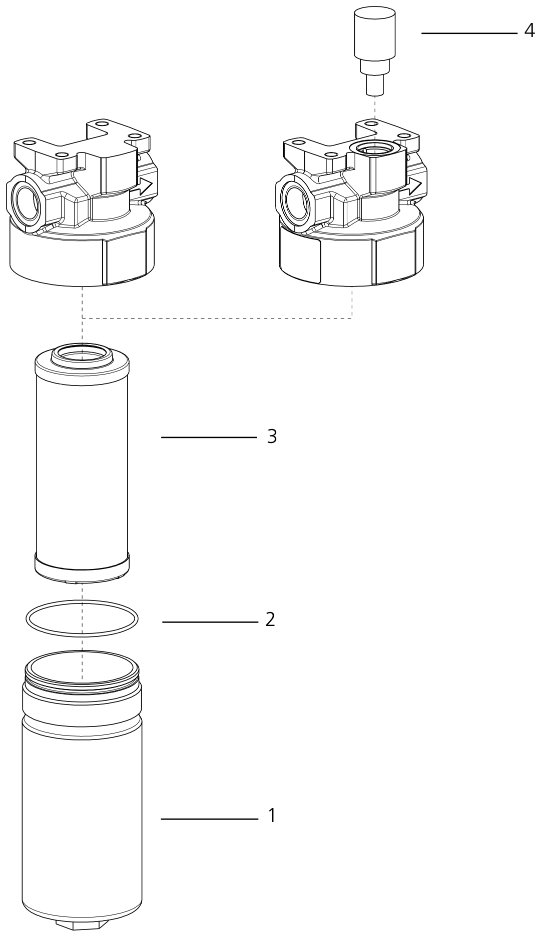

2




3




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Filter bowl D 072 | D 072.0101 |
| 1 | Filter bowl D 112 | D 112.0101 |
| 1 | Filter bowl D 152 | D 152.0101 |
| 2 | O-ring<br>62 x 2 mm<br>2.44 x 0.08 inch | N007.0622 |
| 3 | Replacement filter element<br>(with seal) | see Chart / col. 9 |
| 4 | Clogging indicator<br>(with seal) | s. catalog sheet<br>60.40 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

**Before release into the series production the filter casing is tested for fatigue strength in our pressure pulse test rig. Various quality controls during the production process guarantee the leakfree function and solidity of our filters.**

Pressure Filters

# D 162 · D 232 · D 332

In-line mounting · Operating pressure up to 63 bar / 914 psi · Nominal flow rate up to 350 l/min / 92.5 gpm

Pressure Filter D 162

## Description

### Application

In the pressure circuits of hydraulic and lubrication systems.

### Performance features

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

*Protection against malfunction:*
Through installation near to the control valves or other expensive components. The specific determined flow rate guarantees a closed by-pass valve even at $\nu \leq 200$ mm²/s / 927 SUS (cold start condition).

### Filter elements

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

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

### 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: | Aluminum alloy |
| Filter bowl: | Aluminum alloy |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web<br>Paper - cellulose web, impregnated with resin |

### Clogging indicators

Electrical and / or optical clogging indicators can be integrated in the filter head if desired. For dimensions and technical data see catalog sheet 60.40.
Suitable retrofittable indicators - optionally with one or two switching points or temperature compensation - can be found in catalog sheet 60.30.

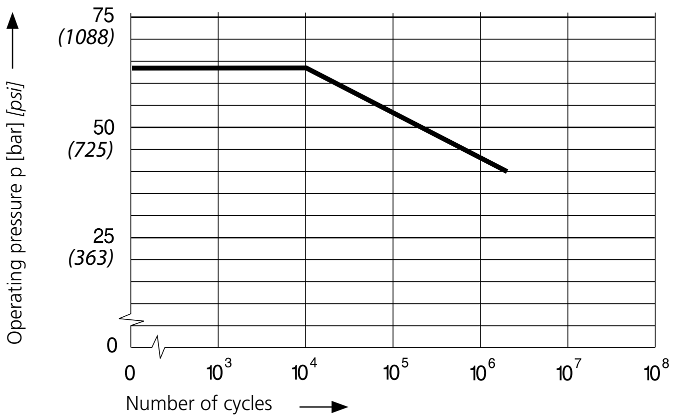
## Characteristics

### Operating pressure

0 ... 40 bar / 580 psi, min. 3 x $10^6$ pressure cycles
Nominal pressure according to DIN 24550

0 ... 63 bar / 914 psi, min. $10^4$ pressure cycles
Quasi-static operating pressure

### Permissible pressures for other numbers of cycles




### Nominal flow rate

Up to 350 l/min / 92.5 gpm (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines:
  up to 100 bar ≤ 6 m/s / 1450 psi ≤ 19.7 ft/s

### Filter fineness

5 µm(c) ... 30 µm(c)
β-values according to ISO 16889
(see Selection Chart, column 4 and diagram Dx).

### Dirt-holding capacity

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

### Hydraulic fluids

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

### Temperature range

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

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Mounting position

Preferably vertical, filter head on top.

### Connection

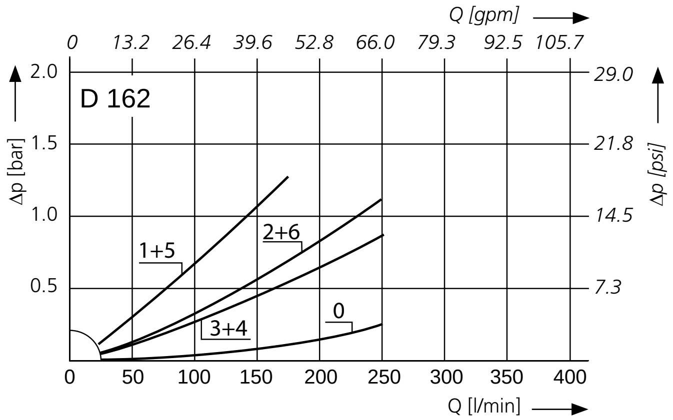
Threaded ports according to

- ISO 228 or DIN 13
- SAE standard J514.

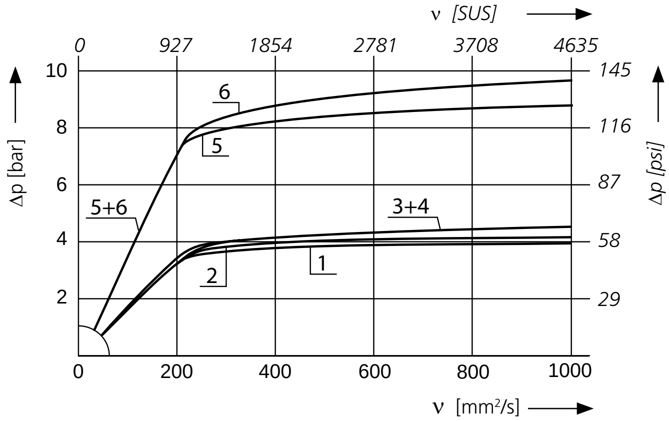
Sizes see Selection Chart, column 6
(other port threads on request).

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

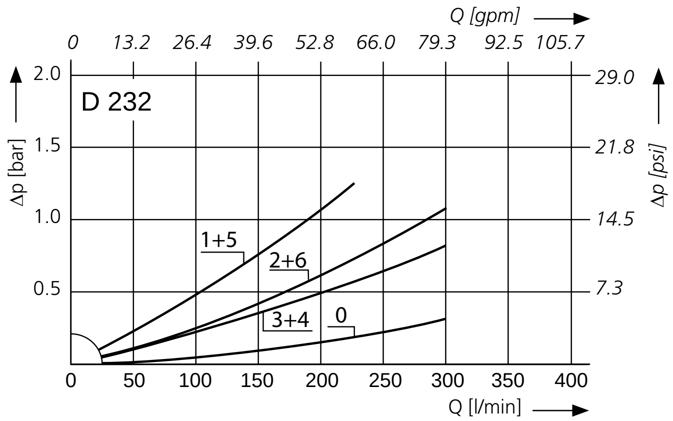
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



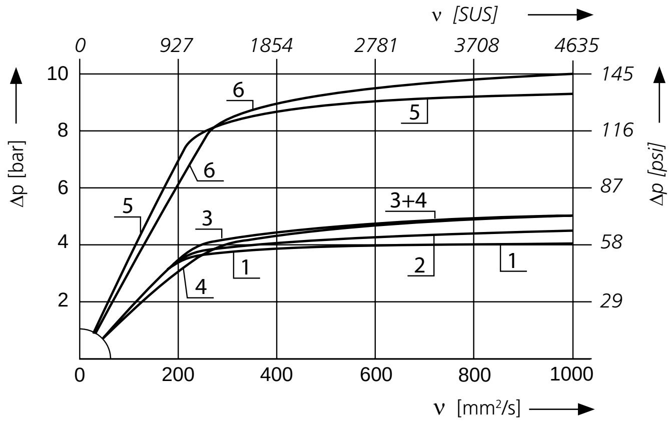

Pressure drop as a function of the **kinematic viscosity** at nominal flow



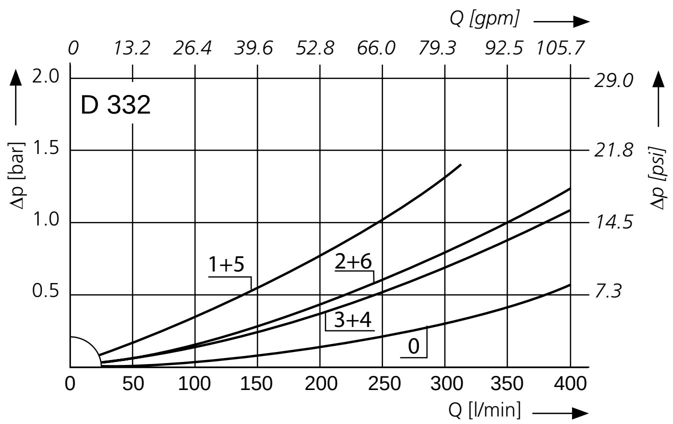

**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



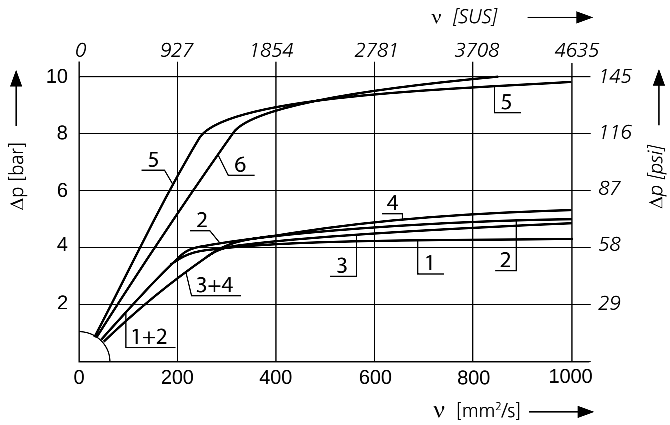

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D3** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

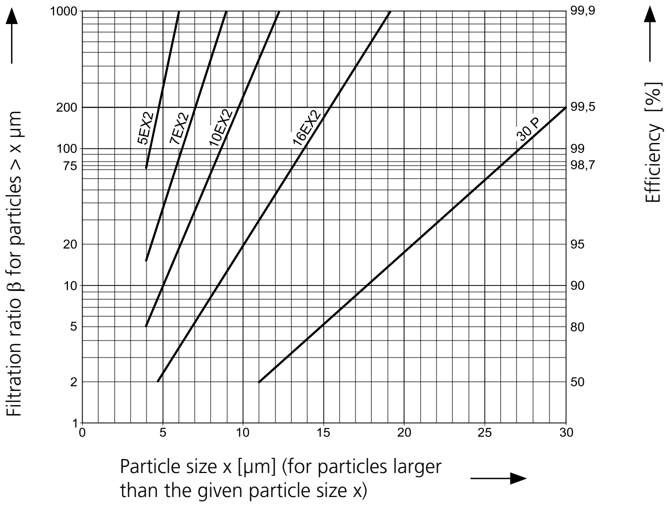



Pressure drop as a function of the **kinematic viscosity** at nominal flow



## Filter fineness curves in Selection Chart, column 4

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX2 and Paper elements:**

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

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

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

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **DX** | Dirt-holding capacity | Connection A/B | Cracking pressure of by-pass | Symbol | Replacement filter element Part No. | Weight | Clogging indicator | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | | | kg | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| D 162-253 | 85 | **D1**/1 | 5EX2 | 24 | G1¼ | 3.5 | 1 | V3.0817-03 | 2.4 | retrofittable | - |
| **D 162-256**[1] | 140 | **D1**/2 | 10EX2 | 33 | G1¼ | 3.5 | 1 | V3.0817-06 | 2.4 | retrofittable | - |
| **D 162-258**[1] | 200 | **D1**/3 | 16EX2 | 33 | G1¼ | 3.5 | 1 | V3.0817-08 | 2.4 | retrofittable | - |
| D 162-251 | 220 | **D1**/4 | 30P | 18 | G1¼ | 3.5 | 1 | P3.0817-01[2] | 2.4 | retrofittable | - |
| D 162-283 | 160 | **D1**/5 | 5EX2 | 24 | G1¼ | 7 | 1 | V3.0817-03 | 2.4 | retrofittable | - |
| D 162-286 | 250 | **D1**/6 | 10EX2 | 33 | G1¼ | 7 | 1 | V3.0817-06 | 2.4 | retrofittable | - |
| | | | | | | | | | | | |
| D 232-253 | 120 | **D2**/1 | 5EX2 | 33 | G1¼ | 3.5 | 1 | V3.0823-03 | 3.4 | retrofittable | - |
| **D 232-256**[1] | 195 | **D2**/2 | 10EX2 | 47 | G1¼ | 3.5 | 1 | V3.0823-06 | 3.4 | retrofittable | - |
| **D 232-258**[1] | 275 | **D2**/3 | 16EX2 | 48 | G1¼ | 3.5 | 1 | V3.0823-08 | 3.4 | retrofittable | - |
| D 232-251 | 280 | **D2**/4 | 30P | 26 | G1¼ | 3.5 | 1 | P3.0823-01[2] | 3.4 | retrofittable | - |
| D 232-283 | 220 | **D2**/5 | 5EX2 | 33 | G1¼ | 7 | 1 | V3.0823-03 | 3.4 | retrofittable | - |
| D 232-286 | 300 | **D2**/6 | 10EX2 | 47 | G1½ | 7 | 1 | V3.0823-06 | 3.4 | retrofittable | - |
| | | | | | | | | | | | |
| D 332-253 | 170 | **D3**/1 | 5EX2 | 49 | G1¼ | 3.5 | 1 | V3.0833-03 | 4.0 | retrofittable | - |
| **D 332-256**[1] | 275 | **D3**/2 | 10EX2 | 67 | G1¼ | 3.5 | 1 | V3.0833-06 | 4.0 | retrofittable | - |
| **D 332-258**[1] | 280 | **D3**/3 | 16EX2 | 68 | G1¼ | 3.5 | 1 | V3.0833-08 | 4.0 | retrofittable | - |
| D 332-251 | 350 | **D3**/4 | 30P | 34 | G1½ | 3.5 | 1 | P3.0833-01[2] | 4.0 | retrofittable | - |
| D 332-283 | 280 | **D3**/5 | 5EX2 | 49 | G1¼ | 7 | 1 | V3.0833-03 | 4.0 | retrofittable | - |
| D 332-286 | 350 | **D3**/6 | 10EX2 | 67 | G1½ | 7 | 1 | V3.0833-06 | 4.0 | retrofittable | - |

[1] Preferred type, no minimum order quantity required [2] Paper media supported with metal gauze

Optical or electrical clogging indicators are available to monitor the clogging condition of the element. When ordering filters with integrated monitoring, the abbreviation of the clogging indicator has to be added to the order code of the desired filter variant.

**For the appropriate clogging indicator see catalog sheet 60.40.**

**Oder example: The filter D 162-253 is to be supplied with an optical indicator with automatic reset.**

**Order code:** **D 162-253 OD1**

**Part No. (basic unit)**

**Clogging indicator**

From catalog sheet 60.30, you can see clogging indicators that can be retrofitted.

**Remarks:**

- The switching pressure of the clogging indicator has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- The filters listed in this chart are standard filters. Other designs available on request.
- For versions with electrical clogging indicator, the device socket is not included in the scope of delivery.
- For the electrical clogging indicator of type DIN EN 175301-803 (ED8 and ED9) a device socket with two LEDs is available, which additionally enables visual indication of the filter contamination (order no. DG 041.1200).

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **DX** | Dirt-holding capacity | Connection A/B | Cracking pressure of by-pass | Symbol | Replacement filter element Part No. | Weight | Clogging indicator | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | gpm | | | g | SAE | psi | | | lbs | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| D 162-753 | 22.5 | **D1**/1 | 5EX2 | 24 | -20[2] | 51 | 1 | V3.0817-03 | 5.3 | retrofittable | - |
| **D 162-756**[1] | 37.0 | **D1**/2 | 10EX2 | 33 | -20[2] | 51 | 1 | V3.0817-06 | 5.3 | retrofittable | - |
| **D 162-758**[1] | 52.8 | **D1**/3 | 16EX2 | 33 | -20[2] | 51 | 1 | V3.0817-08 | 5.3 | retrofittable | - |
| D 162-751 | 58.1 | **D1**/4 | 30P | 18 | -20[2] | 51 | 1 | P3.0817-01[4] | 5.3 | retrofittable | - |
| D 162-783 | 42.3 | **D1**/5 | 5EX2 | 24 | -20[2] | 101 | 1 | V3.0817-03 | 5.3 | retrofittable | - |
| D 162-786 | 66.0 | **D1**/6 | 10EX2 | 33 | -20[2] | 101 | 1 | V3.0817-06 | 5.3 | retrofittable | - |
| | | | | | | | | | | | |
| D 232-753 | 31.7 | **D2**/1 | 5EX2 | 33 | -20[2] | 51 | 1 | V3.0823-03 | 7.5 | retrofittable | - |
| **D 232-756**[1] | 51.5 | **D2**/2 | 10EX2 | 47 | -20[2] | 51 | 1 | V3.0823-06 | 7.5 | retrofittable | - |
| **D 232-758**[1] | 72.6 | **D2**/3 | 16EX2 | 48 | -20[2] | 51 | 1 | V3.0823-08 | 7.5 | retrofittable | - |
| D 232-751 | 74.0 | **D2**/4 | 30P | 26 | -20[2] | 51 | 1 | P3.0823-01[4] | 7.5 | retrofittable | - |
| D 232-783 | 58.1 | **D2**/5 | 5EX2 | 33 | -20[2] | 101 | 1 | V3.0823-03 | 7.5 | retrofittable | - |
| D 232-786 | 79.3 | **D2**/6 | 10EX2 | 47 | -24[3] | 101 | 1 | V3.0823-06 | 7.5 | retrofittable | - |
| | | | | | | | | | | | |
| D 332-753 | 44.9 | **D3**/1 | 5EX2 | 49 | -20[2] | 51 | 1 | V3.0833-03 | 8.8 | retrofittable | - |
| **D 332-756**[1] | 72.6 | **D3**/2 | 10EX2 | 67 | -20[2] | 51 | 1 | V3.0833-06 | 8.8 | retrofittable | - |
| **D 332-758**[1] | 74.0 | **D3**/3 | 16EX2 | 68 | -20[2] | 51 | 1 | V3.0833-08 | 8.8 | retrofittable | - |
| D 332-751 | 92.5 | **D3**/4 | 30P | 34 | -24[3] | 51 | 1 | P3.0833-01[4] | 8.8 | retrofittable | - |
| D 332-783 | 74.0 | **D3**/5 | 5EX2 | 49 | -20[2] | 101 | 1 | V3.0833-03 | 8.8 | retrofittable | - |
| D 332-786 | 92.5 | **D3**/6 | 10EX2 | 67 | -24[3] | 101 | 1 | V3.0833-06 | 8.8 | retrofittable | - |

[1] Preferred type, no minimum order quantity required
[2] Corresponds to $1^5/_8$-12 UN-2B
[3] Corresponds to $1^7/_8$-12 UN-2B
[4] Paper media supported with metal gauze

Optical or electrical clogging indicators are available to monitor the clogging condition of the element. When ordering filters with integrated monitoring, the abbreviation of the clogging indicator has to be added to the order code of the desired filter variant.

**For the appropriate clogging indicator see catalog sheet 60.40.**

**Oder example: The filter D 162-753 is to be supplied with an optical indicator with automatic reset.**

**Order code:** **D 162-753 OD1**
**Part No. (basic unit)**
**Clogging indicator**

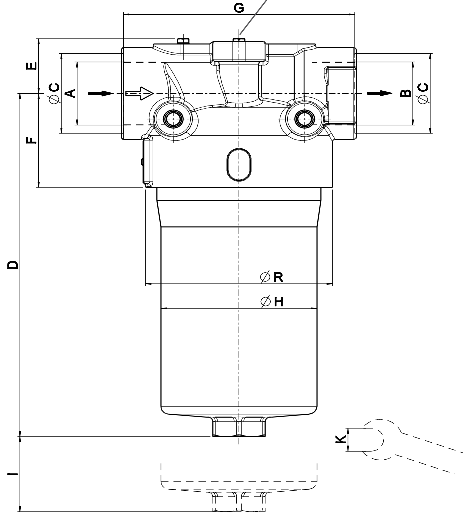
From catalog sheet 60.30, you can see clogging indicators that can be retrofitted.

**Remarks:**

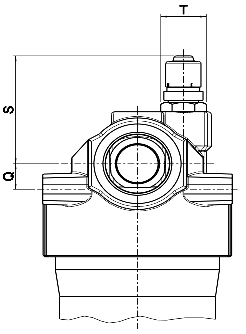
- The switching pressure of the clogging indicator has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- The filters listed in this chart are standard filters. Other designs available on request.
- For versions with electrical clogging indicator, the device socket is not included in the scope of delivery.
- For the electrical clogging indicator of type DIN EN 175301-803 (ED8 and ED9), a device socket with two LEDs is available, which additionally enables visual indication of the filter contamination (order no. DG 041.1200).

## Dimensions

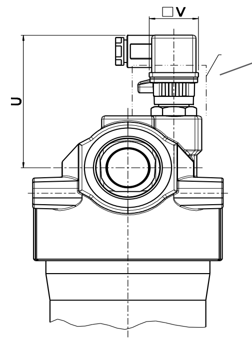
Clogging indicator optional:
Pressure holes plugged with screws M4




Version with integrated optical clogging indicator (OD2)

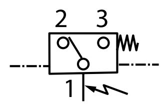


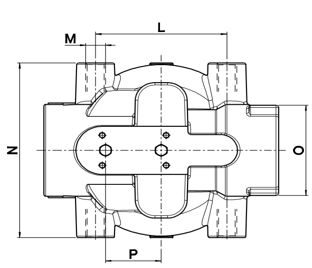

Version with integrated electrical clogging indicator (ED8) and device socket*

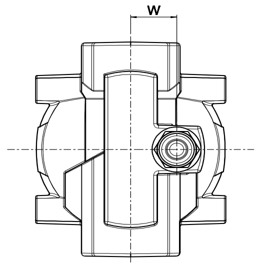


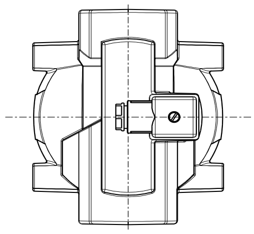

* not included in scope of delivery

Terminal connection ED8



## Measurements in mm

| Type | A/B | C | D | E | F | G | H | I | K | L | M Ø/depth | N | O | P | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D 162 | G1¼ | 53 | 228 | 38 | 62 | 140 | 95 | 80 | AF 32 | 80 | M12 / 18 | 116 | AF 60 | 34 | 17 |
| D 232 | G1¼, G1½ | 53 | 291 | 38 | 62 | 140 | 95 | 80 | AF 32 | 80 | M12 / 18 | 116 | AF 60 | 34 | 17 |
| D 332 | G1¼, G1½ | 53 | 398 | 38 | 62 | 140 | 95 | 80 | AF 32 | 80 | M12 / 18 | 116 | AF 60 | 34 | 17 |

| Type | R | S | T | U | V | W |
|---|---|---|---|---|---|---|
| D 162 | 115 | 72 | AF 24 | 89 | □ 30 | 28 |
| D 232 | 115 | 72 | AF 24 | 89 | □ 30 | 28 |
| D 332 | 115 | 72 | AF 24 | 89 | □ 30 | 28 |

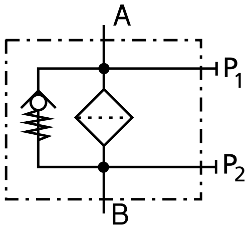
## Measurements in inch

| Type | A/B SAE | C | D | E | F | G | H | I | K mm | L | M Ø / depth | N | O mm | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D 162 | -20 | 2.09 | 8.98 | 1.50 | 2.44 | 5.51 | 3.74 | 3.15 | AF 32 | 3.15 | M12 / 0.71 | 4.57 | AF 60 | 1.34 |
| D 232 | -20, -24 | 2.09 | 11.46 | 1.50 | 2.44 | 5.51 | 3.74 | 3.15 | AF 32 | 3.15 | M12 / 0.71 | 4.57 | AF 60 | 1.34 |
| D 332 | -20, -24 | 2.09 | 15.67 | 1.50 | 2.44 | 5.51 | 3.74 | 3.15 | AF 32 | 3.15 | M12 / 0.71 | 4.57 | AF 60 | 1.34 |

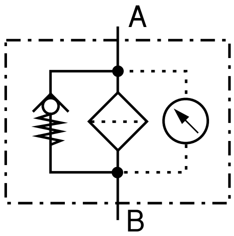
| Type | Q | R | S | T | U | V | W |
|---|---|---|---|---|---|---|---|
| D 162 | 0.67 | 4.53 | 2.83 | AF 24 | 3.50 | □ 1.18 | 1.10 |
| D 232 | 0.67 | 4.53 | 2.83 | AF 24 | 3.50 | □ 1.18 | 1.10 |
| D 332 | 0.67 | 4.53 | 2.83 | AF 24 | 3.50 | □ 1.18 | 1.10 |

## Symbols

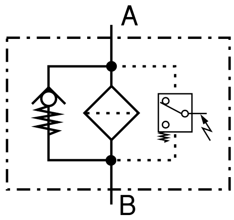
1



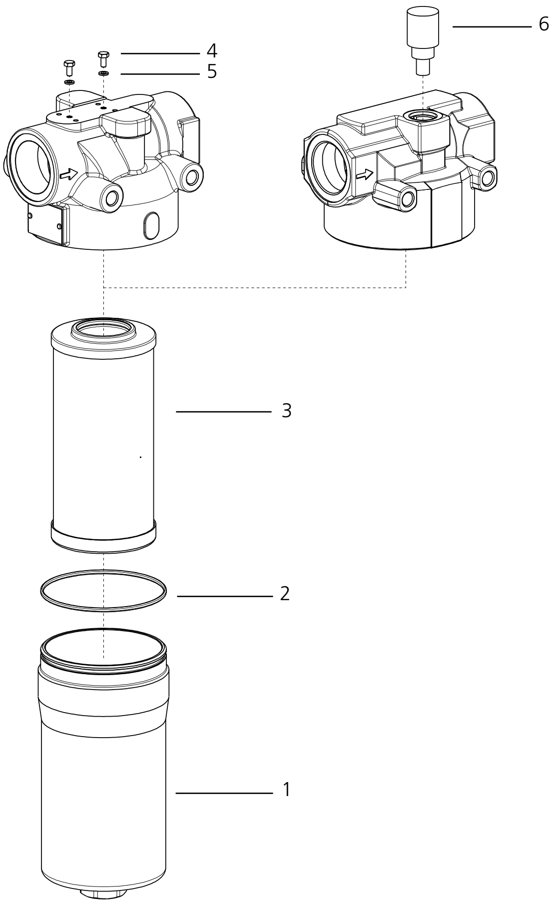

2




3




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Filter bowl D 162 | D 162.0102 |
| 1 | Filter bowl D 232 | D 232.0102 |
| 1 | Filter bowl D 332 | D 332.0102 |
| 2 | O-ring<br>88.57 x 2.62 mm<br>3.49 x 0.10 inch | N007.0886 |
| 3 | Replacement filter element<br>(with seal) | see Chart / col. 9 |
| 4 | Hexagonal head screw M4 x 8<br>DIN 933-8.8 | 11385800 |
| 5 | Bonded seal<br>4.1 x 7.2 x 1 mm<br>0.16 x 0.28 x 0.04 inch | 12504600 |
| 6 | Clogging indicator<br>(with seal) | s. catalog sheet<br>60.40 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

**Before release into the series production the filter casing is tested for fatigue strength in our pressure pulse test rig. Various quality controls during the production process guarantee the leakfree function and solidity of our filters.**

ARGO HYTOS

## Low-Pressure In-Line Filters

# FNL 1000 · FNL 2000

In-line mounting · Operating pressure up to 40 bar / 580 psi · Nominal flow rate up to 1450 l/min / 383 gpm

Low-Pressure In-Line Filter
FNL 1000

## Description

### Application

In the pressure circuits of hydraulic and lubrication systems.

### Performance features

*Protection against wear:*
By means of filter elements that even meet 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 $\nu \leq 200$ mm²/s / 927 SUS (cold start condition).

### Filter elements

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

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

### Filter maintenance

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

### Materials

| | |
|---|---|
| Cover: | Aluminum alloy |
| Filter housing: | Aluminum alloy |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web<br>Paper - cellulose web, impregnated with resin |

### Accessories

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

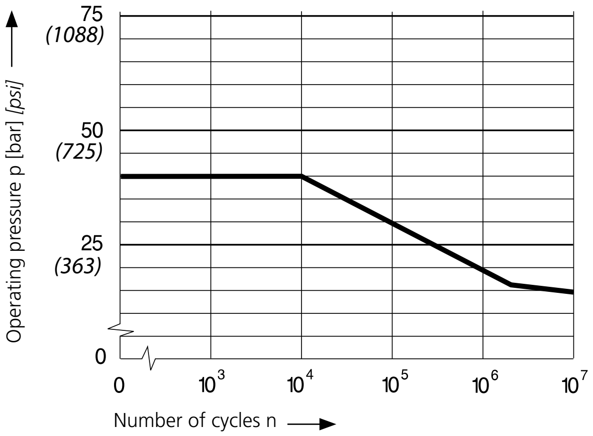
## Characteristics

### Operating pressure

0 ... 16 bar / 232 psi, min. 3 x $10^6$ pressure cycles
Nominal pressure according to DIN 24550

0 ... 40 bar / 580 psi, min. $10^4$ pressure cycles
Quasi-static operating pressure

### Permissible pressures for other numbers of cycles




### Nominal flow rate

Up to 1450 l/min / 383 gpm (see Selection Chart, column 2).
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

› closed by-pass valve at $\nu \leq$ 200 mm²/s / 927 SUS

› element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume

› flow velocity in the connection lines:
up to 25 bar ≤ 4.5 m/s / 363 psi ≤ 14.8 ft/s

### Filter fineness

5 µm(c) ... 10 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 )
-22 °F ... +212 °F (temporary -40 °F ... +248 °F )

### Viscosity at nominal flow rate

› at operating temperature: $\nu <$ 60 mm²/s / 280 SUS

› as starting viscosity: $\nu_{max}$ = 1200 mm²/s / 5560 SUS

› at initial operation:
The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% Δp of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the Δp curve at a point. Read this point on the horizontal axis for the viscosity.

### Mounting position

Preferably vertical, filter head at the bottom.

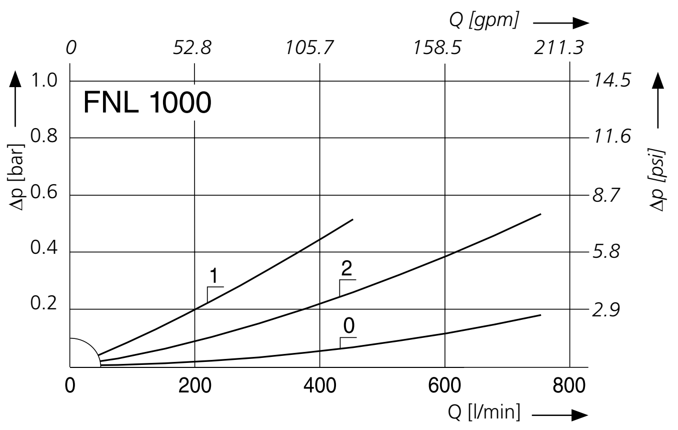
### Connection

› SAE-flange (3000 psi)

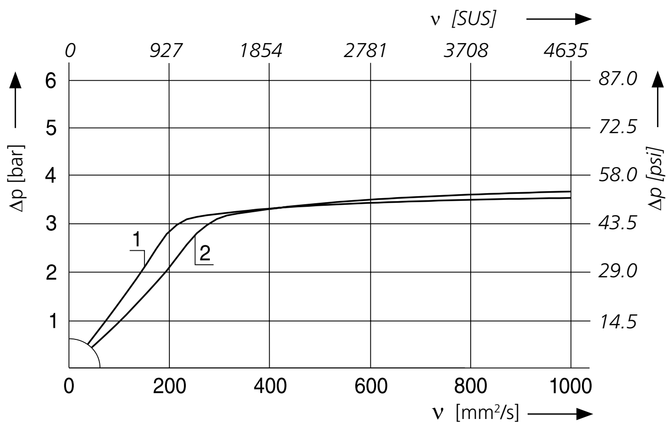
Sizes see Selection Chart, line 6
(other connections on request).
Standard: connection ports A/B opposed.
Optional: connection port A sidewise, connection port B at the bottom.

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

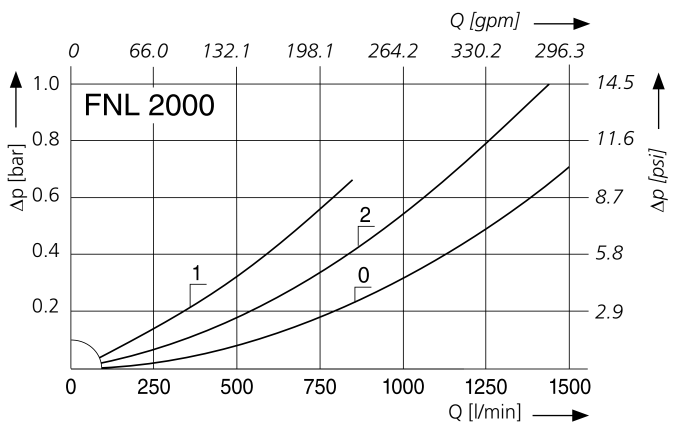
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



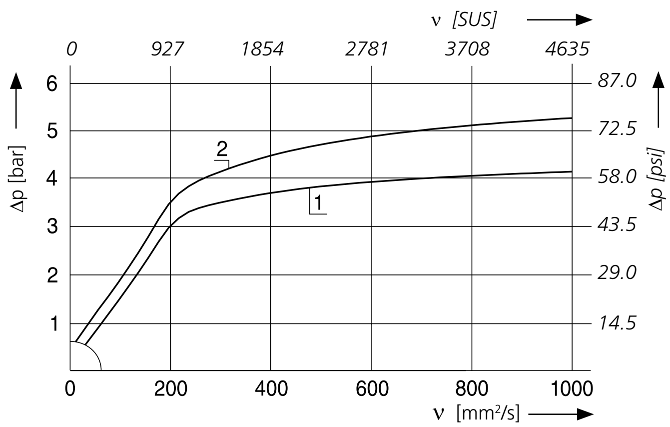

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

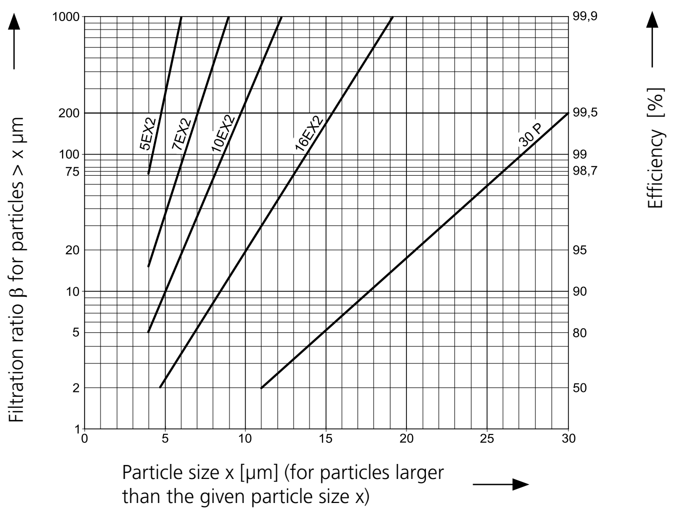



Pressure drop as a function of the **kinematic viscosity** at nominal flow




## Filter fineness curves in Selection Chart, column 4

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX2 and Paper elements:**

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

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

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

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt-holding capacity | Connection A/B | Cracking pressure of bypass | Symbol | Replacement filter element Part No. | Weight | Clogging indicator | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | | | kg | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| FNL 1000-153 | 420 | **D1**/1 | 5EX2 | 130 | SAE 2 | 3.0 | 4 | V3.1449-53 | 21 | retrofittable | - |
| FNL 1000-156 | 555 | **D1**/2 | 10EX2 | 190 | SAE 2 | 3.0 | 4 | V3.1449-56 | 21 | retrofittable | - |
| FNL 2000-153 | 820 | **D2**/1 | 5EX2 | 260 | SAE 4 | 3.0 | 4 | V3.1493-53 | 28 | retrofittable | - |
| FNL 2000-156 | 1450 | **D2**/2 | 10EX2 | 370 | SAE 4 | 3.0 | 4 | V3.1493-56 | 28 | retrofittable | - |

| | gpm | | | g | | psi | | | lbs | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| FNL 1000-153 | 111.0 | **D1**/1 | 5EX2 | 130 | SAE 2 | 43.5 | 4 | V3.1449-53 | 46.3 | retrofittable | - |
| FNL 1000-156 | 146.6 | **D1**/2 | 10EX2 | 190 | SAE 2 | 43.5 | 4 | V3.1449-56 | 46.3 | retrofittable | - |
| FNL 2000-153 | 216.6 | **D2**/1 | 5EX2 | 260 | SAE 4 | 43.5 | 4 | V3.1493-53 | 61.7 | retrofittable | - |
| FNL 2000-156 | 383.0 | **D2**/2 | 10EX2 | 370 | SAE 4 | 43.5 | 4 | V3.1493-56 | 61.7 | retrofittable | - |

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 FNL 1000-153 has to be supplied with electrical clogging indicator - response pressure 2.5 bar / 36 psi.**

**Order description:** **FNL 1000-153** **/** **DG 041-32** **M**

**Part No. (basic unit)** — FNL 1000-153

**Clogging indicator** — DG 041-32

**Mounted** — M

**For the appropriate clogging indicator see catalog sheet 60.30.**

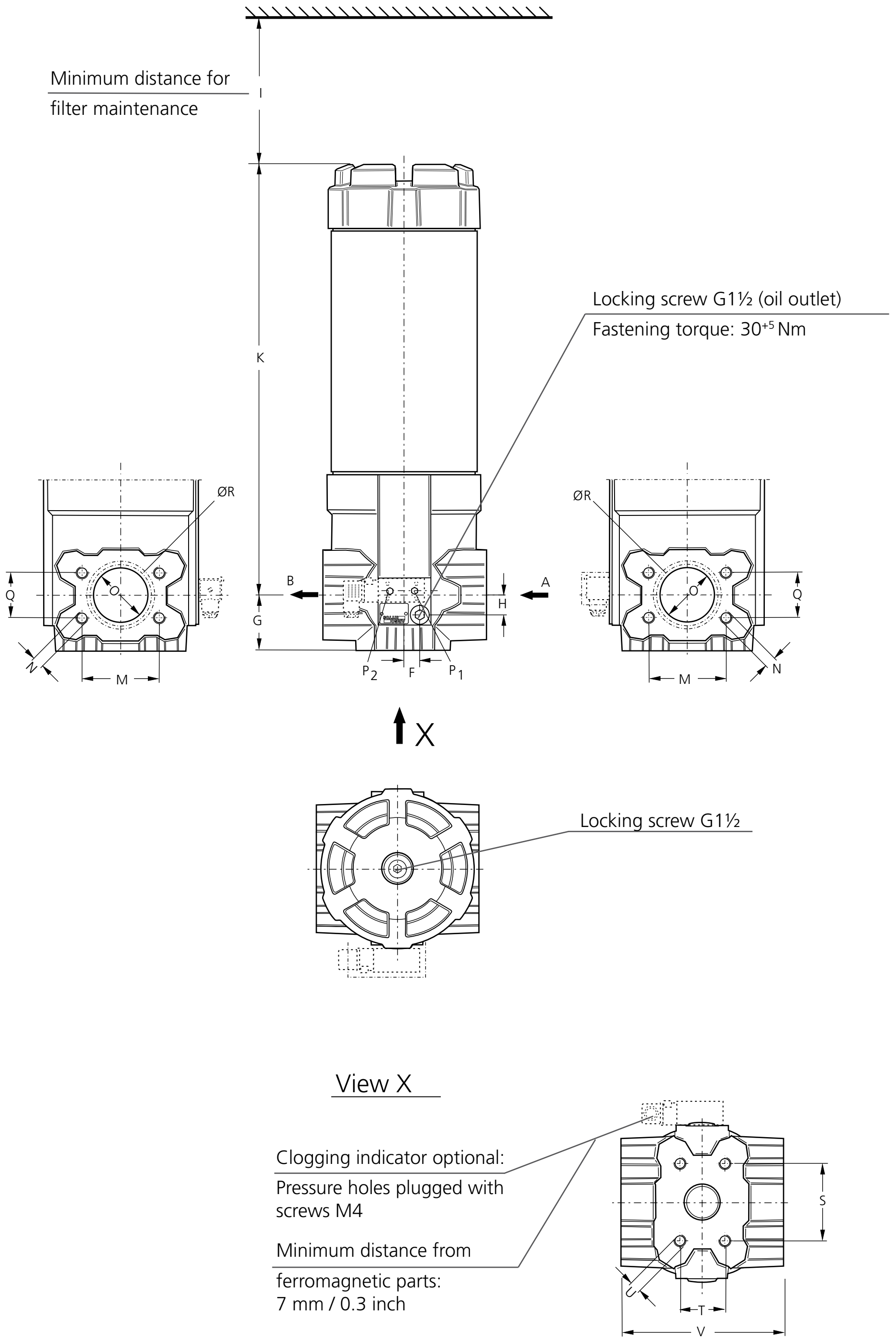
**Remarks:**

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

**Options:**

- Other filter finenesses on request.
- Check valve in filter head on request.
- Connection port A sidewise, connection port B at the bottom (standard: connection ports A/B opposed).

## Dimensions



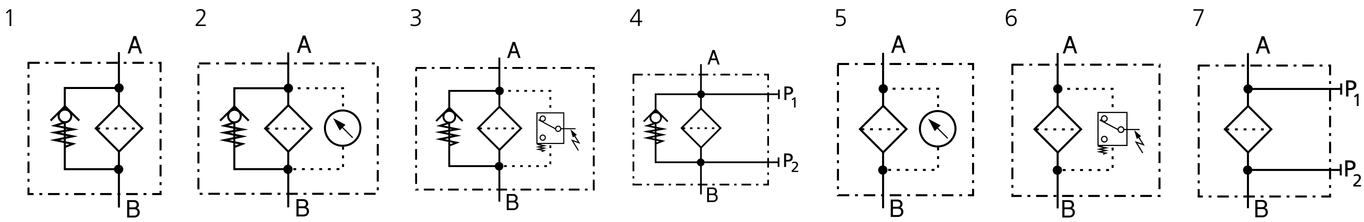

## Measurements in mm

| Type | A/B | F | G | H | I | K | M | N | O | Q | R | S | T | U | V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FNL 1000 | SAE 2 | 19 | 76.5 | 26.5 | 450 | 593 | 77.8 | M12 | Ø 50 | 42.6 | 56 - 64 | 130.2 | 77.8 | M16 | 224 |
| FNL 2000 | SAE 4 | 19 | 76.5 | 26.5 | 890 | 1033 | 130.2 | M16 | Ø 100 | 77.8 | 110 - 118 | 130.2 | 77.8 | M16 | 224 |

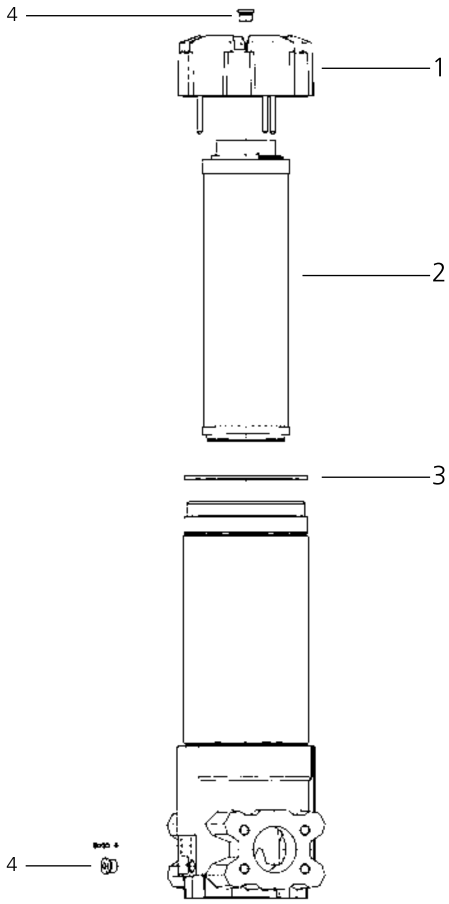
## Measurements in inch

| Type | A/B | F | G | H | I | K | M | N | O | Q | R | S | T | U | V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FNL 1000 | SAE 2 | 0.75 | 3.01 | 1.04 | 17.72 | 23.35 | 3.06 | M12 | Ø1.97 | 1.68 | 2.20 - 2.52 | 5.13 | 3.06 | M16 | 8.82 |
| FNL 2000 | SAE 4 | 0.75 | 3.01 | 1.04 | 35.04 | 40.67 | 5.13 | M16 | Ø3.94 | 3.06 | 4.33 - 4.65 | 5.13 | 3.06 | M16 | 8.82 |

## Symbols




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Cover (complete) | FNL 1000.1200 |
| 2 | Replacement filter element | see Chart / col. 9 |
| 3 | O-ring | N007.1905 |
| 4 | Locking screw | SV 0620.08 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

**Before release into the series production the filter casing is tested for fatigue strength in our pressure pulse test rig. Various quality controls during the production process guarantee the leakfree function and solidity of our filters.**

High-Pressure Safety Filters

# HD 040 · HD 081 · HD 150

In-line mounting · Operating pressure up to 500 bar / 7250 psi · Nominal flow rate up to 100 l/min / 26.4 gpm

M

High-Pressure Safety Filter HD 081

## Description

### Application

In the high-pressure circuits of hydraulic systems.

### Performance features

*Functional protection:*
The high-pressure safety filter retains residues remaining in the system due to installation or after repairs, and intake chops from pumps (especially gear pumps). This prevents functional failures or faults on downstream components, particularly control / regulation or throttle valves.

*Protection against wear:*
For wear protection, a fine filter should be installed elsewhere in the system.

### Filter elements

Flow direction from outside to center.
The star-shaped pleating of the filter material provides:

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

### Materials

| | |
|---|---|
| Housing: | Steel, zinc plated |
| Seals: | NBR (FPM on request) |
| Filter media: | Stainless steel wire mesh (1.4301) |

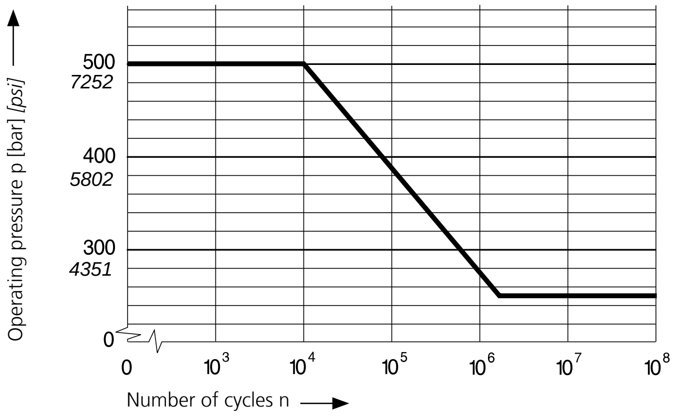
## Characteristics

### Operating pressure

0 ... 250 bar / 3625 psi, min. 2 x $10^6$ pressure cycles
Nominal pressure according to DIN 24550

0 ... 500 bar / 7250 psi, min. $10^4$ pressure cycles
Quasi-static operating pressure

### Permissible pressure for other numbers of cycles




### Nominal flow rate

Up to 100 l/min / 26.4 gpm (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- flow velocity in the connection lines:
  up to 250 bar ≤ 8 m/s / up to 3626 psi ≤ 26.3 ft/s
  > 250 bar ≤ 12 m/s / > 3626 psi ≤ 39.4 ft/s

### Filter fineness

60 µm, 100 µm
(see Selection Chart, column 4).

### 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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Mounting position

As desired.

### Connection

Threaded ports according to

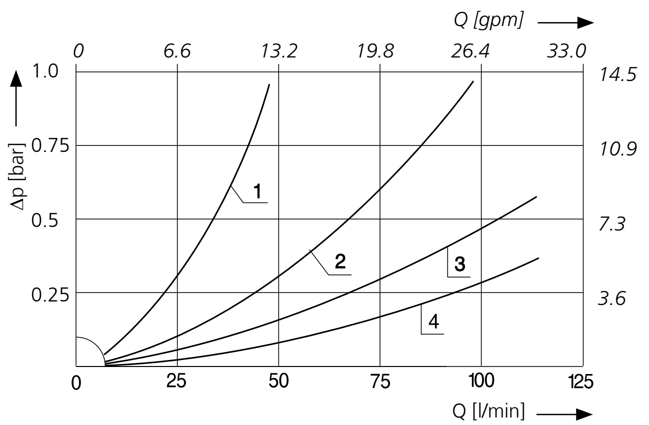
- ISO 228, DIN 13 or DIN 3861
- SAE standard J514

Sizes see Selection Chart, column 7
(other port threads on request).

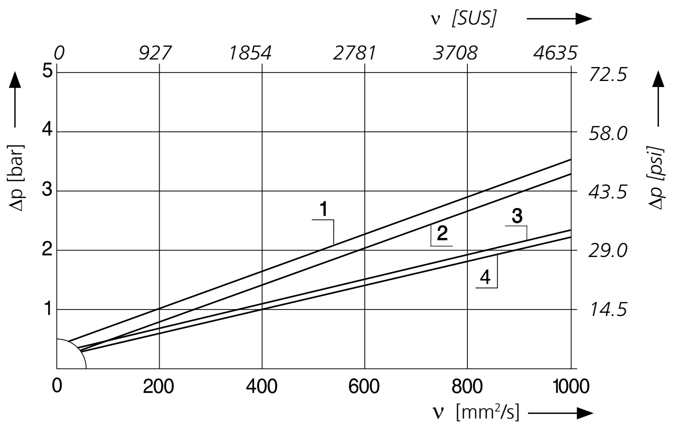
## Diagrams

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

**D1** Pressure drop as a function of the **flow volume** at $\nu = 35$ mm²/s / 162 SUS




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



## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness | Filter surface | Cracking pressure of by-pass | Connection A/B | Dimension C | Dimension D | Dimension E | Dimension F | Dimension H | Dimension L | Width across flats AF 1/2 | Symbol | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | µm | cm² | bar | | mm | mm | mm | mm | mm | mm | | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| HD 040-110 | 40 | **D1**/1 | 100 | 60 | - | M22 x 1.5 | 12 | - | 7 | 15 | 63 | 97 | 36/36 | 1 | 0.45 | 1+2 |
| HD 081-111 | 80 | **D1**/2 | 100 | 125 | - | M26 x 1.5 | 12 | 52 | 7.5 | 18 | 11 | 130 | 46/46 | 1 | 1.10 | 1+2 |
| HD 150-01 | 100 | **D1**/3 | 100 | 300 | - | G¾ | 12 | 65 | 10.5 | - | - | 142.5 | 55/36 | 1 | 2.00 | 1 |
| HD 150-50 | 100 | **D1**/4 | 60 | 320 | 3.5 | G¾ | 12 | 65 | 10.5 | - | - | 142.5 | 55/36 | 2 | 1.90 | - |

[1] Filter element differential pressure stable up to 160 bar / 2320 psi
[2] Connection according to DIN 3861

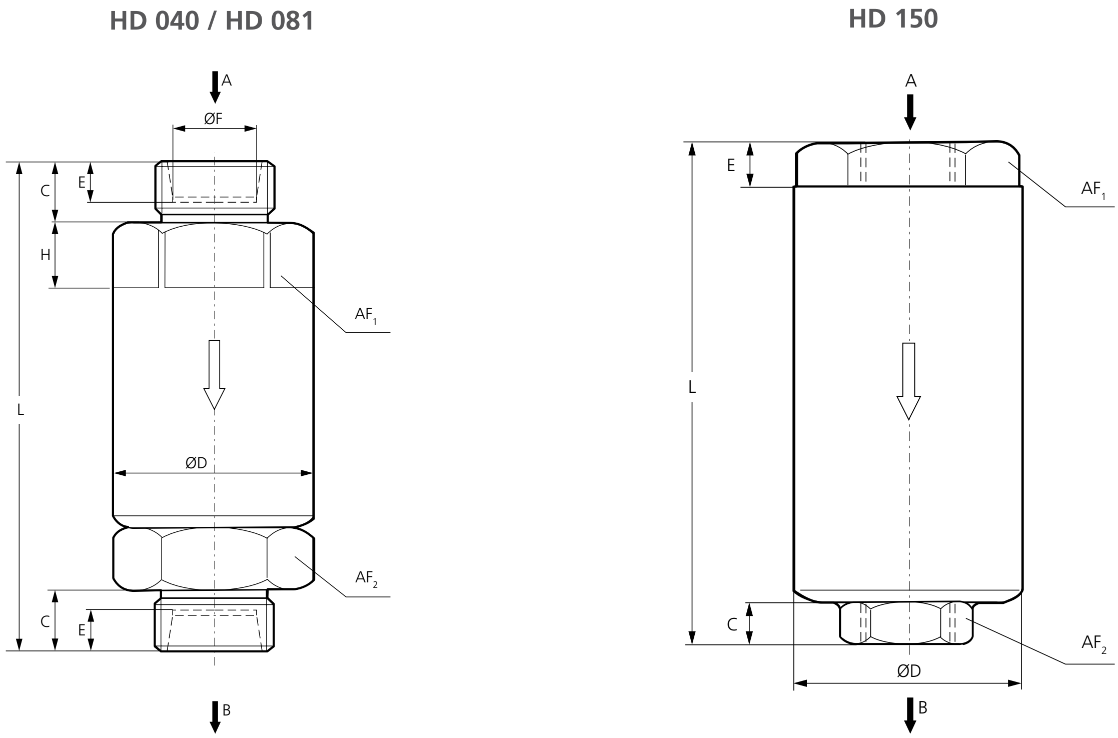
| | gpm | | µm | inch² | psi | | inch | inch | inch | inch | inch | inch | mm | | lbs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| HD 040-710 | 10.6 | **D1**/1 | 60 | 9.3 | - | -10/<br>-8 SAE[3] | 0.47 | - | 0.28 | 0.59 | 2.48 | 3.82 | 36/36 | 1 | 1.0 | 1 |
| HD 081-711 | 21.1 | **D1**/2 | 100 | 19.4 | - | -12 SAE[4] | 0.47 | 2.05 | 0.30 | 0.71 | 0.43 | 5.12 | 46/46 | 1 | 2.4 | 1 |
| HD 150-701 | 26.4 | **D1**/3 | 100 | 46.5 | - | -12 SAE[5] | 0.47 | 2.56 | 0.41 | - | - | 5.61 | 55/36 | 1 | 4.4 | 1 |

[1] Filter element differential pressure stable up to 2320 psi / 160 bar
[3] Corresponds to 1-14 UNS-2A / 13/16-16 UN-2A
[4] Corresponds to 1 1/16-12 UN-2A
[5] Corresponds to 1 1/16-12 UN-2B

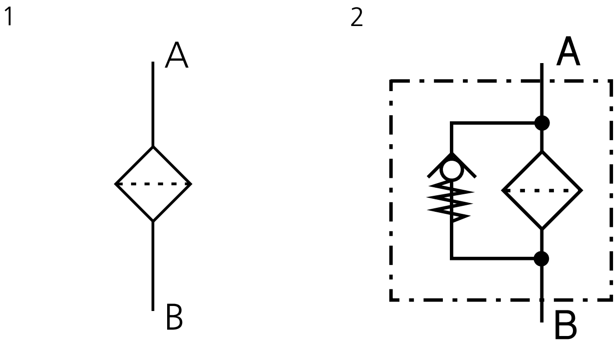
**Remark:**

The filters listed in the chart are standard filters. If modifications are required, e.g. different filter finenesses, we kindly ask for your request.

## Dimensions




## Symbols




## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

**Before release into the series production the filter casing is tested for fatigue strength in our pressure pulse test rig. Various quality controls during the production process guarantee the leakfree function and solidity of our filters.**

ARGO HYTOS



# HD 049 · HD 069

In-line mounting · Operating pressure up to 630 bar / 9137 psi · Nominal flow rate up to 105 l/min / 27.7 gpm

High Pressure Filter HD 049

## Description

### Application

In the high pressure circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
Through installation near to the control valves or other expensive components. The specific determined flow rate guarantees a closed by-pass valve even at ≤ 200 mm²/s / 927 SUS (cold start condition).

### Filter elements

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

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

### 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: | Spheroidal graphite cast iron (SGI) |
| Filter bowl: | Cold extruded steel |
| Coating: | Powder paint resp. phosphate coating/primed |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web<br>Paper - cellulose web, impregnated with resin |

### Accessories

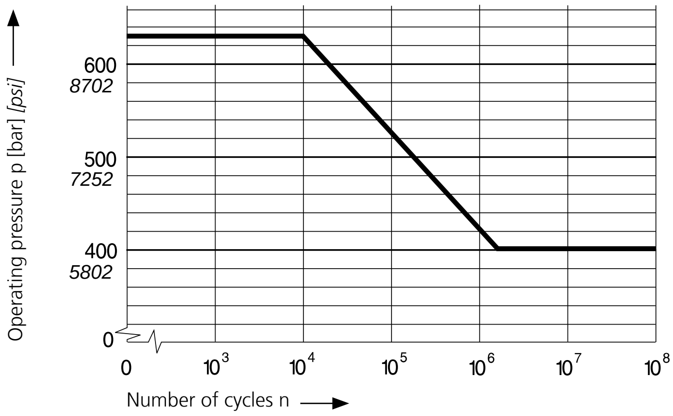
Electrical and / or optical clogging indicators are available on request. Dimensions and technical data see catalog sheet 60.40.

**Operating pressure**

0 ... 400 bar / 5800 psi, min. 2 x $10^6$ pressure cycles
Nominal pressure according to DIN 24550

0 ... 630 bar / 9137 psi, min. $10^4$ pressure cycles
Quasi-static operating pressure

**Permissible pressures for other numbers of cycles**




**Nominal flow rate**

Up to 105 l/min / 27.7 gpm (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

› closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
› element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
› flow velocity in the connection lines:
up to 250 bar ≤ 8 m/s / up to 3626 ≤ 26.3 ft/s
> 250 bar ≤ 12 m/s / > 3626 ≤ 39.4 ft/s

**Filter fineness**

5 µm(c) ... 30 µm(c)
β-values according to ISO 16889
(see Selection Chart, column 4 and diagram Dx).

**Dirt-holding capacity**

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

**Hydraulic fluids**

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

**Temperature range**

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

**Viscosity at nominal flow rate**

› at operating temperature: $\nu < 60$ mm²/s / 280 SUS
› as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
› at initial operation:
The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% Δp of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the Δp curve at a point. Read this point on the horizontal axis for the viscosity.

**Mounting position**

Preferably vertical, filter head on top.

**Connection**

Threaded ports according to

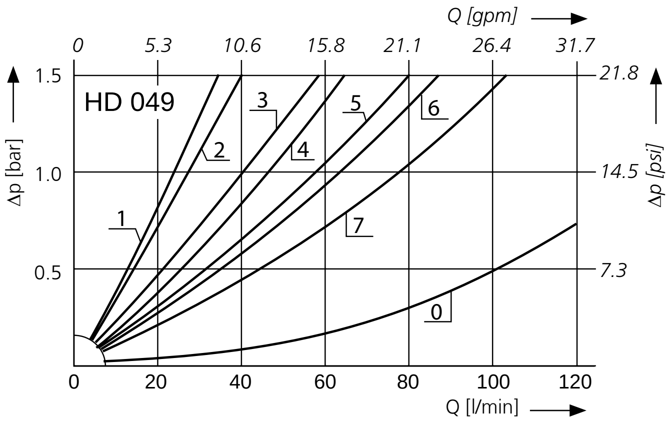
› ISO 228 or DIN 13
› SAE standard J514

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

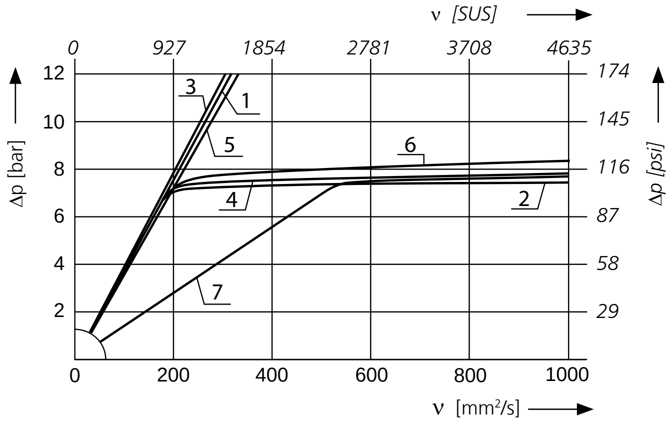
## Diagrams

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

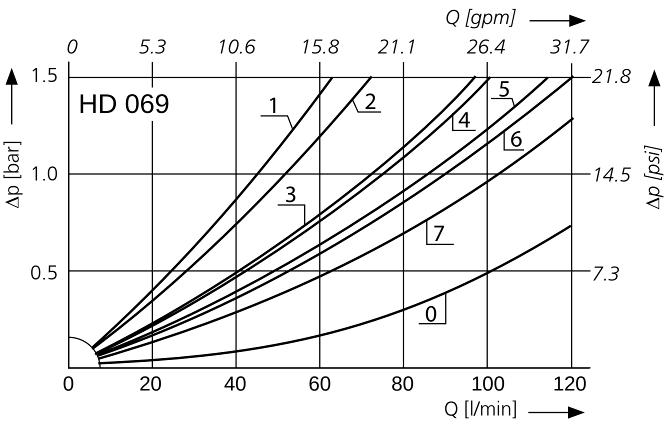
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



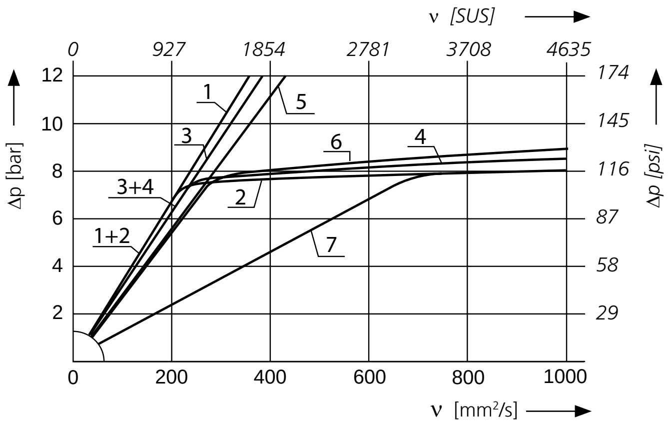

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

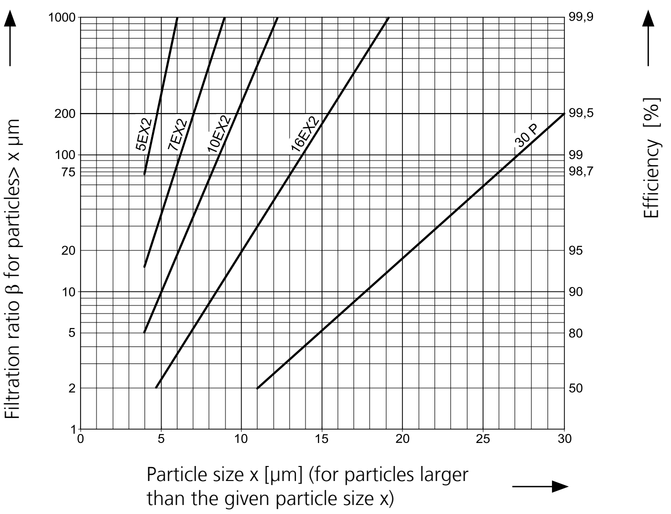



Pressure drop as a function of the **kinematic viscosity** at nominal flow




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

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX2 and Paper element:**

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

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

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189

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

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness diagr. **Dx** | Dirt-holding capacity | Connection A/B | Cracking pressure of by-pass | Symbol | Replacement element Part No. | Weight | Clogging indicator Cracking pressure ( ) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | | | kg | bar | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| HD 049-189 ED8 | 27 | **D1**/1 | 5EX2 | 5.2 | G½ | - | 4 | V3.0510-13[2] | 3.9 | electrical (5) | change-over |
| HD 049-169 | 30 | **D1**/2 | 5EX2 | 4.9 | G½ | 7 | 1 | V3.0510-03 | 3.8 | - | - |
| | | | | | | | | | | | |
| HD 049-186 ED8 | 47 | **D1**/3 | 10EX2 | 5.1 | G½ | - | 4 | V3.0510-16[2] | 3.9 | electrical (5) | change-over |
| **HD 049-166**[1] | 50 | **D1**/4 | 10EX2 | 6.8 | G½ | 7 | 1 | V3.0510-06 | 3.8 | - | - |
| | | | | | | | | | | | |
| HD 049-188 ED8 | 65 | **D1**/5 | 16EX2 | 5.6 | G½ | - | 4 | V3.0510-18[2] | 3.9 | electrical (5) | change-over |
| **HD 049-268**[1] | 75 | **D1**/6 | 16EX2 | 6.9 | M18 x 1.5 | 7 | 1 | V3.0510-08 | 3.8 | - | [4] |
| **HD 049-168**[1] | 75 | **D1**/6 | 16EX2 | 6.9 | G½ | 7 | 1 | V3.0510-08 | 3.8 | - | - |
| | | | | | | | | | | | |
| HD 049-151 | 55 | **D1**/7 | 30P | 3.6 | G½ | 7 | 1 | P3.0510-11[3] | 3.8 | - | - |
| | | | | | | | | | | | |
| HD 069-189 ED8 | 50 | **D2**/1 | 5EX2 | 8.7 | G½ | - | 4 | V3.0520-13[2] | 5.1 | electrical (5) | change-over |
| HD 069-169 | 60 | **D2**/2 | 5EX2 | 10 | G½ | 7 | 1 | V3.0520-03 | 4.9 | - | - |
| | | | | | | | | | | | |
| HD 069-186 ED8 | 80 | **D2**/3 | 10EX2 | 11 | G¾ | - | 4 | V3.0520-16[2] | 5.1 | electrical (5) | change-over |
| **HD 069-166**[1] | 85 | **D2**/4 | 10EX2 | 14 | G¾ | 7 | 1 | V3.0520-06 | 4.9 | - | - |
| | | | | | | | | | | | |
| HD 069-188 ED8 | 100 | **D2**/5 | 16EX2 | 12 | G¾ | - | 4 | V3.0520-18[2] | 5.1 | electrical (5) | change-over |
| **HD 069-268**[1] | 105 | **D2**/6 | 16EX2 | 15 | G¾ | 7 | 1 | V3.0520-08 | 4.9 | - | [4] |
| **HD 069-168**[1] | 105 | **D2**/6 | 16EX2 | 15 | G¾ | 7 | 1 | V3.0520-08 | 4.9 | - | - |
| | | | | | | | | | | | |
| HD 069-151 | 80 | **D2**/7 | 30P | 7.1 | G¾ | 7 | 1 | P3.0520-01[3] | 4.9 | - | - |

[1] Preferred type, no minimum order quantity required
[2] Element differential pressure up to 160 bar, clogging indicator required
[3] Paper media supported with metal gauze
[4] Housing primed/phosphated

Optical or electrical clogging indicators are available to monitor the clogging condition of the element. When ordering filters with integrated monitoring, the abbreviation of the clogging indicator has to be added to the order code of the desired filter variant.

**For the appropriate clogging indicator see catalog sheet 60.40.**

**Oder example: The filter HD 049-169 is to be supplied with an optical indicator with automatic reset.**

**Order code:** **HD 049-169 OD1**

**Part No. (basic unit)** → HD 049-169

**Clogging indicator** → OD1

**Remarks:**

- The switching pressure of the clogging indicator has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- For versions with electrical clogging indicator, the device socket is not included in the scope of delivery.
- For the electrical clogging indicator of type DIN EN 175301-803 (ED8 and ED9), a device socket with two LEDs is available, which additionally enables visual indication of the filter contamination (order no. DG 041.1200).
- The filters listed in this chart are standard filters. Other designs available on request.

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness diagr. **DX** | Dirt-holding capacity | Connection A/B | Cracking pressure of by-pass | Symbol | Replacement element Part No. | Weight | Clogging indicator Cracking pressure ( ) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | gpm | | | g | SAE | psi | | | lbs | psi | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| HD 049-789 ED8 | 7.1 | **D1**/1 | 5EX2 | 5.2 | -8[4] | - | 4 | V3.0510-13[2] | 8.6 | electrical (73) | change-over |
| HD 049-769 | 7.9 | **D1**/2 | 5EX2 | 4.9 | -8[4] | 102 | 1 | V3.0510-03 | 8.4 | - | - |
| | | | | | | | | | | | |
| HD 049-786 ED8 | 12.4 | **D1**/3 | 10EX2 | 5.1 | -8[4] | - | 4 | V3.0510-16[2] | 8.6 | electrical (73) | change-over |
| **HD 049-766[1]** | 13.2 | **D1**/4 | 10EX2 | 6.8 | -8[4] | 102 | 1 | V3.0510-06 | 8.4 | - | - |
| | | | | | | | | | | | |
| HD 049-788 ED8 | 17.2 | **D1**/5 | 16EX2 | 5.6 | -8[4] | - | 4 | V3.0510-18[2] | 8.6 | electrical (73) | change-over |
| **HD 049-798[1]** | 19.8 | **D1**/6 | 16EX2 | 6.9 | -8[4] | 102 | 1 | V3.0510-08 | 8.4 | - | - |
| | | | | | | | | | | | |
| HD 049-751 | 14.5 | **D1**/7 | 30P | 3.6 | -8[4] | 102 | 1 | P3.0510-11[3] | 8.4 | - | - |
| | | | | | | | | | | | |
| HD 069-789 ED8 | 13.2 | **D2**/1 | 5EX2 | 8.7 | -8[4] | - | 4 | V3.0520-13[2] | 11.2 | electrical (73) | change-over |
| HD 069-769 | 15.9 | **D2**/2 | 5EX2 | 10 | -8[4] | 102 | 1 | V3.0520-03 | 10.8 | - | - |
| | | | | | | | | | | | |
| HD 069-786 ED8 | 21.1 | **D2**/3 | 10EX2 | 11 | -12[5] | - | 4 | V3.0520-16[2] | 11.2 | electrical (73) | change-over |
| **HD 069-766[1]** | 22.5 | **D2**/4 | 10EX2 | 14 | -12[5] | 102 | 1 | V3.0520-06 | 10.8 | - | - |
| | | | | | | | | | | | |
| HD 069-788 ED8 | 26.4 | **D2**/5 | 16EX2 | 12 | -12[5] | - | 4 | V3.0520-18[2] | 11.2 | electrical (73) | change-over |
| **HD 069-768[1]** | 27.7 | **D2**/6 | 16EX2 | 15 | -12[5] | 102 | 1 | V3.0520-08 | 10.8 | - | - |
| | | | | | | | | | | | |
| HD 069-751 | 21.1 | **D2**/7 | 30P | 7.1 | -12[5] | 102 | 1 | P3.0520-01[3] | 10.8 | - | - |

[1] Preferred type, no minimum order quantity required
[2] Element differential pressure up to 2320 psi, clogging indicator required
[3] Paper media supported with metal gauze
[4] Corresponds to ¾-16 UNF-2B
[5] Corresponds to 1 1/16-12 UN-2B

Optical or electrical clogging indicators are available to monitor the clogging condition of the element. When ordering filters with integrated monitoring, the abbreviation of the clogging indicator has to be added to the order code of the desired filter variant.

**For the appropriate clogging indicator see catalog sheet 60.40.**

**Oder example: The filter HD 049-769 is to be supplied with an optical indicator with automatic reset.**

**Order code:** **HD 049-769 OD1**

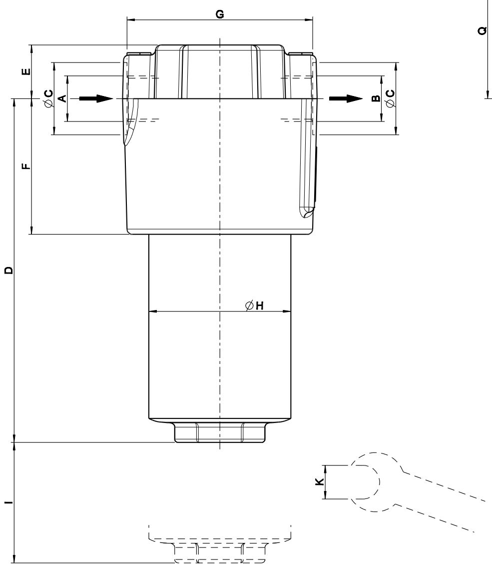
**Part No. (basic unit)**

**Clogging indicator**

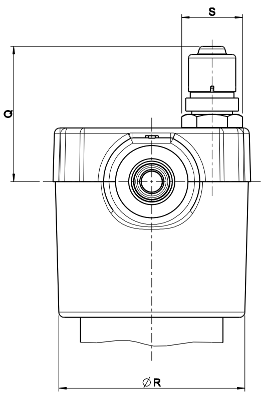
**Remarks:**

- The switching pressure of the clogging indicator has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- For versions with electrical clogging indicator, the device socket is not included in the scope of delivery.
- For the electrical clogging indicator of type DIN EN 175301-803 (ED8 and ED9), a device socket with two LEDs is available, which additionally enables visual indication of the filter contamination (order no. DG 041.1200).
- The filters listed in this chart are standard filters. Other designs available on request.

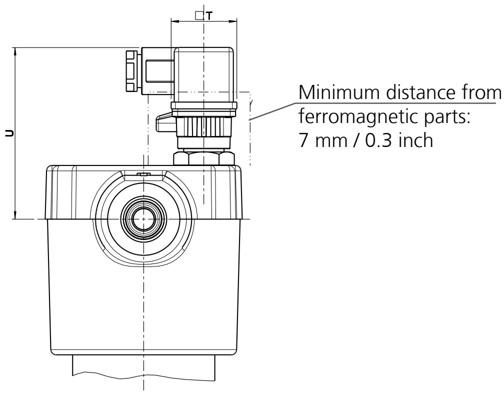
## Dimensions




Version with integrated optical clogging indicator OD1

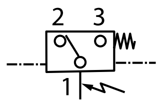


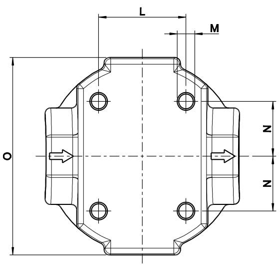

Version with integrated electrical clogging indicator ED8 with device socket [1]

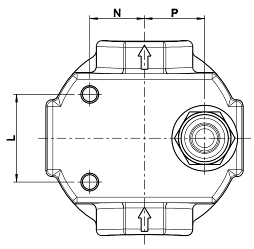


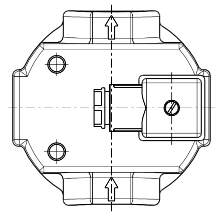

[1] not included in scope of delivery

Terminal connection ED8



## Measurements in mm

| Type | A/B | C | D | E | F | G | H | I | K | L | M Ø/depth | N | O | P | Q | R | S | T | U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HD 049 | M18 x 1.5 resp. G½ | 28 / 33 | 158 | 24.5 | 61 | 84 | 65 | 55 | AF 36 | 40 | M8 / 12 | 25 | 89 | 27.5 | 62 | 85 | AF 24 | ☐ 30 | 79 |
| HD 069 | G½, G¾ | 33 / 36 | 254 | 24.5 | 61 | 84 | 65 | 55 | AF 36 | 40 | M8 / 12 | 25 | 89 | 27.5 | 62 | 85 | AF 24 | ☐ 30 | 79 |

## Measurements in inch

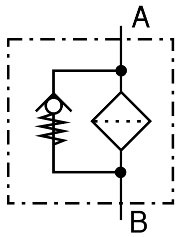
| Type | A/B | C | D | E | F | G | H | I | K mm | L | M Ø/depth | N | O | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HD 049 | -8 SAE | 1.10/1.30 | 6.22 | 0.96 | 2.40 | 3.31 | 2.56 | 2.17 | AF 36 | 1.57 | [2] | 0.98 | 3.50 | 1.08 |
| HD 069 | -8 SAE / -12 SAE | 1.30/1.42 | 10.00 | 0.96 | 2.40 | 3.31 | 2.56 | 2.17 | AF 36 | 1.57 | [2] | 0.98 | 3.50 | 1.08 |

| Type | Q | R | S mm | T | U |
|---|---|---|---|---|---|
| HD 049 | 2.44 | 3.35 | AF 24 | ☐ 1.18 | 3.11 |
| HD 069 | 2.44 | 3.35 | AF 24 | ☐ 1.18 | 3.11 |

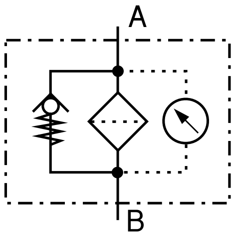
[2] 5/16-18 UNC-2B / 0.47

## Symbols

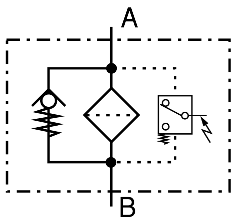
1



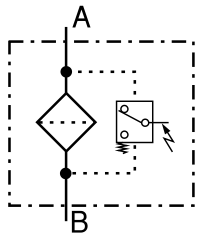

2



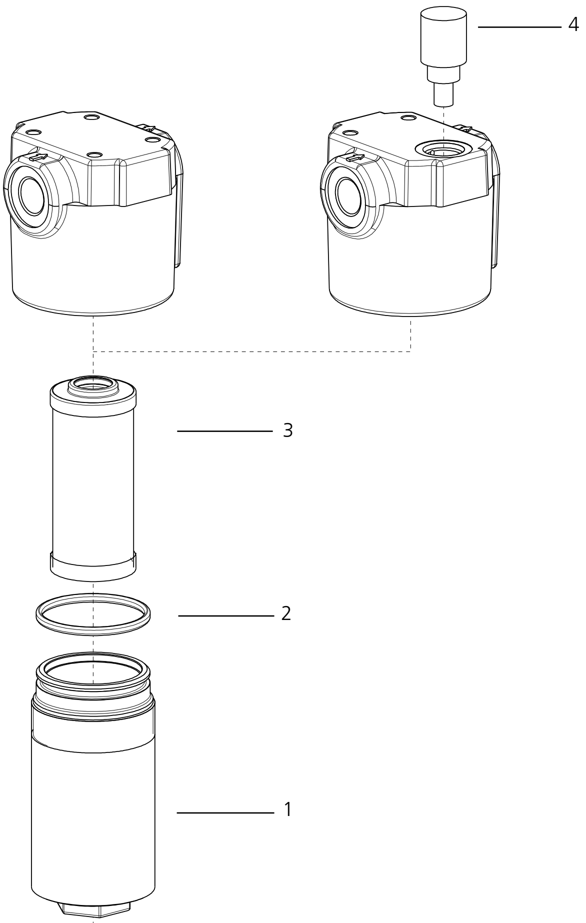

3




4




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Filter bowl HD 049 | HD 052.0102 |
| 1 | Filter bowl HD 069 | HD 072.0102 |
| 2 | O-ring<br>53.57 x 3.53 mm<br>2.11 x 0.14 inch | N007.0543/1 |
| 3 | Replacement filter element | s. Chart / col. 9 |
| 4 | Clogging indicator | s. catalog sheet 60.40 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

**Before release into the series production the filter casing is tested for fatigue strength in our pressure pulse test rig. Various quality controls during the production process guarantee the leakfree function and solidity of our filters.**

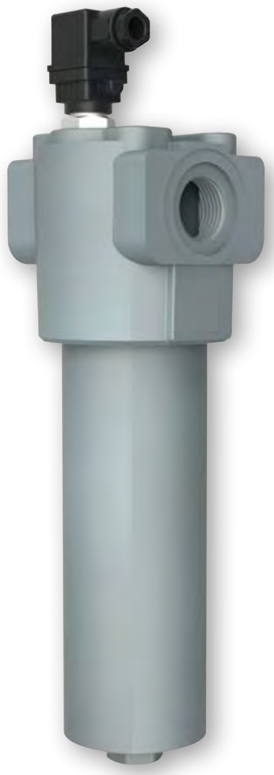
Illustrations may sometimes differ from the original. ARGO-HYTOS is not responsible for any unintentional mistake in this specification sheet.

ARGO HYTOS

High Pressure Filters – Worldline 200

# HD 152 · HD 172

In-line mounting · Operating pressure up to 630 bar / 9137 psi · Nominal flow rate up to 190 l/min / 50.2 gpm



High Pressure Filter HD 172

## Description

### Application

In the high pressure circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
Through installation near to the control valves or other expensive components. The specific determined flow rate guarantees a closed by-pass valve even at $\nu \leq 200\ mm^2/s$ / 927 SUS (cold start condition).

### Filter elements

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

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

### 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: | Spheroidal graphite cast iron (SGI) |
| Filter bowl: | Cold extruded steel |
| Coating: | Powder paint |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web<br>Paper - cellulose web, impregnated with resin |

### Accessories

Electrical and / or optical clogging indicators are available on request. Dimensions and technical data see catalog sheet 60.40.

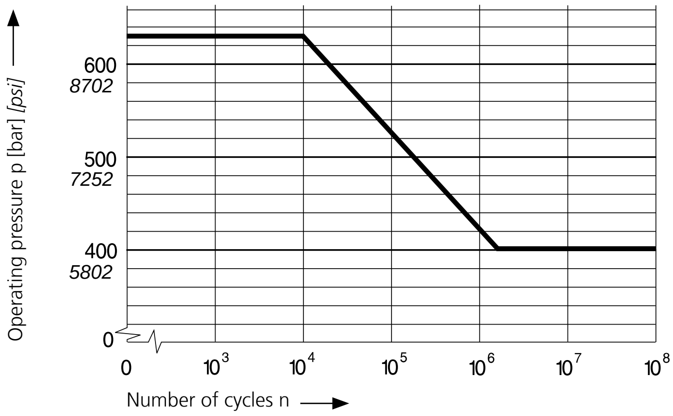
## Characteristics

### Operating pressure

0 ... 400 bar / 5800 psi, min. 2 x $10^6$ pressure cycles
Nominal pressure according DIN 24550

0 ... 630 bar / 9137 psi, min. $10^4$ pressure cycles
Quasi-static operating pressure

### Permissible pressures for other numbers of cycles




### Nominal flow rate

Up to 190 l/min / 47.6 gpm (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines:
  up to 250 bar ≤ 8 m/s / up to 3626 psi ≤ 26.3 ft/s
  > 250 bar ≤12 m/s / > 3626 ps ≤ 39.4 ft/s

### Filter fineness

5 µm(c) ... 30 µm(c)
β-values according to ISO 16889
(see Selection Chart, column 4 and diagram Dx).

### Dirt-holding capacity

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

### Hydraulic fluids

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

### Temperature range

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

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% Δp of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the Δp curve at a point. Read this point on the horizontal axis for the viscosity.

### Mounting position

Preferably vertical, filter head on top.

### Connection

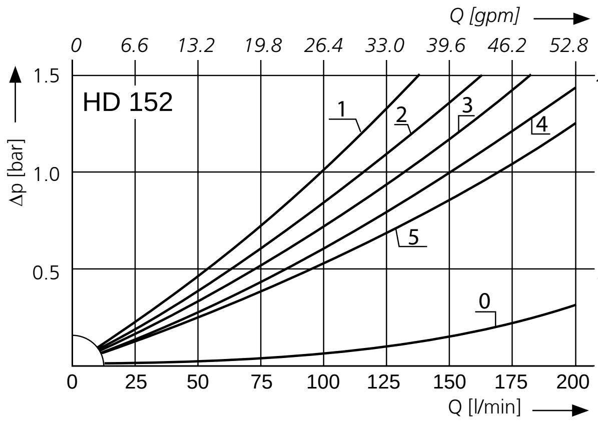
Threaded ports according to

- ISO 228 or DIN 13
- SAE standard J514

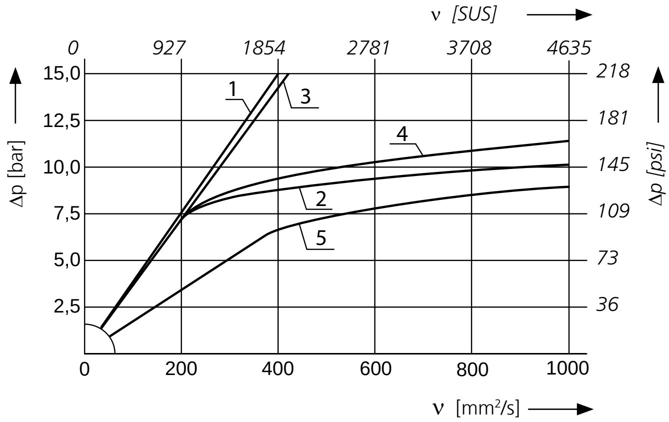
Sizes see Selection Chart, column 6
(other port threads on request).

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

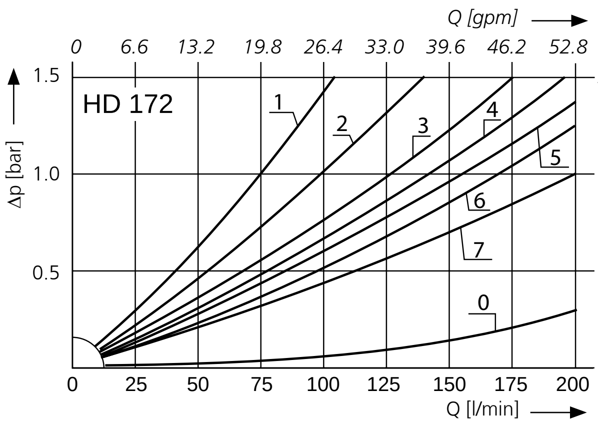
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



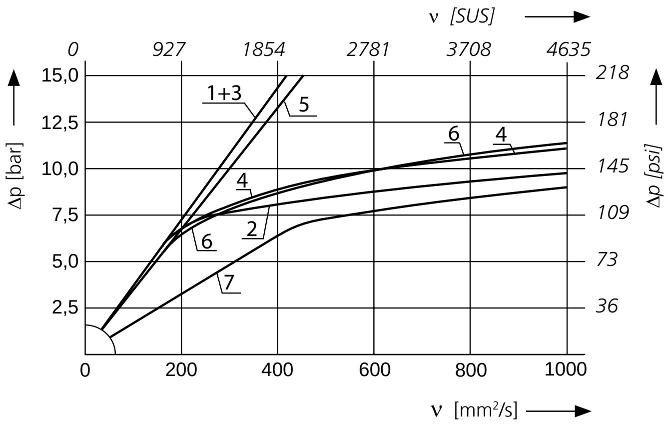

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

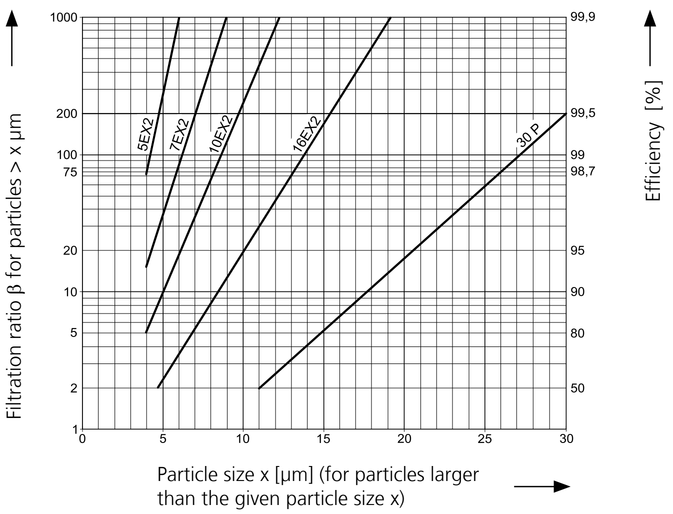



Pressure drop as a function of the **kinematic viscosity** at nominal flow




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

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX2 and Paper elements:**

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

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

**For screen elements**

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

Tolerances for mesh size according to DIN 4189

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

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt-holding capacity | Connection A/B | Cracking pressure of by-pass | Symbol | Replacement filter element Part No. | Weight | Clogging indicator Cracking pressure in ( ) | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | | | kg | | bar | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | 12 |
| HD 152-186 ED8 | 110 | **D1**/1 | 10EX2 | 13 | G¾ | - | 4 | V3.0617-26[2] | 7.1 | electrical | (5) | change-over |
| **HD 152-166[1]** | 125 | **D1**/2 | 10EX2 | 17 | G¾ | 7 | 1 | V3.0617-06 | 6.9 | - | | - |
| | | | | | | | | | | | | |
| HD 152-188 ED8 | 150 | **D1**/3 | 16EX2 | 14 | G1 | - | 4 | V3.0617-18[2] | 7.1 | electrical | (5) | change-over |
| **HD 152-168[1]** | 175 | **D1**/4 | 16EX2 | 17 | G1 | 7 | 1 | V3.0617-08 | 6.9 | - | | - |
| | | | | | | | | | | | | |
| HD 152-151 | 130 | **D1**/5 | 30P | 8,7 | G1 | 7 | 1 | P3.0617-01[3] | 6.9 | - | | - |
| | | | | | | | | | | | | |
| HD 172-189 ED8 | 80 | **D2**/1 | 5EX2 | 16 | G1 | - | 4 | V3.0623-13[2] | 8.4 | electrical | (5) | change-over |
| HD 172-163 | 110 | **D2**/2 | 5EX2 | 17 | G1 | 7 | 1 | V3.0623-03 | 8.0 | - | | - |
| | | | | | | | | | | | | |
| HD 172-186 ED8 | 140 | **D2**/3 | 10EX2 | 18 | G1 | - | 4 | V3.0623-26[2] | 8.4 | electrical | (5) | change-over |
| **HD 172-166[1]** | 160 | **D2**/4 | 10EX2 | 23 | G1 | 7 | 1 | V3.0623-06 | 8.0 | - | | - |
| | | | | | | | | | | | | |
| HD 172-188 ED8 | 180 | **D2**/5 | 16EX2 | 19 | G1 | - | 4 | V3.0623-18[2] | 8.4 | electrical | (5) | change-over |
| **HD 172-168[1]** | 190 | **D2**/6 | 16EX2 | 25 | G1 | 7 | 1 | V3.0623-08 | 8.0 | - | | - |
| | | | | | | | | | | | | |
| HD 172-151 | 150 | **D2**/7 | 30P | 14 | G1 | 7 | 1 | P3.0623-11[3] | 8.0 | - | | - |

[1] Preferred type, no minimum order quantity required
[2] Filter element differential pressure stable up to 160 bar , clogging indicator required
[3] Paper media supported with metal gauze

Optical or electrical clogging indicators are available to monitor the clogging condition of the element. When ordering filters with integrated monitoring, the abbreviation of the clogging indicator has to be added to the order code of the desired filter variant.

**For the appropriate clogging indicator see catalog sheet 60.40.**

**Oder example: The filter HD 152-166 is to be supplied with an optical indicator with automatic reset.**

**Order code:** **HD 152-166 OD1**

**Part No. (basic unit)**

**Clogging indicator**

**Remarks:**

- The switching pressure of the clogging indicator has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- For versions with electrical clogging indicator, the device socket is not included in the scope of delivery.
- For the electrical clogging indicator of type DIN EN 175301-803 (ED8 and ED9), a device socket with two LEDs is available, which additionally enables visual indication of the filter contamination (order no. DG 041.1200).
- The filters listed in this chart are standard filters. Other designs available on request.

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt-holding capacity | Connection A/B | Cracking pressure of by-pass | Symbol | Replacement filter element Part No. | Weight | Clogging indicator Cracking pressure in ( ) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | gpm | | | g | SAE | psi | | | lbs | psi | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| HD 152-786 ED8 | 29.1 | **D1**/1 | 10EX2 | 13 | -12[4] | - | 4 | V3.0617-26[2] | 15.7 | electrical (73) | change-over |
| **HD 152-766**[1] | 33.0 | **D1**/2 | 10EX2 | 17 | -12[4] | 102 | 1 | V3.0617-06 | 15.2 | - | - |
| HD 152-788 ED8 | 39.6 | **D1**/3 | 16EX2 | 14 | -16[5] | - | 4 | V3.0617-18[2] | 15.7 | electrical (73) | change-over |
| **HD 152-768**[1] | 46.2 | **D1**/4 | 16EX2 | 17 | -16[5] | 102 | 1 | V3.0617-08 | 15.2 | - | - |
| HD 152-871 | 34.3 | **D1**/5 | 30P | 8.7 | -16[5] | 102 | 1 | P3.0617-01[3] | 15.2 | - | - |
| HD 172-789 ED8 | 21.1 | **D2**/1 | 5EX2 | 16 | -16[5] | - | 4 | V3.0623-13[2] | 18.5 | electrical (73) | change-over |
| HD 172-763 | 29.1 | **D2**/2 | 5EX2 | 17 | -16[5] | 102 | 1 | V3.0623-03 | 17.6 | - | - |
| HD 172-786 ED8 | 37.0 | **D2**/3 | 10EX2 | 18 | -16[5] | - | 4 | V3.0623-26[2] | 18.5 | electrical (73) | change-over |
| **HD 172-766**[1] | 42.3 | **D2**/4 | 10EX2 | 23 | -16[5] | 102 | 1 | V3.0623-06 | 17.6 | - | - |
| HD 172-788 ED8 | 47.6 | **D2**/5 | 16EX2 | 19 | -16[5] | - | 4 | V3.0623-18[2] | 18.5 | electrical (73) | change-over |
| **HD 172-768**[1] | 50.2 | **D2**/6 | 16EX2 | 25 | -16[5] | 102 | 1 | V3.0623-08 | 17.6 | - | - |
| HD 172-761 | 39.6 | **D2**/7 | 30P | 14 | -16[5] | 102 | 1 | P3.0623-11[3] | 17.6 | - | - |

[1] Preferred type, no minimum order quantity required
[2] Filter element differential pressure stable up to 2320 psi, clogging indicator required
[3] Paper media supported with metal gauze
[4] Corresponds to 1 1/16-12 UN-2B
[5] Corresponds to 1 5/16-12 UN-2B

Optical or electrical clogging indicators are available to monitor the clogging condition of the element. When ordering filters with integrated monitoring, the abbreviation of the clogging indicator has to be added to the order code of the desired filter variant.

**For the appropriate clogging indicator see catalog sheet 60.40.**

**Oder example: The filter HD 152-766 is to be supplied with an optical indicator with automatic reset.**

**Order code:** **HD 152-766 OD1**

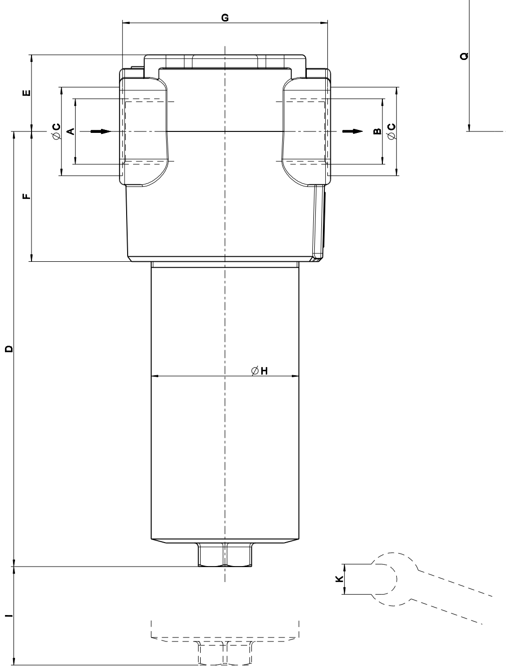
**Part No. (basic unit)**

**Clogging indicator**

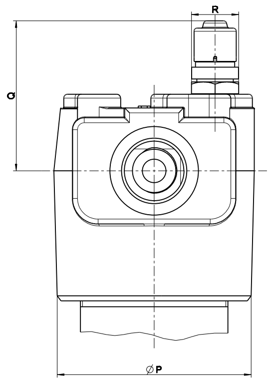
**Remarks:**

- The switching pressure of the clogging indicator has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- For versions with electrical clogging indicator, the device socket is not included in the scope of delivery.
- For the electrical clogging indicator of type DIN EN 175301-803, a device socket with two LEDs is available, which additionally enables visual indication of the filter contamination (order no. DG 041.1200).
- The filters listed in this chart are standard filters. Other designs available on request.

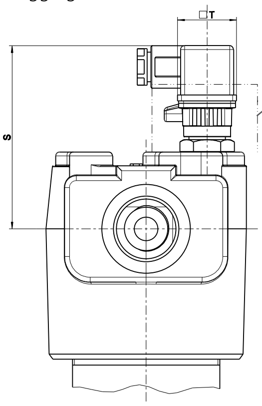
## Dimensions




Version with integrated optical clogging indicator OD1

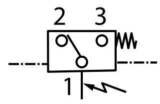


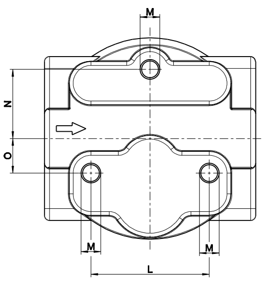

Version with integrated electrical clogging indicator ED8 with device socket [1]

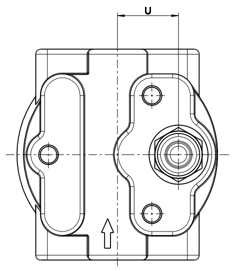


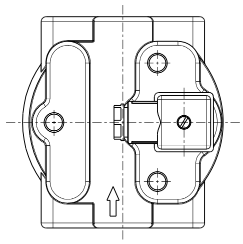

[1] not included in scope of delivery

Terminal connection ED8



## Measurements in mm

| Type | A/B | C | D | E | F | G | H | I | K | L | M Ø / depth | N | O | P | Q | R | S | T | U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HD 152 | G¾, G1 | 36 / 45 | 222 | 39 | 66 | 104 | 75 | 70 | AF 27 | 60 | M10 / 12 | 35 | 17.5 | 99 | 77 | AF 24 | 93 | ☐ 30 | 31 |
| HD 172 | G1 | 45 | 286 | 39 | 66 | 104 | 75 | 70 | AF 27 | 60 | M10 / 12 | 35 | 17.5 | 99 | 77 | AF 24 | 93 | ☐ 30 | 31 |

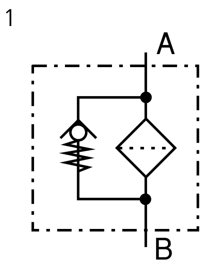
## Measurements in inch

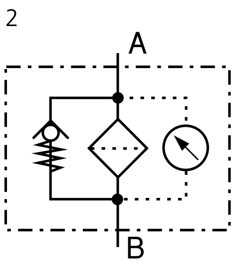
| Type | A/B SAE | C | D | E | F | G | H | I | K mm | L | M Ø / depth | N | O | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HD 152 | -12 / -16 | 1.42 / 1.77 | 8.74 | 1.54 | 2.60 | 4.09 | 2.95 | 2.76 | AF 27 | 2.36 | [2] | 1.38 | 0.71 | 3.90 |
| HD 172 | -16 | 1.77 | 11.26 | 1.54 | 2.60 | 4.09 | 2.95 | 2.76 | AF 27 | 2.36 | [2] | 1.38 | 0.71 | 3.90 |

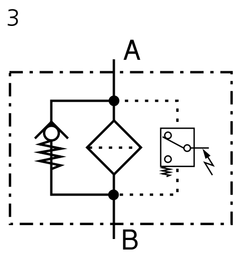
| Type | Q | R mm | S | T mm | U |
|---|---|---|---|---|---|
| HD 152 | 3.03 | AF 24 | 3.66 | ☐ 1.18 | 1.22 |
| HD 172 | 3.03 | AF 24 | 3.66 | ☐ 1.18 | 1.22 |

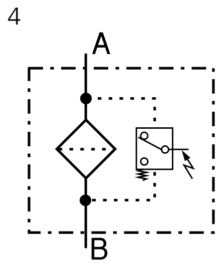
[2] 3/8-16 UNC-2B / 0.47

## Symbols

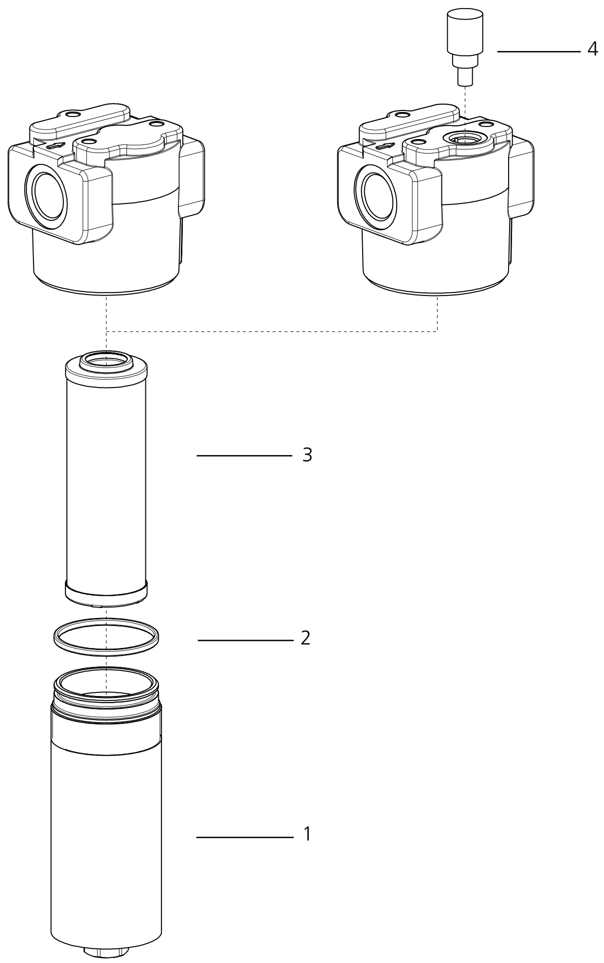



## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Filter bowl HD 152 | HD 152.0102 |
| 1 | Filter bowl HD 172 | HD 171.0102 |
| 2 | O-ring<br>63 x 3.5 mm<br>2.48 x 0.14 inch | N007.0634 |
| 3 | Replacement filter element | see Chart/col. 9 |
| 4 | Clogging indicator | see catalog sheet 60.40 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

**Before release into the series production the filter casing is tested for fatigue strength in our pressure pulse test rig. Various quality controls during the production process guarantee the leakfree function and solidity of our filters.**

# HD 319 · HD 419 · HD 619

In-line mounting · Operating pressure up to 630 bar / 9137 psi · Nominal flow rate up to 450 l/min / 118.9 gpm

High Pressure Filter HD 319

## Description

### Application

In the high pressure circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
Through installation near to the control valves or other expensive components. The specific determined flow rate guarantees a closed by-pass valve even at ν ≤ 200 mm²/s / 927 SUS (cold start condition).

### Filter elements

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

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

### Filter maintenance

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

### Materials

| | |
|---|---|
| Filter head: | Spheroidal graphite cast iron (SGI) |
| Filter bowl: | Cold extruded steel |
| Coating: | Powder paint |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web |

### Accessories

Electrical and / or optical clogging indicators are available on request. Dimensions and technical data see catalog sheet 60.40.

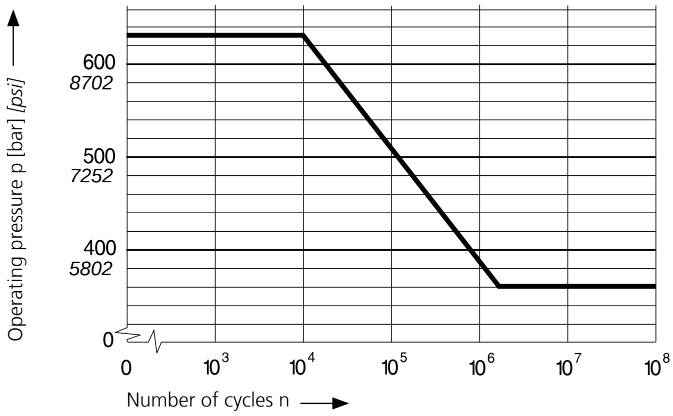
## Characteristics

### Operating pressure

0 ... 360 bar / 5220 psi, min. 2 x $10^6$ pressure cycles
Nominal pressure according to DIN 24550

0 ... 630 bar / 9137 psi, min. $10^4$ pressure cycles
Quasi-static operating pressure

### Permissible pressures for other numbers of cycles




### Nominal flow rate

Up to 450 l/min / 118.9 gpm (see Selection Charts, column 2). The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

› closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
› element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
› flow velocity in the connection lines:
  up to 250 bar ≤ 8 m/s / up to 3626 psi ≤ 26.3 ft/s
  > 250 bar ≤ 12 m/s / > 3626 psi ≤ 39.4 ft/s

### Filter fineness

5 µm(c) ... 16 µm(c)
β-values according to ISO 16889
(see Selection Charts, column 4 and diagram Dx).

### Dirt-holding capacity

Values in g test dust ISO MTD according to ISO 16889
(see Selection Charts, 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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

### Viscosity at nominal flow rate

› at operating temperature: $\nu < 60$ mm²/s / 280 SUS
› as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
› at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Mounting position

Preferably vertical, filter head on top.

### Connection

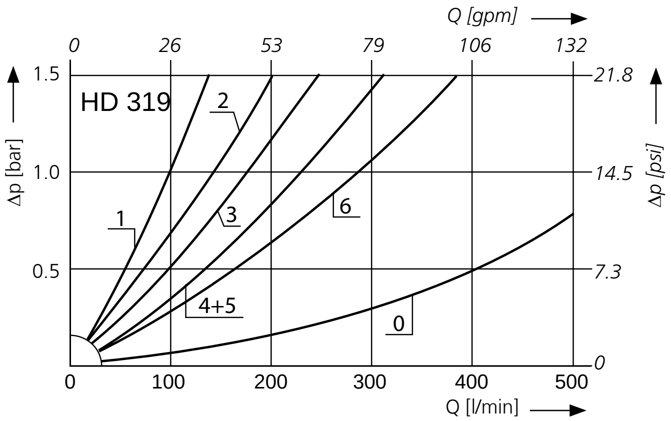
Threaded ports according to

› ISO 228 or DIN 13
› SAE standard J514
› SAE-flange (6000 psi)

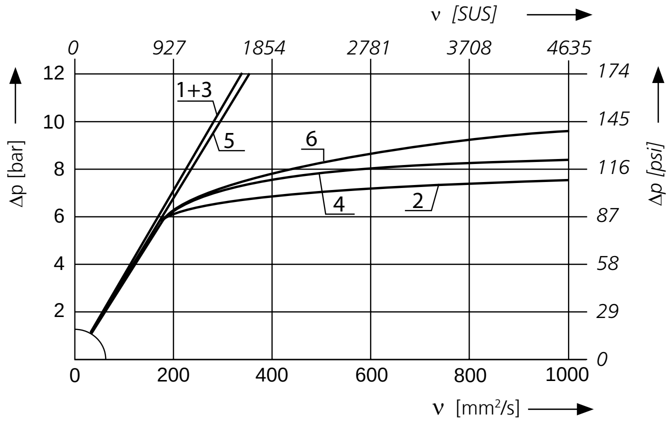
Sizes see Order Information and Selection Charts, column 6 as well as ordering example (other connections on request).

## Δp-curves for complete filters in Selection Charts, column 3

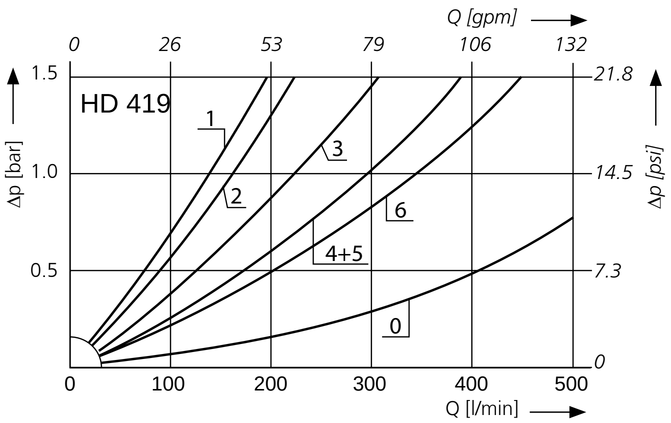
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



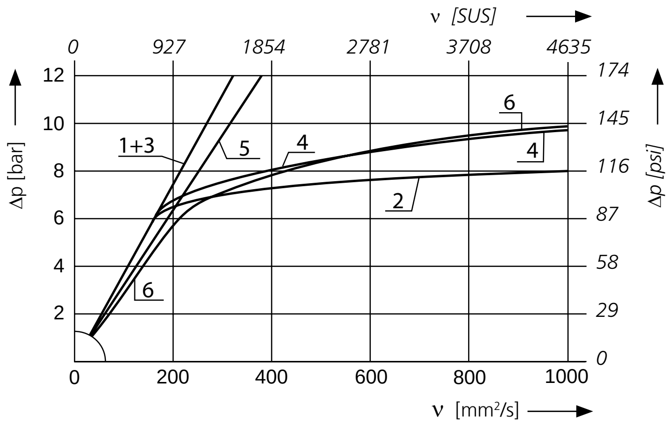

Pressure drop as a function of the **kinematic viscosity** at nominal flow



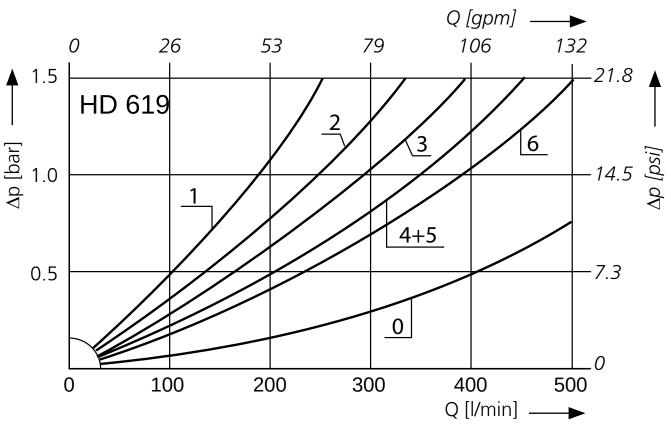

**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



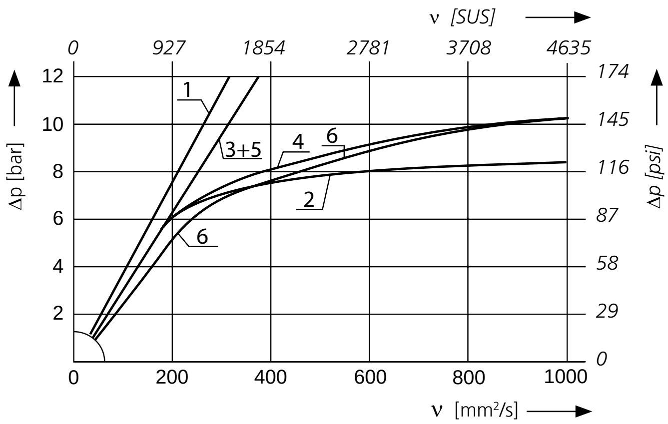

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D3** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

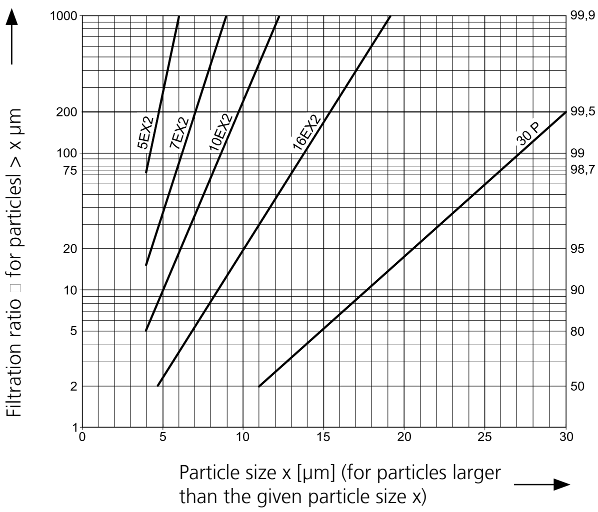



Pressure drop as a function of the **kinematic viscosity** at nominal flow



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

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX2 and Paper elements:**

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

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

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189

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

## Order Information

Two different head pieces with four various connecting options are available.

**Order example: The filter HD 319-265 has to be supplied with SAE 1¼ flanged connection (with metric fastening threads) and with an optical clogging indicator with automatic reset.**

**Order description:** **HD 319-165 OD1**

**Connections:**

4 options are available

| | |
|---|---|
| Flanged connection (A/B) SAE 1¼ (6000 psi) [1] | 1 |
| Threaded port (A/B) G1¼ resp. G1½ [2] | 2 |
| Flanged connection (A/B) SAE 1¼ (6000 psi) [3] | 3 |
| Threaded port (A/B) -20 SAE resp. -24 SAE [4] | 7 |

**Clogging indicator (code)**

For the appropriate clogging indicator see catalog sheet 60.40. The desired clogging indicator model is indicated by the code (Selection Charts, column 2).

[1] With metric fastening threads
[2] G1½ from size HD 619 upwards
[3] With UNC fastening threads
[4] -24 SAE (1⅞-12 UN-2B) from size HD 619 upwards

## Selection Chart 1 of 2

| Part No.[1] | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt-holding capacity | Connection A/B | Cracking pressure of by-pass | Symbol | Replacement filter element Part No. | Weight | Clogging indicator Cracking pressure in ( ) | Remarks / contact type of clogging indicator |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | | | kg | bar | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| HD 319-289 ED8 | 110 | **D1**/1 | 5EX2 | 20 | G1¼ | - | 4 | V3.0817-13[3] | 16.3 | electrical (5) | change-over |
| HD 319-269 | 155 | **D1**/2 | 5EX2 | 24 | G1¼ | 7 | 1 | V3.0817-03 | 15.9 | - | - |
| HD 319-286 ED8 | 195 | **D1**/3 | 10EX2 | 24 | G1¼ | - | 4 | V3.0817-16[3] | 16.3 | electrical (5) | change-over |
| **HD 319-265**[2] | 250 | **D1**/4 | 10EX2 | 33 | G1¼ | 7 | 1 | V3.0817-06 | 15.9 | - | - |
| HD 319-288 ED8 | 270 | **D1**/5 | 16EX2 | 25 | G1¼ | - | 4 | V3.0817-18[3] | 16.3 | electrical (5) | change-over |
| **HD 319-267**[2] | 330 | **D1**/6 | 16EX2 | 33 | G1¼ | 7 | 1 | V3.0817-08 | 15.9 | - | - |
| | | | | | | | | | | | |
| HD 419-289 ED8 | 155 | **D2**/1 | 5EX2 | 29 | G1¼ | - | 4 | V3.0823-13[3] | 17.8 | electrical (5) | change-over |
| HD 419-269 | 190 | **D2**/2 | 5EX2 | 33 | G1¼ | 7 | 1 | V3.0823-03 | 17.2 | - | - |
| HD 419-286 ED8 | 265 | **D2**/3 | 10EX2 | 33 | G1¼ | - | 4 | V3.0823-16[3] | 17.8 | electrical (5) | change-over |
| **HD 419-266**[2] | 330 | **D2**/4 | 10EX2 | 47 | G1¼ | 7 | 1 | V3.0823-06 | 17.2 | - | - |
| HD 419-288 ED8 | 330 | **D2**/5 | 16EX2 | 35 | G1¼ | - | 4 | V3.0823-18[3] | 17.8 | electrical (5) | change-over |
| **HD 419-268**[2] | 380 | **D2**/6 | 16EX2 | 48 | G1¼ | 7 | 1 | V3.0823-08 | 17.2 | - | - |
| | | | | | | | | | | | |
| HD 619-289 ED8 | 220 | **D3**/1 | 5EX2 | 41 | G1½ | - | 4 | V3.0833-13[3] | 20.6 | electrical (5) | change-over |
| HD 619-269 | 280 | **D3**/2 | 5EX2 | 49 | G1½ | 7 | 1 | V3.0833-03 | 19.9 | - | - |
| HD 619-286 ED8 | 330 | **D3**/3 | 10EX2 | 49 | G1½ | - | 4 | V3.0833-16[3] | 20.6 | electrical (5) | change-over |
| **HD 619-266**[2] | 400 | **D3**/4 | 10EX2 | 67 | G1½ | 7 | 1 | V3.0833-06 | 19.9 | - | - |
| HD 619-288 ED8 | 450 | **D3**/5 | 16EX2 | 51 | G1½ | - | 4 | V3.0833-18[3] | 20.6 | electrical (5) | change-over |
| **HD 619-268**[2] | 450 | **D3**/6 | 16EX2 | 68 | G1½ | 7 | 1 | V3.0833-08 | 19.9 | - | - |

[1] For additional options please see section "Order Information"
[2] Preferred type, no minimum order quantity required
[3] Element differential pressure stable up to 160 bar, clogging indicator required

Optical or electrical clogging indicators are available to monitor the clogging condition of the element. When ordering filters with integrated monitoring, the code of the clogging indicator (to be found in catalog sheet 60.40) has to be added to the part no. of the desired filter (basic unit).
The mounting hole for clogging indicators is available at all filters, i.e. all clogging indicators from catalog sheet 60.40 can also be retroffited.

**For the appropriate clogging indicator see catalog sheet 60.40.**

**Oder example: see "Order Information".**

**Remarks:**

› The switching pressure of the clogging indicator has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
› For versions with electrical clogging indicator, the device socket is not included in the scope of delivery.
› For the electrical clogging indicator of type ED8, a transparent socket with two LEDs is available, which additionally enables visual indication of the filter contamination (order no. DG 041.1200).
› The filters listed in this chart are standard filters. Other designs available on request.

## Selection Chart 2 of 2

| Part No.[1] | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt-holding capactiy | Connection A/B | Cracking pressure of by-pass | Symbol | Replacement filter element Part No. | Weight | Clogging indicator Cracking pressure in ( ) | Remarks / contact type of clogging indicator |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | gpm | | | g | | psi | | | lbs | psi | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| HD 319-789 ED8 | 29.1 | **D1**/1 | 5EX2 | 20 | -20[4] | - | 4 | V3.0817-13[3] | 35.9 | electrical (73) | change-over |
| HD 319-769 | 40.9 | **D1**/2 | 5EX2 | 24 | -20[4] | 102 | 1 | V3.0817-03 | 35.1 | - | - |
| HD 319-786 ED8 | 51.5 | **D1**/3 | 10EX2 | 24 | -20[4] | - | 4 | V3.0817-16[3] | 35.9 | electrical (73) | change-over |
| **HD 319-766[2]** | 66.0 | **D1**/4 | 10EX2 | 33 | -20[4] | 102 | 1 | V3.0817-06 | 35.1 | - | - |
| HD 319-788 ED8 | 71.3 | **D1**/5 | 16EX2 | 25 | -20[4] | - | 4 | V3.0817-18[3] | 35.9 | electrical (73) | change-over |
| **HD 319-768[2]** | 87.2 | **D1**/6 | 16EX2 | 33 | -20[4] | 102 | 1 | V3.0817-08 | 35.1 | - | - |
| | | | | | | | | | | | |
| HD 419-789 ED8 | 40.9 | **D2**/1 | 5EX2 | 29 | -20[4] | - | 4 | V3.0823-13[3] | 39.2 | electrical (73) | change-over |
| HD 419-769 | 50.2 | **D2**/2 | 5EX2 | 33 | -20[4] | 102 | 1 | V3.0823-03 | 37.9 | - | - |
| HD 419-786 ED8 | 70.0 | **D2**/3 | 10EX2 | 33 | -20[4] | - | 4 | V3.0823-16[3] | 39.2 | electrical (73) | change-over |
| **HD 419-766[2]** | 87.2 | **D2**/4 | 10EX2 | 47 | -20[4] | 102 | 1 | V3.0823-06 | 37.9 | - | - |
| HD 419-788 ED8 | 87.2 | **D2**/5 | 16EX2 | 35 | -20[4] | - | 4 | V3.0823-18[3] | 39.2 | electrical (73) | change-over |
| **HD 419-768[2]** | 100.4 | **D2**/6 | 16EX2 | 48 | -20[4] | 102 | 1 | V3.0823-08 | 37.9 | - | - |
| | | | | | | | | | | | |
| HD 619-789 ED8 | 58.1 | **D3**/1 | 5EX2 | 41 | -24[5] | - | 4 | V3.0833-13[3] | 45.4 | electrical (73) | change-over |
| HD 619-769 | 73.9 | **D3**/2 | 5EX2 | 49 | -24[5] | 102 | 1 | V3.0833-03 | 43.9 | - | - |
| HD 619-786 ED8 | 87.2 | **D3**/3 | 10EX2 | 49 | -24[5] | - | 4 | V3.0833-16[3] | 45.4 | electrical (73) | change-over |
| **HD 619-766[2]** | 105.6 | **D3**/4 | 10EX2 | 67 | -24[5] | 102 | 1 | V3.0833-06 | 43.9 | - | - |
| HD 619-788 ED8 | 118.9 | **D3**/5 | 16EX2 | 51 | -24[5] | - | 4 | V3.0833-18[3] | 45.4 | electrical (73) | change-over |
| **HD 619-768[2]** | 118.9 | **D3**/6 | 16EX2 | 68 | -24[5] | 102 | 1 | V3.0833-08 | 43.9 | - | - |

[1] For additional options please see section "Order Information"
[2] Preferred type, no minimum order quantity required
[3] Element differential pressure stable up to 2320 psi, clogging indicator required
[4] Corresponds to 1 5/8-12 UN-2B
[5] Corresponds to 1 7/8-12 UN-2B

Optical or electrical clogging indicators are available to monitor the clogging condition of the element. When ordering filters with integrated monitoring, the code of the clogging indicator (to be found in catalog sheet 60.40) has to be added to the part no. of the desired filter (basic unit).
The mounting hole for clogging indicators is available at all filters, i.e. all clogging indicators from catalog sheet 60.40 can also be retroffited.

**For the appropriate clogging indicator see catalog sheet 60.40.**

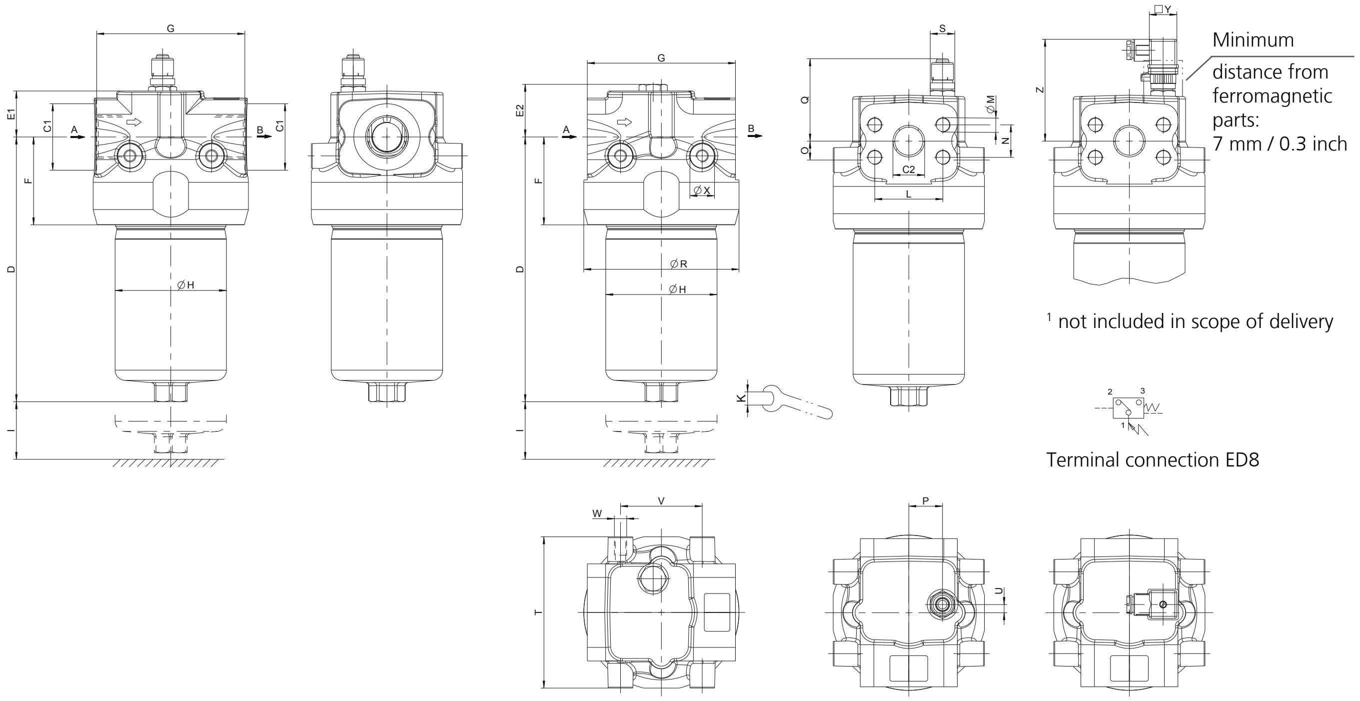
**Oder example: see "Order Information".**

**Remarks:**

- The switching pressure of the clogging indicator has always to be lower than the cracking pressure of the by-pass valve (see Selection Chart, column 7).
- For versions with electrical clogging indicator, the device socket is not included in the scope of delivery.
- For the electrical clogging indicator of type ED8, a transparent socket with two LEDs is available, which additionally enables visual indication of the filter contamination (order no. DG 041.1200).
- The filters listed in this chart are standard filters. Other designs available on request.

## Dimensions

Threaded connection | Flanged connection | Version with integrated optical clogging indicator OD1 | Version with integrated electrical clogging indicator ED8 and connector socket[1]




[1] not included in scope of delivery

## Measurements in mm

| Type | A/B | $C_1$ | $C_2$ | D | $E_1$ | $E_2$ | F | G | H | I | K | L | M Ø / depth | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HD 319 | see | 65 | 31 | 259 | 45 | 52 | 86 | 145 | 109 | 55 | AF 32 | 66,7 | M14 / 22 | 31.8 |
| HD 419 | Selection | 65 | 31 | 323 | 45 | 52 | 86 | 145 | 109 | 55 | AF 32 | 66,7 | M14 / 22 | 31.8 |
| HD 619 | Chart | 65 | 31 | 424 | 45 | 52 | 86 | 145 | 109 | 55 | AF 32 | 66,7 | M14 / 22 | 31.8 |

| Type | O | P | Q | R | S | T | U | V | W Ø / depth | X | Y | Z | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HD 319 | 18.5 | 33 | 81 | 152 | AF 24 | 148 | 8 | 80 | M12 / 18 | 24 | ☐ 30 | 100 | | |
| HD 419 | 18.5 | 33 | 81 | 152 | AF 24 | 148 | 8 | 80 | M12 / 18 | 24 | ☐ 30 | 100 | | |
| HD 619 | 18.5 | 33 | 81 | 152 | AF 24 | 148 | 8 | 80 | M12 / 18 | 24 | ☐ 30 | 100 | | |

## Measurements in inch

| Type | A/B | $C_1$ | $C_2$ | D | $E_1$ | $E_2$ | F | G | H | I | K mm | L | M Ø / depth | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HD 319 | see | 2.56 | 1.22 | 10.20 | 1.77 | 2.05 | 3.39 | 5.71 | 4.29 | 2.17 | AF 32 | 2.63 | [2] | 1.25 |
| HD 419 | Selection | 2.56 | 1.22 | 12.72 | 1.77 | 2.05 | 3.39 | 5.71 | 4.29 | 2.17 | AF 32 | 2.63 | [2] | 1.25 |
| HD 619 | Chart | 2.56 | 1.22 | 16.69 | 1.77 | 2.05 | 3.39 | 5.71 | 4.19 | 2.17 | AF 32 | 2.63 | [2] | 1.25 |

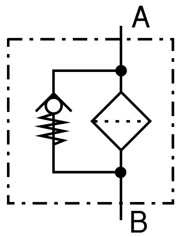
| Type | O | P | Q | R | S mm | T | U | V | W Ø / depth | X | Y mm | Z | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HD 319 | 0.73 | 1.30 | 3.19 | 5.98 | AF 24 | 5.83 | 0.31 | 3.15 | [3] | 0.94 | ☐ 1.18 | 3.86 | | |
| HD 419 | 0.73 | 1.30 | 3.19 | 5.98 | AF 24 | 5.83 | 0.31 | 3.15 | [3] | 0.94 | ☐ 1.18 | 3.86 | | |
| HD 619 | 0.73 | 1.30 | 3.19 | 5.98 | AF 24 | 5.83 | 0.31 | 3.15 | [3] | 0.94 | ☐ 1.18 | 3.86 | | |

[2] ½-13 UNG-2B / 0.78

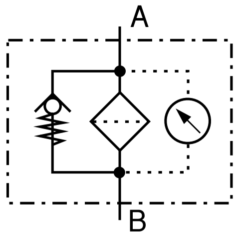
[3] $W_{Flange}$ = ½-13 UNC-2B, $W_{Thread}$ = $^{7}/_{16}$-14 UNC-2B, depth = 0.71

## Symbols

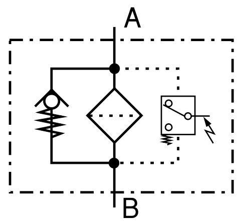
1



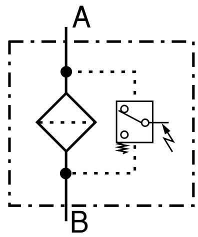

2



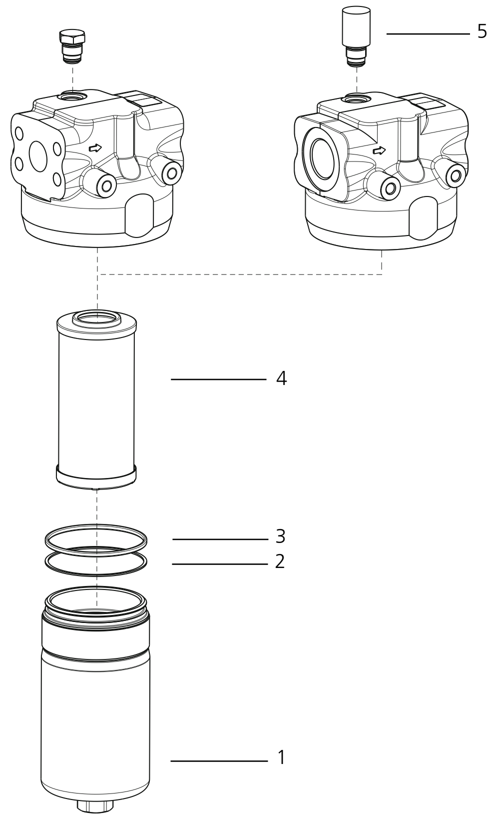

3




4




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Filter bowl HD 319<br>(with Pos. 2 und 3) | HD 250.0701 |
| 1 | Filter bowl HD 419<br>(with Pos. 2 und 3) | HD 451.0702 |
| 1 | Filter bowl HD 619<br>(with Pos. 2 und 3) | HD 619.0701 |
| 2 | Back-ring | HD 255.0102 |
| 3 | O-ring<br>94.84 x 3.53 mm<br>3.73 x 0.14 inch | N007.0953 |
| 4 | Replacement filter element | see Chart / col. 9 |
| 5 | Clogging indicator | see catalog sheet 60.40 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

**Before release into the series production the filter casing is tested for fatigue strength in our pressure pulse test rig. Various quality controls during the production process guarantee the leakfree function and solidity of our filters.**

High Pressure Filters – Worldline 400

# HD 790 · HD 990

In-line mounting · Operating pressure up to 630 bar / 9137 psi · Nominal flow rate up to 1.000 l/min / 264.2 gpm

High Pressure Filter HD 990

## Description

### Application

In the high pressure circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
Through installation near to the control valves or other expensive components. The specific determined flow rate guarantees a closed by-pass valve even at $\nu \leq 200\ mm^2/s$ / 927 SUS (cold start condition).

### Filter elements

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

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

### 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: | Spheroidal graphite cast iron (SGI) |
| Filter bowl: | Steel |
| Housing cover: | Spheroidal graphite cast iron (SGI) |
| Coating: | Powder paint |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 – inorganic multi-layer microfiber web |

### Accessories

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

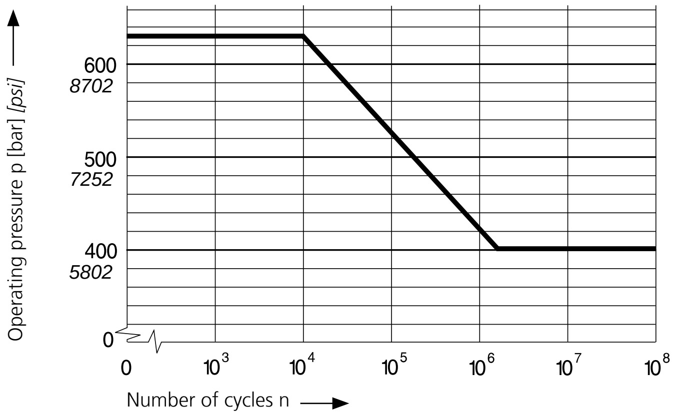
## Characteristics

### Operating pressure

0 ... 400 bar / 5800 psi, min. 2 x $10^6$ pressure cycles
Nominal pressure according to DIN 24550

0 ... 630 bar / 9137 psi, min. $10^4$ pressure cycles
Quasi-static operating pressure

### Permissible pressures for other numbers of cycles




### Nominal flow rate

Up to 1000 l/min / 264.2 gpm (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines:
  up to 250 bar ≤ 8 m/s / up to 3626 psi ≤ 26.3 ft/s
  > 250 bar ≤ 12 m/s / > 3626 psi ≤ 39.4 ft/s

### Filter fineness

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

### Dirt-holding capacity

Values in g test dust 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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% Δp of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the Δp curve at a point. Read this point on the horizontal axis for the viscosity.

### Mounting position

Preferably vertical. The filter head can be mounted in either the uppermost position or the inverse as required.

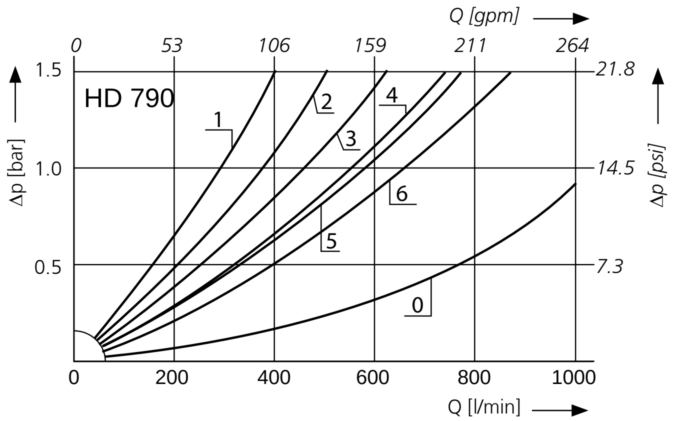
### Connection

- SAE-flange (6000 psi).

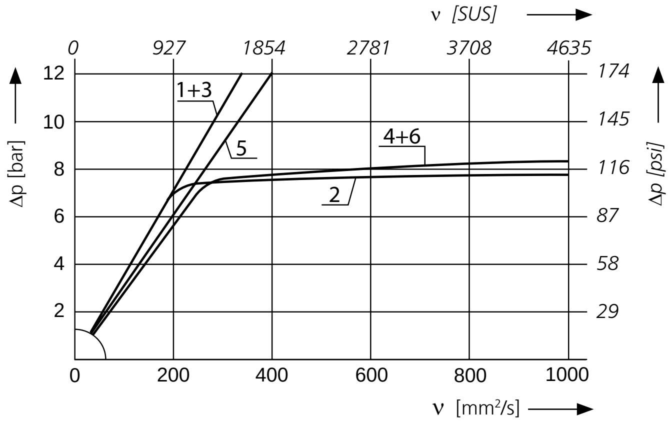
Sizes see Selection Chart, column 6
(other connections on request).

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

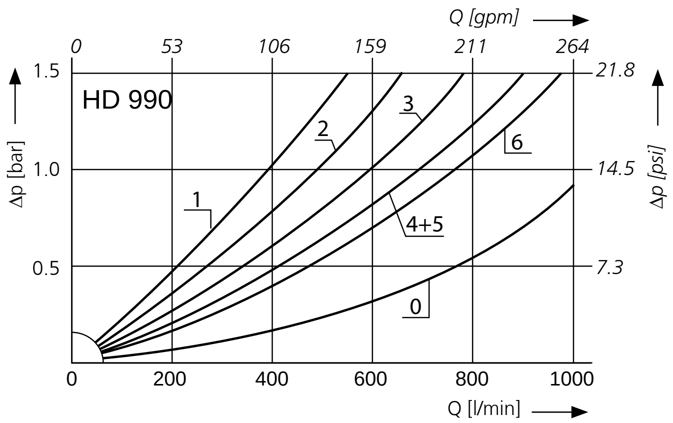
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



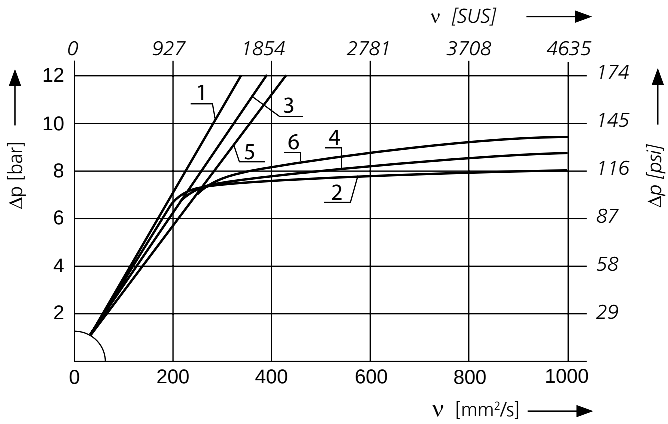

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

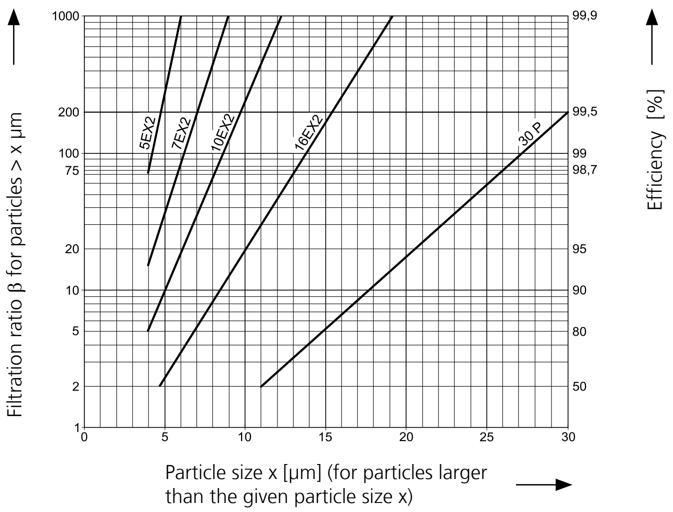



Pressure drop as a function of the **kinematic viscosity** at nominal flow




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

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX2 and Paper elements:**

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

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

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189

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

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt-holding capacity | Connection A/B | Cracking pressure of by-pass | Symbol | Replacement filter element Part No. | Weight | Clogging indicator | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | g | | bar | | | kg | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| HD 790-189 | 320 | **D1**/1 | 5EX2 | 58 | SAE 2 | - | 7 | V3.1040-13* | 47 | retrofittable | - |
| HD 790-159 | 440 | **D1**/2 | 5EX2 | 63 | SAE 2 | 7 | 4 | V3.1040-03 | 46 | retrofittable | - |
| | | | | | | | | | | | |
| HD 790-186 | 540 | **D1/3** | 10EX2 | 71 | SAE 2 | - | 7 | V3.1040-16* | 47 | retrofittable | - |
| HD 790-156 | 640 | **D1**/4 | 10EX2 | 88 | SAE 2 | 7 | 4 | V3.1040-06 | 46 | retrofittable | - |
| | | | | | | | | | | | |
| HD 790-188 | 660 | **D1**/5 | 16EX2 | 72 | SAE 2 | - | 7 | V3.1040-18* | 47 | retrofittable | - |
| HD 790-158 | 750 | **D1**/6 | 16EX2 | 89 | SAE 2 | 7 | 4 | V3.1040-08 | 46 | retrofittable | - |
| | | | | | | | | | | | |
| HD 990-189 | 460 | **D2**/1 | 5EX2 | 85 | SAE 2 | - | 7 | V3.1060-13* | 56 | retrofittable | - |
| HD 990-159 | 570 | **D2**/2 | 5EX2 | 95 | SAE 2 | 7 | 4 | V3.1060-03 | 55 | retrofittable | - |
| | | | | | | | | | | | |
| HD 990-186 | 680 | **D2**/3 | 10EX2 | 110 | SAE 2 | - | 7 | V3.1060-16* | 56 | retrofittable | - |
| HD 990-156 | 780 | **D2**/4 | 10EX2 | 130 | SAE 2 | 7 | 4 | V3.1060-06 | 55 | retrofittable | - |
| | | | | | | | | | | | |
| HD 990-188 | 870 | **D2**/5 | 16EX2 | 110 | SAE 2 | - | 7 | V3.1060-18* | 56 | retrofittable | - |
| HD 990-158 | 1000 | **D2**/6 | 16EX2 | 140 | SAE 2 | 7 | 4 | V3.1060-08 | 55 | retrofittable | - |

| | gpm | | | g | | psi | | | lbs | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| HD 790-389 | 84.5 | **D1**/1 | 5EX2 | 58 | SAE 2 | - | 7 | V3.1040-13* | 103.6 | retrofittable | - |
| HD 790-359 | 116.2 | **D1**/2 | 5EX2 | 63 | SAE 2 | 102 | 4 | V3.1040-03 | 101.4 | retrofittable | - |
| | | | | | | | | | | | |
| HD 790-386 | 142.7 | **D1/3** | 10EX2 | 71 | SAE 2 | - | 7 | V3.1040-16* | 103.6 | retrofittable | - |
| HD 790-356 | 169.1 | **D1**/4 | 10EX2 | 88 | SAE 2 | 102 | 4 | V3.1040-06 | 101.4 | retrofittable | - |
| | | | | | | | | | | | |
| HD 790-388 | 174.4 | **D1**/5 | 16EX2 | 72 | SAE 2 | - | 7 | V3.1040-18* | 103.6 | retrofittable | - |
| HD 790-358 | 198.1 | **D1**/6 | 16EX2 | 89 | SAE 2 | 102 | 4 | V3.1040-08 | 101.4 | retrofittable | - |
| | | | | | | | | | | | |
| HD 990-389 | 121.5 | **D2**/1 | 5EX2 | 85 | SAE 2 | - | 7 | V3.1060-13* | 123.5 | retrofittable | - |
| HD 990-359 | 150.6 | **D2**/2 | 5EX2 | 95 | SAE 2 | 102 | 4 | V3.1060-03 | 121.3 | retrofittable | - |
| | | | | | | | | | | | |
| HD 990-386 | 179.6 | **D2**/3 | 10EX2 | 110 | SAE 2 | - | 7 | V3.1060-16* | 123.5 | retrofittable | - |
| HD 990-356 | 206.1 | **D2**/4 | 10EX2 | 130 | SAE 2 | 102 | 4 | V3.1060-06 | 121.3 | retrofittable | - |
| | | | | | | | | | | | |
| HD 990-388 | 229.8 | **D2**/5 | 16EX2 | 110 | SAE 2 | - | 7 | V3.1060-18* | 123.5 | retrofittable | - |
| HD 990-358 | 264.2 | **D2**/6 | 16EX2 | 140 | SAE 2 | 102 | 4 | V3.1060-08 | 121.3 | retrofittable | - |

* Element differential pressure stable up to 160 bar / 2320 psi, clogging indicator is obligatory

## Order Information

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 HD 790-156 has to be supplied with optical clogging indicator – response pressure 5.0 bar / 73 psi.**

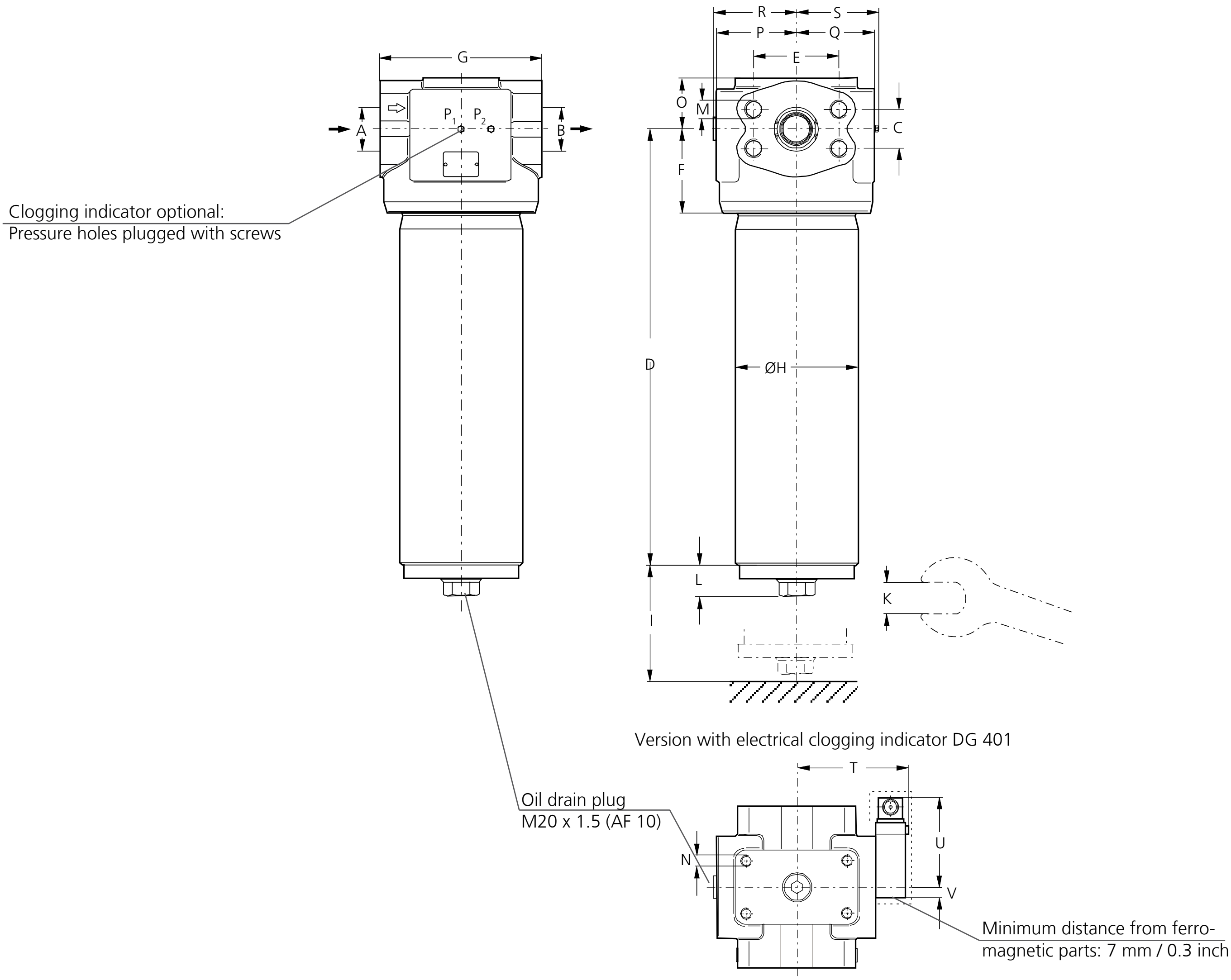
| | | | | |
|---|---|---|---|---|
| **Order description:** | **HD 790-156** | **/** | **DG 042-02** | **M** |
| **Part No. (Basic unit)** | ↑ | | | **Mounted** |
| **Clogging indicator** | | | ↑ | |

**For the appropriate clogging indicators see catalog sheet 60.30.**

**Remarks:**

- Filter versions without by-pass valves must always be equipped with a clogging indicator.
- The filters listed in this chart are standard filters. Other designs available on request.

## Dimensions




## Measurements in mm

| Type | A/B | C | D | E | F | G | H | I | K mm | L | M Ø/depth | N Ø/depth | O | P | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HD 790 | SAE 2 | 44.4 | 495 | 96.6 | 96 | 184 | 140 | 430 | AF 36 | 36 | M20 / 32 | M12 / 20 | 58 | 91 | 89 | 95 |
| HD 990 | SAE 2 | 44.4 | 700 | 96.6 | 96 | 184 | 140 | 640 | AF 36 | 36 | M20 / 32 | M12 / 20 | 58 | 91 | 89 | 95 |

| Type | S | T | U | V |
|---|---|---|---|---|
| HD 790 | 93 | 122 | 102 | 13 |
| HD 990 | 93 | 122 | 102 | 13 |

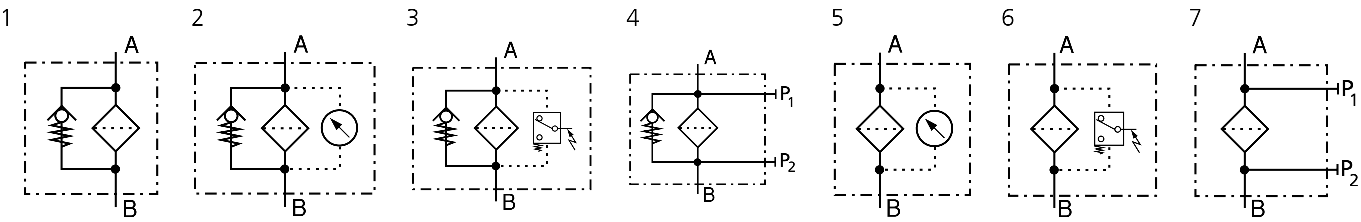
## Measurements in inch

| Type | A/B | C | D | E | F | G | H | I | K mm | L | M Ø/depth | N Ø/depth | O | P | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HD 790 | SAE 2 | 1.75 | 19.49 | 3.80 | 3.78 | 7.24 | 5.51 | 16.93 | AF 36 | 1.42 | * | ** | 2.28 | 3.58 | 3.50 | 3.74 |
| HD 990 | SAE 2 | 1.75 | 27.56 | 3.80 | 3.78 | 7.24 | 5.51 | 25.20 | AF 36 | 1.42 | * | ** | 2.28 | 3.58 | 3.50 | 3.74 |

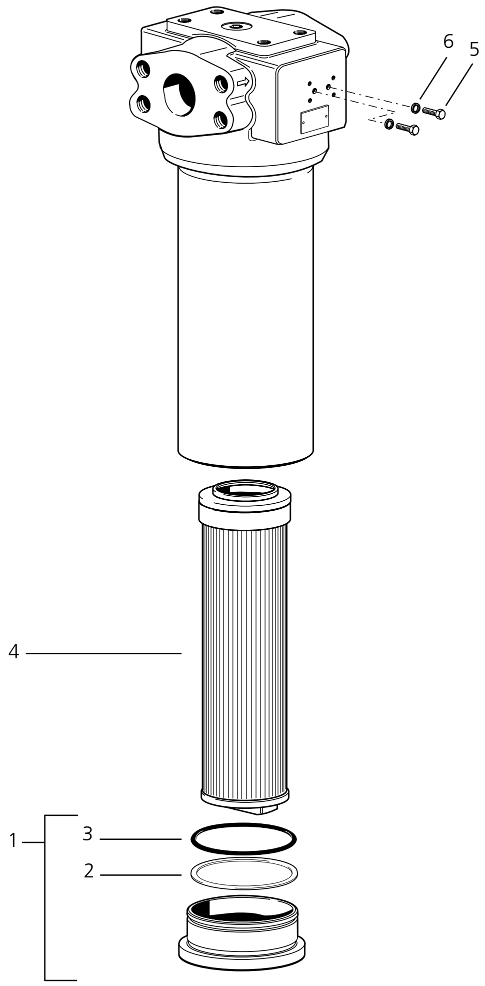
| Type | S | T | U | V |
|---|---|---|---|---|
| HD 790 | 3.66 | 4.80 | 4.02 | 0.51 |
| HD 990 | 3.66 | 4.80 | 4.02 | 0.51 |

* ¾-10 UNC-2B / 1.26     ** ½-13 UNC-2B / 0.79

## Symbols




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Housing cover<br>(with Pos. 2 and 3) | HD 990.1900 |
| 2 | Back-ring | HD 256.0104 |
| 3 | O-ring<br>104.37 x 3.53 mm<br>4.11 x 0.14 inch | N007.1044S |
| 4 | Replacement filter element | see Chart / col. 9 |
| 5 | Hexagonal head screw M4 x 8<br>ISO 4017-8.8 | 11385800 |
| 6 | Bonded seal<br>4.1 x 7.2 x 1 mm<br>0.16 x 0.28 x 0.04 inch | 12504600 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

**Before release into the series production the filter casing is tested for fatigue strength in our pressure pulse test rig. Various quality controls during the production process guarantee the leakfree function and solidity of our filters..**

ARGO HYTOS

**High Pressure Filters**

# HD 044 · HD 064

Flangeable · Operating pressure up to 500 bar / 7250 psi · Nominal flow rate up to 105 l/min / 27.7 gpm

High Pressure Filter HD 064

## Description

### Application

In the high pressure circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
Through installation near to the control valves or other expensive components. The specific determined flow rate guarantees a closed by-pass valve even at $\nu \leq 200$ mm²/s / 927 SUS (cold start condition).

### Filter elements

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

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

### 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: | Spheroidal graphite cast iron (SGI) |
| Filter bowl: | Cold extruded steel |
| Coating: | Powder paint |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web |

### Accessories

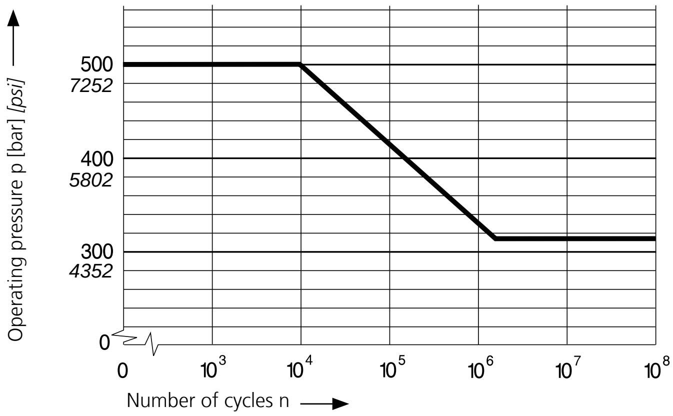
Electrical and / or optical clogging indicators are available - optionally with one or two switching points resp. temperature suppression.
Dimensions and technical data see catalog sheet 60.30.

### Operating pressure

0 ... 315 bar / 4570 psi, min. 2 x $10^6$ pressure cycles
Nominal pressure according to DIN 24550

0 ... 500 bar / 7250 psi, min. $10^4$ pressure cycles
Quasi-static operating pressure

### Permissible pressures for other numbers of cycles




### Nominal flow rate

Up to 105 l/min / 27.7 gpm (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines:
  up to 250 bar ≤ 8 m/s / 3626 psi ≤ 26.3 ft/s
  > 250 bar ≤ 12 m/s / 3626 psi ≤ 39.4 ft/s

### Filter fineness

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

### Dirt-holding capacity

Values in g test dust ISO MTD according to ISO16889
(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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

### Viscosity at nominal flow rate

- at operating temperature: < 60 mm²/s / 280 SUS
- as starting viscosity: $\nu_{max}$ = 1200 mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% $\Delta p$ of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the $\Delta p$ curve at a point. Read this point on the horizontal axis for the viscosity.

### Mounting position

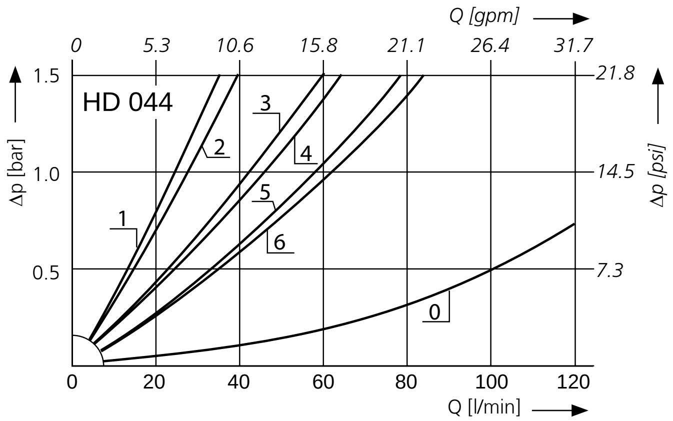
Preferably vertical, filter head on top.

### Connection

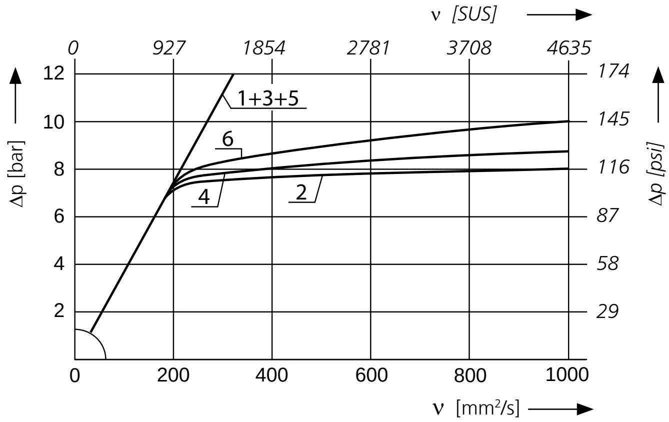
2 x Ø 15 mm / 2 x Ø 0.59 inch on plain flange

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

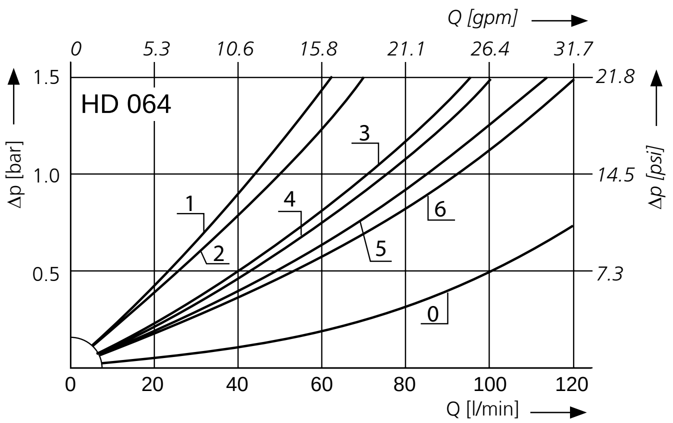
**D1** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



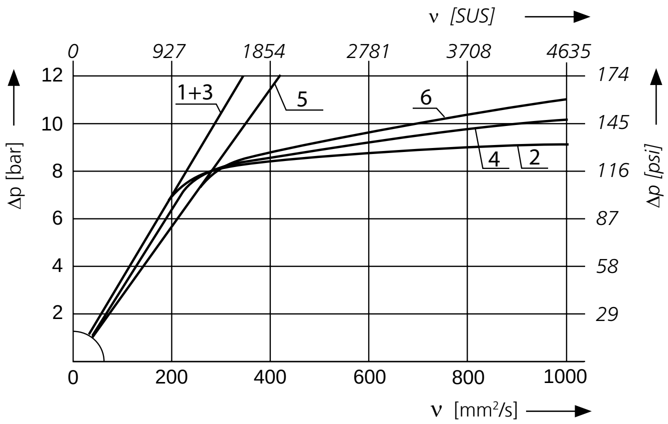

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

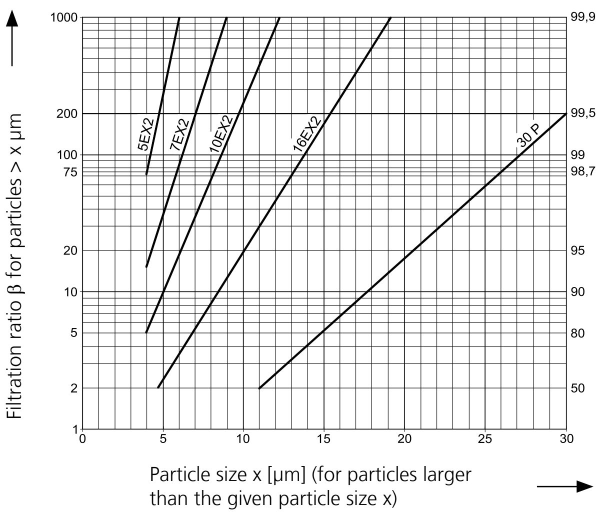



Pressure drop as a function of the **kinematic viscosity** at nominal flow




## Filter fineness curves in Selection Chart, column 4

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX2 and Paper elements:**

| | | | | |
|---|---|---|---|---|
| 5EX2 | = | $\beta_{5\,(c)}$ | = 200 | EXAPOR®MAX 2 |
| 7EX2 | = | $\beta_{7\,(c)}$ | = 200 | EXAPOR®MAX 2 |
| 10EX2 | = | $\beta_{10\,(c)}$ | = 200 | EXAPOR®MAX 2 |
| 16EX2 | = | $\beta_{16\,(c)}$ | = 200 | EXAPOR®MAX 2 |
| 30P | = | $\beta_{30\,(c)}$ | = 200 | Paper |

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

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189

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

## Selection Chart

| Part No. | Nominal flow rate | | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **DX** | Dirt-holding capacity | Connection A/B | | Cracking pressure of by-pass | | Symbol | Replacement filter element Part No. | Weight | | Clogging indicator |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | gpm | | | g | mm | inch | bar | psi | | | kg | lbs | |
| 1 | 2 | | 3 | 4 | 5 | 6 | | 7 | | 8 | 9 | 10 | | 11 |
| HD 044-183 | 27 | 7.1 | **D1**/1 | 5EX2 | 5.2 | Ø 15 | Ø 0.59 | - | - | 2 | V3.0510-13[2] | 3.4 | 7.5 | retrofittable |
| HD 044-153 | 30 | 7.9 | **D1**/2 | 5EX2 | 4.9 | Ø 15 | Ø 0.59 | 7 | 102 | 1 | V3.0510-03 | 3.4 | 7.5 | retrofittable |
| HD 044-186 | 47 | 12.4 | **D1**/3 | 10EX2 | 5.1 | Ø 15 | Ø 0.59 | - | - | 2 | V3.0510-16[2] | 3.4 | 7.5 | retrofittable |
| **HD 044-156**[1] | 50 | 13.2 | **D1**/4 | 10EX2 | 6.8 | Ø 15 | Ø 0.59 | 7 | 102 | 1 | V3.0510-06 | 3.4 | 7.5 | retrofittable |
| HD 044-178 | 65 | 17.2 | **D1**/5 | 16EX2 | 5.6 | Ø 15 | Ø 0.59 | - | - | 2 | V3.0510-18[2] | 3.4 | 7.5 | retrofittable |
| **HD 044-158**[1] | 75 | 19.8 | **D1**/6 | 16EX2 | 6.9 | Ø 15 | Ø 0.59 | 7 | 102 | 1 | V3.0510-08 | 3.4 | 7.5 | retrofittable |
| HD 064-183 | 50 | 13.2 | **D2**/1 | 5EX2 | 8.7 | Ø 15 | Ø 0.59 | - | - | 2 | V3.0520-13[2] | 4.6 | 10.1 | retrofittable |
| HD 064-153 | 60 | 15.9 | **D2**/2 | 5EX2 | 10 | Ø 15 | Ø 0.59 | 7 | 102 | 1 | V3.0520-03 | 4.5 | 9.9 | retrofittable |
| HD 064-196 | 85 | 22.2 | **D2**/3 | 10EX2 | 11 | Ø 15 | Ø 0.59 | - | - | 2 | V3.0520-16[2] | 4.6 | 10.1 | retrofittable |
| **HD 064-156**[1] | 85 | 22.2 | **D2**/4 | 10EX2 | 14 | Ø 15 | Ø 0.59 | 7 | 102 | 1 | V3.0520-06 | 4.5 | 9.9 | retrofittable |
| HD 064-178 | 100 | 26.4 | **D2**/5 | 16EX2 | 12 | Ø 15 | Ø 0.59 | - | - | 2 | V3.0520-18[2] | 4.6 | 10.1 | retrofittable |
| **HD 064-158**[1] | 105 | 27.7 | **D2**/6 | 16EX2 | 15 | Ø 15 | Ø 0.59 | 7 | 102 | 1 | V3.0520-08 | 4.5 | 9.9 | retrofittable |

[1] Preferred type, no minimum order quantity required
[2] Element differential pressure stable up to 160 bar / 2320 psi , clogging indicator is obligatory

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 HD 064-156 has to be supplied with optical clogging indicator - response pressure 5.0 bar / 73 psi.**

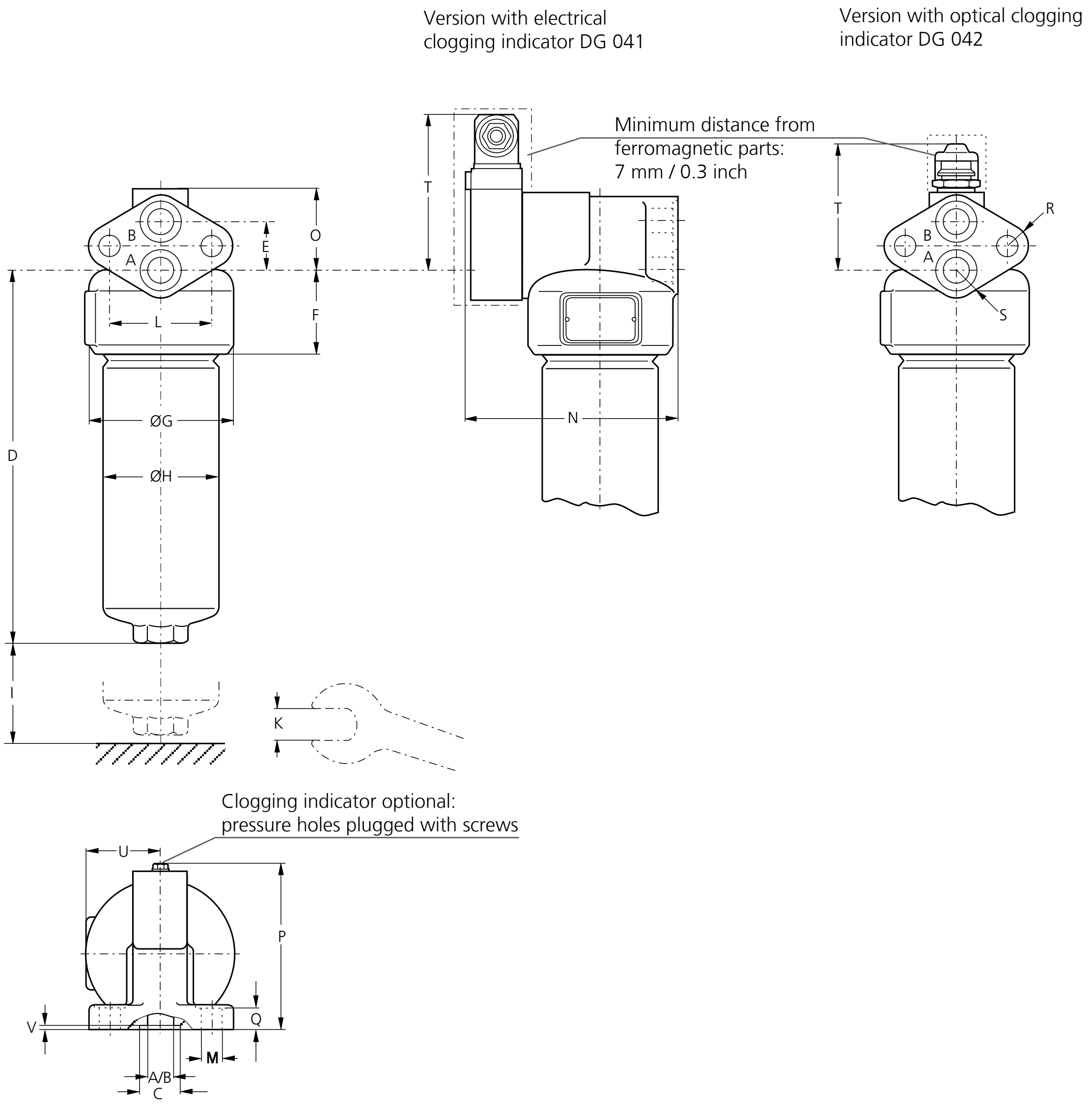
**Order description:** **HD 064-156** **/** **DG 042-02** **M**
**Part No. (Basic unit)**
**Clogging indicator**
**Mounted**

**For the appropriate clogging indicators see catalog sheet 60.30.**

**Remarks:**

- Filter versions without by-pass valves must always be equipped with a clogging indicator.
- The filters listed in this chart are standard filters. If modifications are required, e.g. filter fineness 30P, we kindly ask for your request.

## Dimensions




## Measurements in mm

| Type | A/B | C | D | E | F | G | H | I | K | L | M | N | O | P | Q | R | S | T electr./opt. | U | V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HD 044 | Ø 15 | 23.5 | 145 | 26 | 49 | 83 | 66 | 70 | AF 36 | 58 | 12.5 | 118.5 | 48 | 90 | 17 | 13 | 16 | 106 / 79 | 45 | 2 |
| HD 064 | Ø 15 | 23.5 | 241 | 26 | 49 | 83 | 66 | 70 | AF36 | 58 | 12.5 | 118.5 | 48 | 90 | 17 | 13 | 16 | 106 / 79 | 45 | 2 |

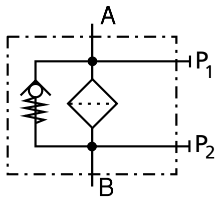
## Measurements in inch

| Type | A/B | C | D | E | F | G | H | I | K mm | L | M | N | O | P | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HD 044 | Ø 0.59 | 0.93 | 5.71 | 1.02 | 1.93 | 3.27 | 2.60 | 2.76 | AF 36 | 2.28 | 0.49 | 4.67 | 1.89 | 3.54 | 0.67 | 0.51 |
| HD 064 | Ø 0.59 | 0.93 | 9.49 | 1.02 | 1.93 | 3.27 | 2.60 | 2.76 | AF 36 | 2.28 | 0.49 | 4.67 | 1.89 | 3.54 | 0.67 | 0.51 |

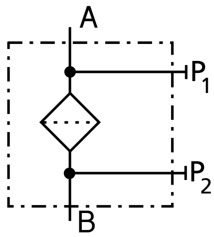
| Type | S | T electr./opt. | U | V |
|---|---|---|---|---|
| HD 044 | 0.63 | 4.17 / 3.11 | 1.77 | 0.08 |
| HD 064 | 0.63 | 4.17 / 3.11 | 1.77 | 0.08 |

## Symbols

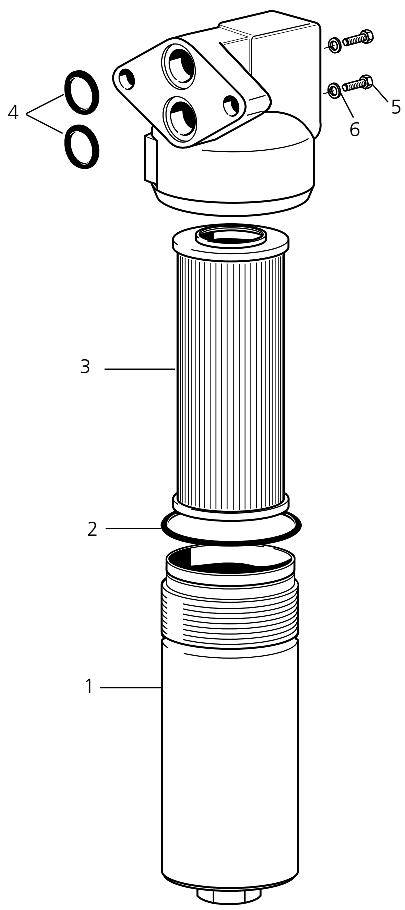
1




2




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Filter bowl HD 044 | HD 052.0102 |
| 1 | Filter bowl HD 064 | HD 072.0102 |
| 2 | O-ring<br>53.57 x 3.53 mm<br>11 x 0.14 inch | N007.0543/1 |
| 3 | Replacement filter element | s. Chart / col. 9 |
| 4 | O-ring<br>18.72 x 2.62* mm<br>0.74 x 0.10* inch | N007.0193 |
| 5 | Hexagonal head screw M4 x 8<br>DIN 933-8.8 | 11385800 |
| 6 | Bonded Seal<br>4.1 x 7.2 x 1 mm<br>0.16 x 0.28 x 0.04 inch | 12504600 |

*Not supplied with filter - has to be ordered separately

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

**Before release into the series production the filter casing is tested for fatigue strength in our pressure pulse test rig. Various quality controls during the production process guarantee the leakfree function and solidity of our filters.**

ARGO HYTOS

High Pressure Filters

# HD 314 · HD 414 · HD 614

Flangeable · Operating pressure up to 500 bar / 7250 psi · Nominal flow rate up to 400 l/min / 105.7 gpm

High Pressure Filter HD 414

## Description

### Application

In the high pressure circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
Through installation near to the control valves or other expensive components. The specific determined flow rate guarantees a closed by-pass valve even at ≤ 200 mm²/s / 927 SUS (cold start condition).

### Filter elements

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

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

### 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: | Spheroidal graphite cast iron (SGI) |
| Filter bowl: | Cold extruded steel |
| Coating: | Powder paint |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web<br>Paper - cellulose web, impregnated with resin |

### Accessories

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

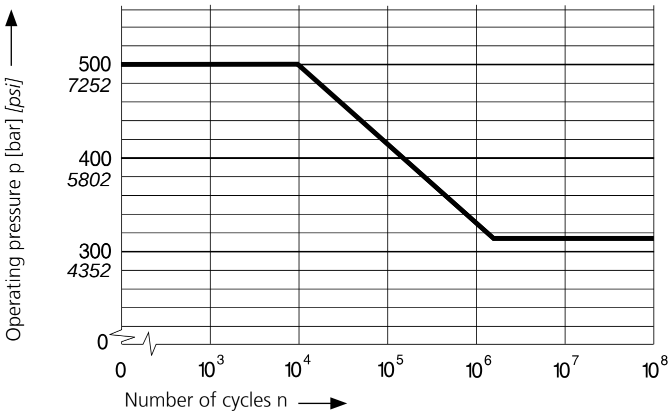
## Characteristics

### Operating pressure

0 ... 315 bar / 4570 psi, min. 2 x $10^6$ pressure cycles
Nominal pressure according to DIN 24550

0 ... 500 bar / 7250 psi, min. $10^4$ pressure cycles
Quasi-static operating pressure

### Permissible pressures for other numbers of cycles




### Nominal flow rate

Up to 400 l/min / 105,7 gpm (see Selection Chart, column 2).
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines:
  up to 250 bar ≤ 8 m/s / up to 3626 psi ≤ 26.3 ft/s
  > 250 bar ≤ 12 m/s / > 3626 psi ≤ 39.4 ft/s

### Filter fineness

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

### Dirt-holding capacity

Values in g test dust 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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

### Viscosity at nominal flow rate

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% Δp of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the Δp curve at a point. Read this point on the horizontal axis for the viscosity.

### Mounting position

Preferably vertical, filter head on top.

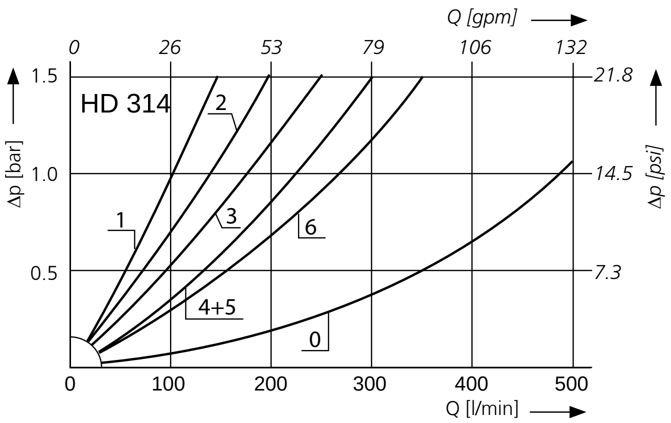
### Connection

2 x Ø 31 mm / 2 x Ø 1.22 inch on plain flange.

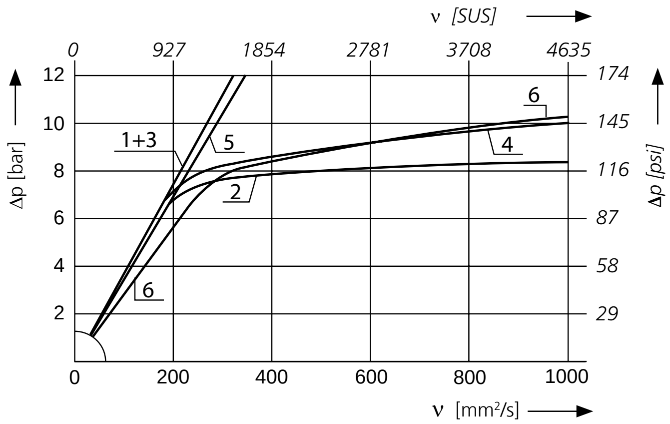
## Diagrams

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

**D1** Pressure drop as a function of the **flow volume** at $\nu = 35$ mm²/s / 162 SUS (0 = casing empty)

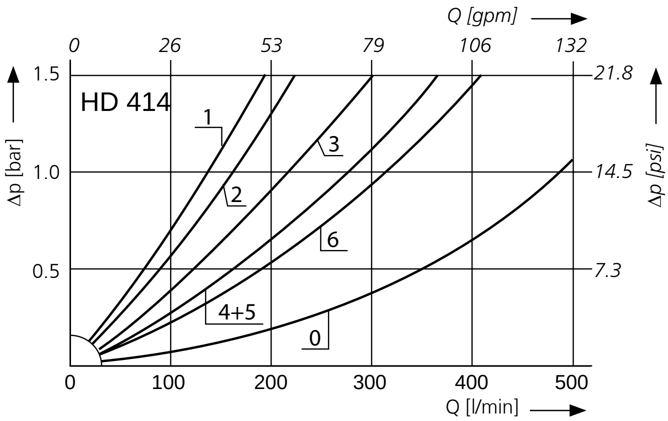



Pressure drop as a function of the **kinematic viscosity** at nominal flow

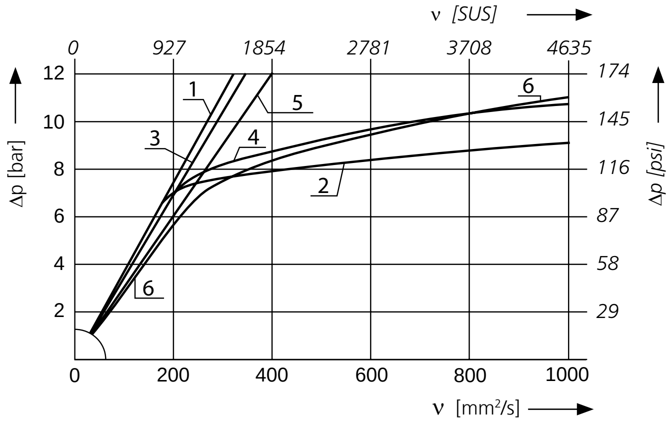


## Δp-curves for complete filters in Selection Chart, column 3

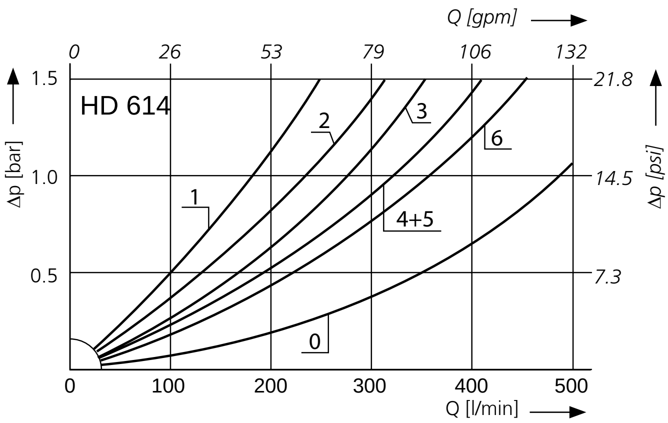
**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)



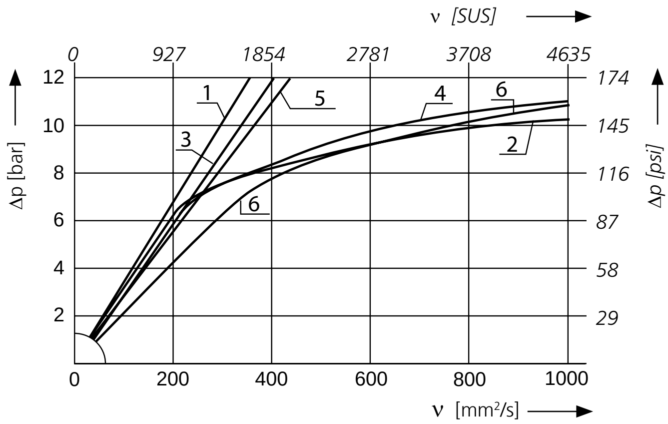

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D3** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS (0 = casing empty)

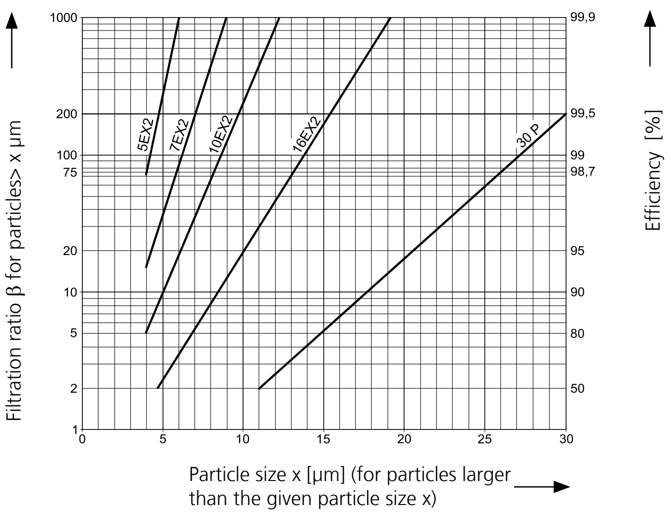



Pressure drop as a function of the **kinematic viscosity** at nominal flow




## Filter fineness curves in Selection Chart, column 4

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX2 and Paper elements:**

| | | | |
|---|---|---|---|
| 5EX2 = | $\beta_{5\,(c)}$ | = 200 | EXAPOR®MAX 2 |
| 7EX2 = | $\beta_{7\,(c)}$ | = 200 | EXAPOR®MAX 2 |
| 10EX2 = | $\beta_{10\,(c)}$ | = 200 | EXAPOR®MAX 2 |
| 16EX2 = | $\beta_{16\,(c)}$ | = 200 | EXAPOR®MAX 2 |
| 30P = | $\beta_{30\,(c)}$ | = 200 | Paper |

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

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189

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

## Selection Chart

| Part No. | Nominal flow rate | | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt-holding capacity | Connection A/B | | Cracking pressure of by-pass | | Symbol | Replacement filter element Part No. | Weight | | Clogging indicator |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | gpm | | | g | mm | inch | bar | psi | | | kg | lbs | |
| 1 | 2 | | 3 | 4 | 5 | 6 | | 7 | | 8 | 9 | 10 | | 11 |
| HD 314-279 | 110 | 29.1 | **D1**/1 | 5EX2 | 20 | Ø 31 | Ø 1.22 | - | - | 2 | V3.0817-13[2] | 14.2 | 31.3 | retrofittable |
| HD 314-259 | 155 | 40.9 | **D1**/2 | 5EX2 | 24 | Ø 31 | Ø 1.22 | 7 | 102 | 1 | V3.0817-03 | 13.8 | 30.4 | retrofittable |
| HD 314-246 | 195 | 51.5 | **D1**/3 | 10EX2 | 24 | Ø 31 | Ø 1.22 | - | - | 2 | V3.0817-16[2] | 14.2 | 31.3 | retrofittable |
| **HD 314-256**[1] | 250 | 66.0 | **D1**/4 | 10EX2 | 33 | Ø 31 | Ø 1.22 | 7 | 102 | 1 | V3.0817-06 | 13.8 | 30.4 | retrofittable |
| HD 314-248 | 260 | 68.7 | **D1**/5 | 16EX2 | 25 | Ø 31 | Ø 1.22 | - | - | 2 | V3.0817-18[2] | 14.2 | 31.3 | retrofittable |
| **HD 314-258**[1] | 300 | 79.3 | **D1**/6 | 16EX2 | 33 | Ø 31 | Ø 1.22 | 7 | 102 | 1 | V3.0817-08 | 13.8 | 30.4 | retrofittable |
| | | | | | | | | | | | | | | |
| HD 414-279 | 155 | 40.9 | **D2**/1 | 5EX2 | 29 | Ø 31 | Ø 1.22 | - | - | 2 | V3.0823-13[2] | 15.7 | 34.6 | retrofittable |
| HD 414-259 | 190 | 50.2 | **D2**/2 | 5EX2 | 33 | Ø 31 | Ø 1.22 | 7 | 102 | 1 | V3.0823-03 | 15.1 | 33.3 | retrofittable |
| HD 414-296 | 250 | 66.0 | **D2**/3 | 10EX2 | 33 | Ø 31 | Ø 1.22 | - | - | 2 | V3.0823-16[2] | 15.7 | 34.6 | retrofittable |
| **HD 414-256**[1] | 310 | 81.9 | **D2**/4 | 10EX2 | 47 | Ø 31 | Ø 1.22 | 7 | 102 | 1 | V3.0823-06 | 15.1 | 33.3 | retrofittable |
| HD 414-298 | 310 | 81.9 | **D2**/5 | 16EX2 | 35 | Ø 31 | Ø 1.22 | - | - | 2 | V3.0823-18[2] | 15.7 | 34.6 | retrofittable |
| **HD 414-258**[1] | 360 | 95.1 | **D2**/6 | 16EX2 | 48 | Ø 31 | Ø 1.22 | 7 | 102 | 1 | V3.0823-08 | 15.1 | 33.3 | retrofittable |
| | | | | | | | | | | | | | | |
| HD 614-279 | 210 | 55.5 | **D3**/1 | 5EX2 | 41 | Ø 31 | Ø 1.22 | - | - | 2 | V3.0833-13[2] | 18.5 | 40.8 | retrofittable |
| HD 614-259 | 270 | 71.3 | **D3**/2 | 5EX2 | 49 | Ø 31 | Ø 1.22 | 7 | 102 | 1 | V3.0833-03 | 17.8 | 39.2 | retrofittable |
| HD 614-246 | 310 | 81.9 | **D3**/3 | 10EX2 | 49 | Ø 31 | Ø 1.22 | - | - | 2 | V3.0833-16[2] | 18.5 | 40.8 | retrofittable |
| **HD 614-256**[1] | 360 | 95.1 | **D3**/4 | 10EX2 | 67 | Ø 31 | Ø 1.22 | 7 | 102 | 1 | V3.0833-06 | 17.8 | 39.2 | retrofittable |
| HD 614-288 | 400 | 105.7 | **D3**/5 | 16EX2 | 51 | Ø 31 | Ø 1.22 | - | - | 2 | V3.0833-18[2] | 18.5 | 40.8 | retrofittable |
| **HD 614-258**[1] | 400 | 105.7 | **D3**/6 | 16EX2 | 68 | Ø 31 | Ø 1.22 | 7 | 102 | 1 | V3.0833-08 | 17.8 | 39.2 | retrofittable |

[1] Preferred type, no minimum order quantity required
[2] Element differential pressure stable up to 160 bar / 2320 psi, clogging indicator is obligatory

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 HD HD 314-279 has to be supplied with optical clogging indicator - response pressure 5.0 bar / 73 psi**

**Order description:** **HD 314-279** **/** **DG 042-02** **M**

**Part No. (Basic unit)** **Mounted**

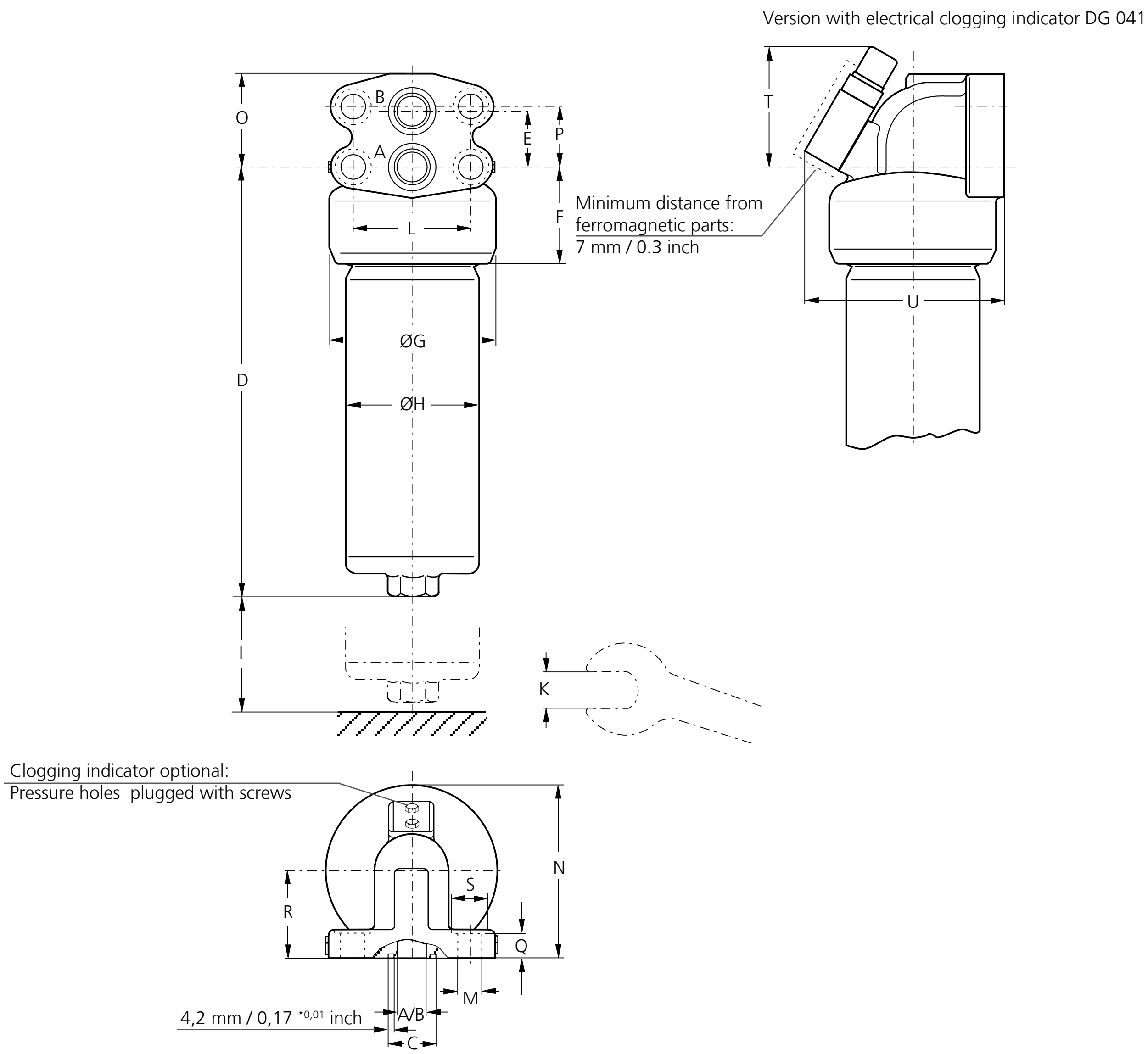
**Clogging indicator**

**For the appropriate clogging indicators see catalog sheet 60.30.**

**Remarks:**

- Filter versions without by-pass valves must always be equipped with a clogging indicator.
- The filters listed in this chart are standard filters. If modifications are required, e.g. filter fineness 30P, we kindly ask for your request.

## Dimensions




## Measurements in mm

| Type | A/B | C | D | E | F | G | H | I | K | L | M | N | O | P | Q | R | S | T | U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HD 314 | Ø 31 | 44.4 | 263 | 52 | 82 | 138 | 109 | 80 | AF 32 | 95 | 21.5 | 150 | 83 | 58 | 25 | 80 | 34 | 93 | 165 |
| HD 414 | Ø 31 | 44.4 | 325 | 52 | 82 | 138 | 109 | 80 | AF 32 | 95 | 21.5 | 150 | 83 | 58 | 25 | 80 | 34 | 93 | 165 |
| HD 614 | Ø 31 | 44.4 | 426 | 52 | 82 | 138 | 109 | 80 | AF 32 | 95 | 21.5 | 150 | 83 | 58 | 25 | 80 | 34 | 93 | 165 |

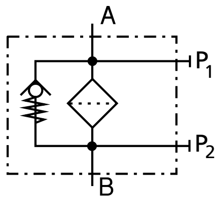
## Measurements in inch

| Type | A/B | C | D | E | F | G | H | I | K mm | L | M | N | O | P | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HD 314 | Ø 1.22 | 1.75 | 10.35 | 2.05 | 3.23 | 5.43 | 4.29 | 3.15 | AF 32 | 3.74 | 0.85 | 5.91 | 3.27 | 2.28 | 0.98 | 3.15 |
| HD 414 | Ø 1.22 | 1.75 | 12.80 | 2.05 | 3.23 | 5.43 | 4.29 | 3.15 | AF 32 | 3.74 | 0.85 | 5.91 | 3.27 | 2.28 | 0.98 | 3.15 |
| HD 614 | Ø 1.22 | 1.75 | 16.77 | 2.05 | 3.23 | 5.43 | 4.29 | 3.15 | AF 32 | 3.74 | 0.85 | 5.91 | 3.27 | 2.28 | 0.98 | 3.15 |

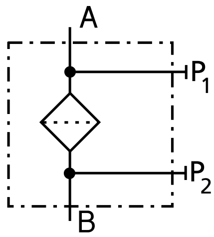
| Type | S | T | U |
|---|---|---|---|
| HD 314 | 1.34 | 3.66 | 6.50 |
| HD 414 | 1.34 | 3.66 | 6.50 |
| HD 614 | 1.34 | 3.66 | 6.50 |

## Symbols

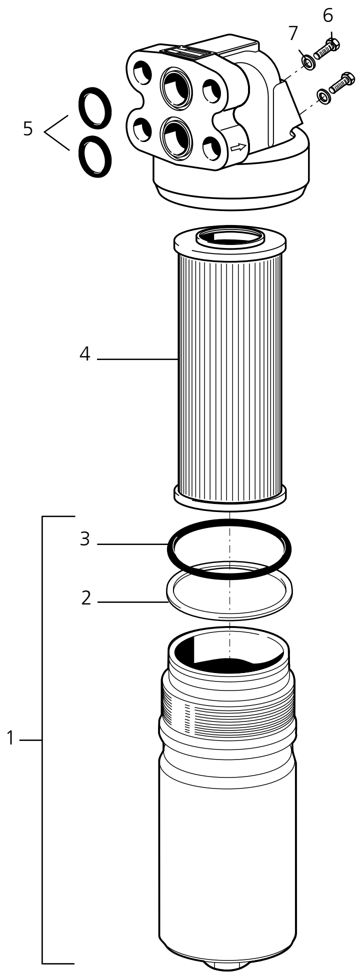
1




2




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Filter bowl HD 314 (with Pos. 2 und 3) | HD 250.0701 |
| 1 | Filter bowl HD 414 (with Pos. 2 und 3) | HD 451.0702 |
| 1 | Filter bowl HD 614 (with Pos. 2 und 3) | HD 619.0701 |
| 2 | Back-ring | HD 255.0102 |
| 3 | O-ring<br>94.84 x 3.53 mm<br>3.73 x 0.14 inch | N007.0953 |
| 4 | Replacement filter element | s. Chart / col. 9 |
| 5 | O-ring<br>37.69 x 3.53* mm<br>1.48 x 0.14* inch | N007.0384 |
| 6 | Hexagonal head screw M4 x 8 DIN 933-8.8 | 11385800 |
| 7 | Bonded Seal<br>4.1 x 7.2 x 1 mm<br>0.16 x 0.28 x 0.04 inch | 12504600 |

* Not supplied with filter - has to be ordered separately

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

**Before release into the series production the filter casing is tested for fatigue strength in our pressure pulse test rig. Various quality controls during the production process guarantee the leakfree function and solidity of our filters.**

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

High Pressure Filters

# HD 417 · HD 617

Bi-directional flow · In-line mounting · Operating pressure up to 500 bar / 7250 psi · Nominal flow rate up to 420 l/min / 111 gpm

High Pressure Filter HD 417

## Description

### Application

In the high pressure circuits of hydraulic systems with changing flow direction.

### Performance features

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

*Protection against malfunction:*
Through installation near to the control valves or other expensive components. The specific determined flow rate guarantees a closed by-pass valve even at $\nu \leq 200$ mm²/s / 927 SUS (cold start condition).

### Special features

*Reverse flow valves:*
The "Graetz" system (see Symbols) integrated into the head piece ensures the filtration of the hydraulic fluid in both flow directions.

### Filter elements

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

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

### 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: | Spheroidal graphite cast iron (SGI) |
| Filter bowl: | Cold extruded steel |
| Coating: | Powder paint |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web<br>Paper - cellulose web, impregnated with resin |

### Accessories

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

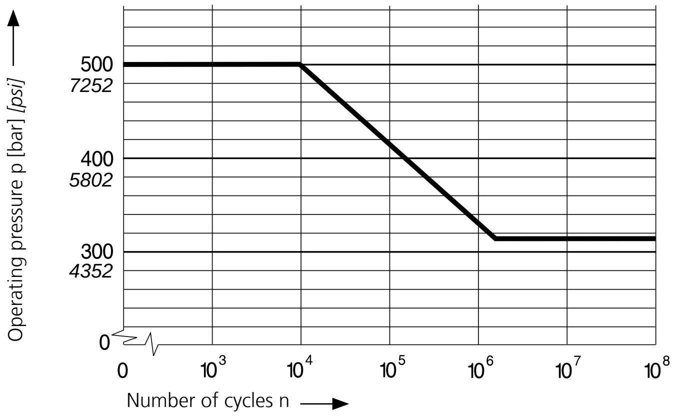
## Characteristics

### Operating pressure

0 ... 315 bar / 4570 psi, min. 2 x $10^6$ pressure cycles
Nominal pressure according to DIN 24550

0 ... 500 bar / 7250 psi, min. $10^4$ pressure cycles
Quasi-static operating pressure

### Permissible pressures for other numbers of cycles




### Nominal flow rate

Up to 420 l/min / 111 gpm (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at $\nu \leq 200$ mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines:
  up to 250 bar ≤ 8 m/s / up to 3626 psi ≤ 26.3 ft/s
  > 250 bar ≤ 12 m/s / > 3626 psi ≤ 39.4 ft/s

### Filter fineness

5 µm(c) ... 30 µm(c)
β-values according to ISO 16889
(see Selection Chart, column 4 and diagram Dx).

### Dirt-holding capacity

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

### Hydraulic fluids

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

### Temperature range

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

- at operating temperature: $\nu < 60$ mm²/s / 280 SUS
- as starting viscosity: $\nu_{max} = 1200$ mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% Δp of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the Δp curve at a point. Read this point on the horizontal axis for the viscosity.

### Mounting position

Preferably vertical, filter head on top.

### Connection

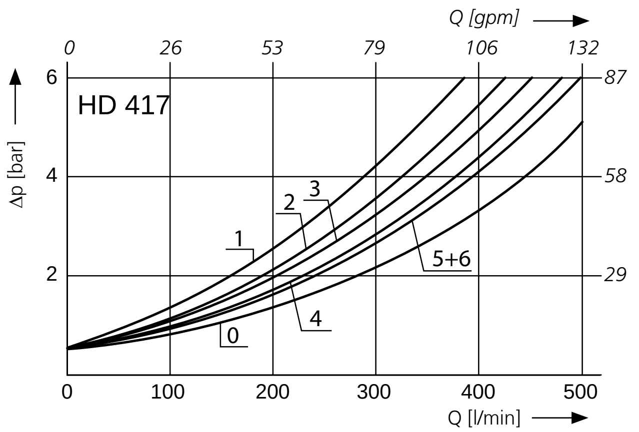
- SAE-flange (6000 psi).

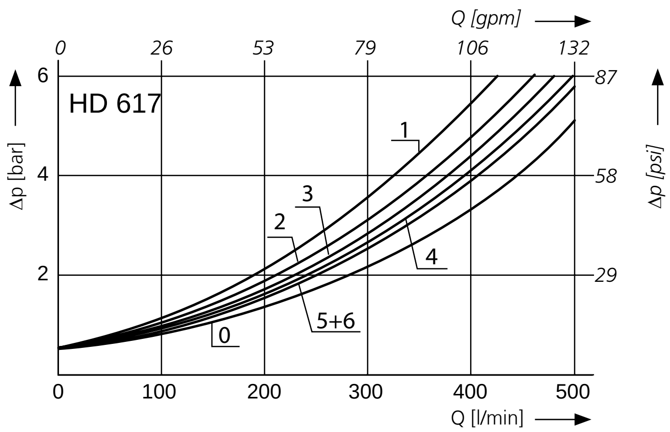
Sizes see Selection Chart, column 6,
(other connections on request).

## Diagrams

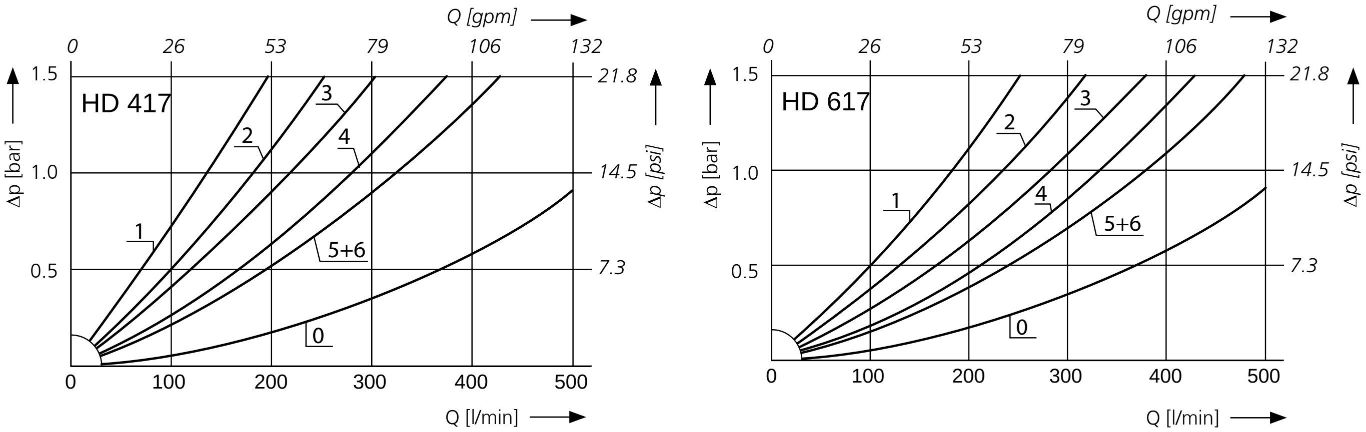
### Δp-curves for complete filters in Selection Chart, column 3

**D1** Pressure drop as a function of the **flow volume** at $\nu = 35$ mm²/s / 162 SUS, measurement **with** reverse flow valves, (0 = casing empty)

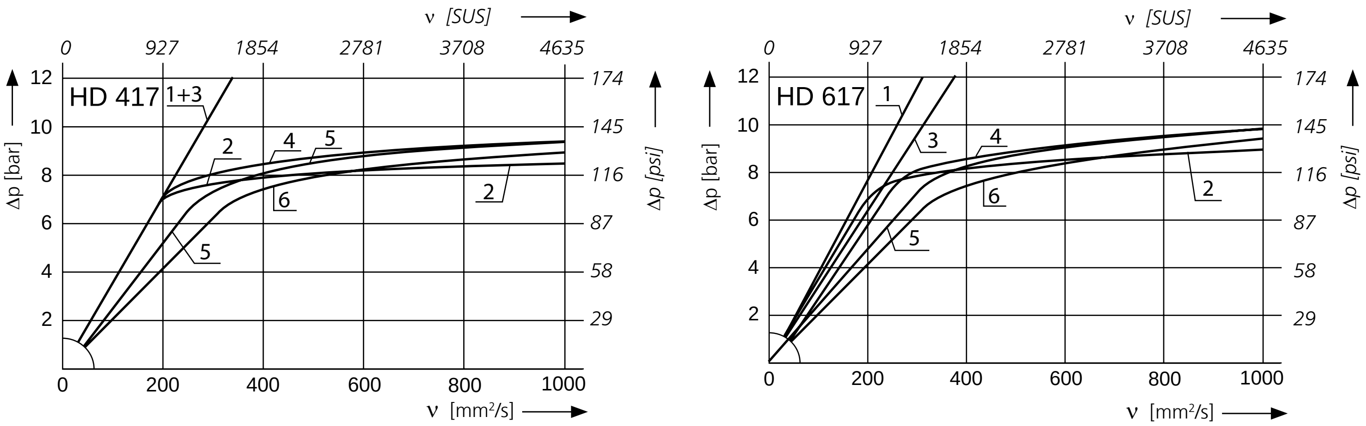


**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS, measurement **without** reverse flow valves, (0 = casing empty)

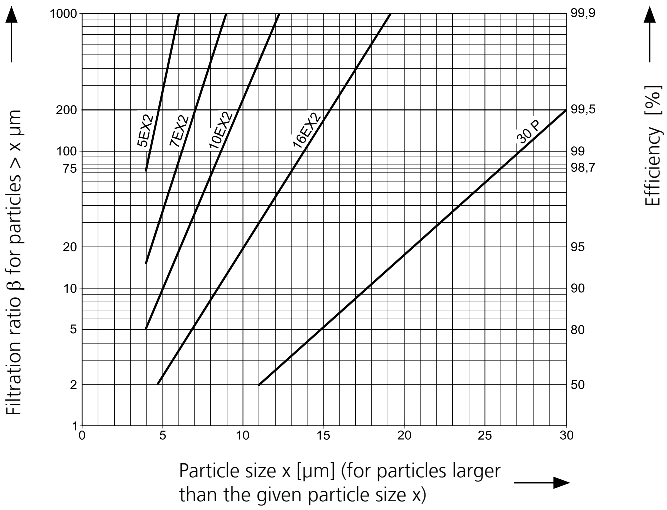



**D3** Pressure drop as a function of the **kinematic viscosity** at nominal flow, measurement **without** reverse flow valves




## Filter fineness curves in Selection Chart, column 4

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




The abbreviations represent the following β-values resp. finenesses:

**For EXAPOR®MAX2 and Paper elements:**

| | | | |
|---|---|---|---|
| 5EX2 = | $\beta_{5\,(c)}$ | = 200 | EXAPOR®MAX 2 |
| 7EX2 = | $\beta_{7\,(c)}$ | = 200 | EXAPOR®MAX 2 |
| 10EX2 = | $\beta_{10\,(c)}$ | = 200 | EXAPOR®MAX 2 |
| 16EX2 = | $\beta_{16\,(c)}$ | = 200 | EXAPOR®MAX 2 |
| 30P = | $\beta_{30\,(c)}$ | = 200 | Paper |

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

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189

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

## Selection Chart

| Part No. | Nominal flow rate | | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt-holding capacity | Connection A/B | Cracking pressure of by-pass | | Symbol | Replacement filter element Part No. | Weight | | Clogging indicator | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | gpm | | | g | | bar | psi | | | kg | lbs | | |
| 1 | 2 | | 3 | 4 | 5 | 6 | 7 | | 8 | 9 | 10 | | 11 | 12 |
| HD 417-149 | 150 | 39.6 | **D1,2,3**/1 | 5EX2 | 29 | SAE 1¼ | - | - | 2 | V3.0823-13[1] | 20.3 | 44.8 | optional | [2] |
| HD 417-179 | 220 | 58.1 | **D1,2,3**/2 | 5EX2 | 33 | SAE 1¼ | 7 | 102 | 1 | V3.0823-03 | 19.7 | 43.4 | optional | - |
| HD 417-146 | 260 | 68.7 | **D1,2,3**/3 | 10EX2 | 33 | SAE 1¼ | - | - | 2 | V3.0823-16[1] | 20.3 | 44.8 | optional | [2] |
| HD 417-176 | 320 | 84.5 | **D1,2,3**/4 | 10EX2 | 47 | SAE 1¼ | 7 | 102 | 1 | V3.0823-06 | 19.7 | 43.4 | optional | - |
| HD 417-168 | 350 | 92.5 | **D1,2,3**/5 | 16EX2 | 48 | SAE 1¼ | 7 | 102 | 1 | V3.0823-08 | 19.7 | 43.4 | optional | - |
| HD 417-161 | 350 | 92.5 | **D1,2,3**/6 | 30P | 26 | SAE 1¼ | 7 | 102 | 1 | P3.0823-01[3] | 19.7 | 43.4 | optional | - |
| HD 617-149 | 220 | 58.1 | **D1,2,3**/1 | 5EX2 | 41 | SAE 1½ | - | - | 2 | V3.0833-13[1] | 23.1 | 50.9 | optional | [2] |
| HD 617-179 | 280 | 74.0 | **D1,2,3**/2 | 5EX2 | 49 | SAE 1½ | 7 | 102 | 1 | V3.0833-03 | 22.4 | 49.4 | optional | - |
| HD 617-146 | 320 | 84.5 | **D1,2,3**/3 | 10EX2 | 49 | SAE 1½ | - | - | 2 | V3.0833-16[1] | 23.1 | 50.9 | optional | [2] |
| HD 617-176 | 380 | 100.4 | **D1,2,3**/4 | 10EX2 | 67 | SAE 1½ | 7 | 102 | 1 | V3.0833-06 | 22.4 | 49.4 | optional | - |
| HD 617-178 | 420 | 111.0 | **D1,2,3**/5 | 16EX2 | 68 | SAE 1½ | 7 | 102 | 1 | V3.0833-08 | 22.4 | 49.4 | optional | - |
| HD 617-161 | 420 | 111.0 | **D1,2,3**/6 | 30P | 34 | SAE 1½ | 7 | 102 | 1 | P3.0833-01[3] | 22.4 | 49.4 | optional | - |

[1] Element differential pressure up to 160 bar / 2320 psi
[2] Clogging indicator is obligatory
[3] Paper media supported with metal gauze

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 HD 417-149 has to be supplied with electrical clogging indicator - cracking pressure 5.0 bar / 73 psi.**

**Order description:** **HD 417-149** **/** **DG 041-33** **M**

**Part No. (Basic unit)** — HD 417-149

**Clogging indicator** — DG 041-33

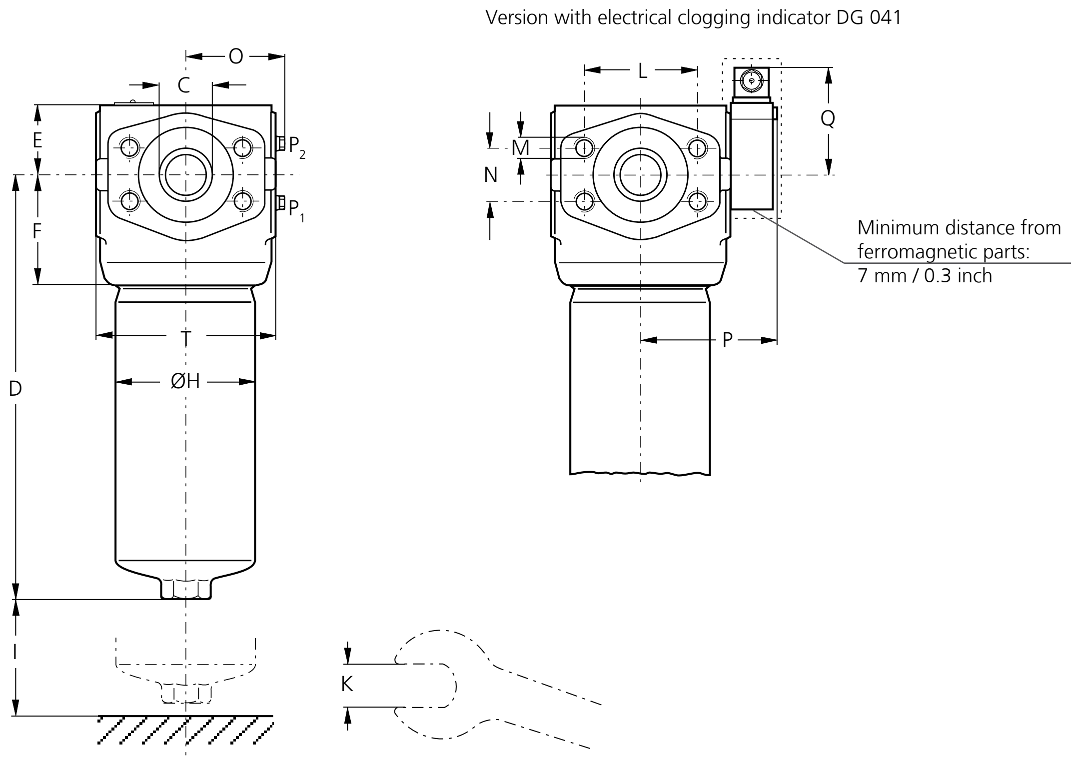
**M** — **Mounted**

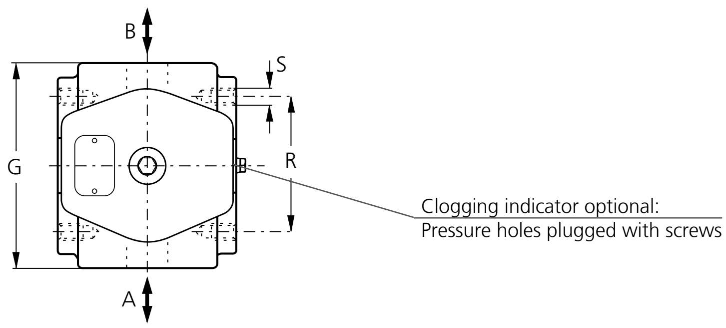
**For the appropriate clogging indicators see catalog sheet 60.30.**

**Remarks:**

› Filter versions without by-pass valves must always be equipped with a clogging indicator.
› The filters listed in this chart are standard filters. Other designs available on request.

## Dimensions




## Measurements in mm

| Type | A/B | C | D | E | F | G | H | I | K | L | M Ø / depth | N | O | P | Q | R | S Ø / depth | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HD 417 | SAE 1¼ | 31.5 | 328 | 58 | 87.5 | 156 | 108 | 80 | AF 32 | 66.7 | M14 / 22 | 31.8 | 73 | 102 | 87 | 100 | M12 / 18 | 138 |
| HD 617 | SAE 1½ | 31.5 | 428 | 58 | 87.5 | 156 | 108 | 80 | AF 32 | 79.4 | M16 / 24 | 36.5 | 73 | 102 | 87 | 100 | M12 / 18 | 138 |

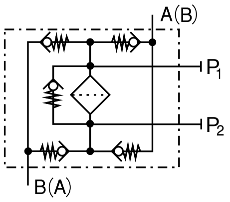
## Measurements in inch

| Type | A/B | C | D | E | F | G | H | I | K mm | L | M Ø / depth | N | O | P | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HD 417 | SAE 1¼ | 1.24 | 12.91 | 2.28 | 3.44 | 6.14 | 4.25 | 3.15 | AF 32 | 2.63 | M14 / 0.87 | 1.25 | 2.87 | 4.02 | 3.43 |
| HD 617 | SAE 1½ | 1.24 | 16.85 | 2.28 | 3.44 | 6.14 | 4.25 | 3.15 | AF 32 | 3.13 | M16 / 0.95 | 1.44 | 2.87 | 4.02 | 3.43 |

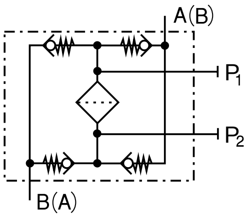
| Type | R | S Ø / depth | T |
|---|---|---|---|
| HD 417 | 3.94 | M12 / 0.71 | 5.43 |
| HD 617 | 3.94 | M12 / 0.71 | 5.43 |

## Symbols

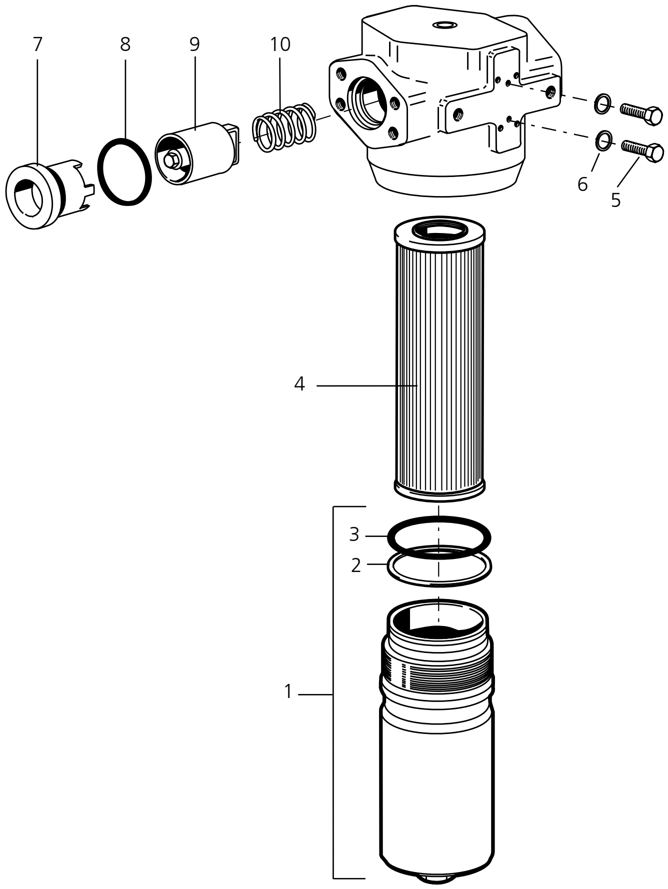
1




2




## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Filter bowl HD 417<br>(with Pos. 2 and 3) | HD 451.0702 |
| 1 | Filter bowl HD 617<br>(with Pos. 2 and 3) | HD 619.0701 |
| 2 | Back-ring | HD 255.0102 |
| 3 | O-ring<br>94.84 x 3.53 mm<br>3.73 x 0.14 inch | N007.0953 |
| 4 | Replacement filter element | see Chart / col. 9 |
| 5 | Hexagonal head screw M4 x 8<br>DIN 933-8.8 | 11385800 |
| 6 | Bonded seal<br>4.1 x 7.2 x 1 mm<br>0.16 x 0.28 x 0.04 inch | 12504600 |
| 7 | Sleeve | HD 417.0505 |
| 8 | O-ring<br>42.52 x 2.62 mm<br>1.67 x 0.1 inch | N007.0433 |
| 9 | Reverse flow valve | HD 417.1520 |
| 10 | Spring DM 38 | N015.3801 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

**Before release into the series production the filter casing is tested for fatigue strength in our pressure pulse test rig. Various quality controls during the production process guarantee the leakfree function and solidity of our filters.**

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

High Pressure Filter Kits

# HD 049 · HD 069 · HD 172 · HD 319 · HD 419 · HD 619

Operating pressure up to 630 bar / 9137 psi · Nominal flow rate up to 450 l/min / 118.9 gpm

M

High Pressure Filter Kit HD 049

## Description

### Application

In the high pressure circuits of hydraulic systems.

### Performance features

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

*Protection against malfunction:*
Through installation near to the control valves or other expensive components. The specific determined flow rate guarantees a closed by-pass valve even at $\nu \leq 200$ mm²/s / 927 SUS (cold start condition).

### Filter elements

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

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

### Filter maintenance

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

### Materials

| | |
|---|---|
| Filter bowl: | Cold extruded steel |
| Coating: | Powder paint |
| Seals: | NBR (FPM on request) |
| Filter media: | EXAPOR®MAX 2 - inorganic multi-layer microfiber web |

### Accessories

To monitor the clogging, screw-in (see section Dimensions) or flange-mounted differential pressure switches are available.
For dimensions and technical data of integrable clogging indicators, see catalog sheet 60.40.
Flange-mounted clogging indicators optionally with one or two switching points resp. temperature suppression – Dimensions and technical data see catalog sheet 60.30.

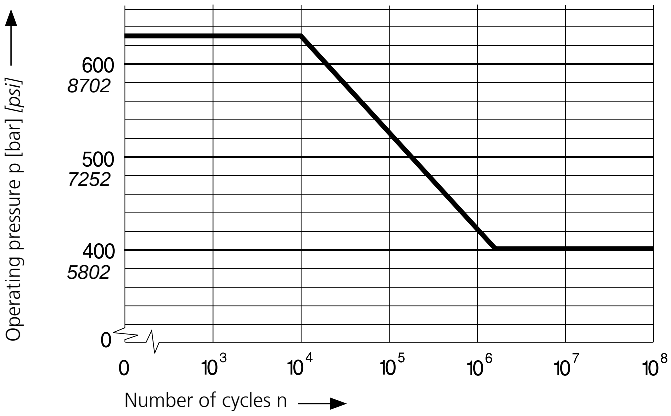
## Characteristics

### Operating Pressure

0 ... 400 bar / 5800 psi, min. 2 x $10^6$ pressure cycles
Nominal pressure according to DIN 24550

0 ... 630 bar / 9137 psi, min. $10^4$ pressure cycles
Quasi-static operating pressure

### Permissible pressures for other numbers of cycles




### Nominal flow rate

Up to 450 l/min / 118.9 gpm (see Selection Chart, column 2)
The nominal flow rates indicated by ARGO-HYTOS are based on the following features:

- closed by-pass valve at ν ≤ 200 mm²/s / 927 SUS
- element service life > 1000 operating hours at an average fluid contamination of 0.07 g per l/min / 0.27 g per gpm flow volume
- flow velocity in the connection lines:
  up to 250 bar ≤ 8 m/s / up to 3626 psi ≤ 26.3 ft/s
  > 250 bar ≤ 12 m/s / > 3626 psi ≤ 39.4 ft/s

### Filter fineness

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

### Dirt-holding capacity

Values in g test dust 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)
-22 °F ... +212 °F (temporary -40 °F ... +248 °F)

### Viscosity at nominal flow rate

- at operating temperature: ν < 60 mm²/s / 280 SUS
- as starting viscosity $\nu_{max}$ = 1200 mm²/s / 5560 SUS
- at initial operation:
  The recommended starting viscosity can be read from the diagram D (pressure drop as a function of the kinematic viscosity) as follows: Find the 70% Δp of the cracking pressure of the by-pass valve on the vertical axis. Draw a horizontal line so that it intersects the Δp curve at a point. Read this point on the horizontal axis for the viscosity.

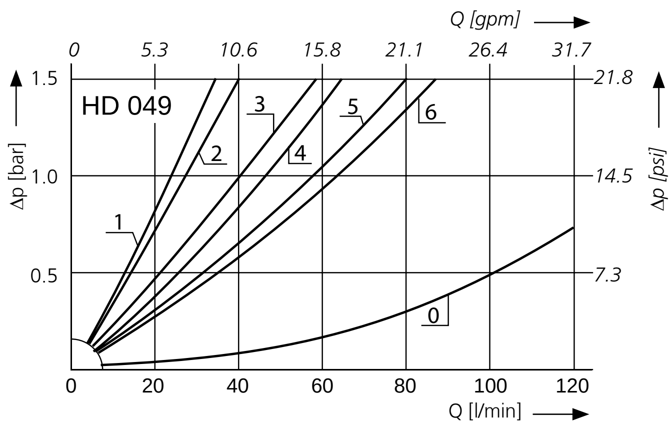
### Mounting position

Preferably vertical.

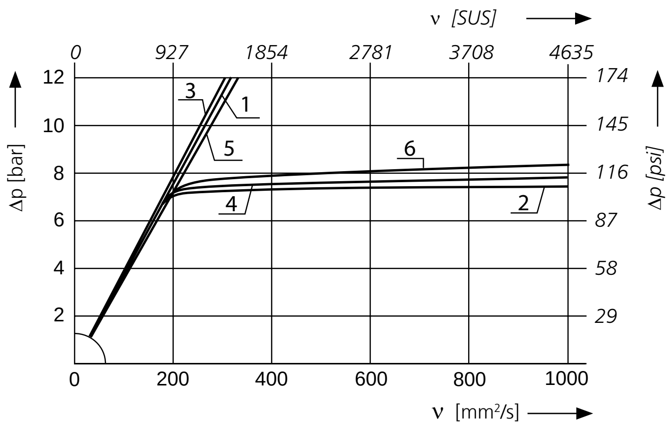
## Diagrams

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

**D1** Pressure drop as a function of the **flow volume**
at ν = 35 mm²/s / 162 SUS



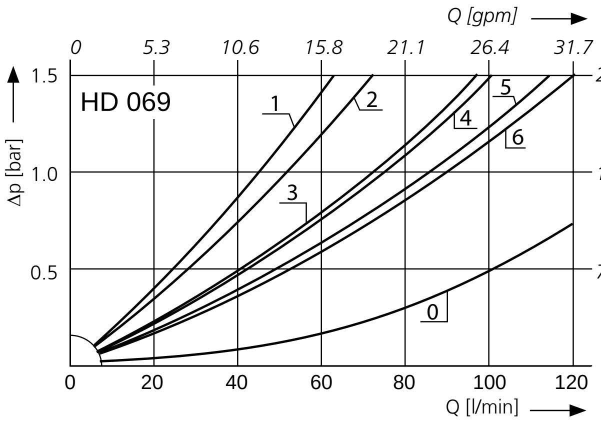

Pressure drop as a function of the
**kinematic viscosity** at nominal flow



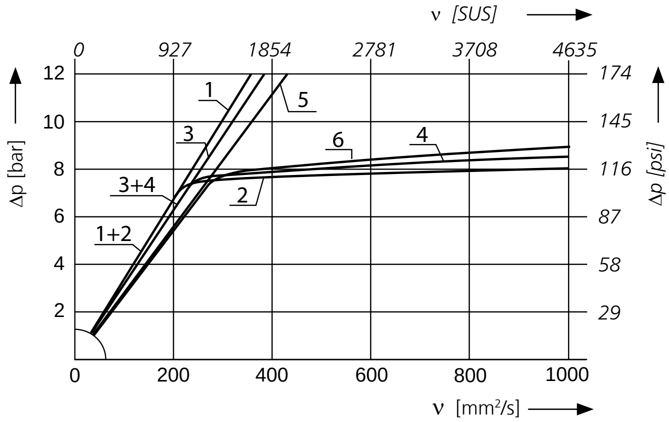
## Diagrams

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

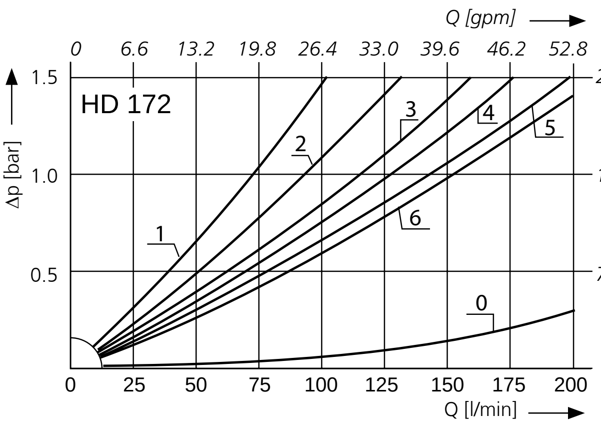
**D2** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS



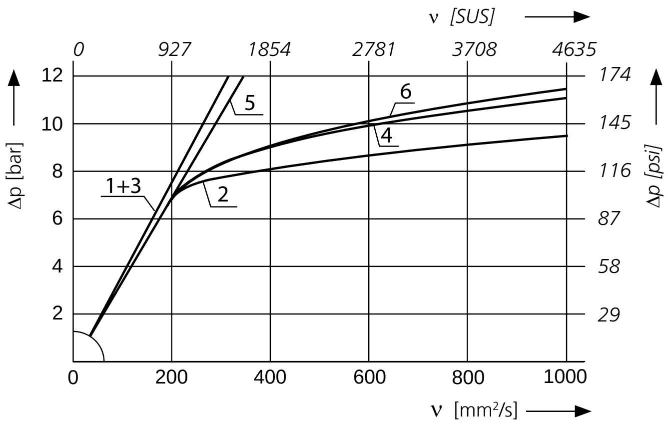

Pressure drop as a function of the **kinematic viscosity** at nominal flow



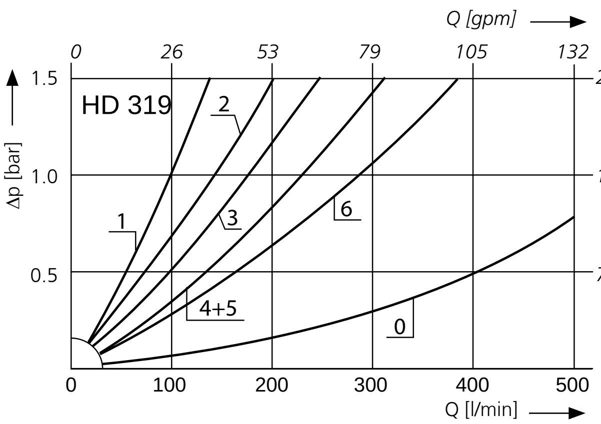

**D3** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS



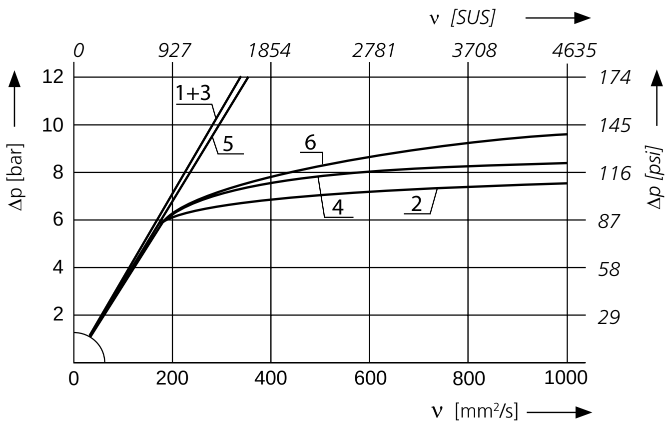

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D4** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS



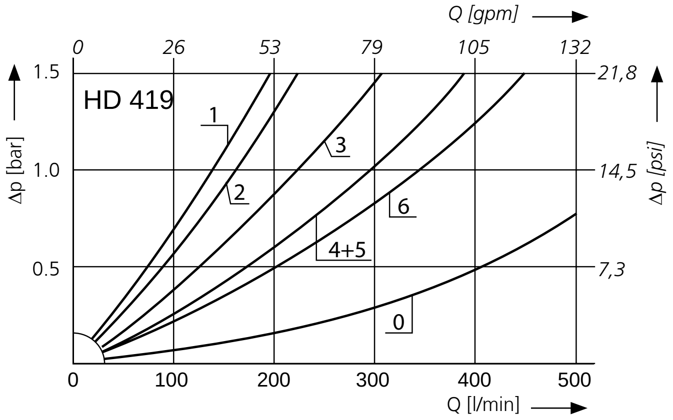

Pressure drop as a function of the **kinematic viscosity** at nominal flow



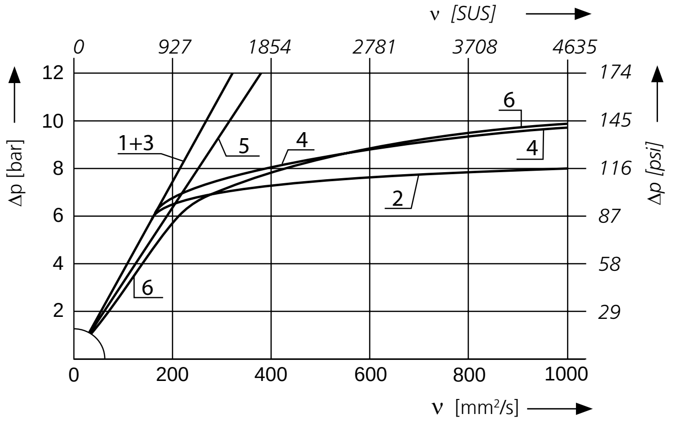
## Diagrams

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

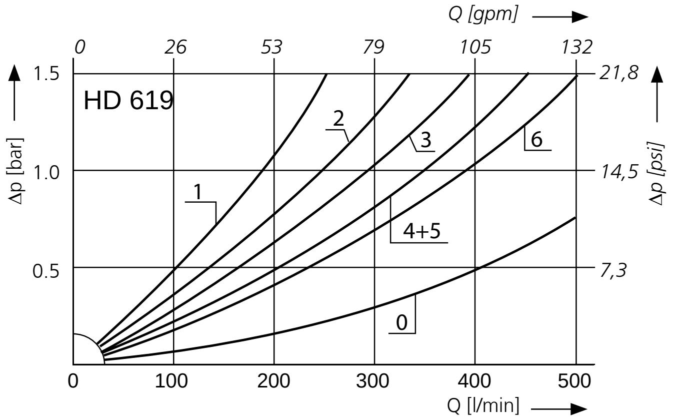
**D5** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS



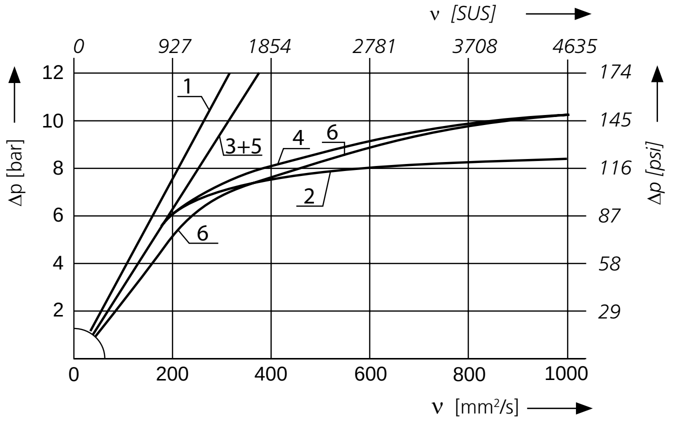

Pressure drop as a function of the **kinematic viscosity** at nominal flow




**D5** Pressure drop as a function of the **flow volume** at ν = 35 mm²/s / 162 SUS

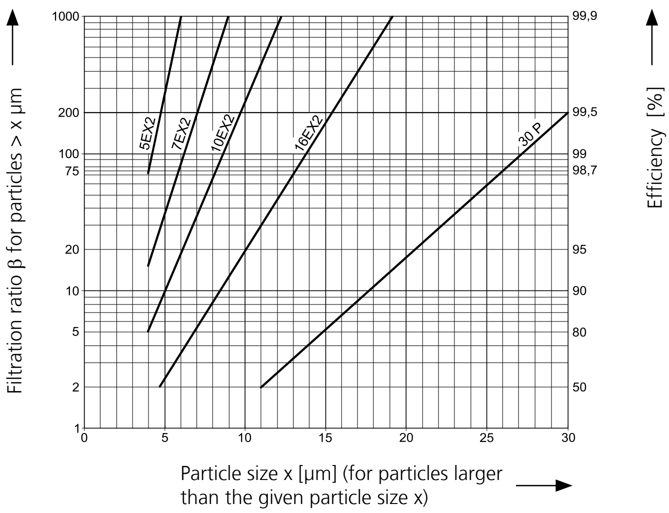



Pressure drop as a function of the **kinematic viscosity** at nominal flow




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

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




The abbreviations represent the following β-values resp. finenesses

**For EXAPOR®MAX2 and paper elements:**

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

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

**For screen elements:**

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

Tolerances for mesh size according to DIN 4189

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

## Selection Chart

| Part No. | Nominal flow rate | | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt-holding capacity | Cracking pressure of by-pass | | Symbol | Replacement filter element Part No. | Weight | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | gpm | | | g | bar | psi | | | kg | lbs | |
| 1 | 2 | | 3 | 4 | 5 | 6 | | 7 | 8 | 9 | | 10 |
| HD 049-0213 | 27 | 7.1 | **D1**/1 | 5EX2 | 5.2 | - | - | 5 | V3.0510-13[2] | 1.6 | 3.5 | with screw-in bushing |
| HD 049-1503 | 30 | 7.9 | **D1**/2 | 5EX2 | 4.9 | 7 | 102 | 1 | V3.0510-03 | 1.5 | 3.3 | - |
| HD 049-0216 | 47 | 12.4 | **D1**/3 | 10EX2 | 5.1 | - | - | 5 | V3.0510-16[2] | 1.6 | 3.5 | with screw-in bushing |
| **HD 049-1506**[1] | 50 | 13.2 | **D1**/4 | 10EX2 | 6.8 | 7 | 102 | 1 | V3.0510-06 | 1.5 | 3.3 | - |
| HD 049-0218 | 65 | 17.2 | **D1**/5 | 16EX2 | 5.6 | - | - | 5 | V3.0510-18[2] | 1.6 | 3.5 | with screw-in bushing |
| **HD 049-1508**[1] | 75 | 19.8 | **D1**/6 | 16EX2 | 6.9 | 7 | 102 | 1 | V3.0510-08 | 1.5 | 3.3 | - |
| | | | | | | | | | | | | |
| HD 069-0213 | 50 | 13.2 | **D2**/1 | 5EX2 | 8.7 | - | - | 5 | V3.0520-13[2] | 2.7 | 6.0 | with screw-in bushing |
| HD 069-1503 | 60 | 15.9 | **D2**/2 | 5EX2 | 10 | 7 | 102 | 1 | V3.0520-03 | 2.6 | 5.7 | - |
| HD 069-0216 | 80 | 21.1 | **D2**/3 | 10EX2 | 11 | - | - | 5 | V3.0520-16[2] | 2.7 | 6.0 | with screw-in bushing |
| **HD 069-1506**[1] | 85 | 22.5 | **D2**/4 | 10EX2 | 14 | 7 | 102 | 1 | V3.0520-06 | 2.6 | 5.7 | - |
| HD 069-0218 | 100 | 26.4 | **D2**/5 | 16EX2 | 12 | - | - | 5 | V3.0520-18[2] | 2.7 | 6.0 | with screw-in bushing |
| **HD 069-1508**[1] | 105 | 27.7 | **D2**/6 | 16EX2 | 15 | 7 | 102 | 1 | V3.0520-08 | 2.6 | 5.7 | - |
| | | | | | | | | | | | | |
| HD 172-0213 | 80 | 21.1 | **D3**/1 | 5EX2 | 16 | - | - | 5 | V3.0623-13[2] | 4.2 | 9.3 | with screw-in bushing |
| HD 172-1503 | 105 | 27.7 | **D3**/2 | 5EX2 | 17 | 7 | 102 | 1 | V3.0623-03 | 3.9 | 8.6 | - |
| HD 172-0226 | 130 | 34.3 | **D3**/3 | 10EX2 | 18 | - | - | 5 | V3.0623-26[2] | 4.2 | 9.3 | with screw-in bushing |
| **HD 172-1506**[1] | 150 | 39.6 | **D3**/4 | 10EX2 | 23 | 7 | 102 | 1 | V3.0623-06 | 3.9 | 8.6 | - |
| HD 172-0218 | 165 | 43.6 | **D3**/5 | 16EX2 | 19 | - | - | 5 | V3.0623-18[2] | 4.2 | 9.3 | with screw-in bushing |
| **HD 172-1508**[1] | 180 | 47.6 | **D3**/6 | 16EX2 | 25 | 7 | 102 | 1 | V3.0623-08 | 3.9 | 8.6 | - |
| | | | | | | | | | | | | |
| HD 319-0213 | 110 | 29.1 | **D4**/1 | 5EX2 | 20 | - | - | 5 | V3.0817-13[2] | 6.5 | 14.3 | with screw-in bushing |
| HD 319-1503 | 115 | 30.4 | **D4**/2 | 5EX2 | 24 | 7 | 102 | 1 | V3.0817-03 | 6 | 13.2 | - |
| HD 319-0216 | 195 | 51.5 | **D4**/3 | 10EX2 | 24 | - | - | 5 | V3.0817-16[2] | 6.5 | 14.3 | with screw-in bushing |
| **HD 319-1506**[1] | 250 | 66.0 | **D4**/4 | 10EX2 | 33 | 7 | 102 | 1 | V3.0817-06 | 6 | 13.2 | - |
| HD 319-0218 | 270 | 71.3 | **D4**/5 | 16EX2 | 25 | - | - | 5 | V3.0817-18[2] | 6,5 | 14.3 | with screw-in bushing |
| **HD 319-1508**[1] | 330 | 87.2 | **D4**/6 | 16EX2 | 33 | 7 | 102 | 1 | V3.0817-08 | 6 | 13.2 | - |
| | | | | | | | | | | | | |
| HD 419-0213 | 155 | 40.9 | **D5**/1 | 5EX2 | 29 | - | - | 5 | V3.0823-13[2] | 8.8 | 19.4 | with screw-in bushing |
| HD 419-1503 | 190 | 50.2 | **D5**/2 | 5EX2 | 33 | 7 | 102 | 1 | V3.0823-03 | 8.2 | 18.1 | - |
| HD 419-0216 | 265 | 70.0 | **D5**/3 | 10EX2 | 33 | - | - | 5 | V3.0823-16[2] | 8.8 | 19.4 | with screw-in bushing |
| **HD 419-1506**[1] | 330 | 87.2 | **D5**/4 | 10EX2 | 47 | 7 | 102 | 1 | V3.0823-06 | 8.2 | 18.1 | - |
| HD 419-0218 | 330 | 87.2 | **D5**/5 | 16EX2 | 35 | - | - | 5 | V3.0823-18[2] | 8.8 | 19.4 | with screw-in bushing |
| **HD 419-1508**[1] | 380 | 100.4 | **D5**/6 | 16EX2 | 48 | 7 | 102 | 1 | V3.0823-08 | 8.2 | 18.1 | - |

[1] Preferred type, no minimum order quantity required
[2] Element differential pressure stable up to 160 bar / 2320 psi, clogging indicator obligatory

## Selection Chart

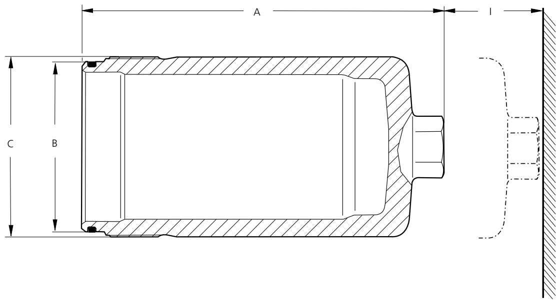
| Part No. | Nominal flow rate | | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Dirt-holding capacity | Cracking pressure of by-pass | | Symbol | Replacement filter element Part No. | Weight | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | gpm | | | g | bar | psi | | | kg | lbs | |
| 1 | 2 | | 3 | 4 | 5 | 6 | | 7 | 8 | 9 | | 10 |
| HD 619-0213 | 220 | 58.1 | **D6**/1 | 5EX2 | 41 | - | - | 5 | V3.0833-13[2] | 11.9 | 26.2 | with screw-in bushing |
| HD 619-1503 | 280 | 74.0 | **D6**/2 | 5EX2 | 49 | 7 | 102 | 1 | V3.0833-03 | 11.1 | 24.5 | - |
| HD 619-0216 | 330 | 87.2 | **D6**/3 | 10EX2 | 49 | - | - | 5 | V3.0833-16[2] | 11.9 | 26.2 | with screw-in bushing |
| **HD 619-1506**[1] | 400 | 105.7 | **D6**/4 | 10EX2 | 67 | 7 | 102 | 1 | V3.0833-06 | 11.1 | 24.5 | - |
| HD 619-0218 | 450 | 118.9 | **D6**/5 | 16EX2 | 51 | - | - | 5 | V3.0833-18[2] | 11.9 | 26.2 | with screw-in bushing |
| **HD 619-1508**[1] | 450 | 118.9 | **D6**/6 | 16EX2 | 68 | 7 | 102 | 1 | V3.0833-08 | 11.1 | 24.5 | - |

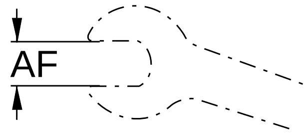
[1] Preferred type, no minimum order quantity required
[2] Element differential pressure stable up to 160 bar / 2320 psi, clogging indicator obligatory

**Remarks:**

- Filter versions without by-pass valves must be equipped with a clogging indicator.
- Optional integrable clogging indicators for screwing into the hydraulic block can be found under section Dimensions and in the catalog sheet 60.40.
- For the appropriate, flange-mounted clogging indicators see catalog sheet 60.30.
- The filter sets listed in this chart are standard filters. If modifications are required, we kindly ask for your request.

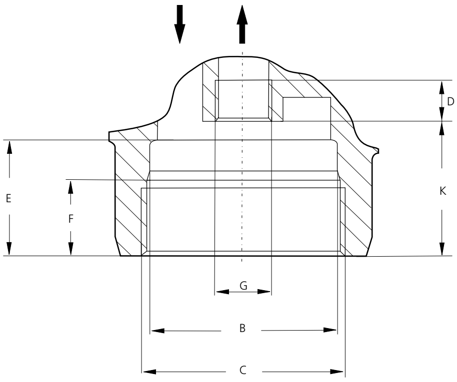
## Dimensions



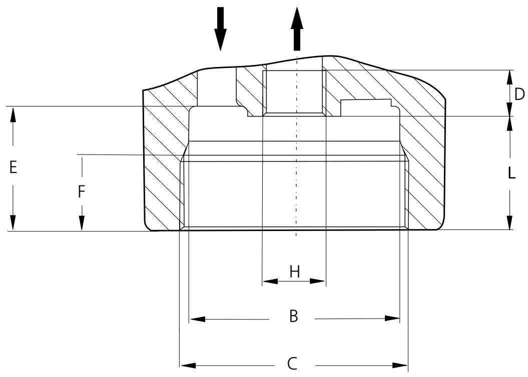




**Version with by-pass valve**

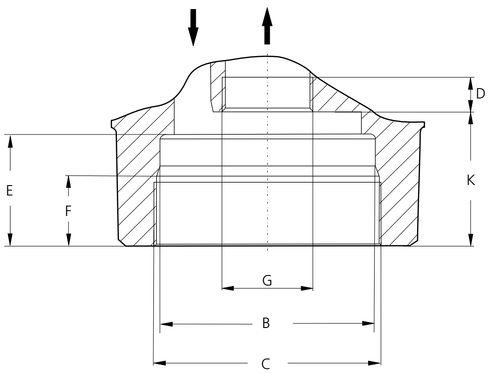
HD 049 / 069

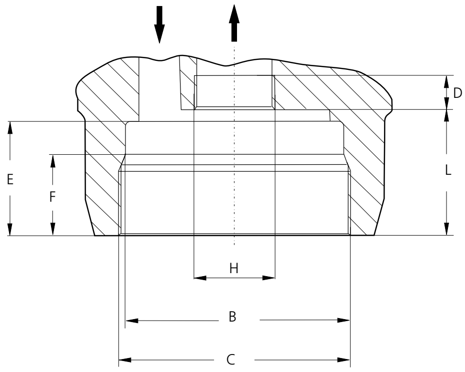



**Version with screw-in bushing**

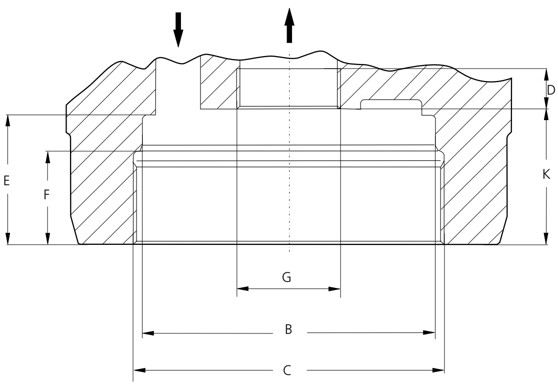


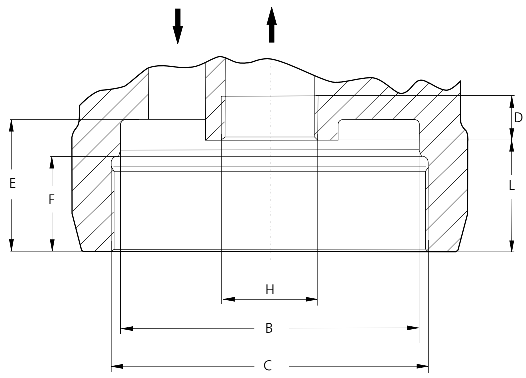

HD 172




HD 319 / 419 / 619



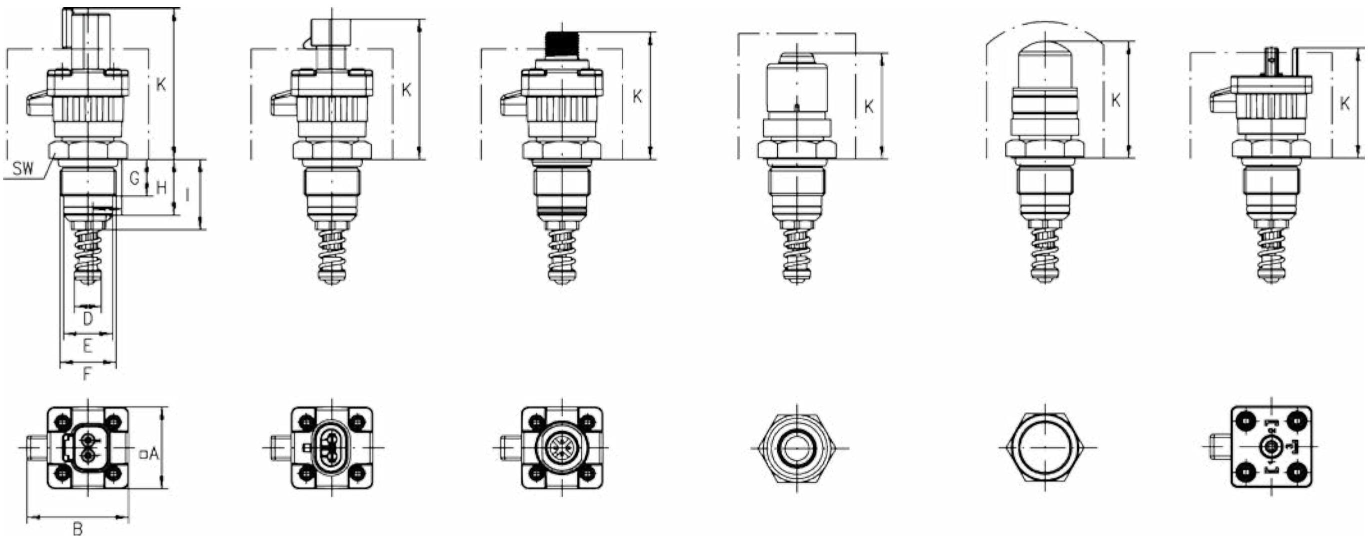



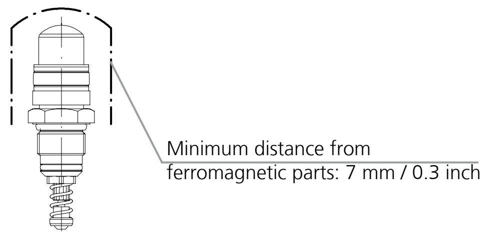

All measurements and tolerances required for machining are available on request.

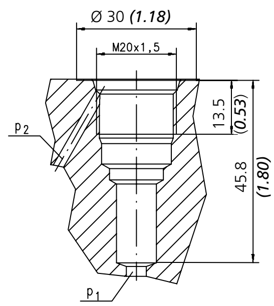
## Dimensions

Extract from catalog sheet 60.40

DT04 -2P/-3P | AMP -2P/-3P | M12 x 1-4P | DG 063 (autom. RS) | DG 064 (man. RS) | DIN EN 175301-803




All measurements and tolerances required for machining are available on request.

## Measurements in mm

| Type | A | B | C | D | E | F | G | H | I | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HD 049/069 | 133/227.5 | 60 | M65 x 1.5 | min. 13 | 35.5 | 22.5 | M18 x 1.5 | M18 x 1.5 | 55 | 42 | 32.5 | AF 36 |
| HD 172 | 256.5 | 71 | M75 x 1.5 | min. 13 | 37 | 22.5 | M30 x 1 | M26 x 1.5 | 70 | 47.5 | 41 | AF 27 |
| HD 319/419/619 | 218/282/383 | 102 | M108 x 1.5 | min. 14 | 45 | 32.5 | M36 x 1 | M36 x 1.5 | 80 | 47 | 38 | AF 32 |

| Type | A | B | D | E | F | G | H | I | K | AF |
|---|---|---|---|---|---|---|---|---|---|---|
| DT04 -2P/-3P | ☐ 29 | 36.5 | 9.7 | 17.5 | M20 x 1.5 | 13 | 20 | 25 | 55 | 24 |
| AMP -2P/-3P | ☐ 29 | 36.5 | 9.7 | 17.5 | M20 x 1.5 | 13 | 20 | 25 | 50 | 24 |
| M12 x 1-4P | ☐ 29 | 36.5 | 9.7 | 17.5 | M20 x 1.5 | 13 | 20 | 25 | 46 | 24 |
| DG 063 | - | - | 9.7 | 17.5 | M20 x 1.5 | 13 | 20 | 25 | 37.5 | 24 |
| DG 064 | - | - | 9.7 | 17.5 | M20 x 1.5 | 13 | 20 | 25 | 41.5 | 24 |
| DIN EN 175301-803 | ☐ 29 | 36.5 | 9.7 | 17.5 | M20 x 1.5 | 13 | 20 | 25 | 39 | 24 |

## Measurements in inch

| Type | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| HD 049/069 | 5.24/8.96 | 2.36 | M65 x 1.5* | min. 0.51 | 1.40 | 0.89 | M18 x 1.5* | M18 x 1.5* | 2.17 |
| HD 172 | 10.10 | 2.80 | M75 x 1.5* | min. 0.51 | 1.46 | 0.89 | M30 x 1* | M26 x 1.5* | 2.76 |
| HD 319/419/619 | 8.58/11.10/15.08 | 4.02 | M108 x 1.5* | min. 0.55 | 1.77 | 1.28 | M36 x 1* | M36 x 1.5* | 3.15 |

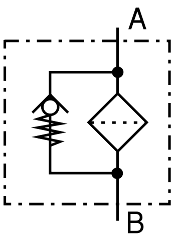
| Type | K | L | M mm |
|---|---|---|---|
| HD 049/069 | 1.65 | 1.28 | AF 36 |
| HD 172 | 1.87 | 1.61 | AF 27 |
| HD 319/419/619 | 1.85 | 1.50 | AF 32 |

| Type | A | B | D | E | F mm | G | H | I | K | AF mm |
|---|---|---|---|---|---|---|---|---|---|---|
| DT04 -2P/-3P | ☐ 1.1 | 1.44 | 0.38 | 0.69 | M20 x 1.5 | 0.51 | 0.79 | 0.98 | 2.17 | 24 |
| AMP -2P/-3P | ☐ 1.1 | 1.44 | 0.38 | 0.69 | M20 x 1.5 | 0.51 | 0.79 | 0.98 | 1.97 | 24 |
| M12 x 1-4P | ☐ 1.1 | 1.44 | 0.38 | 0.69 | M20 x 1.5 | 0.51 | 0.79 | 0.98 | 1.81 | 24 |
| DG 063 | - | - | 0.38 | 0.69 | M20 x 1.5 | 0.51 | 0.79 | 0.98 | 1.48 | 24 |
| DG 064 | - | - | 0.38 | 0.69 | M20 x 1.5 | 0.51 | 0.79 | 0.98 | 1.63 | 24 |
| DIN EN 175301-803 | ☐ 1.1 | 1.44 | 0.38 | 0.69 | M20 x 1.5 | 0.51 | 0.79 | 0.98 | 2.54 | 24 |

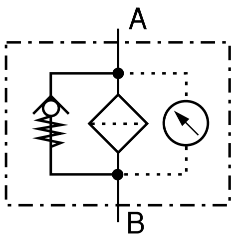
* Dimensions in mm

## Symbols

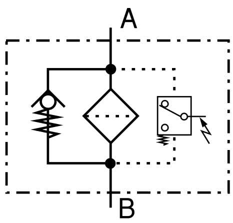
1



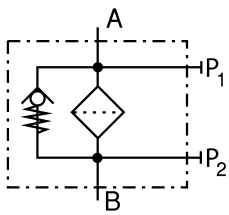

2



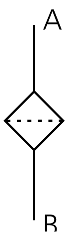

3



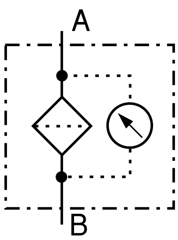

4



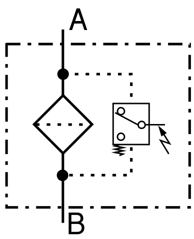

5



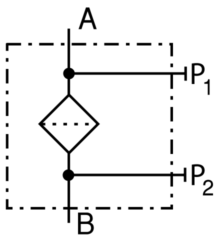

6



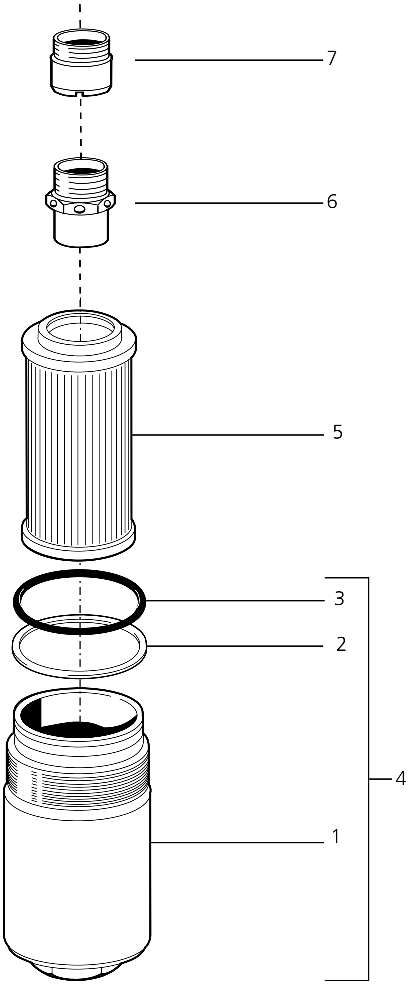

7




8



## Spare Parts




### HD 049 / HD 069

| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Filter bowl HD 049 | HD 052.0102 |
| 1 | Filter bowl HD 069 | HD 072.0102 |
| 3 | O-ring<br>53.57 x 3.53 mm<br>2.11 x 0.14 inch | N007.0543/1 |
| 5 | Replacement filter element | see Chart / col. 8 |
| 6 | By-pass valve | HD 045.1510 |
| 7 | Screw-in bushing | HD 049.0503 |

### HD 172

| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Filter bowl HD 172 | HD 171.0102 |
| 3 | O-ring<br>63 x 3.5 mm<br>2.48 x 0.14 inch | N007.0634 |
| 5 | Replacement filter element | see Chart / col. 8 |
| 6 | By-pass valve | HD 172.1500 |
| 7 | Screw-in bushing | HD 171.0205 |

### HD 319 / HD 419 / HD 619

| Pos. | Designation | Part No. |
|---|---|---|
| 2 | Back-ring | HD 255.0102 |
| 3 | O-ring<br>94.84 x 3.53 mm<br>3.73 x 0.14 inch | N007.0953 |
| 4 | Filter bowl HD 319<br>(with Pos. 2 and 3) | HD 250.0701 |
| 4 | Filter bowl HD 419<br>(with Pos. 2 and 3) | HD 451.0702 |
| 4 | Filter bowl HD 619<br>(with Pos. 2 and 3) | HD 619.0701 |
| 5 | Replacement filter element | see Chart / col. 8 |
| 6 | By-pass valve | HD 319.1510 |
| 7 | Screw-in bushing | HD 319.0212 |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

**Before release into the series production the filter casing is tested for fatigue strength in our pressure pulse test rig. Various quality controls during the production process guarantee the leakfree function and solidity of our filters.**

Ventilating Filters

# L1.0406 · L1.0506 · L1.0706 · L1.0807

Connection up to M60 x 2 / 1 5/8-12 UN-2A · Nominal flow rate up to 850 l/min / 225 gpm


Ventilating Filter L1.0807

## Description

### Application

Ventilation of tanks for hydraulic and lubrication systems and gearboxes.

### General

The oil levels in the tanks of hydraulic systems are subject to continuous variation due to temperature changes and the operation of cylinders and pressure vessels.
In order to prevent over pressure in the tanks, an exchange of air with the external atmosphere is necessary. By the use of a ventilating filter, the outside air that is drawn in is filtered and the ingress of dust is therefore prevented.

### Special features

The ventilation openings are designed that dust on the surface of the tank is not drawn in, and that the ingress of spray and rainwater is largely prevented. The use in marine applications presents no problem due to the use of synthetic materials and stainless steel.

### Design

Flow direction bi-directional (air IN/OUT).
The star-shaped pleating of the filter material results in:

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

### Ordering options / versions

*Integrated oil-level dipstick (for all types):*
A dipstick can be integrated in the ventilating filter for checking the oil level. Therefore, a separate dipstick or an additional opening in the tank is not required.

*Oil separator (L1.0406, L1.0706, L1.0807):*
An effective protection against splashing oil in mobile operation.

*Double check valves (L1.0506, L1.0807):*
By the use of double check valves, the exchange of air between the tank and the environment can considerably be reduced, whereby the ingress of dust is minimized and the lifetime of the ventilating filter can be increased.
With the double check valve, an over-pressure can be created in the tank in order to improve the suction conditions for the pumps. A further advantage is the reduction of spray water entry and the loss of oil through the ventilating filter.

*Roll-over protection (L1.0506):*
Ventilating filter with safety valve to prevent the hydraulic oil spilling out should the machinery roll or tip over.

*Vandalism proof types (L1.0807):*
Ventilating filters in patented vandalism proof version, please see catalog sheet 50.20.
Filling and ventilating filters in standard or patented vandalism proof version, see catalog sheet 50.30.

**Maintenance**

Ventilating filters should be changed at least every 1000 operating hours, or at minimum once a year.

## Characteristics

**Nominal flow rate**

Up to 850 l/min / 225 gpm (see Selection Chart, column 2).
The nominal flow rates indicated by ARGO-HYTOS are based on the following criteria:

- Ventilating filters without double check valve: $\Delta p < 0.03$ bar / $\Delta p \leq 0.44$ psi
- Ventilating filters with double check valve: $\Delta p < 0.1$ bar / $\Delta p \leq 1.45$ psi for air IN

**Connection**

Threaded ports according to

- ISO 228, DIN 13 or DIN 20400

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

**Filter fineness**

2 µm
Tested in a single pass test with ISO MTD.

**Hydraulic fluids**

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

**Temperature range hydraulic fluid**

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

**Temperature range environment**

-30 °C ... +100 °C
-22 °F ... +212 °F

**Materials**

| | |
|---|---|
| Cap: | Polyamide, GF reinforced (L1.0506 Polyester, GK reinforced) |
| Base: | Polyamide, GF reinforced |
| Dipstick: | Stainless steel (1.4301) |
| Gaskets: | NBR (FPM on request) |
| Filter media: | Composite, multi-layer |

**Mounting position**

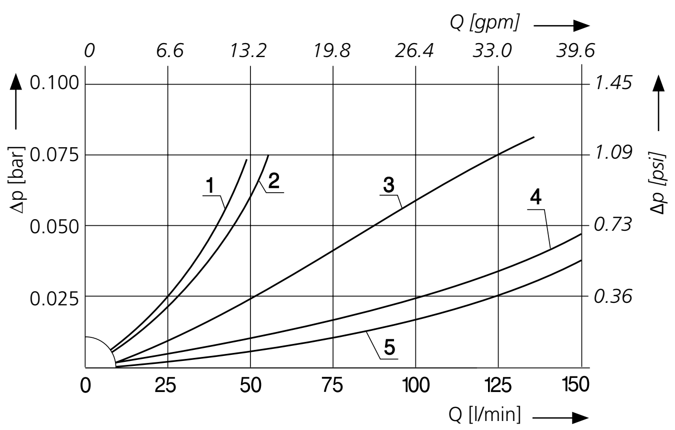
No limitation, position on the tank see section Layout.

Ventilating filters with roll-over protection must be installed vertically.

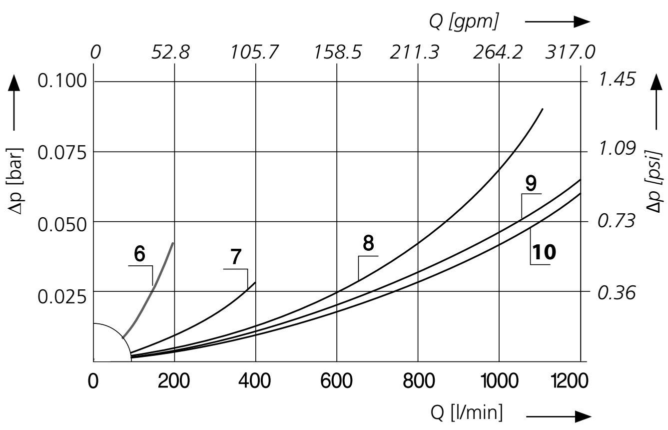
## Diagrams

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

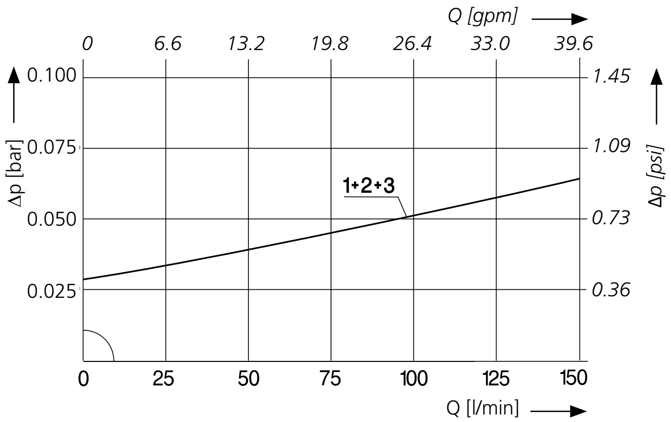
**D1** Pressure drop as a function of the **flow volume Air IN/OUT**



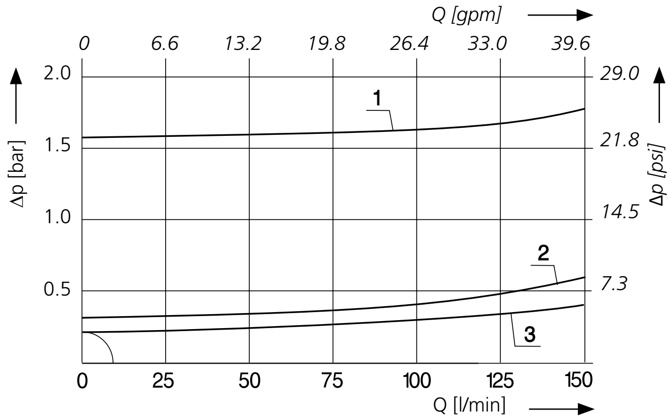

Pressure drop as a function of the **flow volume Air IN/OUT**



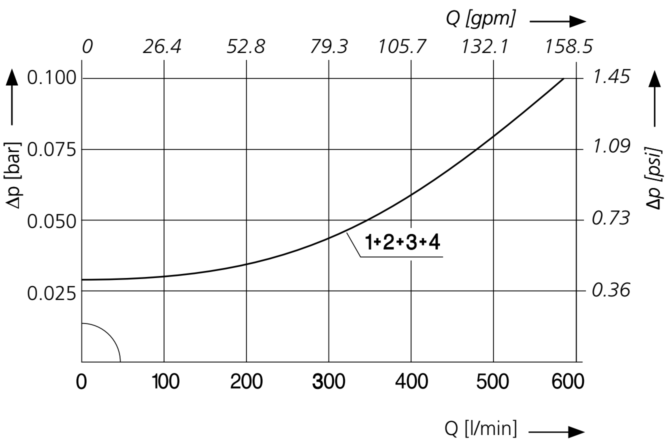
**D2** Pressure drop as a function of the **flow volume** **Air IN**



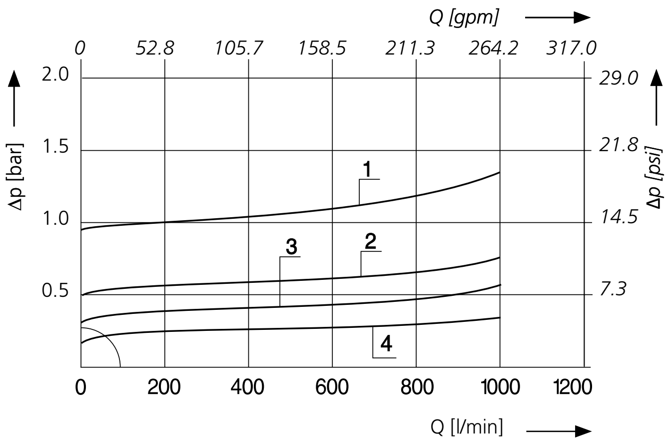

Pressure drop as a function of the **flow volume** **Air OUT**




**D3** Pressure drop as a function of the **flow volume** **Air IN**

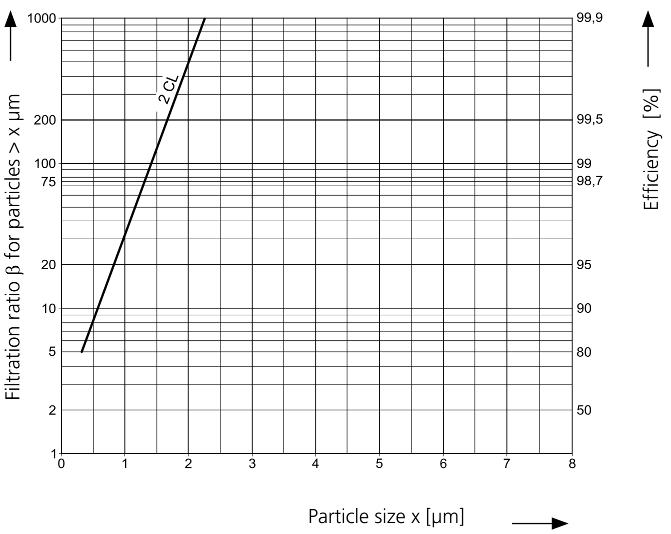



Pressure drop as a function of the **flow volume** **Air OUT**




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

**Dx** Filtration ratio β as a function of particle size x tested in a single pass test with ISO MTD




The abbreviation represents the following β-values resp. finenesses:

**2CL**

- 2 μm Composite
  99.5% efficiency for particles of size 2 μm
  tested in a single pass test with ISO MTD

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

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Filter surface | Connection A | DCV[3] -cracking pressure air IN | DCV[3] -cracking pressure air OUT | Dipstick measurement L1 | Dipstick measurement L2 | Dipstick measurement L3 | Symbol | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | $cm^2$ | | bar | bar | mm | mm | mm | | g | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| **L1.0406-12**[1] | 120 | **D1**/4 | 2CL | 35 | M18 x 1.5 | - | - | - | - | - | 1 | 25 | - |
| L1.0406-21 | 25 | **D1**/1 | 2CL | 35 | M18 x 1.5 | - | - | - | - | - | 1 | 25 | with labyrinth oil separator |
| L1.0406-73 | 25 | **D1**/1 | 2CL | 35 | M18 x 1.5 | - | - | 75 | 70 | 55 | 1 | 30 | with labyrinth oil separator |
| L1.0406-76 | 25 | **D1**/1 | 2CL | 35 | M18 x 1.5 | - | - | 80 | 75 | 60 | 1 | 30 | with labyrinth oil separator |
| L1.0406-45 | 25 | **D1**/1 | 2CL | 35 | M18 x 1.5 | - | - | 95 | 90 | 45 | 1 | 35 | with labyrinth oil separator |
| L1.0406-69 | 25 | **D1**/1 | 2CL | 35 | M18 x 1.5 | - | - | 100 | 95 | 80 | 1 | 35 | with labyrinth oil separator |
| L1.0406-56 | 25 | **D1**/1 | 2CL | 35 | M18 x 1.5 | - | - | 130 | 125 | 100 | 1 | 35 | with labyrinth oil separator |
| **L1.0406-03**[1] | 135 | **D1**/5 | 2CL | 35 | M22 x 1.5 | - | - | - | - | - | 1 | 25 | - |
| L1.0406-87 | 30 | **D1**/2 | 2CL | 35 | M22 x 1.5 | - | - | - | - | - | 1 | 25 | with labyrinth oil separator |
| L1.0406-60 | 30 | **D1**/2 | 2CL | 35 | M22 x 1.5 | - | - | 85 | 80 | 55 | 1 | 30 | with labyrinth oil separator |
| L1.0406-79 | 135 | **D1**/2 | 2CL | 35 | M22 x 1.5 | - | - | 120 | 115 | 90 | 1 | 35 | - |
| L1.0406-51 | 30 | **D1**/2 | 2CL | 35 | M22 x 1.5 | - | - | 130 | 125 | - | 1 | 35 | with labyrinth oil separator |
| L1.0406-59 | 30 | **D1**/2 | 2CL | 35 | M22 x 1.5 | - | - | 130 | 125 | 100 | 1 | 35 | with labyrinth oil separator |
| L1.0406-98 | 30 | **D1**/2 | 2CL | 35 | M22 x 1.5 | - | - | 180 | 175 | 150 | 1 | 40 | with labyrinth oil separator |
| L1.0406-33 | 30 | **D1**/2 | 2CL | 35 | M22 x 1.5 | - | - | 250 | 235 | 215 | 1 | 40 | with labyrinth oil separator |
| L1.0406-101 | 16 | **D1**/3 | 2CL | 6 | M22 x 1.5 | - | - | - | - | - | 1 | 25 | - |
| **L1.0406-102**[1] | 16 | **D1**/3 | 2CL | 6 | M22 x 1.5 | - | - | - | - | - | 1 | 25 | with labyrinth oil separator |
| | | | | | | | | | | | | | |
| L1.0506-73 | 150[2] | **D2**/3 | 2CL | 35 | M22 x 1.5 | -0.03 | 0.20 | - | - | - | 2 | 55 | - |
| **L1.0506-91**[1] | 150[2] | **D2**/2 | 2CL | 35 | M22 x 1.5 | -0.03 | 0.35 | - | - | - | 2 | 55 | - |
| L1.0506-43 | 150[2] | **D2**/1 | 2CL | 35 | M22 x 1.5 | -0.03 | 1.60 | - | - | - | 2 | 55 | - |
| L1.0506-185 | 10 | **D2**/4 | 2CL | 35 | M22 x 1.5 | - | - | - | - | - | 3 | 60 | with roll-over-protection |
| L1.0506-195 | 15 | **D2**/4 | 2CL | 35 | Rd42 x 5.0 | - | - | - | - | - | 3 | 75 | with roll-over-protection |
| | | | | | | | | | | | | | |
| L1.0706-03 | 250 | **D1**/7 | 2CL | 50 | M30 x 1.5 | - | - | - | - | - | 1 | 50 | - |
| **L1.0706-02**[1] | 250 | **D1**/7 | 2CL | 50 | M42 x 2.0 | - | - | - | - | - | 1 | 50 | - |
| L1.0706-07 | 160 | **D1**/6 | 2CL | 50 | Rd42 x 5.0 | - | - | - | - | - | 1 | 60 | with labyrinth oil separator |

[1] Preferred type, no minimum order quantity required
[2] $\Delta p \leq 0.1$ bar / 1.45 psi for air IN
[3] Double check valve

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagram **D**/curve no. | Filter fineness see diagr. **Dx** | Filter surface | Connection A | DCV[3] -cracking pressure air IN | DCV[3] -cracking pressure air OUT | Dipstick measurement L1 | Dipstick measurement L2 | Dipstick measurement L3 | Symbol | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | $cm^2$ | | bar | bar | mm | mm | mm | | g | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| L1.0807-04 | 800 | **D1**/9 | 2CL | 203 | M30 x 1.5 | - | - | - | - | - | 1 | 145 | with labyrinth oil separator |
| **L1.0807-11**[1] | 800 | **D1**/9 | 2CL | 203 | M30 x 1.5 | - | - | - | - | - | 1 | 140 | with flat gasket |
| **L1.0807-61**[1] | 550[2] | **D3**/3 | 2CL | 203 | M30 x 1.5 | -0.03 | 0.35 | - | - | - | 2 | 160 | - |
| L1.0807-07 | 650 | **D1**/8 | 2CL | 203 | G¾ | - | - | - | - | - | 1 | 145 | with labyrinth oil separator |
| **L1.0807-21**[1] | 650 | **D1**/8 | 2CL | 203 | G¾ | - | - | - | - | - | 1 | 140 | - |
| L1.0807-81 | 550[2] | **D3**/4 | 2CL | 203 | G¾ | -0.03 | 0.20 | - | - | - | 2 | 160 | with flat gasket |
| **L1.0807-71**[1] | 550[2] | **D3**/3 | 2CL | 203 | G¾ | -0.03 | 0.35 | - | - | - | 2 | 160 | with flat gasket |
| L1.0807-93 | 550[2] | **D3**/2 | 2CL | 203 | G¾ | -0.03 | 0.50 | - | - | - | 2 | 160 | - |
| L1.0807-63 | 550[2] | **D3**/1 | 2CL | 203 | G¾ | -0.03 | 1.00 | - | - | - | 2 | 160 | - |
| L1.0807-05 | 850 | **D1**/10 | 2CL | 203 | M42 x 2.0 | - | - | - | - | - | 1 | 145 | with labyrinth oil separator |
| **L1.0807-31**[1] | 850 | **D1**/10 | 2CL | 203 | M42 x 2.0 | - | - | - | - | - | 1 | 140 | - |
| L1.0807-91 | 550[2] | **D3**/4 | 2CL | 203 | M42 x 2.0 | -0.03 | 0.20 | - | - | - | 2 | 160 | - |
| **L1.0807-51**[1] | 550[2] | **D3**/3 | 2CL | 203 | M42 x 2.0 | -0.03 | 0.35 | - | - | - | 2 | 160 | - |
| L1.0807-06 | 850 | **D1**/10 | 2CL | 203 | M60 x 2.0 | - | - | - | - | - | 1 | 150 | with labyrinth oil separator |
| L1.0807-14 | 850 | **D1**/10 | 2CL | 203 | M60 x 2.0 | - | - | - | - | - | 1 | 140 | - |

[1] Preferred type, no minimum order quantity required
[2] $\Delta p \leq 0.1$ bar / 1.45 psi for air IN
[3] Double check valve

| | gpm | | | $inch^2$ | | psi | psi | inch | inch | inch | | lbs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| L1.0406-43 | 32 | **D1**/1 | 2CL | 5.4 | $^{1}/_{4}$-18 NPTF | - | - | - | - | - | 1 | 0.06 | - |
| | | | | | | | | | | | | | |
| L1.0506-47 | 40* | **D2**/1 | 2CL | 5.4 | 1$^{1}/_{16}$-12 UN-2A | -0.44 | 5.08 | - | - | - | 2 | 0.12 | - |
| | | | | | | | | | | | | | |
| L1.0706-04 | 66 | **D1**/2 | 2CL | 7.8 | 1$^{1}/_{2}$-UNF-12 2A | - | - | - | - | - | 1 | 0.11 | - |
| | | | | | | | | | | | | | |
| L1.0807-16 | 170 | **D1**/3 | 2CL | 31.5 | $^{3}/_{4}$-14 NPT | - | - | - | - | - | 1 | 0.31 | use gasket strips |
| L1.0807-57 | 145* | **D3**/1 | 2CL | 31.5 | $^{3}/_{4}$-14 NPT | -0.44 | 5.08 | - | - | - | 2 | 0.35 | use gasket strips |
| L1.0807-08 | 225 | **D1**/4 | 2CL | 31.5 | 1$^{5}/_{8}$-12 UN-2A | - | - | - | - | - | 1 | 0.32 | with labyrinth oil separator |
| L1.0807-15 | 225 | **D1**/4 | 2CL | 31.5 | 1$^{5}/_{8}$-12 UN-2A | - | - | - | - | - | 1 | 0.31 | - |
| L1.0807-56 | 145* | **D3**/1 | 2CL | 31.5 | 1$^{5}/_{8}$-12 UN-2A | -0.44 | 5.08 | - | - | - | 2 | 0.35 | - |

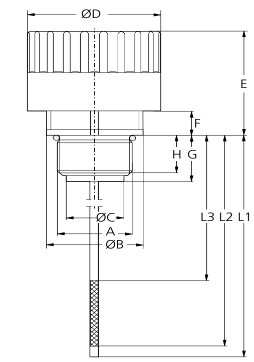
* $\Delta p \leq 0.1$ bar / 1.45 psi for air IN

**Remarks:**

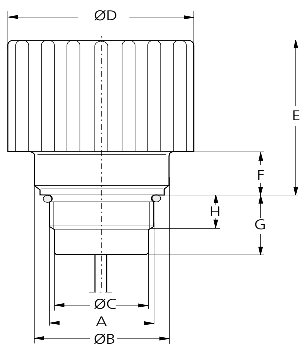
› The ventilating filters listed in this chart are standard filters. If modifications are required, we kindly ask for your request.
› Ventilating filters in Vandalism Proof design see catalog sheet 50.20.
› Ventilating filters with filling filters see catalog sheet 50.30.
› Ventilating filters for water adsorption see catalog sheet 50.40.

## Dimensions

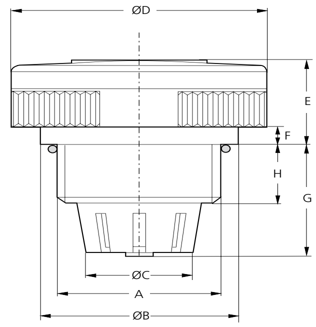
L1.0406



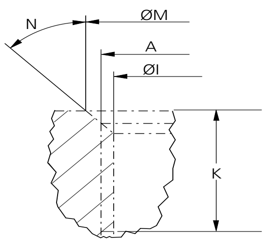

L1.0506



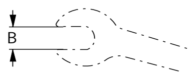

L1.0706



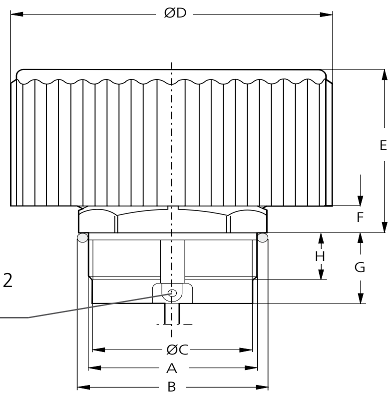

Recommended port sizes




Spanner size: L1.0807




L1.0807




Version with thread M42 x 2 and 1 5/8-12
eye R2.5 / hole Ø 2 mm / 0.08 inch
Fixing chain (length 17 cm / 6.69 inch)
on request
ARGO-HYTOS Part No. S0.0512.1302

## Measurements in mm

| Type | A* | B | C | D | E | F | G | H | I | K | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L1.0406 | M18 x 1.5, M22 x 1.5 | 31.5 | 16 | 37 | 33.5 | 7.5 | 16.5 | 13.5 | - | - | as A | 45° |
| L1.0506 | M22 x 1.5 | 29 | 19.5 | 46 | 47 | 13.0 | 17.5 | 10.5 | - | - | as A | 45° |
| | Rd42 x 5.0** | 50 | 35.0 | 46 | 44 | 10.5 | 28.0 | 28.0 | 35.5 | min. 28 | 45 | 45° |
| L1.0706 | M30 x 1.5 | 51 | 20.5 | 66 | 26.5 | 6 | 35 | 18 | - | - | as A | 45° |
| | M42 x 2.0 | 51 | 28 | 66 | 26.5 | 6 | 35 | 18 | - | - | as A | 45° |
| | Rd42 x 5.0** | 51 | 28 | 66 | 26.5 | 6 | 35 | 28 | 35.5 | min. 28 | 45 | 45° |
| L1.0807 | M30 x 1.5 | AF 47 | 27 | 80 | 50 | 7.5 | 17.5 | 13.5 | - | - | as A | 45° |
| | G¾ | AF 33 | 24 | 80 | 50 | 7.5 | 17.5 | 13.5 | - | - | as A | 45° |
| | M42 x 2.0 | AF 47 | 40 | 80 | 50 | 8 | 21 | 14 | - | - | 48 | 45° |
| | M60 x 2.0 | AF 47 | 56.4 | 80 | 52 | 11 | 18 | 15 | - | - | as A | 45° |

* The thread dimensions do not exactly conform to the DIN ISO standard thread (functioning with the DIN ISO standard thread is guaranteed)
** Round thread according to DIN 20400, not conforming to thread depth standards (functioning with the DIN standard thread is guaranteed)

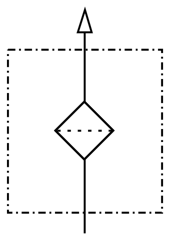
## Measurements in inch

| Type | A[1] | B | C | D | E | F | G | H | I | K | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L1.0406 | 1/4-18 NPTF [2] | 1.24 | 0.63 | 1.46 | 1.32 | 0.30 | 0.65 | 0.53 | - | - | as A | 45° |
| L1.0506 | 1 1/16-12 UN-2A | 1.42 | 0.95 | 1.81 | 1.52 | 0.32 | 0.98 | 0.70 | - | - | 1.08 | 45° |
| | Rd42 x 5.0 | 1.97 | 1.38 | 1.77 | 1.73 | 0.41 | 1.10 | 1.10 | - | - | 1.77 | 45° |
| L1.0706 | 1 1/2-UNF-12 2A | 2.01 | 0.81 | 2.60 | 1.04 | 0.24 | 1.34 | 0.71 | - | - | 1.5 | 45° |
| | Rd42 x 5.0 | 2.01 | 1.10 | 2.60 | 1.04 | 0.24 | 1.38 | 1.10 | 1.40 | min. 1.10 | 1.77 | 45° |
| L1.0807 | 1 5/8-12 UN-2A | 47 mm | 1.50 | 3.15 | 1.97 | 0.31 | 0.83 | 0.55 | - | - | 1.71 | 45° |
| | 3/4-14 NPT [2] | 33 mm | n.a. | 3.15 | 1.97 | 0.30 | - | 0.87 | - | - | - | 45° |

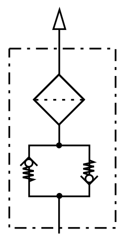
[1] The thread dimensions do not exactly conform to the ANSI standard thread (functioning with the ANSI standard thread is guaranteed)
[2] For NPT threads we recommend the use of gasket strips

## Symbols

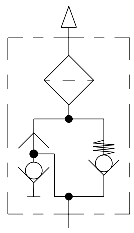
1



2



3



## Layout

### Sizes

The determining factor for selecting the size is the maximum over / under pressure allowed in the container.
For versions without double check valves, the initial pressure drop with a clean air filter should not exceed 0.03 bar / 0.44 psi.
For versions with double check valves, the initial pressure drop for air IN with a clean air filter should not exceed 0.1 bar / 1.45 psi.

### Filter fineness

In the ideal case, the fineness of the ventilating filter matches the fineness of the system filter (see also CETOP RP 98 H).
By the use of filter fineness 2 CL the ingress of dust into the tank is effectively reduced.

### Mounting

The ventilating filter should be mounted in a low-dust area of the machine and not in depressions in which water can collect.
For mobile use, the ventilating filter is to be mounted on the tank such that neither splashing oil from the inside nor spray water from the outside can reach the area of the ventilation opening.

### Double check valves

By the use of double check valves, the exchange of air between the tank and the environment can considerably be reduced, whereby the ingress of dust is minimized and the lifetime of the ventilating filter is increased.
With the double check valve, a predefined level of pressure can be created in the tank in order to improve the suction conditions for the pumps.
The valve opening pressure required for the ventilating filter can be approximately determined with the ideal gas equation depending on the following system characteristics:

- differential volume
- volume of oil in the system
- volume of air in the tank
- operating temperatures

Calculation tool available.

## Quality Assurance

### Quality management according to DIN EN ISO 9001

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

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

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

## Ventilating Filters - Vandalism Proof

# L1.0808 · L1.0809

Connection up to M42 x 2 / $1^{5}/_{8}$-12 UN-2A · Nominal flow rate up to 850 l/min / 225 gpm

Ventilating Filter L1.0809

Ventilating Filter L1.0808

## Description

### Application

Ventilation of tanks for hydraulic and lubrication systems and gearboxes.

### General

The oil levels in the tanks of hydraulic systems are subject to continuous variation due to temperature changes and the operation of cylinders and pressure vessels.
In order to prevent over pressure in the tanks, an exchange of air with the external atmosphere is necessary. By the use of a ventilating filter, the outside air that is drawn in is filtered and the ingress of dust is therefore prevented.

### Special features

The ventilation openings are designed that dust on the surface of the tank is not drawn in, and that the ingress of spray and rainwater is largely prevented.
The use in marine applications presents no problem due to the use of synthetic materials and stainless steel.
The patented vandalism proof ventilating filters can only be removed with the special tool supplied. This makes the removal of the ventilating filter or the ingress of dirt via the tank port considerably more difficult.

### Design

Flow direction bi-directional (air IN/OUT).
The star-shaped pleating of the filter material results in:

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

### Ordering options / versions

*Integrated oil-level dipstick:*
A dipstick can be integrated in the ventilating filter for checking the oil level. Therefore, a separate dipstick or an additional opening in the tank is not required.

*Double check valves:*
By the use of double check valves, the exchange of air between the tank and the environment can considerably be reduced, whereby the ingress of dust is minimized and the lifetime of the ventilating filter can be increased.
With the double check valve, an over-pressure can be created in the tank in order to improve the suction conditions for the pumps. A further advantage is the reduction of spray water ingress and the loss of oil through the ventilating filter.

*Vandalism proof version "Standard" (L1.0808):*
Ventilating filters in the patented vandalism proof version can only be removed with the special spanner supplied (AF 47). This makes the removal of the ventilating filter or the ingress of dirt via the tank port considerably more difficult.

*Vandalism proof version "Easy Lock" (L1.0809):*
Ventilators in the patented "Easy Lock" version can only be removed with the special pin supplied.

Standard ventilating filters without vandalism proof see catalog sheet 50.10.
Filling and ventilating filters with and without vandalism proof see catalog sheet 50.30

### Maintenance

Ventilating filters should be changed at least every 1000 operating hours, or at minimum once a year.

## Characteristics

### Nominal flow rate

Up to 850 l/min / 225 gpm (see Selection Chart, column 2).
The nominal flow rates indicated by ARGO-HYTOS are based on the following criteria:

- Ventilating filters without double check valve:
  $\Delta p \leq 0.03$ bar / $\Delta p \leq 0.44$ psi for air IN
- Ventilating filters with double check valve:
  $\Delta p \leq 0.1$ bar / $\Delta p \leq 1.45$ psi for air IN

### Connection

Threaded ports according to

- ISO 228 or DIN 13.

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

### Filter fineness

2 µm
Tested in a single pass test with ISO MTD.

### Hydraulic fluids

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

### Temperature range hydraulic fluid

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

### Temperature range environment

-30 °C ... +100 °C
-22 °C ... +212 °C

### Materials

| | |
|---|---|
| Cap: | Polyamide, GF reinforced |
| Base: | Polyamide, GF reinforced |
| Dipstick: | Stainless steel (1.4301) |
| Spanner: | Steel, galvanized |
| Gaskets: | NBR (FPM on request) |
| Filter media: | Composite, multi-layer |

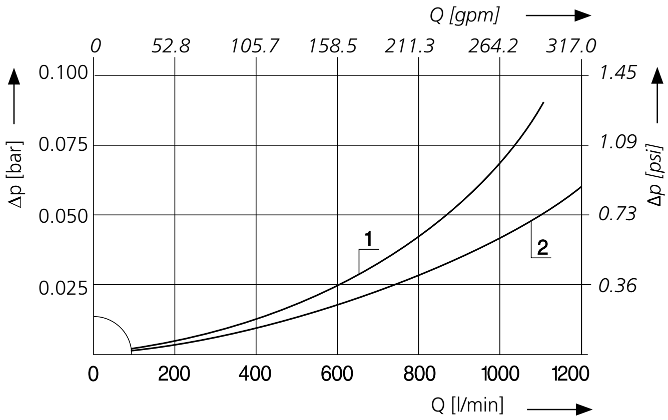
### Mounting position

No limitation, position on the tank see section Layout.

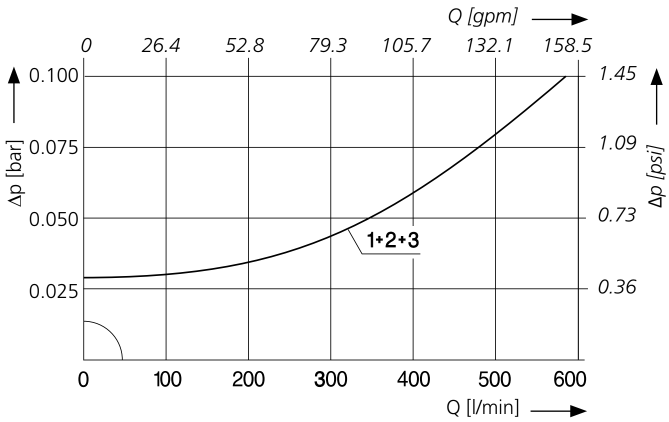
## Diagrams

### ∆p-curves for complete filters in Selection Chart, column 3

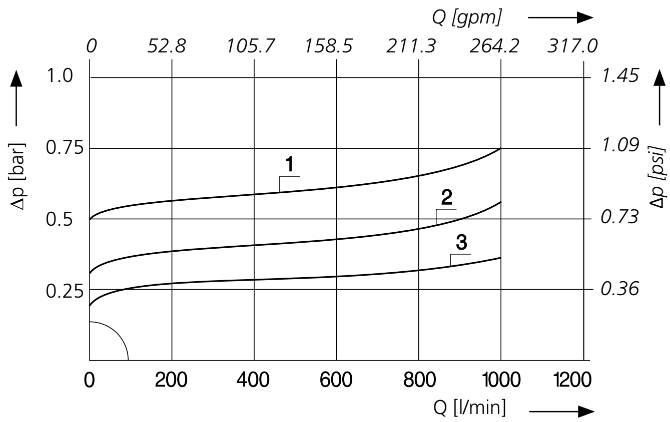
**D1** Pressure drop as a function of the **flow volume**
**Air IN/OUT**




**D2** Pressure drop as a function of the **flow volume**
**Air IN**

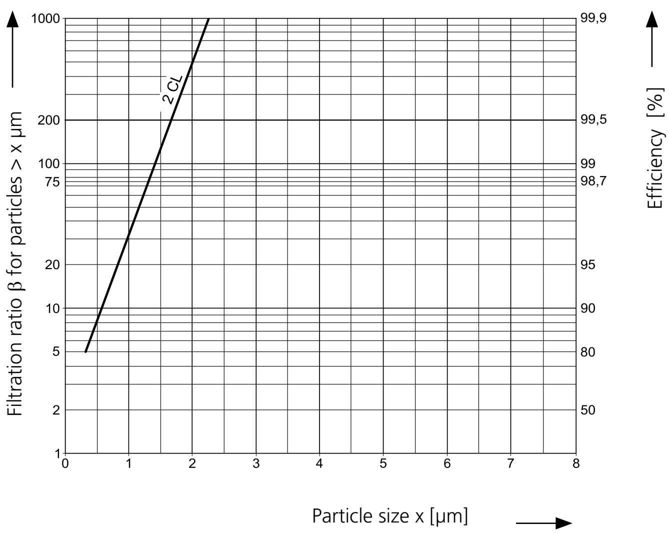



Pressure drop as a function of the **flow volume**
**Air OUT**




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

**Dx** Filtration ratio β as a function of particle size x tested in a single pass test with ISO MTD




The abbreviation represents the following β-values resp. finenesses:

**2CL**

- 2 µm Composite
  99.5% efficiency for particles of size 2 µm
  tested in a single pass test with ISO MTD

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

## Selection Chart

| Part No. | Nominal flow rate | Pressure drop see diagramm **D**/curve no. | Filter fineness see diagr. **Dx** | Filter surface | Connection A | DCV [2] -cracking pressure air IN | DCV [2] -cracking pressure air OUT | Dipstick measurement L1 | Dipstick measurement L2 | Dipstick measurement L3 | Symbol | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | l/min | | | cm² | | bar | bar | mm | mm | mm | | g | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| L1.0808-00 | 850 | **D1**/2 | 2CL | 203 | M42 x 2.0 | - | - | - | - | - | 1 | 140 | with spanner AF 47 |
| L1.0808-53 | 550[1] | **D2**/3 | 2CL | 203 | M42 x 2.0 | -0.03 | 0.20 | - | - | - | 2 | 160 | with spanner AF 47 |
| L1.0808-52 | 550[1] | **D2**/2 | 2CL | 203 | M42 x 2.0 | -0.03 | 0.35 | - | - | - | 2 | 160 | with spanner AF 47 |
| L1.0808-61 | 550[1] | **D2**/1 | 2CL | 203 | M42 x 2.0 | -0.03 | 0.50 | - | - | - | 2 | 160 | with spanner AF 47 |
| | | | | | | | | | | | | | |
| L1.0809-00 | 650 | **D1**/1 | 2CL | 203 | G¾ | - | - | - | - | - | 1 | 140 | with Easy Lock Pin |
| L1.0809-52 | 550[1] | **D2**/3 | 2CL | 203 | G¾ | -0.03 | 0.20 | - | - | - | 2 | 160 | with Easy Lock Pin |
| L1.0809-51 | 550[1] | **D2**/2 | 2CL | 203 | G¾ | -0.03 | 0.35 | - | - | - | 2 | 160 | with Easy Lock Pin |
| L1.0809-53 | 550[1] | **D2**/1 | 2CL | 203 | G¾ | -0.03 | 0.50 | - | - | - | 2 | 160 | with Easy Lock Pin |
| | | | | | | | | | | | | | |
| L1.0809-01 | 850 | **D1**/2 | 2CL | 203 | M42 x 2.0 | - | - | - | - | - | 1 | 140 | with Easy Lock Pin |
| L1.0809-54 | 550[1] | **D2**/3 | 2CL | 203 | M42 x 2.0 | -0.03 | 0.20 | - | - | - | 2 | 160 | with Easy Lock Pin |
| L1.0809-55 | 550[1] | **D2**/2 | 2CL | 203 | M42 x 2.0 | -0.03 | 0.35 | - | - | - | 2 | 160 | with Easy Lock Pin |
| L1.0809-56 | 550[1] | **D2**/1 | 2CL | 203 | M42 x 2.0 | -0.03 | 0.50 | - | - | - | 2 | 160 | with Easy Lock Pin |

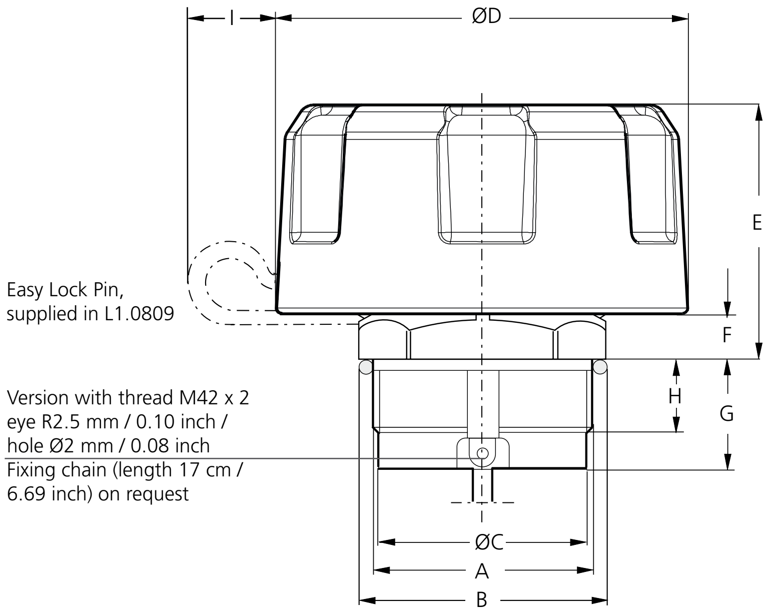
| | gpm | | | inch² | | psi | psi | inch | inch | inch | | lbs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| L1.0809-16 | 170 | **D1**/1 | 2CL | 31.5 | ¾-14 NPT | - | - | - | - | - | 1 | 0.31 | with Easy Lock Pin |
| L1.0809-58 | 145[1] | **D2**/1 | 2CL | 31.5 | ¾-14 NPT | -0.44 | 5.08 | - | - | - | 2 | 0.35 | with Easy Lock Pin |
| | | | | | | | | | | | | | |
| L1.0809-11 | 225 | **D1**/2 | 2CL | 31.5 | 1⁵⁄₈-12 UN-2A | - | - | - | - | - | 1 | 0.31 | with Easy Lock Pin |
| L1.0809-57 | 145[1] | **D2**/1 | 2CL | 31.5 | 1⁵⁄₈-12 UN-2A | -0.44 | 5.08 | - | - | - | 2 | 0.35 | with Easy Lock Pin |

[1] $\Delta p < 0.1$ bar / 1.45 psi for air IN
[2] Double check valve

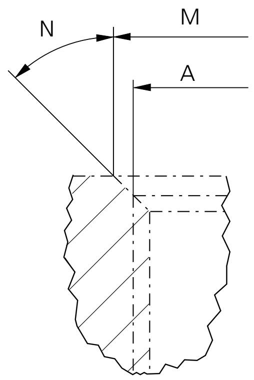
**Remarks:**

The ventilating filters listed in this chart are standard filters. If modifications are required, e.g., with integrated dipstick or oil separator, we kindly ask for your request.

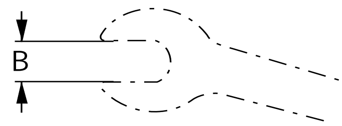
## Dimensions




Recommended port sizes




Spanner size
(special wrench, supplied with L1.0808)




## Measurements in mm

| Type | A[1] | B | C | D | E | F | G | H | I | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|
| L1.0808 | M42 x 2 | AF 47 | 40 | 80 | 50 | 8 | 21 | 14 | - | 48 | 45° |
| L1.0809 | G¾ | AF 33 | 24 | 80 | 50 | 7.5 | 17.5 | 13.5 | 16 | as A | 45° |
| | M42 x 2 | AF 47 | 40 | 80 | 50 | 8 | 21 | 14 | 16 | 48 | 45° |

[1] The thread dimensions do not exactly conform to the DIN ISO standard thread (functioning with the DIN ISO standard thread is guaranteed).

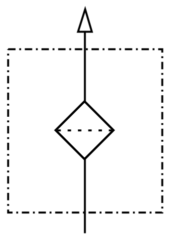
## Measurements in inch

| Type | A[1] | B mm | C | D | E | F | G | H | I | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|
| L1.0809 | ¾-14 NPT[2] | AF 33 | 0.94 | 3.15 | 1.97 | 0.30 | 0.69 | 0.53 | 0.63 | as A | 45° |
| | $1^5/_8$-12 UN-2A | AF 47 | 1.57 | 3.15 | 1.97 | 0.31 | 0.83 | 0.55 | 0.63 | 1.89 | 45° |

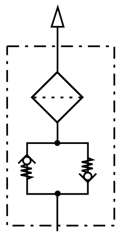
[1] The thread dimensions do not exactly conform to the ANSI standard thread (functioning with the ANSI standard thread is guaranteed).
[2] For NPT threads we recommend the use of gasket strips.

## Symbols

1



2



## Layout

### Sizes

The determining factor for selecting the size is the maximum over / under pressure allowed in the container.

For versions without double check valves, the initial pressure drop with a clean air filter should not exceed 0.03 bar / 0.44 psi. For versions with double check valves, the initial pressure drop for air IN with a clean air filter should not exceed 0.1 bar / 1.45 psi.

### Filter fineness

In the ideal case, the fineness of the ventilating filter matches the fineness of the system filter (see also CETOP RP 98 H). By the use of filter fineness 2 CL the ingress of dust into the tank is effectively reduced.

### Mounting

The ventilating filter should be mounted in a low-dust area of the machine and not in depressions in which water can collect. For mobile use, the ventilating filter is to be mounted on the tank such that neither splashing oil from the inside nor spray water from the outside can reach the area of the ventilation opening.

### Double check valves

By the use of double check valves, the exchange of air between the tank and the environment can considerably be reduced, whereby the ingress of dust is minimized and the lifetime of the ventilating filter is increased.
With the double check valve, a predefined level of pressure can be created in the tank in order to improve the suction conditions for the pumps.
The valve opening pressure required for the ventilating filter can be approximately determined with the ideal gas equation depending on the following system characteristics:

› differential volume
› volume of oil in the system
› volume of air in the tank
› operating temperatures

Calculation tool available.

## Quality Assurance

### Quality management according to DIN EN ISO 9001

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

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

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

## Ventilating Filters - Vandalism Proof

# LE.0716 · LE.0817 · LE.0827 · LE.0818 · LE.0819

With filling filter · 6 hole flange · Nominal flow rate up to 850 l/min / 225 gpm


Ventilating Filter
LE.0817

## Description

### Application

Filling / ventilation of tanks for hydraulic and lubrication systems as well as gearboxes.

### General

The oil levels in the tanks of hydraulic systems are subject to continuous variation due to temperature changes and the operation of cylinders and pressure vessels.
In order to prevent over pressure in the tanks, an exchange of air with the external atmosphere is necessary. By the use of a ventilating filter, the outside air that is drawn in is filtered and ingress of dust is therefore prevented.
A combined filling filter prevents coarse impurities from entering during filling or re-filling due to maintenance or repair reasons.

### Special features

The profiled metal flange with elastomer sealing and the mounting with 6 screws ensure that the filling / ventilating filters seal reliable even on non-planar tank surfaces. Filler screens made of sturdy expanded metal offer 100% safety during filling of the tank – which excludes any damage being caused for example by the filler neck. The ventilating filter is fixed by a chain at the filling filter to prevent it from being lost (exception: LE.0716).
The ventilation openings of the ventilating filters are designed that dust on the surface of the tank is not drawn in, and that the ingress of spray and rainwater is largely prevented.
The patented vandalism proof ventilating filters can only be removed with the special tool supplied. This makes the misuse of the ventilating filter or the ingress of dirt via the tank port considerably more difficult.

### Design

*Filling filter:*
Cylinder screen - flow direction from center to outside.

*Ventilating filter:*
Flow direction bi-directional (air IN/OUT).
The star-shaped pleating of the filter material results in:

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

### Ordering options / versions

*Integrated oil-level dipstick*

A dipstick can be integrated in the ventilating filter for checking the oil level. Therefore, a separate dipstick or an additional opening in the tank is not required.

*Double check valve in the ventilating filter:*

By the use of double check valves, the exchange of air between the tank and the environment is considerably reduced, whereby the ingress of dust is minimized and the lifetime of the ventilating filter is increased.
With the double check valve, an over-pressure is created in the tank in order to improve the suction conditions for the pumps. A further advantage is the reduction of spray water ingress and the loss of oil through the ventilating filter.

*Vandalism proof version "Standard" (LE.0818):*

Ventilating filters in the patented vandalism proof version can only be removed with the special spanner supplied (AF 47).

This makes the misuse of the ventilating filter or the ingress of dirt via the tank port considerably more difficult.

*Vandalism proof version "Easy Lock" (L1.0819):*

Ventilating filters in the patented "Easy Lock" version can only be removed with the special pin supplied.

### Maintenance

Ventilating filters should be changed at least every 1000 operating hours, or at minimum once a year.

## Characteristics

### Nominal flow rate

| | |
|---|---|
| Filling filter: | up to 200 l/min / 52.8 gpm |
| Ventilating filter: | up to 850 l/min / 225 gpm (see Selection Chart, column 2). |

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

- Ventilating filters without double check valve: $\Delta p \leq 0.03$ bar / $\Delta p \leq 0.44$ psi for air IN
- Ventilating filters with double check valve: $\Delta p \leq 0.1$ bar / $\Delta p \leq 1.45$ psi for air IN

### Connection

| | |
|---|---|
| Filling filter: | 6 hole flange, hole pattern according to DIN 24557/T2. |
| Ventilating filter: | outer thread M42 x 2 (the thread dimensions do not exactly conform to the ISO standard thread / functioning with the ISO standard thread is guaranteed). |

### Mounting / sealing

*Version without double check valve:*

6 self-tapping screws ISO 1479-ST4,8x16-C with washers.

*Version with double check valve:*

6 Philips head screws ISO 7045 M5x16-4.8-Z with O-rings.

Sealing of flange with elastomer gasket
(mounting accessories and gaskets included in basic equipment).

### Filter fineness

| | |
|---|---|
| Filling filter: | 800 µm |
| Ventilating filter: | 2 µm, tested in a single pass test with ISO MTD. |

### Hydraulic fluids

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

### Temperature range hydraulic fluid

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

### Temperature range environment

-30 °C ... +100 °C
-22 °F ... +212 °F

### Materials

| | |
|---|---|
| Cap: | Polyamide, GF reinforced |
| Base: | Polyamide, GF reinforced |
| Filler screen: | Steel, galvanized |
| Spanner: | Steel, galvanized |
| Gaskets: | NBR (FPM on request) |
| Filter media: | Composite, multi-layer |

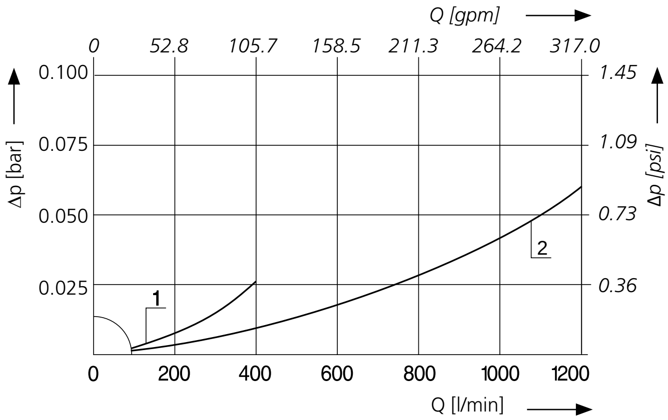
### Mounting position

No limitation, position on the tank see section Layout.

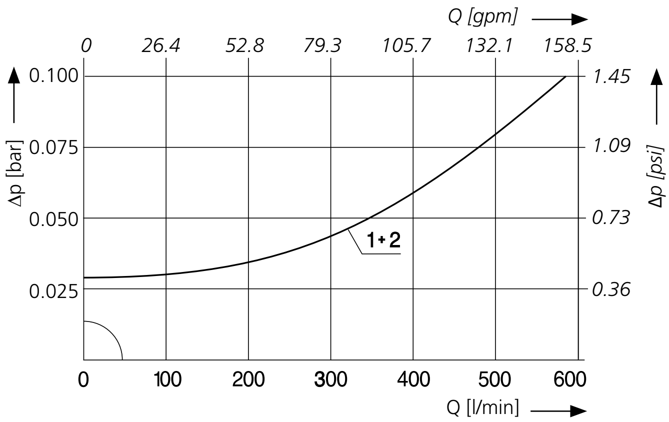
## Diagrams

### Δp-curves for complete filters in Selection Chart, column 2

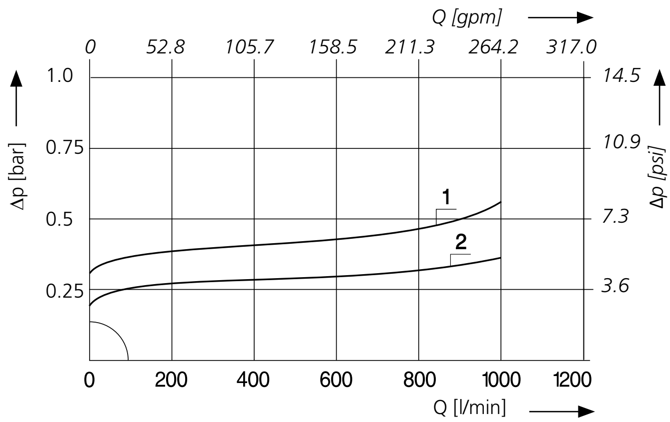
**D1** Pressure drop as a function of the **flow volume**
**Air IN/OUT**




**D2** Pressure drop as a function of the **flow volume**
**Air IN**

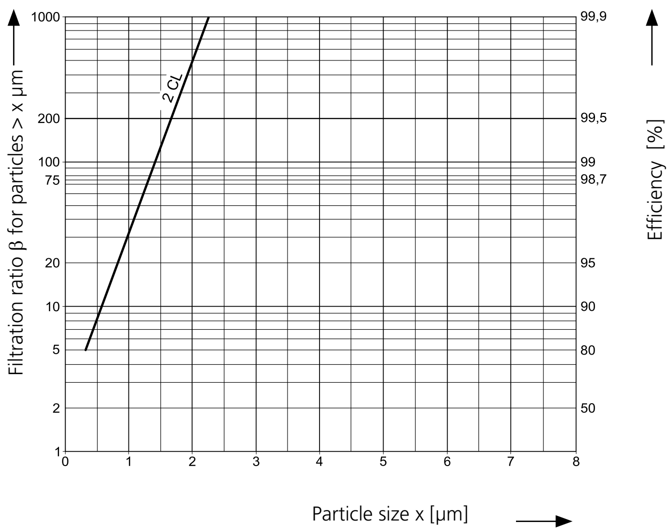



Pressure drop as a function of the **flow volume**
**Air OUT**




### Filter fineness curves in Selection Chart, column 5

**Dx** Filtration ratio β as a function of particle size x tested in a single pass test with ISO MTD




The abbreviation represents the following β-values resp. finenesses:

**2CL**

- 2 µm Composite
  99.5% efficiency for particles of size 2 µm
  tested in a single pass test with ISO MTD.

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

## Selection Chart

| Part No. | Pressure drop see diagram **D**/curve no. | Nominal flow rate filling filter | Nominal flow rate ventilating filter | Filter fineness vent. filter | Filter surface vent. filter | Filter fineness filling filter | Filter surface filling filter | DCV[6] -cracking pressure air IN | DCV[6] -cracking pressure air OUT | Spare ventilating filter | Symbol | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | l/min | l/min | | $cm^2$ | µm | $cm^2$ | bar | bar | | | g | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| **LE.0716-02[1]** | **D1**/1 | 110[2] | 250 | 2CL | 50 | 800 | 160 | - | - | L1.0706-02 | 1 | 255 | without chain[4] |
| | | | | | | | | | | | | | |
| **LE.0817-01[1]** | **D1**/2 | 110[2] | 850 | 2CL | 203 | 800 | 160 | - | - | L1.0807-31 | 1 | 350 | - |
| LE.0817-91 | **D2**/2 | 110[2] | 550[3] | 2CL | 203 | 800 | 160 | -0.03 | 0.20 | L1.0807-91 | 2 | 370 | - |
| **LE.0817-51[1]** | **D2**/1 | 110[2] | 550[3] | 2CL | 203 | 800 | 160 | -0.03 | 0.35 | L1.0807-51 | 2 | 370 | - |
| | | | | | | | | | | | | | |
| LE.0827-01 | **D1**/2 | 200[2] | 850 | 2CL | 203 | 800 | 285 | - | - | L1.0807-31 | 1 | 400 | - |
| LE.0827-91 | **D2**/2 | 200[2] | 550[3] | 2CL | 203 | 800 | 285 | -0.03 | 0.20 | L1.0807-91 | 2 | 420 | - |
| LE.0827-51 | **D2**/1 | 200[2] | 550[3] | 2CL | 203 | 800 | 285 | -0.03 | 0.35 | L1.0807-51 | 2 | 420 | - |
| | | | | | | | | | | | | | |
| LE.0818-01[5] | **D1**/2 | 110[2] | 850 | 2CL | 203 | 800 | 160 | - | - | L1.0808-00 | 1 | 350 | with spanner AF 47 |
| LE.0818-53[5] | **D2**/2 | 110[2] | 550[3] | 2CL | 203 | 800 | 160 | -0.03 | 0.20 | L1.0808-53 | 2 | 370 | with spanner AF 47 |
| LE.0818-51[5] | **D2**/1 | 110[2] | 550[3] | 2CL | 203 | 800 | 160 | -0.03 | 0.35 | L1.0808-52 | 2 | 370 | with spanner AF 47 |
| | | | | | | | | | | | | | |
| LE.0819-01[5] | **D1**/2 | 110[2] | 850 | 2CL | 203 | 800 | 160 | - | - | L1.0809-01 | 1 | 350 | with Easy Lock Pin |
| LE.0819-54[5] | **D2**/2 | 110[2] | 550[3] | 2CL | 203 | 800 | 160 | -0.03 | 0.20 | L1.0809-54 | 2 | 370 | with Easy Lock Pin |
| LE.0819-55[5] | **D2**/1 | 110[2] | 550[3] | 2CL | 203 | 800 | 160 | -0.03 | 0.35 | L1.0809-55 | 2 | 370 | with Easy Lock Pin |

[1] Preferred type, no minimum order quantity required
[2] At 200 $mm^2/s$ (ISO VG 46 at approx. 15°C)
[3] $\Delta p \leq 0.1$ bar for air IN
[4] Ventilating filter not fixed by a chain at the filling filter
[5] Vandalism proof
[6] Double check valve

**Remark:**

The ventilating filters listed in this chart are standard filters. If modifications are required, e.g. with integrated dipstick, we kindly ask for your inquiry.

## Selection Chart

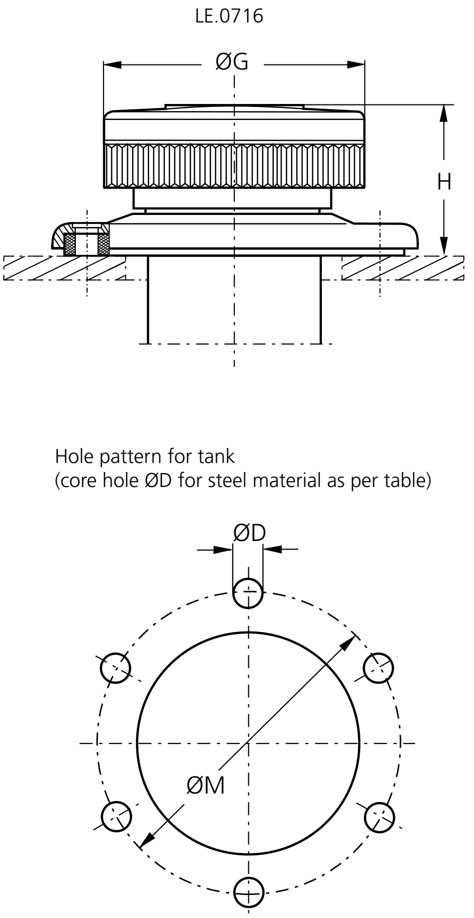
| Part No. | Pressure drop see diagram **D**/curve no. | Nominal flow rate filling filter | Nominal flow rate ventilating filter | Filter fineness vent. filter | Filter surface vent. filter | Filter fineness filling filter | Filter surface filling filter | DCV[5] -cracking pressure air IN | DCV[5] -cracking pressure air OUT | Spare ventilating filter | Symbol | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | gpm | gpm | | inch$^2$ | µm | inch$^2$ | psi | psi | | | lbs | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| LE.0716-02 | **D1**/1 | 29[1] | 66 | 2CL | 7.8 | 800 | 24.8 | - | - | L1.0706-02 | 1 | 0.56 | without chain [3] |
| | | | | | | | | | | | | | |
| LE.0817-01 | **D1**/2 | 29[1] | 225 | 2CL | 31.5 | 800 | 24.8 | - | - | L1.0807-31 | 1 | 0.77 | - |
| LE.0817-91 | **D2**/2 | 29[1] | 145[2] | 2CL | 31.5 | 800 | 24.8 | -0.44 | 2.90 | L1.0807-91 | 2 | 0.82 | - |
| LE.0817-51 | **D2**/1 | 29[1] | 145[2] | 2CL | 31.5 | 800 | 24.8 | -0.44 | 5.08 | L1.0807-51 | 2 | 0.82 | - |
| | | | | | | | | | | | | | |
| LE.0827-01 | **D1**/2 | 52[1] | 225 | 2CL | 31.5 | 800 | 44.2 | - | - | L1.0807-31 | 1 | 0.88 | - |
| LE.0827-91 | **D2**/2 | 52[1] | 145[2] | 2CL | 31.5 | 800 | 44.2 | -0.44 | 2.90 | L1.0807-91 | 2 | 0.93 | - |
| LE.0827-51 | **D2**/1 | 52[1] | 145[2] | 2CL | 31.5 | 800 | 44.2 | -0.44 | 5.08 | L1.0807-51 | 2 | 0.93 | - |
| | | | | | | | | | | | | | |
| LE.0818-01[4] | **D1**/2 | 29[1] | 225 | 2CL | 31.5 | 800 | 24.8 | - | - | L1.0808-00 | 1 | 0.77 | with spanner AF 47 |
| LE.0818-53[4] | **D2**/2 | 29[1] | 145[2] | 2CL | 31.5 | 800 | 24.8 | -0.44 | 2.90 | L1.0808-53 | 2 | 0.82 | with spanner AF 47 |
| LE.0818-51[4] | **D2**/1 | 29[1] | 145[2] | 2CL | 31.5 | 800 | 24.8 | -0.44 | 5.08 | L1.0808-52 | 2 | 0.82 | with spanner AF 47 |
| | | | | | | | | | | | | | |
| LE.0819-01[4] | **D1**/2 | 29[1] | 225 | 2CL | 31.5 | 800 | 24.8 | - | - | L1.0809-01 | 1 | 0.77 | with Easy Lock Pin |
| LE.0819-54[4] | **D2**/2 | 29[1] | 145[2] | 2CL | 31.5 | 800 | 24.8 | -0.44 | 2.90 | L1.0809-54 | 2 | 0.82 | with Easy Lock Pin |
| LE.0819-55[4] | **D2**/1 | 29[1] | 145[2] | 2CL | 31.5 | 800 | 24.8 | -0.44 | 5.08 | L1.0809-55 | 2 | 0.82 | with Easy Lock Pin |

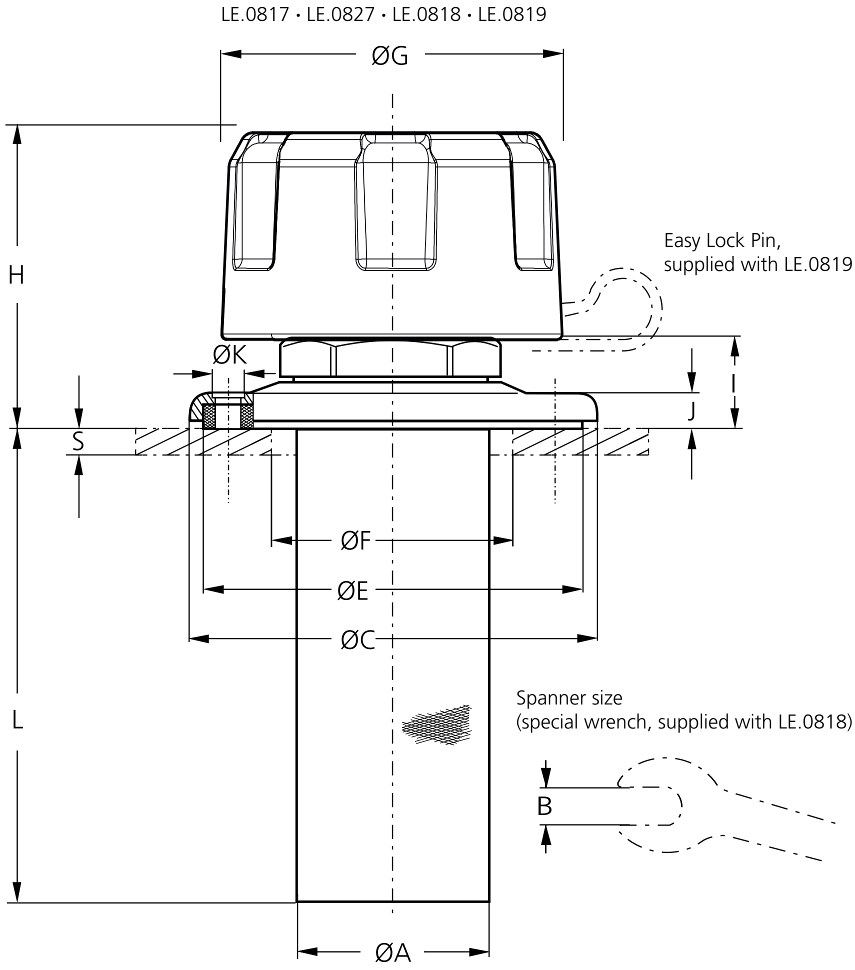
[1] At 930 SUS (ISO VG 46 at approx. 59°F)
[2] $\Delta p \leq 1.45$ psi for air IN
[3] Ventilating filter not fixed by a chain at the filling filter
[4] Vandalism proof
[5] Double check valve

**Remark:**

The ventilating filters listed in this chart are standard filters. If modifications are required, e.g. with integrated dipstick, we kindly ask for your inquiry.

## Dimensions




## Measurements in mm

| Type | A | B | C | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LE.0716 | 46 | - | 89.5 | 84.5 | 58 | 66 | 36 | 15 | 6 | 5.6 ± 0.3 | 111 | 73 |
| LE.0817 | 46 | AF 47 | 89.5 | 84.5 | 58 | 80 | 61 | 20 | 6 | 5.6 ± 0.3 | 111 | 73 |
| LE.0827 | 46 | AF 47 | 89.5 | 84.5 | 58 | 80 | 61 | 20 | 6 | 5.6 ± 0.3 | 200 | 73 |
| LE.0818 | 46 | AF 47 | 89.5 | 84.5 | 58 | 80 | 61 | 20 | 6 | 5.6 ± 0.3 | 111 | 73 |
| LE.0819 | 46 | AF 47 | 89.5 | 84.5 | 58 | 80 | 61 | 20 | 6 | 5.6 ± 0.3 | 111 | 73 |

| Plate thickness S over / up to | Hole D* |
|---|---|
| 1.00 / 1.75 | 3.9 |
| 1.75 / 3.00 | 4.1 |
| 3.00 / 4.75 | 4.4 |
| 4.75 | M5 |

## Measurements in inch

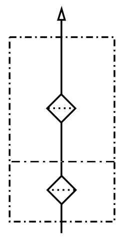
| Type | A | B mm | C | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LE.0716 | 1,81 | - | 3.52 | 3.33 | 2.28 | 2.60 | 1.42 | 0.59 | 0.24 | 0.22±0.01 | 4.37 | 2.87 |
| LE.0817 | 1.81 | AF 47 | 3.52 | 3.33 | 2.28 | 3.15 | 2.40 | 0.79 | 0.24 | 0.22±0.01 | 4.37 | 2.87 |
| LE.0827 | 1.81 | AF 47 | 3.52 | 3.33 | 2.28 | 3.15 | 2.40 | 0.79 | 0.24 | 0.22±0.01 | 7.87 | 2.87 |
| LE.0818 | 1.81 | AF 47 | 3.52 | 3.33 | 2.28 | 3.15 | 2.40 | 0.79 | 0.24 | 0.22±0.01 | 4.37 | 2.87 |
| LE.0819 | 1.81 | AF 47 | 3.52 | 3.33 | 2.28 | 3.15 | 2.40 | 0.79 | 0.24 | 0.22±0.01 | 4.37 | 2.87 |

| Plate thickness S over / up to | Hole D* |
|---|---|
| 0.04 / 0.07 | 0.15 |
| 0.07 / 0.12 | 0.14 |
| 0.12 / 0.19 | 0.17 |
| 0.19 | M5 |

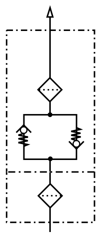
* Core hole Ø D for self-tapping screws according to DIN 7975 for versions without double check valve.
For versions with double check valve always use M5. Fastening screws included in basic equipment.

## Symbols

1



2



## Layout

### Sizes

The determining factor for selecting the size is the maximum over / under pressure allowed in the tank.

For versions without double check valves, the initial pressure drop with a clean air filter should not exceed 0.03 bar / 0.44 psi. For versions with double check valves, the initial pressure drop for air IN with a clean air filter should not exceed 0.1 bar / 1.45 psi.

### Filter fineness

In the ideal case, the fineness of the ventilating filter matches the fineness of the system filter (see also CETOP RP 98 H).
By the use of filter fineness 2 CL the ingress of dust into the tank is effectively reduced.

### Mounting

The ventilating filter should be mounted in a low-dust area of the machine and not in depressions in which water can collect. For mobile use, the ventilating filter is to be mounted on the tank such that neither splashing oil from the inside nor spray water from the outside can reach the area of the ventilation opening.

### Double check valves

By the use of double check valves, the exchange of air between the tank and the environment can considerably be reduced, whereby the ingress of dust is minimized and the lifetime of the ventilating filter is increased.
With the double check valve, a predefined level of pressure can be created in the tank in order to improve the suction conditions for the pumps.
The valve opening pressure required for the ventilating filter can be approximately determined with the ideal gas equation depending on the following system characteristics:

› differential volume
› volume of oil in the system
› volume of air in the tank
› operating temperatures

Calculation tool available.

## Quality Assurance

### Quality management according to DIN EN ISO 9001

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

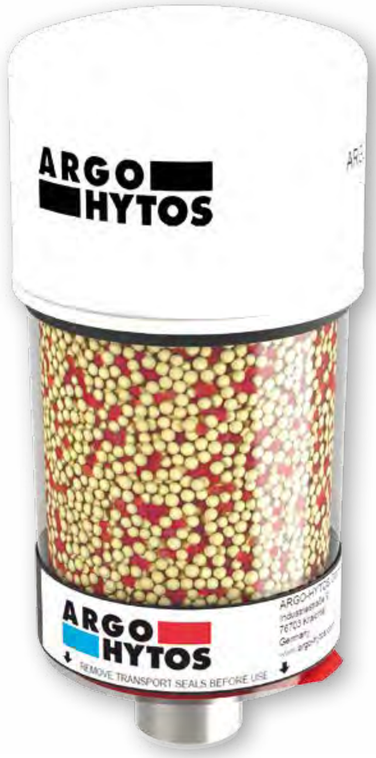
| | |
|---|---|
| ISO 2941 | Verification of collapse / burst pressure rating |
| ISO 2942 | Verification of fabrication integrity (Bubble Point Test) |
| ISO 2943 | Verification of material compatibility with fluids |
| ISO 3968 | Evaluation of pressure drop versus flow characteristics |
| ISO 16889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

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

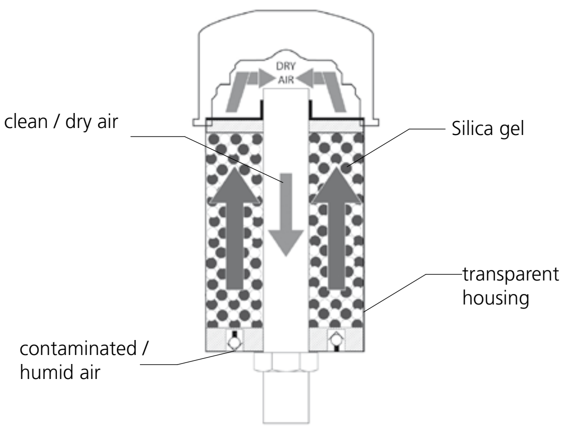
Desiccant Breathers

# LT.1021-51 · LT.1325-51

Connection up to G1¼ · Nominal flow rate up to 400 l/min / 105.7 gpm




Desiccant breather LT.1021-51




## Description

### Application

Desiccant breathers are mounted at tanks of hydraulic and lubrication systems in order to prevent humidity from entering the systems during ventilation.

### General

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

› Environment humidity
› Spray-water

Already small quantities of free water in oil can lead to acidification. Corrosion of surfaces can be the result. Due to water the oil characteristics change, e.g. decreased load-carrying capacity, reduced temperature resistance. In order to avoid economic damage, the oil must be protected against water.

### Special features

Desiccant breathers prevent solid particles as well as humidity, snow, spray- or rainwater from entering. They may even be used in sea atmosphere without any problems. The filter consists of a vessel with silica gel and an integrated ventilating filter.

*Performance features*

› Water abstraction from the humid air to maintain the lubrication effect and to prevent oxidation
› Color change when the maximum dirt holding capacity of the filter element is reached

### Maintenance

With color change of the silica gel from red to orange or with clogged filter element.

### Accessories

Additional humidity sensors for monitoring of the pressure fluid are available on request - LubCos humidity sensors dimensions and technical data see data sheet LubCos $H_2O$ and LubCos $H_2O$+ II.

### Operation

The air flows via the in the bottom integrated valves into the desiccant breather, therein the humid air is first dried in Silica gel, then the solid particle contamination is removed by the 3 µm fine ventilating filter.

## Characteristics

### Nominal flow rate
400 l/min / 105.7 gpm

### Connection
Outer thread according to
› ISO 228 or DIN 13.
Sizes see Selection Chart, column 9.

### Filter fineness
3 µm
Tested in a single pass test with ISO MTD

### Pressure fluid

| | |
|---|---|
| Mineral oils: | H, HL, HLP, HVLP |
| Synthetic ester: | HESS |
| Polyalphaolefin: | HEPR |

Other oils on request.

### Temperature range
- 40 °C ... + 90 °C / - 40 °F ... + 194 °F

### Materials

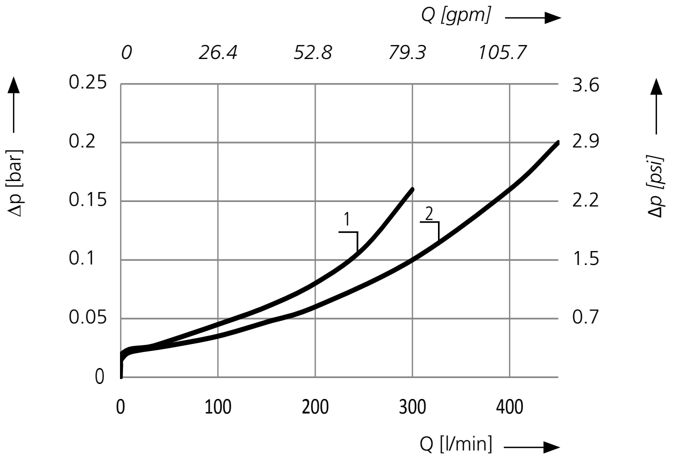
| | |
|---|---|
| Housing: | Styrene acrylonitrile (SAN) |
| Tank connection: | Stainless steel |
| Ventilator housing: | Steel, painted |
| Drying material: | ZR gel (non-toxic) |
| Filter material: | Glass fiber |

### Mounting position
Preferably vertical, on top of the reservoir.

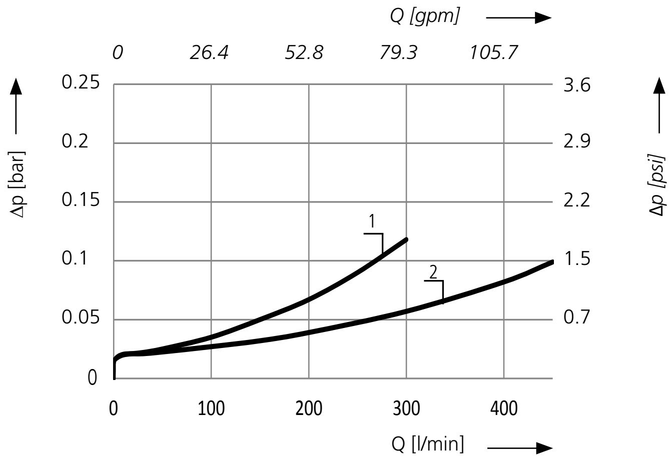
## Diagrams

**∆p-curves**

**D1** Pressure drop as a function of the **flow volume**
**AIR IN**




Pressure drop as a function of the **flow volume**
**AIR OUT**



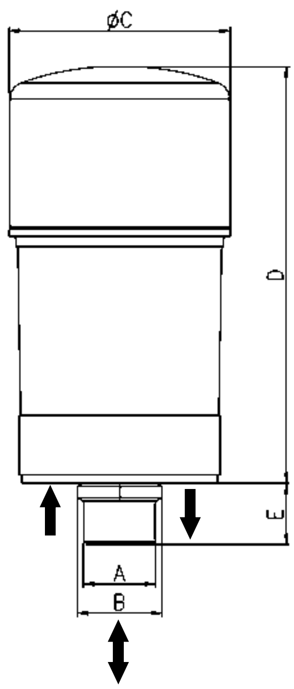
## Selection Chart

| Part No. | Pressure drop see diagram **D**/curve no. | Nominal flow rate ventilating filter | Filter fineness | Filter surface | Water absorption capacity | Cracking pressure air IN | Cracking pressure air OUT | Connection A | Symbol | Weight | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | l/min | µm | cm² | g | bar | bar | | | kg | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| LT.1021-51 | **D1**/1 | 300 | 3 | 754 | 172 | 0.01 | 0.01 | G¾" | 1 | 1.5 | - |
| LT.1325-51 | **D1**/2 | 400 | 3 | 2116 | 288 | 0.01 | 0.01 | G1¼" | 1 | 2.7 | - |

| | | gpm | µm | inch² | lbs | psi | psi | | | lbs | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| LT.1021-51 | **D1**/1 | 79.3 | 3 | 116.9 | 0.4 | 0.15 | 0.15 | G¾" | 1 | 3.3 | - |
| LT.1325-51 | **D1**/2 | 105.7 | 3 | 328.0 | 0.6 | 0.15 | 0.15 | G1¼" | 1 | 6.0 | - |

**Remark:** The ventilating filters listed in this chart are standard filters. If modifications are required, we kindly ask for your request.

## Dimensions

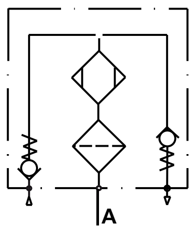



## Measurements

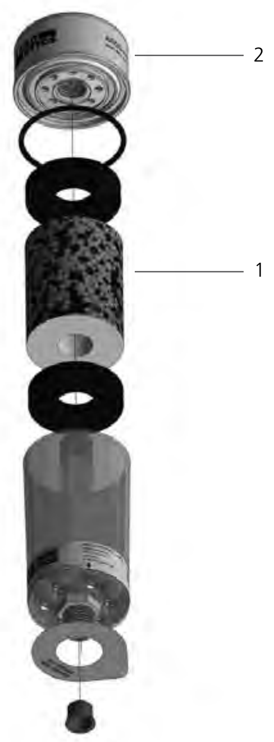
| Type | A | B | ØC | | D | | E | |
|---|---|---|---|---|---|---|---|---|
| | | mm | mm | inch | mm | inch | mm | inch |
| LT.1021-51 | G¾ | AF 32 | 96 | 3.78 | 210 | 8.27 | 20 | 0.79 |
| LT.1325-51 | G1¼ | AF 50 | 128 | 5.04 | 250 | 9.84 | 30 | 1.18 |

## Symbol

1




## Spare Parts




**LT.1021-51**

| Pos. | Designation | Spare Part No. |
|---|---|---|
| 1 | Drying agent | X9.1021-01 (delivered as refill) |
| 2 | Ventilating filter | X9.1021-21 incl. seal |

**LT.1325-51**

| Pos. | Designation | Spare Part No. |
|---|---|---|
| 1 | Drying agent | X9.1325-01 (delivered as refill) |
| 2 | Ventilating filter | X9.1325-21 incl. seal |

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

## Quality Assurance

**Quality management according to DIN EN ISO 9001**

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

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

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

Clogging Indicators

# DG 100 · DG 101 · DG 200 · DG 813 · DG 815 · DG 819 · DG 902

for Suction or Return Filters · Connection G¼ resp. M12 x 1.5 · Response / switching pressure up to 2.5 bar / 36.3 psi


Manometer DG 100

Pressure switch DG 815

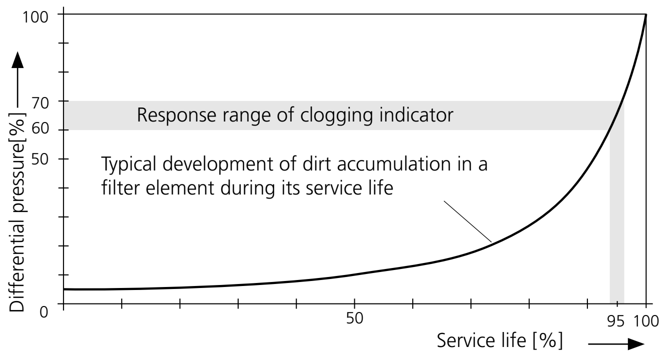
## Description

### Application

Monitoring the contamination of suction resp. return filters.

### General

Filter elements installed in hydraulic filters remove dirt from a hydraulic system and therefore become contaminated themselves. Free pores or spaces in the filter material are obstructed by dirt particles, which causes a continuous increase in the pressure loss.




The dirt load collected in a filter element gradually increases during service, which also leads to a higher pressure drop. The resulting vacuum or back pressure is monitored by a clogging indicator. Once a preset value is reached, an electrical and / or optical signal is generated.
The following must be observed in this context:
The pressure drop caused by the filter element increases depending on the flow rate, the dirt load, and the viscosity of the pressure fluid. Therefore, a filter element is not regarded contaminated before the clogging indicator responds at operating temperature of the hydraulic system, causing a continuous signal.

### Consequences of an overdue filter element change

*Filters with by-pass valve:*
The more dirt has collected in the filter element, the more frequently the bypass valve opens and part of the hydraulic fluid remains unfiltered. The high pressure drop causes unnecessary power consumption.

*Suction filters without by-pass valve:*
There is a high risk of pump cavitation with increasing vacuum caused by contaminated elements.

## Characteristics

| | DG 100 | DG 101 | DG 902 | DG 200 | DG 813 | DG 815 | DG 819 |
|---|---|---|---|---|---|---|---|
| Operating pressure | -1.0 ... +0.25 bar<br><br>-14.5 ... +3.6 psi | -1.0 ... +0.25 bar<br><br>-14.5 ... +3.6 psi | -0.5 ... +1.0 bar<br><br>-7.3 ... +14.5 psi | 0 ... + 10.0 bar<br><br>0 ... +145 psi | 0 ... + 10.0 bar<br><br>0 ... +145 psi | 0 ... + 10.0 bar<br><br>0 ... +145 psi | 0 ... + 10.0 bar<br><br>0 ... +145 psi |
| Connection | Threaded ports according to ISO 228 or DIN 13.<br>Sizes see Selection Chart, column 6 (other port threads on request). | | | | | | |
| Hydraulic fluids | Mineral oil and biodegradable fluids (HEES and HETG, see info-sheet 00.20) | | | | | | |
| Temperature range of fluids | -30 °C ... +100 °C (short term +120 °C)<br><br>-22 °F ... +212 °F (short term +248 °F) | -30 °C ... +100 °C (short term +120 °C)<br><br>-22 °F ... +212 °F (short term +248 °F) | -15 °C ... +100 °C (short term +130 °C)<br><br>+5 °F ... +212 °F (short term +266 °F) | -20 °C ... +90 °C<br><br>-4 °F ... +194 °F | -30 °C ... +100 °C (short term +120 °C)<br><br>-22 °F ... +212 °F (short term +248 °F) | -30 °C ... +100 °C (short term +120 °C)<br><br>-22 °F ... +212 °F (short term +248 °F) | -30 °C ... +100 °C (short term +120 °C)<br><br>-22 °F ... +212 °F (short term +248 °F) |
| Ambient temperature range | -30 °C ... +80 °C<br><br>-22 °F ... +176 °F | -30 °C ... +80 °C<br><br>-22 °F ... +176 °F | -30 °C ... +80 °C<br><br>-22 °F ... +176 °F | -20 °C ... +90 °C<br><br>-4 °F ... +194 °F | -30 °C ... +80 °C<br><br>-22 °F ... +176 °F | -30 °C ... +80 °C<br><br>-22 °F ... +176 °F | -30 °C ... +80 °C<br><br>-22 °F ... +176 °F |

* Design-related the switching tolerance increases at temperatures -15 °C / +5 °F.

## Characteristics

### Materials

DG 100: Housing steel, fitting brass, seal copper
DG 101: Housing steel, fitting brass, seal copper
DG 902: Housing brass, protection cap polyamide, diaphragm FPM, seal NBR
DG 200: Housing polyamide, fitting brass, seal PTFE
DG 813 / DG 819: Housing steel galvanized, protection cap NBR, diaphragm NBR, seal copper
DG 815: Housing polyamide, fitting steel galvanized, diaphragm NBR, seal copper

### Operating voltage

10 ... 30 V DC
(only required for clogging indicators with built-in LEDs).

### Electrical service life

DG 902/DG 813/DG 815/DG 819:
min. $10^6$ switching cycles

### Electrical protection

- DG 902: IP 44 (with protection cap)
- DG 813: IP 65 (switch housing), IP 54 (with protection cap)
- DG 815: IP 65 (with mounted and secured socket)
- DG 819: IP 67 (in connected condition)

### Electrical connection

- DG 902: Flat plugs DIN 46247 - 6.3 x 1 / 0.25 x 0.04
  Cable diameter approx. 6.5 mm / 0.26 inch
- DG 813: Flat plugs DIN 46244 - A 6.3 - 0.8 / 0.25 x 0.03
  Cable diameter approx. 4 mm / 0.16 inch
- DG 815: Socket DIN 43650 - AF3
  Cable diameter 6 ... 8 mm / 0.24 ... 0.31 inch
- DG 819: Mating plug AMP Superseal and Deutsch DT04-2P resp.
  Cable diameter approx. 4 mm / 0.16 inch

### Mounting position

No limitation

## Overview of types

### DG 100 / DG 101 - Manometer for Suction Filters


*Function:*
Manometer for optical monitoring of the dirt load in suction filters.
Green reading area = filter element O.K.,
Red reading area = filter element clogged.

*Option:*
Bottom-mounted fitting (DG 101), making it possible to turn the manometer into the direction from which it is viewed, as compared to a fitting mounted on the back (standard).

### DG 902 - Vacuum Switch for Suction Filters (change-over)

*Function:*
When the preset vacuum is reached, the built-in diaphragm switch changes over.
The change-over (CO) switch makes it possible to indicate a broken wire by means of a suitable electronic circuit, as compared to a make contact (normally open / NO) switch.

### DG 200 - Manometer for Return Filters


*Function:*
Manometer for optical monitoring of the dirt load in return filters.
Green reading area = filter element O.K.,
Red reading area = filter element clogged.
In order to protect the measuring element from pressure peaks, the unit is provided with a built-in orifice system.

*Option:*
Bottom-mounted fitting, making it possible to turn the manometer into the direction from which it is viewed, as compared to a fitting mounted on the back (standard).

### DG 813 / DG 819 - Pressure Switch for Return Filters (make/break)

*Function:*
The diaphragm switch closes resp. opens as soon as the pressure exceeds the preset value.

*Accessories:*
Suitable protection caps for DG 813 are available under part no.
DG 813.0701
(central hole for cable Ø 1.5 up to 5 mm / Ø 0.06 up to 0.20 inch)
and
DG 813.0702
(2 holes for cable Ø 1.7 up to 2.2 mm / Ø 0.07 up to 0.09 inch).

### DG 815 - Pressure Switch for Return Filters (change-over)

*Function:*
When the preset back pressure is reached, the built-in diaphragm switch changes over.
The change-over (CO) switch makes it possible to indicate a broken wire by means of a suitable electronic circuit, as compared to a make contact (normally open / NO) switch.

*Option:*
The transparent socket with 2 built-in LEDs makes it possible to have an additional optical indication of the element contamination. When the operating voltage is switched on, a green LED lights up. When the switching pressure is reached, a yellow LED lights up in addition.

## Selection Chart

| Part No. | Optical indicator | Electrical switch | Temperature suppression < +32 °C / +90 °F | Response / switching pressure | | Type of contact | Switching voltage U | Switching current I | Switching power P | Symbol | Weight | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | bar | psi | | V AC/DC | A AC/DC | VA/W AC/DC | | kg | lbs | |
| 1 | 2 | 3 | 4 | 5 | | 6 | 7 | 8 | 9 | 10 | 11 | | 12 |
| DG 100-00 | • | - | - | -0.25 | -3.6 | - | - | - | - | 1 | 0.11 | 0.24 | fitting on the back |
| DG 101-04 | • | - | - | -0.25 | -3.6 | - | - | - | - | 1 | 0.11 | 0.24 | bottom fitting |
| DG 902-11 | - | • | - | -0.15 | -2.2 | change-over | 250/24 | 6.0/2.0 | 1500/48 | 2 | 0.13 | 0.29 | with protection cap |
| DG 902-12 | - | • | - | -0.25 | -3.6 | change-over | 250/24 | 6.0/2.0 | 1500/48 | 2 | 0.13 | 0.29 | with protection cap |
| DG 200-05 | • | - | - | +1.0 | +14.5 | - | - | - | - | 1 | 0.07 | 0.15 | fitting on the back |
| DG 200-11[1] | • | - | - | +1.0 | +14.5 | - | - | - | - | 1 | 0.07 | 0.15 | fitting on the back |
| DG 200-06 | • | - | - | +2.0 | +29.0 | - | - | - | - | 1 | 0.07 | 0.15 | fitting on the back |
| DG 200-15[1] | • | - | - | +2.0 | +29.0 | - | - | - | - | 1 | 0.07 | 0.15 | fitting on the back |
| DG 200-16[2] | • | - | - | +2.0 | +29.0 | - | - | - | - | 1 | 0.07 | 0.15 | fitting on the back |
| DG 200-10 | • | - | - | +2.0 | +29.0 | - | - | - | - | 1 | 0.07 | 0.15 | bottom fitting |
| DG 813-00 | - | • | - | +1.2 | +17.4 | make | 42/42 | 4.0/4.0 | 100/100 | 3 | 0.09 | 0.20 | without protection cap |
| DG 813-03 | - | • | - | +1.5 | +21.8 | make | 42/42 | 4.0/4.0 | 100/100 | 3 | 0.09 | 0.20 | without protection cap |
| DG 813-01 | - | • | - | +2.0 | +29.0 | make | 42/42 | 4.0/4.0 | 100/100 | 3 | 0.09 | 0.20 | without protection cap |
| DG 813-05 | - | • | - | +2.5 | +36.3 | make | 42/42 | 4.0/4.0 | 100/100 | 3 | 0.09 | 0.20 | without protection cap |
| DG 813-20 | - | • | - | +1.2 | +17.4 | break | 42/42 | 4.0/4.0 | 100/100 | 4 | 0.09 | 0.20 | without protection cap |
| DG 813-21 | - | • | - | +2.0 | +29.0 | break | 42/42 | 4.0/4.0 | 100/100 | 4 | 0.09 | 0.20 | without protection cap |
| DG 819-21 | - | • | - | +2.0 | +29.0 | break | 42/42 | ≤4.0 | 100/100 | 4 | 0.09 | 0.20 | AMP Superseal |
| DG 819-22 | - | • | - | +2.0 | +29.0 | break | 42/42 | ≤4.0 | 100/100 | 4 | 0.09 | 0.20 | Deutsch DT04-2P |
| DG 815-01 | - | • | - | +1.2 | +17.4 | change-over | 250/30 | 4.0/4.0 | 250/60 | 5 | 0.13 | 0.29 | incl. socket |
| DG 815-11 | • | • | - | +1.2 | +17.4 | change-over | -/30 | -/0.25 | -/3.0 | 6 | 0.13 | 0.29 | incl. socket |
| DG 815-02 | - | • | - | +2.0 | +29.0 | change-over | 250/30 | 4.0/4.0 | 250/60 | 5 | 0.13 | 0.29 | incl. socket |
| DG 815-12 | • | • | - | +2.0 | +29.0 | change-over | -/30 | -/0.25 | -/3.0 | 6 | 0.13 | 0.29 | incl. socket |

[1] For FR 043 / FR 072 (with preformed seals)
[2] For FNA 008 / FNA 016 (as DG 200-06 but without throttle screw)

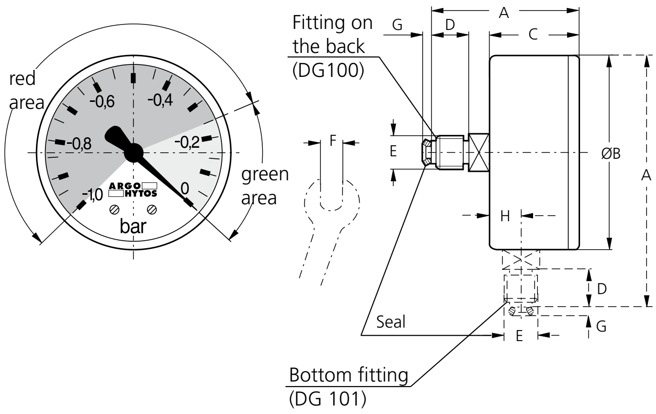
**Remarks:**

› With return filters, the response/switching pressure of the clogging indicator used must be lower than the cracking pressure of the bypass valve, with suction filters it must be higher.

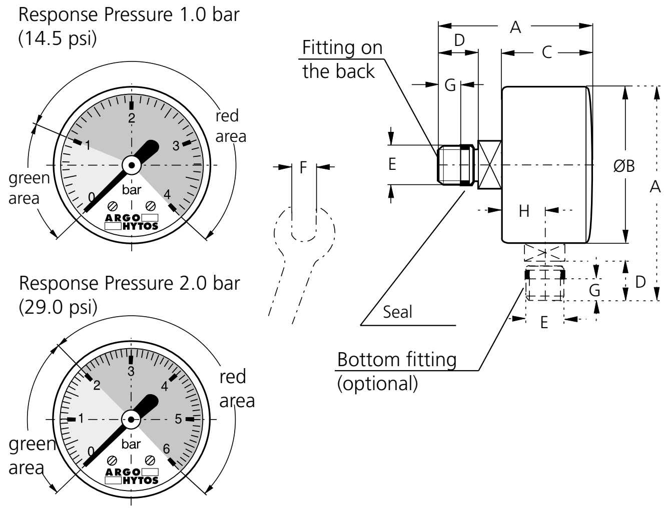
› Clogging indicators listed in this chart are standard units. Other designs available on request.

## Dimensions

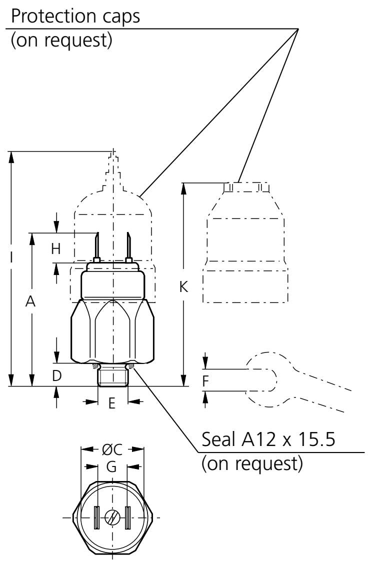
### DG 100 / DG101



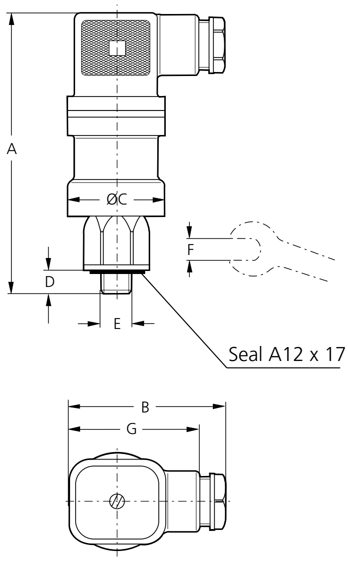

### DG 200



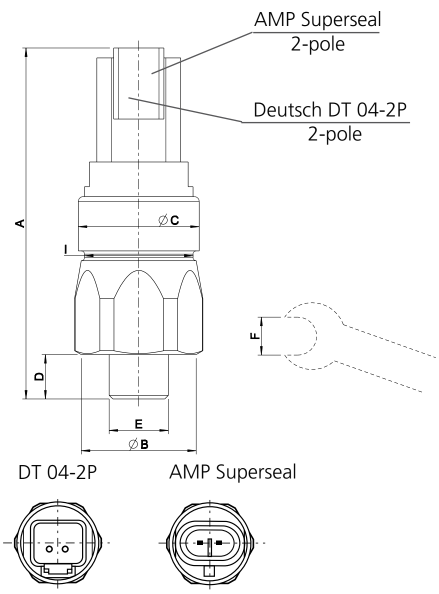

### DG 813



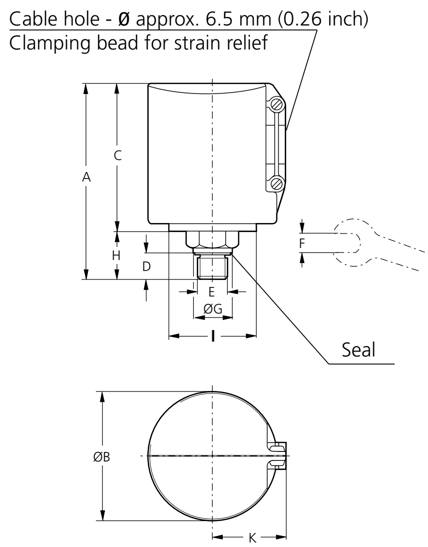

### DG 815




### DG 819




### DG 902



## Measurements in mm

| Type | A | B | C | D | E | F | G | H | I | K |
|---|---|---|---|---|---|---|---|---|---|---|
| DG 100 / 101* | 50 / 84* | 64 | 30 | 13 | G¼ | 14 | 3.2 | 10* | - | - |
| DG 902 | 76 | 50 | 56 | 10 | G¼ | 21 | 18.5 | 20 | 34 | 30 |
| DG 200 | 47 / 59* | 41 | 26 / 24* | 12 | M12x1.5 | 14 / 12* | 5 | 9* | - | - |
| DG 813 | 55 | 23.3 | 24 | 9 | M12x1.5 | AF 24 | 13 | 9 | 88 | 74 |
| DG 815 | 92 | 50 | 34 | 9 | M12x1.5 | AF 27 | 40 | - | - | - |
| DG 819-21 | 70 | 23.3 | 24 | 9 | M12x1.5 | AF 24 | - | - | - | - |
| DG 819-22 | 71 | 23.3 | 24 | 9 | M12x1.5 | AF 24 | - | - | - | - |

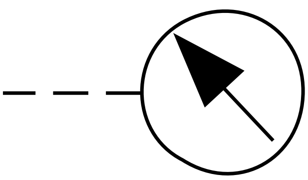
## Measurements in inch

| Type | A | B | C | D | E | F mm | G | H | I | K |
|---|---|---|---|---|---|---|---|---|---|---|
| DG 100 / 101* | 1.97 / 3.31* | 2.52 | 1.18 | 0.51 | G¼ | 14 | 0.13 | 0.39* | - | - |
| DG 902 | 2.99 | 1.97 | 2.20 | 0.39 | G¼ | 21 | 0.73 | 0.79 | 1.34 | 1.18 |
| DG 200 | 1.85 / 2.32* | 1.61 | 1.02 / 0.94* | 0.47 | M12x1.5 | 14 / 12* | 0.20 | 0.35* | - | - |
| DG 813 | 2.17 | 0.92 | 0.94 | 0.35 | M12x1.5 | AF 24 | 0.51 | 0.35 | 3.46 | 2.91 |
| DG 815 | 3.62 | 1.97 | 1.34 | 0.35 | M12x1.5 | AF 27 | 1.57 | - | - | - |
| DG 819-21 | 2.76 | 0.92 | 0.94 | 0.35 | M12x1.5 | AF 24 | - | - | - | - |
| DG 819-22 | 2.80 | 0.92 | 0.94 | 0.35 | M12x1.5 | AF 24 | - | - | - | - |

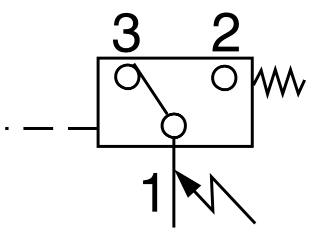
* Bottom fitting

## Symbols

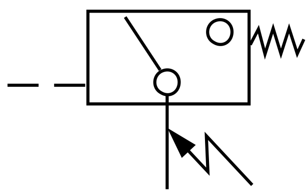
1



2




3



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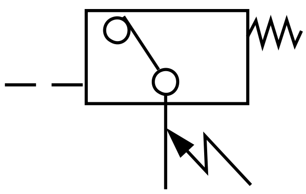
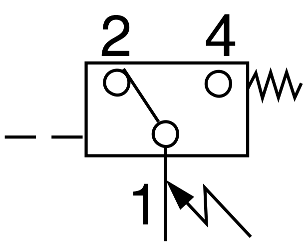
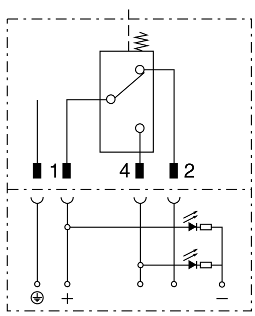


5

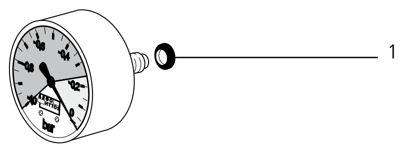



6

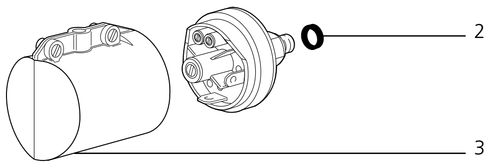


## Spare Parts

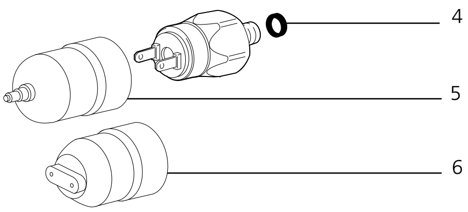
**DG 100**
**DG 101**



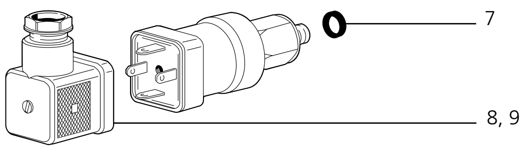

**DG 902**



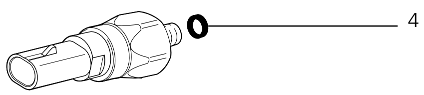

**DG 813**




**DG 815**




**DG 819**




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Seal | DG 100.0101 |
| 2 | Seal | DG 902.0103 |
| 3 | Protection cap | DG 902.1701 |
| 4 | Seal * A12 x 15.5<br>DIN 7603-Cu | 11049900 |
| 5 | Protection cap * | DG 813.0701 |
| 6 | Protection cap * | DG 813.0702 |
| 7 | Seal  A12 x 17<br>DIN 7603-Cu | 11164200 |
| 8 | Socket<br>DIN 43650 - AF3 | DG 041.1220 |
| 9 | Socket with 2 LED<br>DIN 43650 - AF3 | DG 041.1200 |

*Not included in basic unit

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

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

Clogging Indicators

# DG 023 · DG 024 · DG 041 · DG 042

for Pressure and High Pressure Filters · Operating pressure up to 450 bar / 5627 psi · Response / switching pressure up to 5.0 bar / 73 psi

Clogging Indicators

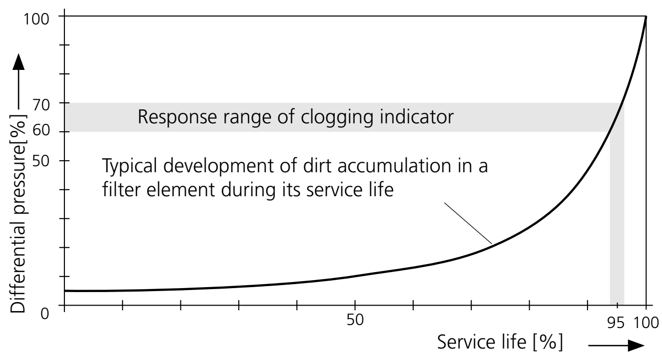
## Description

### Application

Monitoring the contamination of pressure and high pressure filters.

### General

Filter elements installed in hydraulic filters remove dirt from a hydraulic system and therefore become contaminated themselves. Free pores or spaces in the filter material are obstructed by dirt particles, which causes a continuous increase in the pressure loss.




The dirt load collected in a filter element gradually increases during service, which also leads to a higher pressure drop. The resulting differential pressure Δp is monitored by a clogging indicator. Once a preset value is reached, an electrical and / or optical signal is generated.
The following must be observed in this context:
The pressure drop caused by the filter element increases depending on the flow rate, the dirt load, and the viscosity of the pressure fluid.
Therefore, a filter element is not regarded contaminated before the clogging indicator responds at operating temperature of the hydraulic system, causing a continuous signal.

### Consequences of an overdue filter element change

*For filters equipped with a bypass valve:*
The more dirt has collected in the filter element, the more frequently the bypass valve opens and part of the hydraulic fluid remains unfiltered. The high pressure loss causes unnecessary power consumption.

*For filters without a bypass valve:*
The increasing pressure loss across the filter element, which reduces the efficiency of the hydraulic system, eventually causes malfunctions to occur or a pressure relief valve to respond.

### Design and principle of operation

Within the clogging indicator, the differential pressure $\Delta p = p_1 - p_2$ (pressure upstream of the element minus pressure downstream of the element) caused by the filter element acts on a magnetic piston against the force of a spring.
In optical (mechanical) clogging indicators, the increasing differential pressure causes the piston to approach a second magnet with reversed polarity which in turn causes the indicator to change from green to red.
In electrical clogging indicators, the magnetic piston triggers a reed switch.

### Special design features

*Piston seal:*
The piston actuated by the differential pressure is equipped with a leak-free O-ring seal. As a result, the total flow passes the filter element.

*Proximity position sensing:*
Piston movement is detected by sensing a magnetic field, i.e. without mechanical contact. For this reason, ARGO-HYTOS clogging indicators are absolutely leakfree.

## Characteristics

### Operating pressure

0 ... 315 bar / 4570 psi, min. $10^7$ pressure cycles
Nominal pressure according to DIN 24550

0 ... 450 bar / 6527 psi, min. $10^4$ pressure cycles
Quasi-static operating pressure

### Connection

For the flange hole layout please refer to the section Dimensions (other fittings on request).

### Hydraulic fluids

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

### Temperature range of fluids

-30 °C ... +100 °C (short term +125 °C)
-22 °F ... +212 °F (short term +257 °F)

### Ambient temperature range

-30 °C ... + 80 °C
-22 °F ... +176 °F

### Materials

| | |
|---|---|
| Housing: | Aluminum alloy |
| Piston: | Brass |
| Socket: | Polyamide |
| Display piece DG 042: | Polyamide |
| Seals: | NBR (FPM on request) |

### Operating voltage

10 ... 30 V DC
(only required for clogging indicators with built-in LEDs).

### Electrical service life

Min. $10^7$ switching cycles

### Electrical protection

IP 65 (with mounted and secured socket)

### Mounting position

No limitation

## Overview of types

**DG 042 - Optical differential pressure indicator**

*Function:*
When the preset differential pressure is reached, the optical indicator changes from green to red. If the pressure differential returns to a value below the preset limit, the indicator changes back to green, i.e. no manual reset of the indicator is required.

**DG 041-Electrical differential pressure switch (change-over)**

*Function:*
When the preset differential pressure is reached, the built-in Reed switch changes over.
The change-over (CO) switch makes it possible to indicate a broken wire by means of a suitable electronic circuit, as compared to a make contact (normally open NO) switch.

*Option:*
The transparent socket with 2 built-in LEDs makes it possible to have an additional optical indication of the filter contamination. When the operating voltage is switched on, a green LED lights up. When the switching pressure is reached, a yellow LED lights up in addition.

**DG 023 - Electrical differential pressure switch with temperature suppression (change-over)**

*Function:*
The built-in Reed switch changes over when the preset differential pressure is exceeded.
If the temperature drops below 32 °C / 90 °F, a temperature switch opens and suppresses the signal of the differential pressure switch.
The transparent socket with 2 built-in LEDs makes it possible to have an additional optical indication of the filter contamination (function described at DG 041).

**DG 024 - Electrical differential pressure switch with 2 switching points (break)**

*Function:*
When 70% of the preset differential pressure is reached, the first Reed switch opens, at 100% the second built-in Reed switch opens.

*Note:*
Since the differential pressure of a filter element rises at an exponential rate towards the end of the element's service life (refer to the Description section), approximately 95% of the service life has expired when the first Reed contact opens (at 70% of $\Delta p$ setting).

## Selection Chart

| Part no. | Optical indicator | Electrical switch | Temperature suppression < +32 °C / + 90 °F $S_1$ | Response/switching pressure $S_2$/$S_3$ | | Type of contact | Switching voltage U | Switching current I | Switching power P | Symbol | Weight | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | bar | psi | | V AC/DC | A AC/DC | VA/W AC/DC | | kg | lbs | |
| 1 | 2 | 3 | 4 | 5 | | 6 | 7 | 8 | 9 | 10 | 11 | | 12 |
| **DG 042-01**[1] | • | - | - | 2.0 | 29 | - | - | - | - | 1 | 0.17 | 0.37 | - |
| **DG 042-02**[1] | • | - | - | 5.0 | 73 | - | - | - | - | 1 | 0.17 | 0.37 | - |
| DG 041-61 | - | • | - | 1.2 | 17 | change-over | 120/175 | 0.17/0.25 | 3.5/5.0 | 2 | 0.19 | 0.42 | with socket |
| **DG 041-31**[1] | - | • | - | 2.0 | 29 | change-over | 120/175 | 0.17/0.25 | 3.5/5.0 | 2 | 0.19 | 0.42 | with socket |
| DG 041-44 | • | • | - | 2.0 | 29 | change-over | - /30 | - /0.25 | - /3.0 | 3 | 0.19 | 0.42 | with socket |
| **DG 041-32**[1] | - | • | - | 2.5 | 36 | change-over | 120/175 | 0.17/0.25 | 3.5/5.0 | 2 | 0.19 | 0.42 | with socket |
| **DG 041-33**[1] | - | • | - | 5.0 | 73 | change-over | 120/175 | 0.17/0.25 | 3.5/5.0 | 2 | 0.19 | 0.42 | with socket |
| DG 041-43 | • | • | - | 5.0 | 73 | change-over | - /30 | - /0.25 | - /3.0 | 3 | 0.19 | 0.42 | with socket |
| DG 023-03 | • | • | • | 2.0 | 29 | change-over | - /30 | - /0.25 | - /3.0 | 4 | 0.34 | 0.75 | with socket |
| DG 023-02 | • | • | • | 5.0 | 73 | change-over | - /30 | - /0.25 | - /3.0 | 4 | 0.34 | 0.75 | with socket |
| DG 024-02 | - | • | - | 3.5/5.0 | 51/73 | break | 120/175 | 0.17/0.25 | 3.5/5.0 | 5 | 0.27 | 0.60 | with socket |

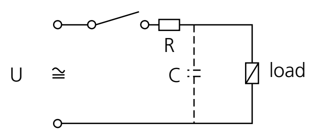
[1] Preferred type, no minimum order quantity required

**Remarks:**

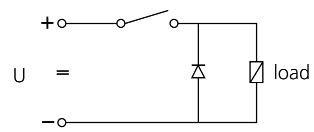
- The response / switching pressure of the clogging indicator must be lower than the cracking pressure of the bypass valve of the filter.
- The clogging indicators listed in this chart are standard units. Other designs available on request.
- Mounting accessories are not included in the scope of delivery and must be ordered separately (Part-no. see spare parts).
- Reed switches are sensitive of excessively strong currents. Even a short-term overload causes an increased contact resistance or failure of the switch. By taking the following precautions, premature failure of Reed switches due to overload is avoided.

## Wiring suggestions

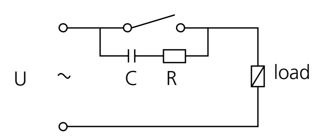
*Current limiter for DC and AC voltage:*
If light bulbs or other loads are connected over long distances (conductor capacity!), a protective resistor should be connected in series in order to limit the current. The same applies when capacitance loads are connected.




*Spark suppression in DC applications:*
The contacts of Reed switches open extremely fast, causing voltage peaks to be induced when switching off inductive loads, such as relays, lifting magnets, or solenoid valves. The resulting self-induction currents are short-circuited by connecting a diode in parallel to the inductive load.

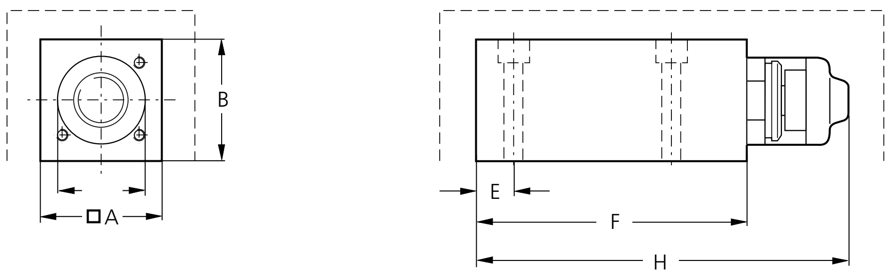



*Spark suppression in AC applications:*
In AC applications, a diode connected in parallel to the load is not sufficient. RC elements should be used here, connected in parallel to the Reed switch. Please contact our design engineers for advice in order to select a suitable RC element.

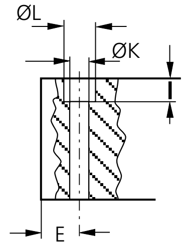


## Dimensions

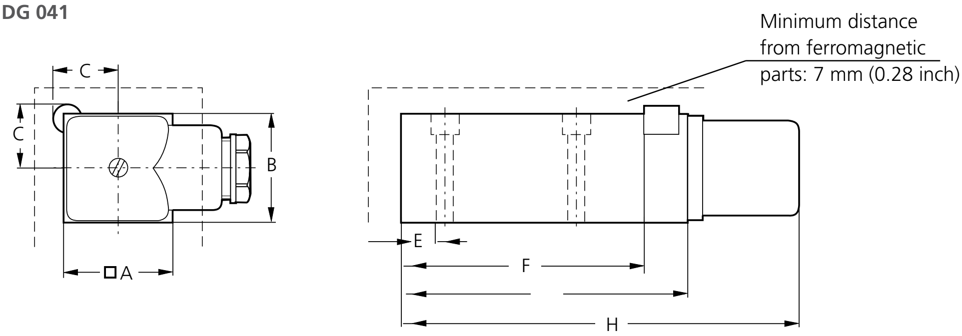
DG 042



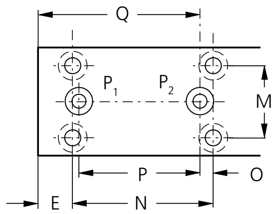

Mounting holes



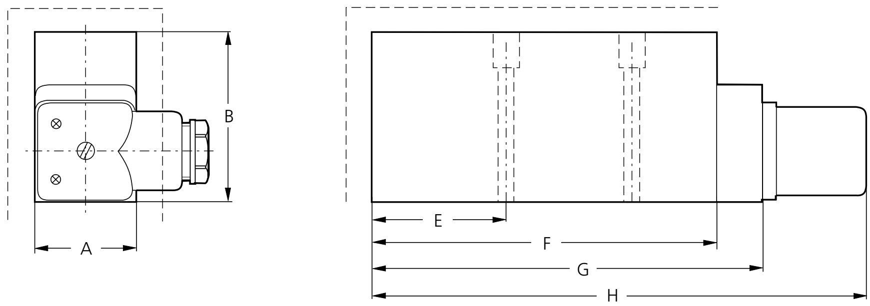

DG 041



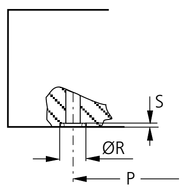

Flange hole layout




DG 023 / DG 024




Holes $P_1$ / $P_2$
$p_1$ = Higher static pressure
$p_2$ = Lower static pressure




## Measurements in mm

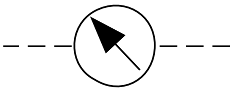
| Type | A | B | C | E | F | G | H | I | K | L | M | N | O | P | Q | R | S | T | U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DG 042 | 30 | 30 | 21.5 | 8 | 67 | - | 93 | 6 | 4.5 | 8 | 20 | 39 | 3 | 34 | 44 | 7.2 | 1.1 | M4 | 6 |
| DG 041 | 30 | 30 | 17.5 | 11 | 70 | 83 | 115 | 6 | 4.5 | 8 | 20 | 39 | 3 | 34 | 47 | 7.2 | 1.1 | M4 | 6 |
| DG 023 | 30 | 50 | - | 12 | 76 | 88 | 121 | 6 | 4.5 | 8 | 20 | 39 | 3 | 34 | 48 | 7.2 | 1.1 | M4 | 6 |
| DG 024 | 30 | 35 | - | 9 | 77 | 89 | 122 | 11 | 4.5 | 8 | 20 | 39 | 3 | 34 | 45 | 7.2 | 1.1 | M4 | 6 |

## Measurements in inch

| Type | A | B | C | E | F | G | H | I | K | L | M | N | O | P | Q | R | S | T mm | U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DG 042 | 1.18 | 1.18 | 0.85 | 0.31 | 2.64 | - | 3.66 | 0.24 | 0.18 | 0.31 | 0.79 | 1.54 | 0.12 | 1.34 | 1.73 | 0.28 | 0.04 | M4 | 0.24 |
| DG 041 | 1.18 | 1.18 | 0.69 | 0.43 | 2.76 | 3.27 | 4.53 | 0.24 | 0.18 | 0.31 | 0.79 | 1.54 | 0.12 | 1.34 | 1.85 | 0.28 | 0.04 | M4 | 0.24 |
| DG 023 | 1.18 | 1.97 | - | 0.47 | 2.99 | 3.46 | 4.76 | 0.24 | 0.18 | 0.31 | 0.79 | 1.54 | 0.12 | 1.34 | 1.77 | 0.28 | 0.04 | M4 | 0.24 |
| DG 024 | 1.18 | 1.38 | - | 0.35 | 3.03 | 3.50 | 4.80 | 0.43 | 0.18 | 0.31 | 0.79 | 1.54 | 0.12 | 1.34 | 1.77 | 0.28 | 0.04 | M4 | 0.24 |

## Symbols

1



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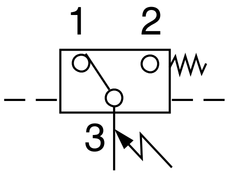


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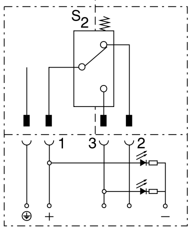

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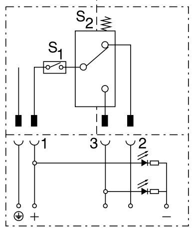

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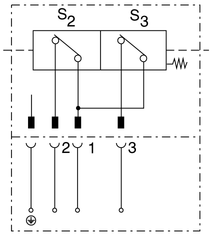
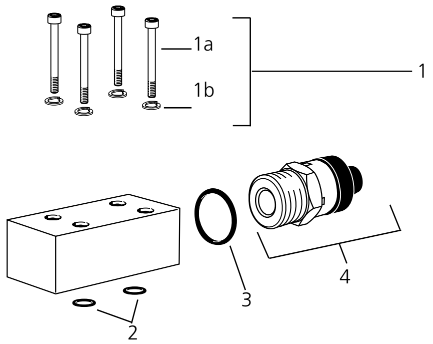
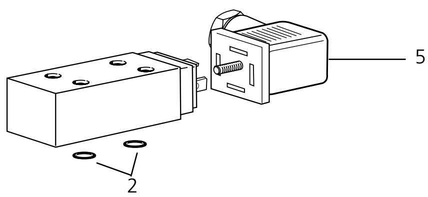


## Spare Parts

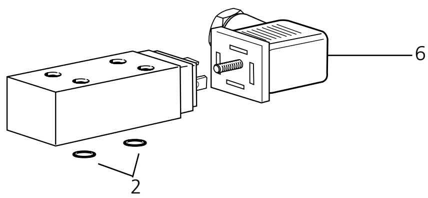



DG 042

DG 041 / DG 024




DG 023




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | Mounting accessories * for versions without temperature compensation | DG 020.1710 |
| 1 | Mounting accessories * for versions with temperature compensation | DG 020.1730 |
| 1a | Bolt* M4 x 30 DIN 912-8.8 | 11272600 |
| 1a | Bolt* M4 x 50 DIN 912-8.8 | 18077800 |
| 1b | Spring washer* B4 DIN 127 | 11272700 |
| 2 | O-ring 4.5 x 1.5 mm 0.18 x 0.06 inch | N007.0041 |
| 3 | O-ring 12.3 x 2.4 mm 0.48 x 0.09 inch | N007.0124 |
| 4 | Display piece assy (incl. pos. 3) | DG 042.1410 |
| 5 | Socket DIN 43650 - AF3 | DG 041.1220 |
| 6 | Socket with 2 LED DIN 43650 - AF3 | DG 041.1200 |

*Not included in basic unit

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

## Clogging Indicators

# DG 060 · DG 061 · DG 062 · DG 063 · DG 064

for Pressure and High Pressure Filters · Operating pressure up to 600 bar / 8702 psi· Response/switching pressure up to 5.0 bar / 73 psi

Clogging indicators
DG 062 and DG 064

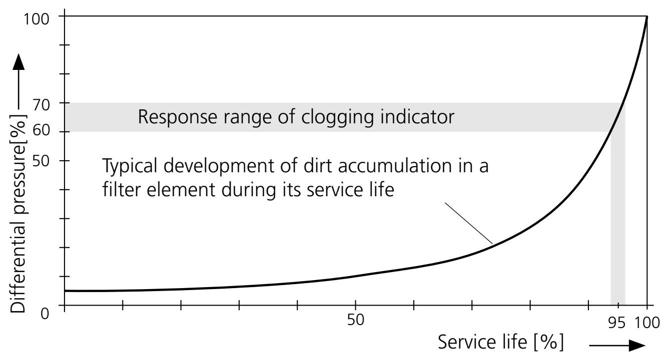
## Description

### Application

Monitoring the contamination of pressure and high pressure filters.

### General

Filter elements installed in hydraulic filters remove dirt from a hydraulic system and therefore become contaminated themselves. Free pores or spaces in the filter material are obstructed by dirt particles, which causes a continuous increase in the pressure loss.




The dirt load collected in a filter element gradually increases during service, which also leads to a higher pressure drop. The resulting differential pressure Δp is monitored by a clogging indicator. Once a preset value is reached, an electrical and / or optical signal is generated.
The following must be observed in this context:
The pressure drop caused by the filter element increases depending on the flow rate, the dirt load, and the viscosity of the pressure fluid.
Therefore, a filter element is not regarded contaminated before the clogging indicator responds at operating temperature of the hydraulic system, causing a continuous signal.

### Consequences of an overdue filter element change

*For filters equipped with a bypass valve:*
The more dirt has collected in the filter element, the more frequently the bypass valve opens and part of the hydraulic fluid remains unfiltered. The high pressure loss causes unnecessary power consumption.

*For filters without a bypass valve:*
The increasing pressure loss across the filter element, which reduces the efficiency of the hydraulic system, eventually causes malfunctions to occur or a pressure relief valve to respond.

### Design and principle of operation

Within the clogging indicator, the differential pressure $\Delta p = p_1 - p_2$ (pressure upstream of the element minus pressure downstream of the element) caused by the filter element acts on a magnetic piston against the force of a spring.
In optical (mechanical) clogging indicators, the increasing differential pressure causes the piston to approach a second magnet with reversed polarity which in turn causes the indicator to change from green to red.
In electrical clogging indicators, the magnetic piston triggers a reed switch.

### Special design features

*Piston seal:*
The piston actuated by the differential pressure is equipped with a leak-free O-ring seal. As a result, the total flow passes the filter element.

*Proximity position sensing:*
Piston movement is detected by sensing a magnetic field, i.e. without mechanical contact. For this reason, ARGO-HYTOS clogging indicators are absolutely leakfree.

## Characteristics

### Operating pressure

0 ... 420 bar / 6092 psi, min. $10^7$ pressure cycles
Nominal pressure according to DIN 24550

0 ... 600 bar / 8702 psi, min. $10^4$ pressure cycles
Quasi-static operating pressure

### Connection

Profiled bore, see section Dimensions

### Hydraulic fluids

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

### Temperature range of fluids

-30 °C ... +100 °C (short term +125 °C)
-22 °F ... +212 °F (short term +257 °F)

### Ambient temperature range

-30 °C ... + 80 °C
-22 °F ... +176 °F

### Materials

| | |
|---|---|
| Housing: | Stainless steel |
| Piston: | Polyamide |
| Socket: | Polyamide |
| Display piece DG 062 / DG 064 | Polyamide |
| Seals: | NBR (FPM on request) |

### Operating voltage

max. 48 V DC

### Electrical service life

$10^7$ switching cycles

### Electrical protection

IP 67 (in connected condition) for DG 060, DG 061, DG 062.

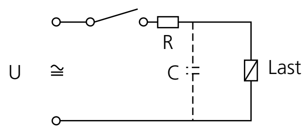
Exception: IP 65 (with mounted and secured socket) for versions with connector socket according to DIN EN 175301-803.

### Mounting position

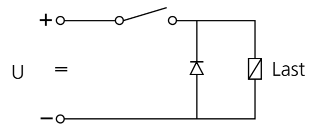
No limitation

## Wiring suggestions

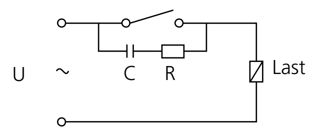
*Current limiter for DC and AC voltage:*
If light bulbs or other loads are connected over long distances (conductor capacity!), a protective resistor should be connected in series in order to limit the current.
The same applies when capacitance loads are connected.




*Spark suppression in DC applications:*
The contacts of Reed switches open extremely fast, causing voltage peaks to be induced when switching off inductive loads, such as relays, lifting magnets, or solenoid valves.
The resulting self-induction currents are short-circuited by connecting a diode in parallel to the inductive load.




*Spark suppression in AC applications:*
In AC applications, a diode connected in parallel to the load is not sufficient.
RC elements should be used here, connected in parallel to the Reed switch.
Please contact our design engineers for advice in order to select a suitable RC element.



## Overview of types

**DG 063 - Optical differential pressure indicator with automatic reset**

*Function:*
When the preset differential pressure is reached, the optical indicator changes from green to red. If the pressure differential returns to a value below the preset limit, the indicator changes back to green, i.e. no manual reset of the indicator is required.

**DG 064 - Optical differential pressure indicator with manual reset**

*Function:*
When the preset differential pressure is reached, a red pin retracts from the hole of the indication.
If the pressure differential returns to a value below the preset limit, the pin does not disappear automatically.
Due to the fitted resting function, a manual reset of the indicator is required.

**DG 060 - Electrical differential pressure switch (make)**

*Function:*
The built-in Reed switch closes when the preset differential pressure is reached.

**DG 061 - Electrical differential pressure switch (break)**

*Function:*
The built-in Reed switch opens when the preset differential pressure is reached.

**DG 062 - Electrical differential pressure switch (change-over)**

*Function:*
When the preset differential pressure is reached, the built-in Reed switch changes over.
The change-over (CO) switch makes it possible to indicate a broken wire by means of a suitable electronic circuit, as compared to a make contact (normally open NO) switch.

*Option:*
For versions with connector plug according to DIN EN 175301-803 and symbol 6, a transparent socket with 2 built-in LEDs is available. This socket makes it possible to have an additional optical indication of the filter contamination.
When the operating voltage is switched on, a green LED lights up. When the switching pressure is reached, a yellow LED lights up in addition.

## Selection Chart

| Part No. | Code | Optical indicator | Electrical indicator | Response/switching pressure | | Type of contact | Switching voltage U | Switching current I | Switching power P | Symbol | Weight | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | bar | psi | | V AC/DC | A AC/DC | VA/W AC/DC | | kg | lbs | |
| 1 | 2 | 3 | 4 | 5 | | 6 | 7 | 8 | 9 | 10 | 11 | | 12 |
| DG 063-02 | OD1 | • | - | 2.0 | 29 | - | - | - | - | 1 | 0.09 | 0.20 | automatic reset |
| DG 063-05 | OD1 | • | - | 5.0 | 73 | - | - | - | - | 1 | 0.09 | 0.20 | automatic reset |
| | | | | | | | | | | | | | |
| **DG 064-02**[1] | OD2 | • | - | 2.0 | 29 | - | - | - | - | 2 | 0.09 | 0.20 | manual reset |
| **DG 064-05**[1] | OD2 | • | - | 5.0 | 73 | - | - | - | - | 2 | 0.09 | 0.20 | manual reset |
| | | | | | | | | | | | | | |
| DG 060-31 | ED2 | - | • | 2.0 | 29 | make | 48/48 | 0.5/0.5 | 10/10 | 3 | 0.09 | 0.20 | AMP Superseal-2P[2] |
| DG 060-21 | ED5 | - | • | 2.0 | 29 | make | 48/48 | 0.5/0.5 | 10/10 | 3 | 0.09 | 0.20 | Deutsch DT04-2P[2] |
| DG 060-30 | ED2 | - | • | 5.0 | 73 | make | 48/48 | 0.5/0.5 | 10/10 | 3 | 0.09 | 0.20 | AMP Superseal-2P[2] |
| DG 060-20 | ED5 | - | • | 5.0 | 73 | make | 48/48 | 0.5/0.5 | 10/10 | 3 | 0.09 | 0.20 | Deutsch DT04-2P[2] |
| | | | | | | | | | | | | | |
| DG 061-31 | ED3 | - | • | 2.0 | 29 | break | 48/48 | 0.5/0.5 | 10/10 | 4 | 0.09 | 0.20 | AMP Superseal-2P[2] |
| DG 061-21 | ED6 | - | • | 2.0 | 29 | break | 48/48 | 0.5/0.5 | 10/10 | 4 | 0.09 | 0.20 | Deutsch DT04-2P[2] |
| DG 061-30 | ED3 | - | • | 5.0 | 73 | break | 48/48 | 0.5/0.5 | 10/10 | 4 | 0.09 | 0.20 | AMP Superseal-2P[2] |
| DG 061-20 | ED6 | - | • | 5.0 | 73 | break | 48/48 | 0.5/0.5 | 10/10 | 4 | 0.09 | 0.20 | Deutsch DT04-2P[2] |
| | | | | | | | | | | | | | |
| **DG 062-04**[1] | ED9 | - | • | 2.0 | 29 | change-over | 48/48 | 0.5/0.5 | 10/10 | 5 | 0.09 | 0.20 | DIN EN 175301-803[2] |
| **DG 062-05**[1] | ED8 | - | • | 2.0 | 29 | change-over | 48/48 | 0.5/0.5 | 10/10 | 6 | 0.09 | 0.20 | DIN EN 175301-803[2] |
| **DG 062-01**[1] | ED9 | - | • | 5.0 | 73 | change-over | 48/48 | 0.5/0.5 | 10/10 | 5 | 0.09 | 0.20 | DIN EN 175301-803[2] |
| **DG 062-02**[1] | ED8 | - | • | 5.0 | 73 | change-over | 48/48 | 0.5/0.5 | 10/10 | 6 | 0.09 | 0.20 | DIN EN 175301-803[2] |
| | | | | | | | | | | | | | |
| **DG 062-31**[1] | ED4 | - | • | 2.0 | 29 | change-over | 48/48 | 0.5/0.5 | 10/10 | 7 | 0.09 | 0.20 | AMP Superseal-3P[2] |
| **DG 062-21**[1] | ED7 | - | • | 2.0 | 29 | change-over | 48/48 | 0.5/0.5 | 10/10 | 8 | 0.09 | 0.20 | Deutsch DT04-3P[2] |
| DG 062-41 | ED1 | - | • | 2.0 | 29 | change-over | 48/48 | 0.5/0.5 | 10/10 | 9 | 0.09 | 0.20 | M12 x 1-4P[2] |
| **DG 062-30**[1] | ED4 | - | • | 5.0 | 73 | change-over | 48/48 | 0.5/0.5 | 10/10 | 7 | 0.09 | 0.20 | AMP Superseal-3P[2] |
| **DG 062-20**[1] | ED7 | - | • | 5.0 | 73 | change-over | 48/48 | 0.5/0.5 | 10/10 | 8 | 0.09 | 0.20 | Deutsch DT04-3P[2] |
| DG 062-40 | ED1 | - | • | 5.0 | 73 | change-over | 48/48 | 0.5/0.5 | 10/10 | 9 | 0.09 | 0.20 | M12 x 1-4P[2] |

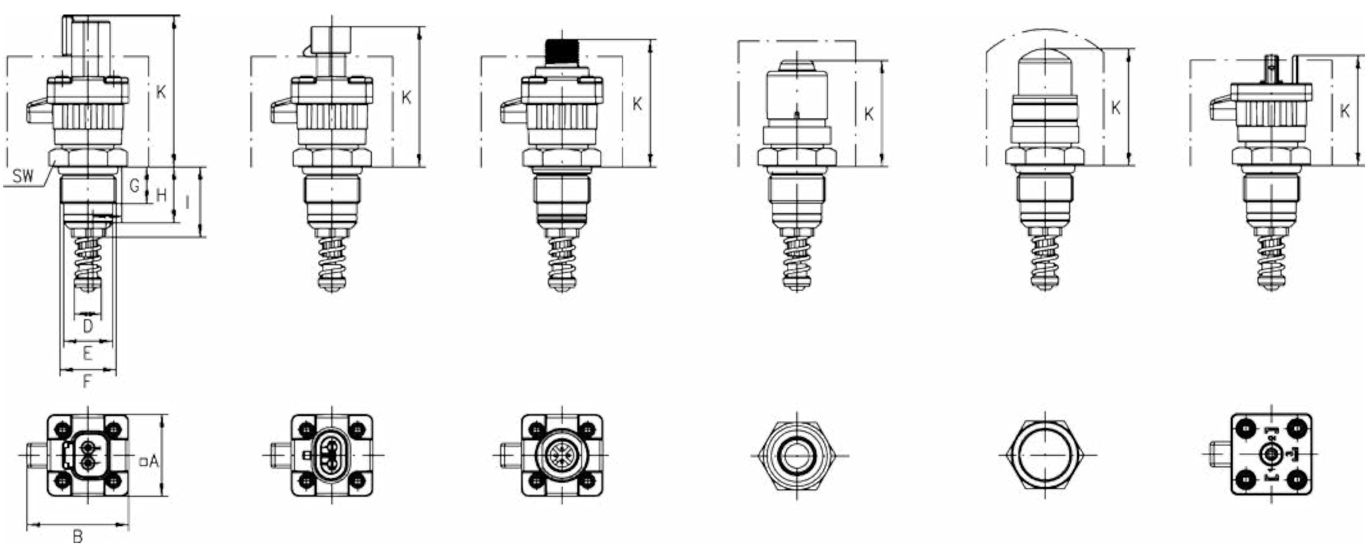
[1] Preferred type, no minimum order quantity required
[2] Design of the connector plug - connector socket not included in the scope of delivery.

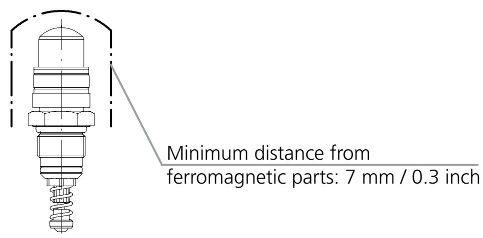
**Remarks:**

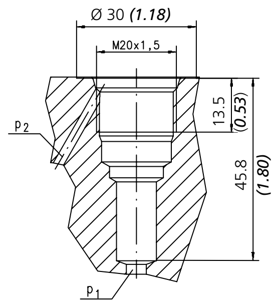
- The response / switching pressure of the clogging indicator must be lower than the cracking pressure of the bypass valve of the filter.
- Reed switches are sensitive of excessively strong currents. Even a short-term overload causes an increased contact resistance or failure of the switch. By taking the precautions described in paragraph wiring suggestions, premature failure of Reed switches due to overload is avoided.
- Although reed switches have a high shock resistance, falling onto a hard surface can cause stress that results in misalignment of the contacts. In order to avoid this, in particular the electrical clogging indicators should be transported professionally and protected against falling down.
- The clogging indicators listed in this chart are standard units. Other designs available on request.

## Dimensions

DT04 -2P/-3P | AMP -2P/-3P | M12 x 1-4P | DG 063 (autom. RS) | DG 064 (man. RS) | DIN EN 175301-803




All for processing necessary measurements and tolerances are available on request.

## Measurements in mm

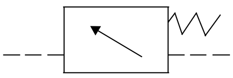
| Type | A | B | D | E | F | G | H | I | K | AF |
|---|---|---|---|---|---|---|---|---|---|---|
| DT04 -2P/-3P | ☐ 29 | 36.5 | 9.7 | 17.5 | M20 x 1.5 | 13 | 20 | 25 | 55 | 24 |
| AMP -2P/-3P | ☐ 29 | 36.5 | 9.7 | 17.5 | M20 x 1.5 | 13 | 20 | 25 | 50 | 24 |
| M12 x 1-4P | ☐ 29 | 36.5 | 9.7 | 17.5 | M20 x 1.5 | 13 | 20 | 25 | 46 | 24 |
| DG 063 | - | - | 9.7 | 17.5 | M20 x 1.5 | 13 | 20 | 25 | 37.5 | 24 |
| DG 064 | - | - | 9.7 | 17.5 | M20 x 1.5 | 13 | 20 | 25 | 41.5 | 24 |
| DIN EN 175301-803 | ☐ 29 | 36.5 | 9.7 | 17.5 | M20 x 1.5 | 13 | 20 | 25 | 39 | 24 |

## Measurements in inch

| Type | A | B | D | E | F mm | G | H | I | K | AF mm |
|---|---|---|---|---|---|---|---|---|---|---|
| DT04 -2P/-3P | ☐ 1.1 | 1.44 | 0.38 | 0.69 | M20 x 1.5 | 0.51 | 0.79 | 0.98 | 2.17 | 24 |
| AMP -2P/-3P | ☐ 1.1 | 1.44 | 0.38 | 0.69 | M20 x 1.5 | 0.51 | 0.79 | 0.98 | 1.97 | 24 |
| M12 x 1-4P | ☐ 1.1 | 1.44 | 0.38 | 0.69 | M20 x 1.5 | 0.51 | 0.79 | 0.98 | 1.81 | 24 |
| DG 063 | - | - | 0.38 | 0.69 | M20 x 1.5 | 0.51 | 0.79 | 0.98 | 1.48 | 24 |
| DG 064 | - | - | 0.38 | 0.69 | M20 x 1.5 | 0.51 | 0.79 | 0.98 | 1.63 | 24 |
| DIN EN 175301-803 | ☐ 1.1 | 1.44 | 0.38 | 0.69 | M20 x 1.5 | 0.51 | 0.79 | 0.98 | 2.54 | 24 |

## Symbols

1



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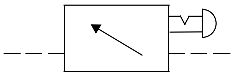

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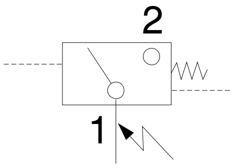


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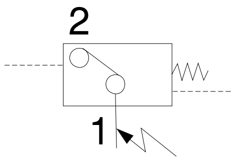


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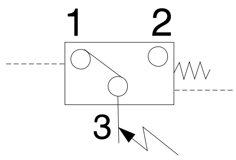


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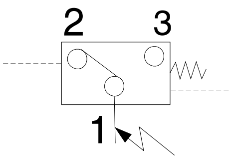


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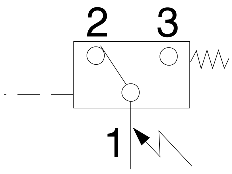


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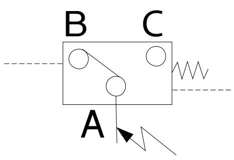


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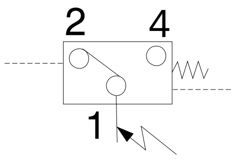
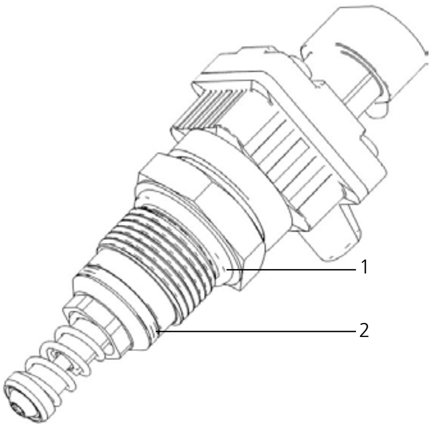



## Spare Parts




| Pos. | Designation | Part No. |
|---|---|---|
| 1 | O-ring 17.3 mm x 2.2 mm / 0.68 inch x 0.09 inch | N007.0172-4 |
| 2 | O-ring 14 mm x 1.78 mm / 0.55 inch x 0.07 inch | N007.0142 |

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

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

ARGO HYTOS

## Oil Level Dipsticks

# C4.0410 · C4.0412 · C4.0421 · C4.0431 · C4.0450 · C4.0464

With mounting bolts · Bolt thread M10 · Dipstick length up to 640 mm / 25.2 inch

Oil Level Dipstick C4.0410-00330

## Description

### Application

Controlling the oil level in hydraulic oil or lubricant reservoirs.

### Construction and function

ARGO-HYTOS oil level dipsticks are robust semicircular metal rods with an O-ring seal. A mounting bolt with a suitable hole is supplied with each dipstick. Dipsticks are available in various lengths, with various markings, and with various mounting bolts (see selection chart).

### Special features

› The robust material withstands even the most severe operating conditions.
› Absolutely leak-free due to the integrated O-ring.
› The supplied dipstick mounting bolt can also replace one of the mounting bolts of an in-tank, return or suction filter.

### Mounting

The bolt supplied with the oil level dipstick is installed either in a separate threaded hole or in an already existing mounting hole for an in-tank filter.
If used as a filter mounting bolt, a separate threaded hole is eliminated. Care should be taken to provide a proper seal between the tank, the filter and the mounting bolt.

## Selection Chart

| Part No. | Dipstick dimension L1 | | Dipstick dimension L2 | | Dipstick dimension L3 | | Mounting bolt | Grade | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | mm | inch | mm | inch | mm | inch | | | |
| 1 | 2 | | 3 | | 4 | | 5 | 6 | 7 |
| **C4.0410-00330**[1] | 100 | 3.94 | - | - | - | - | SV.2810.05 | 8.8 | - |
| C4.0410-01330 | 100 | 3.94 | 95 | 3.74 | 64 | 2.52 | SV.2810.05 | 8.8 | - |
| | | | | | | | | | |
| **C4.0412-00330**[1] | 120 | 4.72 | - | - | - | - | SV.2810.05 | 8.8 | - |
| C4.0412-03330 | 120 | 4.72 | 97 | 3.82 | 47 | 1.85 | SV.2810.05 | 8.8 | - |
| C4.0412-04330 | 120 | 4.72 | 100 | 3.94 | 75 | 2.95 | SV.2810.05 | 8.8 | - |
| | | | | | | | | | |
| **C4.0421-00330**[1] | 210 | 8.27 | - | - | - | - | SV.2810.05 | 8.8 | - |
| C4.0421-04330 | 210 | 8.27 | 118 | 4.65 | 88 | 3.46 | SV.2810.05 | 8.8 | - |
| C4.0421-06330 | 210 | 8.27 | 71 | 2.80 | 46 | 1.81 | SV.2810.05 | 8.8 | - |
| | | | | | | | | | |
| **C4.0431-00330**[1] | 310 | 12.20 | - | - | - | - | SV.2810.05 | 8.8 | - |
| C4.0431-01330 | 310 | 12.20 | 190 | 7.48 | 160 | 6.30 | SV.2810.05 | 8.8 | - |
| | | | | | | | | | |
| **C4.0450-00330**[1] | 500 | 19.68 | - | - | - | - | SV.2810.05 | 8.8 | - |
| | | | | | | | | | |
| **C4.0464-00330**[1] | 640 | 25.20 | - | - | - | - | SV.2810.05 | 8.8 | - |
| C4.0464-01330 | 640 | 25.20 | 630 | 24.80 | 90 | 3.54 | SV.2810.05 | 8.8 | - |

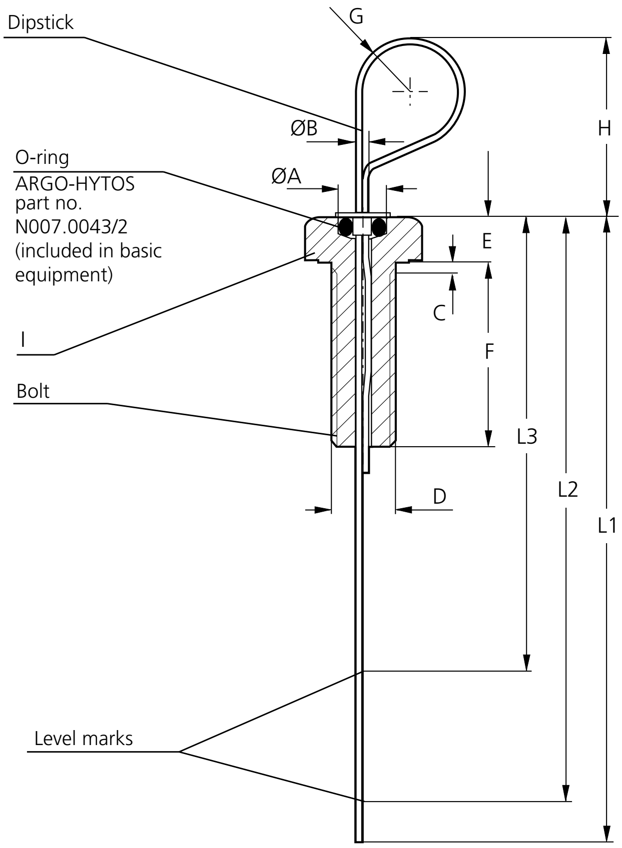
[1] Preferred type, no minimum order quantity required

**Remarks:**

The dipsticks listed in the chart are standard dipsticks. If modifications are required, e.g. for the use in pressurized tanks, we kindly ask for your request.

## Dimensions

### Dipstick with bolt




## Measurements in mm

| Mounting bolt | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| SV.2810.05 | 10 | 3.7 | 4.5 | M10 | 7 | 30 | 10 | 39 | AF 17 |

## Measurements in inch

| Mounting bolt | A | B | C | D | E | F | G | H | I<br>mm |
|---|---|---|---|---|---|---|---|---|---|
| SV.2810.05 | 0.39 | 0.15 | 0.18 | M10 | 0.28 | 1.18 | 0.39 | 1.54 | AF 17 |

## Characteristics

### Operating pressure

Max. 1 bar / 14.5 psi (abs.)
(not suitable for use in pressurized hydraulic oil tanks)

### Connection

Threaded ports according to ISO 228 or DIN 13.
Sizes see section Dimensions
(other port threads on request).

### Hydraulic fluids

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

### Temperature range

-30 °C ... +100 °C (temporary +125 °C)
-22 °F ... +212 °F (temporary +257 °F)

### Ambient temperature range

-30 °C ...+ 80 °C (temporary +100 °C)
-22 °F ... +176 °F (temporary +212 °F)

### Materials

| | |
|---|---|
| Dipsticks: | Steel, zinc plated |
| Bolts: | Steel, zinc plated |
| Seals: | NBR (FPM on request) |

### Mounting position

Preferably in vertical position

## Quality Assurance

**Quality management according to DIN EN ISO 9001**
**Various quality controls during the production process guarantee the leakfree function and solidity of our products.**

Oil Level Gauges

# C5.3511 · C5.3516 · C5.3529

Indication range up to 194 mm / 7.64 inch · With thermometer · Temperature indication up to 80 °C / 180 °F


Oil Level Gauges C5.3516-50

## Description

### Application

Indicates the oil level and the oil temperature in hydraulic oil or lubricant reservoirs.

### Design and function

ARGO-HYTOS oil level gauges consist of a robust metal housing equipped with a sight level tube and built-in thermometer. The fluid enters the thermometer chamber through the mounting bolts, which are hollow. O-rings provide a seal against the housing and the reservoir wall.

### Special features

› The robust metal housing is designed to withstand even the most severe operating conditions.
› The integrated aluminum scale comes with MIN-/MAX marking and a glass thermometer, showing the oil temperature in °C and °F.

### Mounting

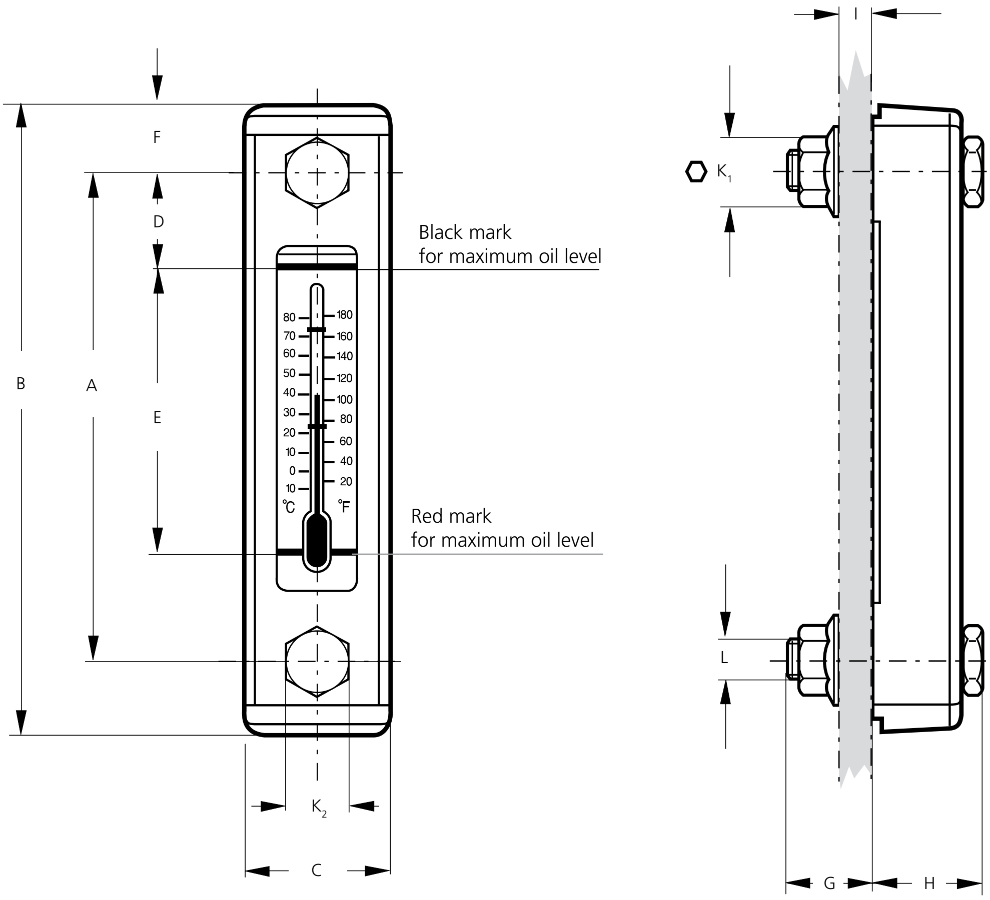
The hollow screws and the locking nuts supplied with the gauge, enable installation on the reservoir wall.
With the locking nuts, the bolts can be retightened from the outside (tightening torque: 8 Nm).
If the wall of the reservoir is more than 8 mm / 0.32 inch thick, no locking nuts are needed. Threaded holes are required instead of smooth bore holes.

## Selection Chart

| Part No. | Oil level indicating range E | | Total height B | | Temperature indicating range | | Mounting bolts | Weight | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | mm | inch | mm | inch | °C | °F | | kg | lbs | |
| 1 | 2 | | 3 | | 4 | 5 | 6 | 7 | | 8 |
| C5.3511-50 | 33 | 1.30 | 108 | 4.25 | +20 ... +80 | 80 ... 180 | M10 | 0.18 | 0.40 | - |
| C5.3516-50 | 74 | 2.91 | 159 | 6.26 | -10 ... +80 | 20 ... 180 | M12 | 0.24 | 0.53 | - |
| C5.3529-50 | 194 | 7.64 | 285 | 11.22 | -10 ... +80 | 20 ... 180 | M12 | 0.32 | 0.71 | - |

**Remarks:**
The gauges listed in the chart are standard gauges. If modifications are required, we kindly ask for your request.

## Dimensions




At the housing C5.3529-50 the vision panel is divided in two sections.

## Measurements in mm

| Type | A | B | C | D | E | F | G | H | I max.* | K1 | K2 | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C5.3511-50 | 76 | 108 | 34.5 | 22.5 | 33 | 16 | 17 | 28 | 8 | AF 15 | AF 17 | M10 |
| C5.3516-50 | 127 | 159 | 34.5 | 27.5 | 74 | 16 | 17 | 28 | 8 | AF 18 | AF 17 | M12 |
| C5.3529-50 | 254 | 286 | 34.5 | 31 | 194 | 16 | 17 | 28 | 8 | AF 18 | AF 17 | M12 |

## Measurements in inch

| Type | A | B | C | D | E | F | G | H | I max.* | K1 mm | K2 mm | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C5.3511-50 | 2.99 | 4.25 | 1.36 | 0.89 | 1.30 | 0.63 | 0.67 | 1.10 | 0.31 | AF 15 | AF 17 | M10 |
| C5.3516-50 | 5.00 | 6.26 | 1.36 | 1.08 | 2.91 | 0.63 | 0.67 | 1.10 | 0.31 | AF 18 | AF 17 | M12 |
| C5.3529-50 | 10.00 | 11.26 | 1.36 | 1.22 | 7.64 | 0.63 | 0.67 | 1.10 | 0.31 | AF 18 | AF 17 | M12 |

* With a reservoir wall thickness of more than 8 mm / 0.32 inch, threaded holes are required instead of smooth bore holes.

## Characteristics

### Operating pressure
Max. 2 bar / 29 psi (abs.)

### Connection
Threaded ports according to DIN 13. Sizes see Selection Chart, column 6 and section Dimensions.

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

### Temperature range
-20 °C ... + 80 °C
- 4 °F ... +180 °F

### Ambient temperature range
-25 °C ... + 80 °C
-13 °F ... +180 °F

### Materials
Housing: Steel, powder coated, black
Sight level tube: Polyamide
Scale: Aluminum
Thermometer: Glass
Bolts: Steel, zinc plated
Seals: NBR (FPM on request)

### Mounting position
In the min. / max. oil level range on the side wall of the hydraulic oil reservoir.

## Quality Assurance

**Quality management according to DIN EN ISO 9001**
**Various quality controls during the production process guarantee the leakfree function and solidity of our products.**

Oil Drain Valves

# AV · TV

For mobile and industrial applications · Connection up to M32 x 1.5 / R1"

Oil drain valves

## Description

### Application

Alternatively to oil drain plugs at oil tanks you can also insert ARGO-HYTOS oil drain valves of type series AV20 or TV. The oil can precisely be discharged over the drain hole into a container or be sucked off by connected oil pumps or ARGO-HYTOS oil service units. Oil change or oil service is being simplified and can be effected almost without losing any oil.
Examples for applications: Oil storage tanks in all industries, gear boxes, test benches, axles of rail vehicles.

### Design and function

ARGO-HYTOS oil drain valves consist of a housing with spindle and poppet sealing. The poppet is opened by the spindle and the oil then will be drained. Threads at the oil drain hole allow connection of oil pumps or ARGO-HYTOS oil service units.

### Special design features

- Sealing by precise steel ball
- With Type AV additional sealing of the spindle

### Fixing

At the bottom of the tank by screw connection.

### Operating pressure

Max. 1 bar / 14.5 psi absolute
(not applicable with pressurized containers)

### Connection

Threaded port – see Measurements

### Hydraulic fluids

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

### Temperature range of fluids

-30 °C … +100 °C
-22 °F … +212 °F

### Ambient temperature range

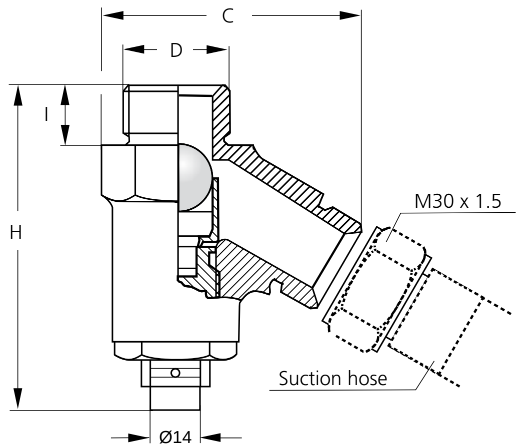
-30 °C … + 80 °C
-22 °F … +212 °F

### Materials

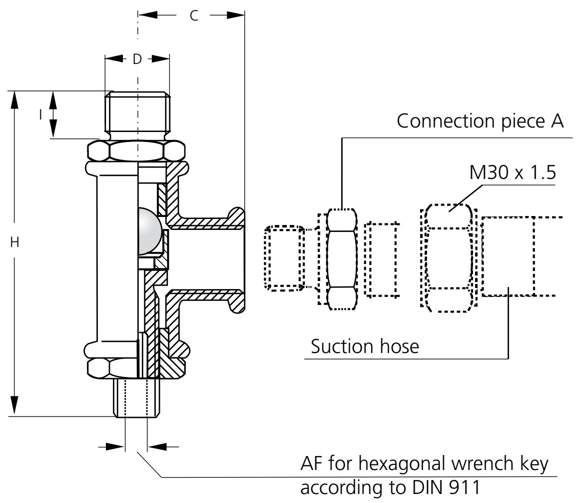
| | |
|---|---|
| Housing: | Malleable iron powder-coated |
| Spindle and ball: | steel |
| Operating position: | vertical or horizontal |

## Dimensions

### Type AV




### Type TV




## Measurements

### Type AV

| Part No. | Type | D | C | | H | | I | | AF |
|---|---|---|---|---|---|---|---|---|---|
| | | | mm | inch | mm | inch | mm | inch | mm |
| EC330400 | AV20 | M32 x 1.5 | 75 | 2.95 | 93 | 3.66 | 16 | 0.63 | 14 |
| EC330410 | AV20/1 | M30 x 1.5 | 75 | 2.95 | 93 | 3.66 | 16 | 0.63 | 14 |

### Type TV

| Part No. | Type | D | C | | H | | I | | Connection A | AF |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | mm | inch | mm | inch | mm | inch | | mm |
| EC330110 | TV R ½" | R 1/2" | 28 | 1.10 | 92 | 3.62 | 15 | 0.59 | M30 x 1.5 to R 1/2" | 6 |
| EC330120 | TV R ¾" | R 3/4" | 33 | 1.30 | 102 | 4.02 | 16 | 0.63 | M30 x 1.5 to R 3/4" | 8 |
| EC330130 | TV R1"* | R 1" | 38 | 1.50 | 125 | 4.92 | 18 | 0.71 | M30 x 1.5 to R 1" | 8 |

* For type TV R1" (EC330130), the spindle is additionally sealed with cap nut and flat gasket (not shown in drawing).

The new generation of filter elements

# EXAPOR®MAX 2

Innovation in filtration

## Description

Higher machine availability, longer service intervals and lower operating costs. These were the development goals for the new generation of filter elements.

With the introduction of EXAPOR®MAX 2, ARGO-HYTOS is opening a new chapter in filtration for hydraulic and lubrication systems.

The structure of the specially developed 3-layer filter material was designed for optimum performance, using glass and polyester fibers of different finenesses combined with an improved hybrid support fabric (patented) made of stainless steel and polyester. This sets the standard for:

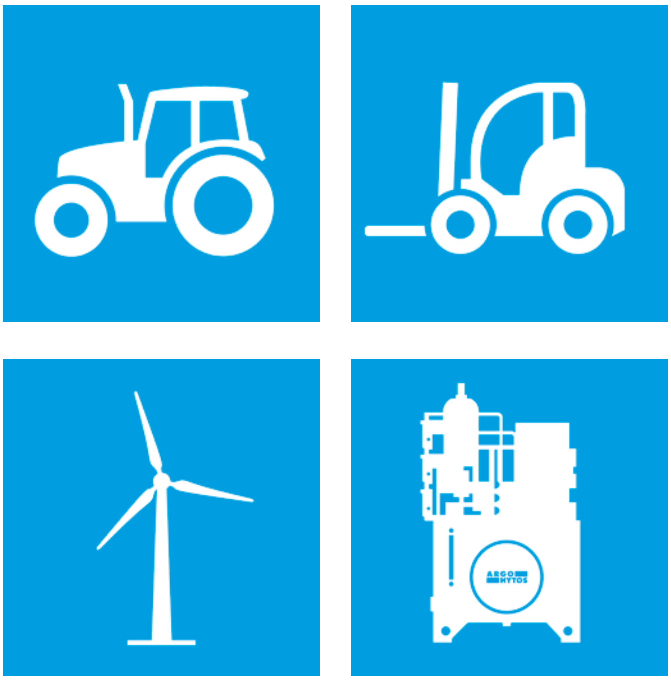
- Pressure loss
- Dirt holding capacity
- Flow fatigue stability

The plastic sleeve used on the EXAPOR®MAX 2 for the first time offers the following benefits:

- Custom label
- Protection from damage
- Improvement of flow fatigue stability

For the user, these improvements bring:

- Extended service intervals
- Higher operational reliability
- Improved oil cleanliness
- Increased performance
- Positive element identification
- Reduced operating and maintenance costs



### Extended service intervals

Higher dirt holding capacity and improved flow fatigue stability are of particular importance in achieving extended service intervals.

The new performance-oriented structure of the filter material makes a substantial contribution to improving dirt holding capacity, reducing pressure losses and improving the differential pressure stability. The improved hybrid support fabric (patented) dissipates electrostatic charge, gives the best possible flexural strength while reducing pressure losses. The plastic sleeve shrunk onto the filter bellows ensures that it tightly fits the perforated core, which has a positive effect on flow fatigue stability. These improvements make a substantial contribution to increasing the life of the filter elements.

### Higher operational reliability

When used on existing machinery with fixed service intervals, EXAPOR®MAX 2 filter elements bring greater operational reliability, minimizing the risk of sudden machine downtimes as well as reducing downtimes caused by time-consuming and expensive maintenance work.

### Improved oil cleanliness

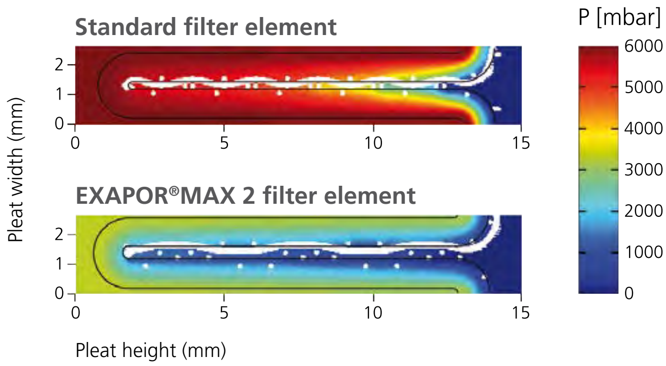
A high degree of oil cleanliness has a positive effect on both the life of components and the hydraulic medium itself. To meet rising standards, in the new generation of filter elements the filter fineness has been improved to 10 µm(c) compared with 12 µm(c) previously. The EXAPOR®MAX 2 filter elements are available in filter finenesses of 5 µm(c), 10 µm(c) and 16 µm(c).

### Positive identification of elements

The plastic sleeve used on the EXAPOR®MAX 2 filter elements can be printed as required. This substantially improves positive identification and is an important feature for building up and securing a spare part business.

### Increased performance

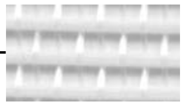
The factors that influence pressure loss could be worked out with the aid of calculations and flow simulations, and the structure of the filter material optimized accordingly. The result is a reduction in pressure losses in the pleat of up to 50% and up to 40% in the filter element. Conversely, this means that at a constant pressure loss the EXAPOR®MAX 2 filter elements can achieve a flow rate that is up to 65% higher. The substantial reduction in pressure losses allied to an improved dirt holding capacity leads to an increase in power density, so that, depending on the application, smaller filters could be used.




### Reduced operating and maintenance costs

These innovations work together to reduce operating and maintenance costs and bring about an improvement in the productivity and economy of machinery and plant.

## Schematic construction



**Plastic sleeve**

Custom label, damage protection, improved flow fatigue stability

**Hybrid support fabric (patented)**

Protection of filter materials from external mechanical damage, prevents electrostatic charge, keeps the pleats open for the free flow of hydraulic medium.

**Pre-filter layer**

Separation of coarse particles, increase in the dirt holding capacity

**Fine filter layer**

Separation of fine particles, improvement of oil cleanliness

**Protective fleece**

Protection of the fine filter layer, improved differential pressure and flow fatigue stability

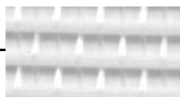


**Safety fabric**

Additional protection of the filter elements with a differential pressure stability of 160 bar / 2320 psi

**Hybrid support fabric (patented)**

Support of the filter materials, keeping the pleats open for free flow of medium. Prevents build-up of electrostatic charges, improved flow fatigue stability



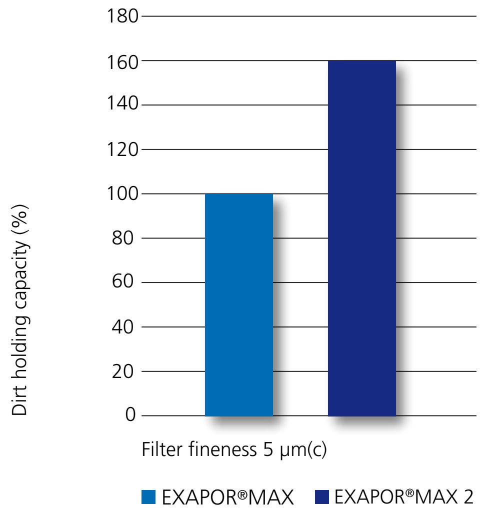
**Woven sleeve**

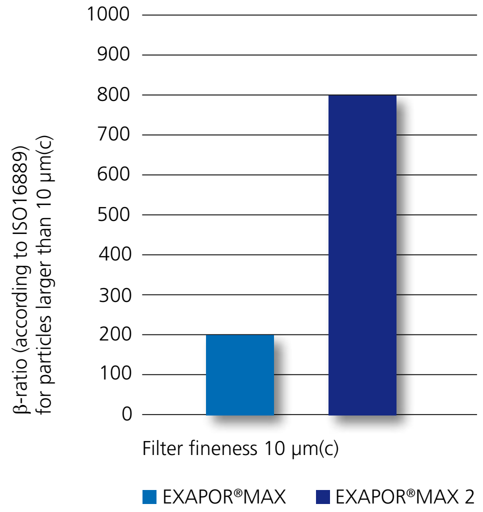
Fine wire mesh provides additional support for the pleated filter material with filter elements that have a differential pressure stability of 160 bar / 2320 psi

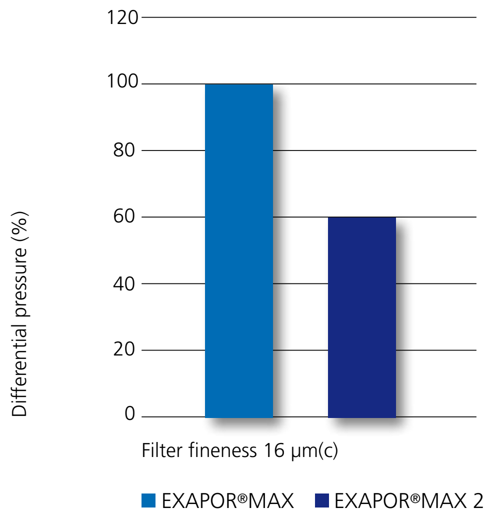
**Perforated core**

Full surface support of the pleated filter material, ensuring collapse pressure stability

## Overview of the improvements in EXAPOR®MAX 2 filter elements



ARGO HYTOS

Filter Elements

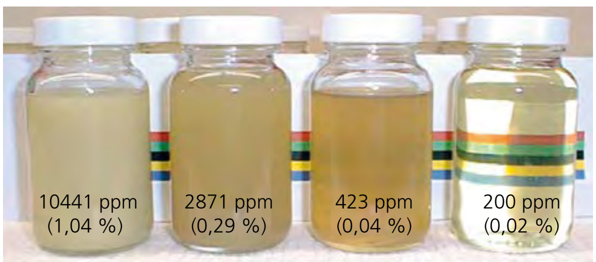
# EXAPOR®AQUA

For water separation

EXAPOR®AQUA Filter Elements

Oil Service Unit FAPC 016

Off-line Filter Unit FNA 008/016




Oil samples with varying water content

## Description

### Application

Quick and efficient dewatering of hydraulic and lubrication oils.

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

- Cooler breakage
- 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 change, 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 or with dewatering units.
At systems with hygroscopic oils (materials that absorb water are described as hygroscopic) 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 permanently installed 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. On request, also suction or return filter elements can be equipped with the EXAPOR®AQUA technology. Depending on the operating situation, the water absorption amounts to approx. 350 ml / element. The combination of water absorbing filter layers with micro-filter material also allows the use of EXAPOR®AQUA in hydraulic and lubrication systems with high requirements to the oil cleanliness.

The efficiency of the EXAPOR®AQUA can be analyzed on-site. As long as a turbidity is visible in the cooled down oil, the water content is, in most cases, 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 with the Karl Fischer method in accordance to DIN 51777).

## Selection chart

| EXAPOR®AQUA Filter element designation | Water capacity per element at ν = 30 mm²/s / 139 SUS | | Filter fineness | Dirt-holding capacity (values in g test dust ISO MTD according to ISO 16889) | | | Applicable in ARGO-HYTOS filter units |
|---|---|---|---|---|---|---|---|
| | ml | gal | | | l/min | gpm | |
| Y7.1560-05 | 1520 | 0.40 | 7 µm | 590 g at | 45 | 11.9 | FNA 045, UM 045, UMPC 045 |
| Y7.1220-113 | 340 | 0.09 | 3 µm | 64 g at | 60 | 15.9 | FA 008, FA 016, FAPC 016, FNA 008, FNA 016 (with filter element size V7.1220) |
| Y7.1220-05 | 370 | 0.10 | 7 µm | 44 g at | 60 | 15.9 | FA 008, FA 016, FAPC 016, FNA 008, FNA 016 (with filter element size V7.1220) |
| Y7.1230-153 | 520 | 0.14 | 3 µm | 130 g at | 60 | 15.9 | FN 060, FNS 060, FNA 040 |

# EXAPOR®SPARK PROTECT

For protection against electrostatic discharges

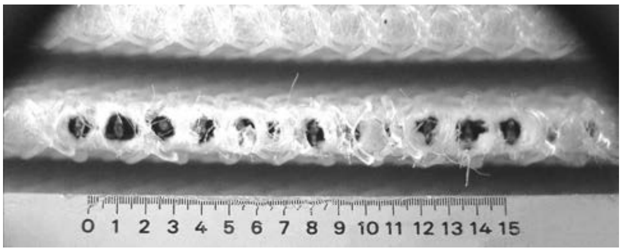
**The new EXAPOR®SPARK PROTECT filter elements combine the well-known high performance characteristics with 100% protection against electrostatic discharges.**

When using modern hydraulic oils as e.g. highly refined or biologically degradable oils, it should be taken into account that these oils are zinc and ash-free in most cases, so that they possess hardly any or just a low electrostatic conductivity, often a lot lower than 500 pS/m.

This can lead to a charge separation within the hydraulic system caused by friction, which allows an electrostatic charge in the filter element to increase to such dimensions that flashes of several thousand volts might appear.

### Consequences of electrostatic discharges

- Sudden discharges which may destruct the filter material layers and also the electric components
- High temperatures, caused by flashes, lead to increased oil aging, thus to a deterioration of the oil characteristics and to reduced oil lifetime
- Earlier contamination of filter elements due to oil aging products
- Higher wear and hydraulic components failures




Damages at the filter material caused by electrostatic discharges

Oil aging products at tube bundles of an oil cooler

### The new element technology

The filter elements with the designation EXAPOR®SPARK PROTECT have especially been developed for non-conductive or low-conductive hydraulic fluids and provide a controlled charge balance in the filter material, so that the oil within the filter element is not exposed to an additional electrostatic charge.

Regarding the construction no further measures are needed, merely the exchange of the standard filter element by the EXAPOR®SPARK PROTECT element.

### Availability and performance

The new technology is available for all filter elements of ARGO-HYTOS and does not have an influence on the performance data of the filter elements that are characterized by:

- High dirt holding capacity
- Excellent filter fineness
- Low pressure loss
- High flow fatigue resistance
- Very good media resistance

*Additional aspects:*

- 100% protection against electrostatic discharges in the filter and prevention of all related disadvantages.

*Customer benefits:*

- No destruction of the filter material layers by electrostatic discharges
- No premature oil aging due to electrostatic discharges
- Protection of electronic components against destruction or failures
- Optimum utilization of the filter life and hydraulic fluids
- No rebuilding or additional measures at already installed filters
- Higher operational safety

### ARGO-HYTOS recommends:

In case the electrostatic conductivity of the used hydraulic fluid should be

- higher than 500 pS/m at 20 °C / 68 °F, e.g. the proven EXAPOR®MAX 2 filter elements
- lower than 500 pS/m at 20 °C / 68 °F, the new EXAPOR®SPARK PROTECT filter elements

## Notes

International

# ARGO-HYTOS worldwide

| | | |
|---|---|---|
| **Benelux** | ARGO-HYTOS B. V. | info.benelux@argo-hytos.com |
| **Brazil** | ARGO-HYTOS AT Fluid Systems Ltda. | info.br@argo-hytos.com |
| **China** | ARGO-HYTOS Fluid Power Systems (Yangzhou) Co., Ltd. | info.cn@argo-hytos.com |
| | ARGO-HYTOS Fluid Power Systems (Beijing) Co., Ltd. | info.cn@argo-hytos.com |
| | ARGO-HYTOS Hong Kong Ltd. | info.hk@argo-hytos.com |
| **Czech Republic** | ARGO-HYTOS s.r.o. | info.cz@ argo-hytos.com |
| | ARGO-HYTOS Protech s.r.o. | info.protech@argo-hytos.com |
| **France** | ARGO-HYTOS SARL | info.fr@argo-hytos.com |
| **Germany** | ARGO-HYTOS GMBH | info.de@argo-hytos.com |
| **Great Britain** | ARGO-HYTOS Ltd. | info.uk@argo-hytos.com |
| **India** | ARGO-HYTOS PVT. LTD. | info.in@argo-hytos.com |
| **Italy** | ARGO-HYTOS srl | info.it@argo-hytos.com |
| **Poland** | ARGO-HYTOS Polska sp. z o.o. | info.pl@argo-hytos.com |
| **Russia** | ARGO-HYTOS LLC | info.ru@argo-hytos.com |
| **Scandinavia** | ARGO-HYTOS Nordic AB | info.se@argo-hytos.com |
| **Turkey** | ARGO-HYTOS | info.tr@argo-hytos.com |
| **USA** | ARGO-HYTOS Inc. | info.us@argo-hytos.com |