

SUCTION FILTERS

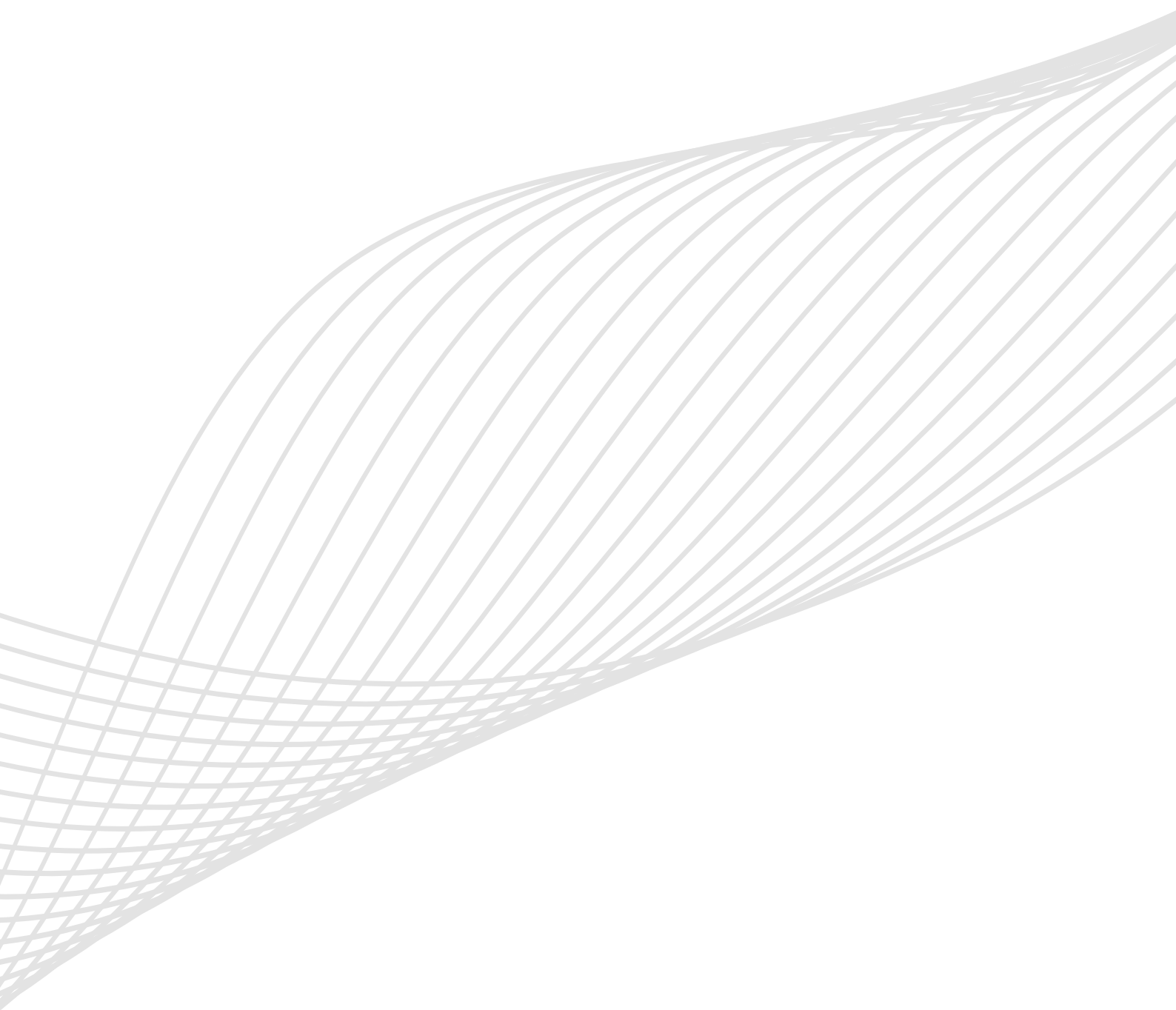
HYDRAULIC
FILTRATION

CATALOGUE



MPFILTRI®

PASSION  PERFORM



CONTAMINATION MANAGEMENT

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1 HYDRAULIC FLUIDS

The fluid is the vector that transmits power, energy within an oleodynamic circuit. In addition to transmitting energy through the circuit, it also performs additional functions such as lubrication, protection and cooling of the surfaces.

The classification of fluids used in hydraulic systems is coded in many regulatory references, different Standards.

The most important classification system for hydraulic fluids is the one defined by International Organization for Standardization (ISO), which established a classification system within their standard: "ISO 6743-4 Lubricants, Industrial Oils and Related Products". In particular, the parts of interest for hydraulic fluids are:

- Lubricants, industrial oils and related products (class L)
- Classifications - Part 4L - Family H (Hydraulic systems)

The ISO 6743-4 classification system can be generally applied to the three primary classes of hydraulic fluids:

- Mineral Oils (i.e.: petroleum) Hydraulic Fluids (i.e.: HH: Mineral lubricants without corrosion inhibitors; HL: HH-type lubricants with oxidation reduction and anticorrosive additives; HM: HL-type lubricants with anti-wear additives; HV: HM-type lubricants with a higher viscosity grade and temperature properties; and others).
- Biodegradable Hydraulic Fluids (HExx), also defined as "Environmentally acceptable hydraulic fluids".
- Fire Resistant Hydraulic Fluids (HFxx), which could be further split into: Fire-resistant aqueous fluids (HFAx, HFB; HFC); Fire-resistant synthetic anhydrous fluids (HFDx).

The choice of fluid for an hydraulic system must take into account several parameters.

These parameters can adversely affect the performance of an hydraulic system, causing delay in the controls, pump cavitation, excessive absorption, excessive temperature rise, efficiency reduction, increased drainage, wear, jam/block or air intake in the plant.

The main properties that characterize hydraulic fluids and affect their choice are:

- **DYNAMIC VISCOSITY**
It identifies the fluid's resistance to sliding due to the impact of the particles forming it.
- **KINEMATIC VISCOSITY**
It is a widespread formal dimension in the hydraulic field.
It is calculated with the ratio between the dynamic viscosity and the fluid density.
Kinematic viscosity varies with temperature and pressure variations.
- **VISCOSITY INDEX**
This value expresses the ability of a fluid to maintain viscosity when the temperature changes.
A high viscosity index indicates the fluid's ability to limit viscosity variations by varying the temperature.
- **FILTERABILITY INDEX**
It is the value that indicates the ability of a fluid to cross the filter materials.
A low filterability index could cause premature clogging of the filter material.
- **WORKING TEMPERATURE**
Working temperature affects the fundamental characteristics of the fluid.
As already seen, some fluid characteristics, such as cinematic viscosity, vary with the temperature variation.

When choosing a hydraulic oil, must therefore be taken into account of the environmental conditions in which the machine will operate.

- **COMPRESSIBILITY MODULE**
Every fluid subjected to a pressure contracts, increasing its density.
The compressibility module identifies the increase in pressure required to cause a corresponding increase in density.
- **HYDROLYTIC STABILITY**
It is the characteristic that prevents galvanic pairs that can cause wear in the plant/system.
- **ANTIOXIDANT STABILITY AND WEAR PROTECTION**
These features translate into the capacity of a hydraulic oil to avoid corrosion of metal elements inside the system.
- **HEAT TRANSFER CAPACITY**
It is the characteristic that indicates the capacity of hydraulic oil to exchange heat with the surfaces and then cool them.

2 FLUID CONTAMINATION

Whatever the nature and properties of fluids, they are inevitably subject to contamination. Fluid contamination can have two origins:

- **INITIAL CONTAMINATION**
Caused by the introduction of contaminated fluid into the circuit, or by incorrect storage, transport or transfer operations.
- **PROGRESSIVE CONTAMINATION**
Caused by factors related to the operation of the system, such as metal surface wear, sealing wear, oxidation or degradation of the fluid, the introduction of contaminants during maintenance, corrosion due to chemical or electrochemical action between fluid and components, cavitation.
The contamination of hydraulic systems can be of different nature:
- **SOLID CONTAMINATION**
For example rust, slag, metal particles, fibers, rubber particles, paint particles or additives
- **LIQUID CONTAMINATION**
For example, the presence of water due to condensation or external infiltration or acids
- **GASEOUS CONTAMINATION**
For example, the presence of air due to inadequate oil level in the tank, drainage in suction ducts, incorrect sizing of tubes or tanks.

3 FLUID COMPATIBILITY CHARTS

For more detailed information on specific fluid compatibility please refer to the fluid compatibility charts on our website:



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④ EFFECTS OF CONTAMINATION ON HYDRAULIC COMPONENTS

Solid contamination is recognized as the main cause of malfunction, failure and early degradation in hydraulic systems. It is impossible to delete it completely, but it can be effectively controlled by appropriate devices.

CONTAMINATION IN PRESENCE OF LARGE TOLERANCES



CONTAMINATION IN PRESENCE OF NARROW TOLERANCES



Solid contamination mainly causes surface damage and component wear.

- ABRASION OF SURFACES
Cause of leakage through mechanical seals, reduction of system performance, failures.
- SURFACE EROSION
Cause of leakage through mechanical seals, reduction of system performance, variation in adjustment of control components, failures.
- ADHESION OF MOVING PARTS
Cause of failure due to lack of lubrication.
- DAMAGES DUE TO FATIGUE
Cause of breakdowns and components breakdown.

ABRASION



EROSION



ADHESION



FATIGUE



Liquid contamination mainly results in decay of lubrication performance and protection of fluid surfaces.

DISSOLVED WATER

- INCREASING FLUID ACIDITY
Cause of surface corrosion and premature fluid oxidation
- GALVANIC COUPLE AT HIGH TEMPERATURES
Cause of corrosion

FREE WATER - ADDITIONAL EFFECTS

- DECAY OF LUBRICANT PERFORMANCE
Cause of rust and sludge formation, metal corrosion and increased solid contamination
- BATTERY COLONY CREATION
Cause of worsening in the filterability feature

- ICE CREATION AT LOW TEMPERATURES
Cause damage to the surface
- ADDITIVE DEPLETION
Free water retains polar additives

Gaseous contamination mainly results in decay of system performance.

- CUSHION SUSPENSION
Cause of increased noise and cavitation.
- FLUID OXIDATION
Cause of corrosion acceleration of metal parts.
- MODIFICATION OF FLUID PROPERTIES (COMPRESSIBILITY MODULE, DENSITY, VISCOSITY)
Cause of system's reduction of efficiency and of control.
It is easy to understand how a system without proper contamination management is subject to higher costs than a system that is provided.
- MAINTENANCE
Increase maintenance activities, spare parts, machine stop costs.
- ENERGY AND EFFICIENCY
Efficiency and performance reduction due to friction, drainage, cavitation.

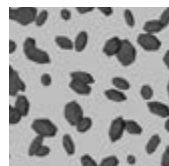
⑤ MEASURING THE SOLID CONTAMINATION LEVEL

The level of contamination of a system identifies the amount of contaminant contained in a fluid. This parameter refers to a unit volume of fluid. The level of contamination may be different at different points in the system. From the information in the previous paragraphs it is also apparent that the level of contamination is heavily influenced by the working conditions of the system, by its working years and by the environmental conditions.

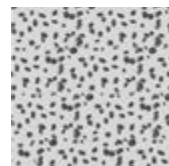
What is the size of the contaminating particles that we must handle in our hydraulic circuit?



HUMAN HAIR
(75 µm)



MINIMUM DIMENSION
VISIBLE WITH HUMAN
EYES
(40 µm)



TYPICAL CONTAMINANT
DIMENSION IN A
HYDRAULIC CIRCUIT
(4 - 14 µm)

Contamination level analysis is significant only if performed with a uniform and repeatable method, conducted with standard test methods and suitably calibrated equipment. To this end, ISO has issued a set of standards that allow tests to be conducted and express the measured values in the following ways.

- GRAVIMETRIC LEVEL - ISO 4405

The level of contamination is defined by checking the weight of particles collected by a laboratory membrane. The membrane must be cleaned, dried and desiccated, with fluid and conditions defined by the Standard. The volume of fluid is filtered through the membrane by using a suitable suction system. The weight of the contaminant is determined by checking the weight of the membrane before and after the fluid filtration.



CLEAN
MEMBRANE



CONTAMINATED
MEMBRANE

CONTAMINATION MANAGEMENT

- CUMULATIVE DISTRIBUTION OF THE PARTICLES SIZE - ISO 4406

The level of contamination is defined by counting the number of particles of certain dimensions per unit of volume of fluid. Measurement is performed by Contamination Monitoring Products (CMP).

Following the count, the contamination classes are determined, corresponding to the number of particles detected in the unit of fluid.

The most common classification methods follow ISO 4406 and SAE AS 4059 (Aerospace Sector) regulations.

NAS 1638 is still used although obsolete.

Classification example according to ISO 4406

The International Standards Organization standard ISO 4406 is the preferred method of quoting the number of solid contaminant particles in a sample. The level of contamination is defined by counting the number of particles of certain dimensions per unit of volume of fluid. The measurement is performed by Contamination Monitoring Products (CMP).

The numbers represent a code which identifies the number of particles of certain sizes in 1ml of fluid. Each code number has a particular size range. The first scale number represents the number of particles equal to or larger than 4 $\mu\text{m}_{(c)}$ per millilitre of fluid; The second scale number represents the number of particles equal to or larger than 6 $\mu\text{m}_{(c)}$ per millilitre of fluid; The third scale number represents the number of particles equal to or larger than 14 $\mu\text{m}_{(c)}$ per millilitre of fluid.

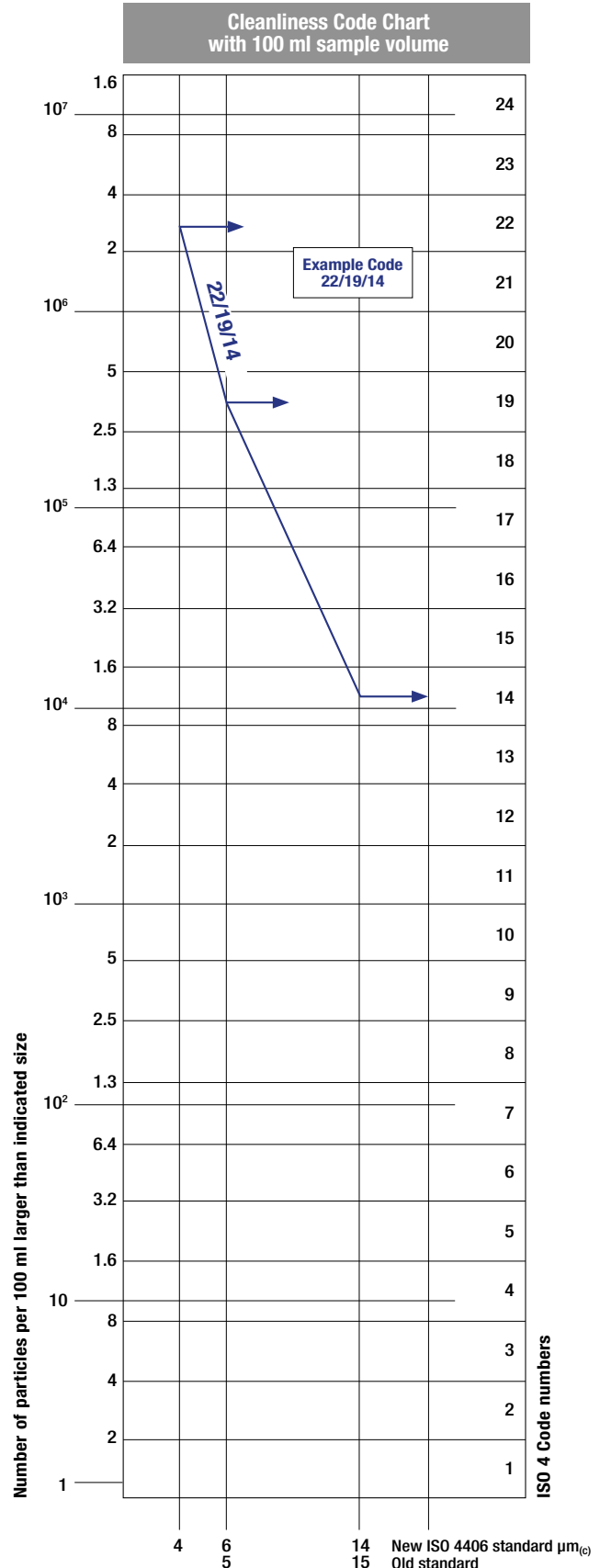
ISO 4406 - Allocation of Scale Numbers

Class	Number of particles per ml	
	Over	Up to
28	1 300 000	2 500 000
27	640 000	1 300 000
26	320 000	640 000
25	160 000	320 000
24	80 000	160 000
23	40 000	80 000
22	20 000	40 000
21	10 000	20 000
20	5 000	10 000
19	2 500	5 000
18	1 300	2 500
17	640	1 300
16	320	640
15	160	320
14	80	160
13	40	80
12	20	40
11	10	20
10	5	10
9	2.5	5
8	1.3	2.5
7	0.64	1.3
6	0.32	0.64
5	0.16	0.32
4	0.08	0.16
3	0.04	0.08
2	0.02	0.04
1	0.01	0.02
0	0	0.01

> 4 $\mu\text{m}_{(c)}$ = 350 particles
> 6 $\mu\text{m}_{(c)}$ = 100 particles
> 14 $\mu\text{m}_{(c)}$ = 25 particles
16 / 14 / 12

ISO 4406 Cleanliness Code System

Microscope counting examines the particles differently to Contamination Monitoring Products (CMP) and the code is given with two scale numbers only. These are at 5 μm and 15 μm equivalent to the 6 $\mu\text{m}_{(c)}$ and 14 $\mu\text{m}_{(c)}$ of Contamination Monitoring Products (CMP).



- CUMULATIVE DISTRIBUTION OF THE PARTICLES SIZE SAE AS4059-1 and SAE AS4059-2

Classification example according to SAE AS4059 - Rev. G

The code, prepared for the aerospace industry, is based on the size, quantity, and particle spacing in a 100 ml fluid sample. The contamination classes are defined by numeric codes, the size of the contaminant is identified by letters (A-F).

This SAE Aerospace Standard (AS) defines cleanliness levels for particulate contamination of hydraulic fluids and includes methods of reporting data relating to the contamination levels. Tables 1 and 2 below provide differential and cumulative particle counts respectively for counts obtained by an automatic particle counter, e.g. LPA3.

Table 1 - Class for differential measurement

Class	Dimension of contaminant Maximum Contamination Limits per 100 ml					(3)
	5-15 µm	15-25 µm	25-50 µm	50-100 µm	>100 µm	
	6-14 µm _(c)	14-21 µm _(c)	21-38 µm _(c)	38-70 µm _(c)	>70 µm _(c)	
00	125	22	4	1	0	(1)
0	250	44	8	2	0	(2)
1	500	89	16	3	1	
2	1 000	178	32	6	1	
3	2 000	356	63	11	2	
4	4 000	712	126	22	4	
5	8 000	1 425	253	45	8	
6	16 000	2 850	506	90	16	
7	32 000	5 700	1 012	180	32	
8	64 000	11 400	2 025	360	64	
9	128 000	22 800	4 050	720	128	
10	256 000	45 600	8 100	1 440	256	
11	512 000	91 200	16 200	2 880	512	
12	1 024 000	182 400	32 400	5 760	1 024	

6 - 14 µm _(c) = 15 000 particles
14 - 21 µm _(c) = 2 200 particles
21 - 38 µm _(c) = 200 particles
38 - 70 µm _(c) = 35 particles
> 70 µm _(c) = 3 particles
SAE AS4059 REV G - Class 6

(1) Size range, optical microscope, based on longest dimension as measured per AS598 or ISO 4407. (2) Size range CMP calibrated per ISO 11171 or an optical or electron microscope with image analysis software, based on projected area equivalent diameter. (3) Contamination classes and particle count limits are identical to NAS 1638.

Table 2 - Class for cumulative measurement

Class	Dimension of contaminant Maximum Contamination Limits per 100 ml						(1)
	>1 µm	>5 µm	>15 µm	>25 µm	>50 µm	>100 µm	
	>4 µm _(c)	>6 µm _(c)	>14 µm _(c)	>21 µm _(c)	>38 µm _(c)	>70 µm _(c)	
000	195	76	14	3	1	0	(2)
00	390	152	27	5	1	0	
0	780	304	54	10	2	0	
1	1 560	609	109	20	4	1	
2	3 120	1 217	217	39	7	1	
3	6 250	2 432	432	76	13	2	
4	12 500	4 864	864	152	26	4	
5	25 000	9 731	1 731	306	53	8	
6	50 000	19 462	3 462	612	106	16	
7	100 000	38 924	6 924	1 224	212	32	
8	200 000	77 849	13 849	2 449	424	64	
9	400 000	155 698	27 698	4 898	848	128	
10	800 000	311 396	55 396	9 796	1 696	256	
11	1 600 000	622 792	110 792	19 592	3 392	512	
12	3 200 000	1 245 584	221 584	39 184	6 784	1 024	

> 4 µm _(c) = 45 000 particles
> 6 µm _(c) = 15 000 particles
> 14 µm _(c) = 1 500 particles
> 21 µm _(c) = 250 particles
> 38 µm _(c) = 15 particles
> 70 µm _(c) = 3 particle
SAE AS4059 REV G
cpc* Class 6 6/6/5/5/4/2

* cumulative particle count

- CLASSES OF CONTAMINATION ACCORDING TO NAS 1638 (January 1964)

The NAS system was originally developed in 1964 to define contamination classes for the contamination contained within aircraft components.

The application of this standard was extended to industrial hydraulic systems simply because nothing else existed at the time.

The coding system defines the maximum numbers permitted of 100 ml volume at various size intervals (differential counts) rather than using cumulative counts as in ISO 4406. Although there is no guidance given in the standard on how to quote the levels, most industrial users quote a single code which is the highest recorded in all sizes and this convention is used on MP Filtri Contamination Monitoring Products (CMP).

The contamination classes are defined by a number (from 00 to 12) which indicates the maximum number of particles per 100 ml, counted on a differential basis, in a given size bracket.

Size Range Classes (in microns)

Maximum Contamination Limits per 100 ml					
Class	5-15	15-25	25-50	50-100	>100
00	125	22	4	1	0
0	250	44	8	2	0
1	500	89	16	3	1
2	1 000	178	32	6	1
3	2 000	356	63	11	2
4	4 000	712	126	22	4
5	8 000	1 425	253	45	8
6	16 000	2 850	506	90	16
7	32 000	5 700	1 012	180	32
8	64 000	11 400	2 025	360	64
9	128 000	22 800	4 050	720	128
10	256 000	45 600	8 100	1 440	256
11	512 000	91 200	16 200	2 880	512
12	1 024 000	182 400	32 400	5 760	1 024

5-15 µm = 42 000 particles
15-25 µm = 2 200 particles
25-50 µm = 150 particles
50-100 µm = 18 particles
> 100 µm = 3 particles
Class NAS 8

- CUMULATIVE DISTRIBUTION OF THE PARTICLES SIZE - ISO 4407

The level of contamination is defined by counting the number of particles collected by a laboratory membrane per unit of fluid volume. The measurement is done by a microscope. The membrane must be cleaned, dried and desiccated, with fluid and conditions defined by the Standard. The fluid volume is filtered through the membrane, using a suitable suction system.

The level of contamination is identified by dividing the membrane into a predefined number of areas and by counting the contaminant particles using a suitable laboratory microscope.

MICROSCOPE CONTROL
AND MEASUREMENT



Example figure 1 and 2

COMPARISON PHOTOGRAPH'S
1 graduation = 10µm



Fig. 1



Fig. 2



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For other comparison photographs for contamination classes see the "Filtration and Particle Analyser Handbook".

- CLEANLINESS CODE COMPARISON

Although ISO 4406 standard is being used extensively within the hydraulics industry other standards are occasionally required and a comparison may be requested. The table below gives a very general comparison but often no direct comparison is possible due to the different classes and sizes involved.

ISO 4406	SAE AS4059 Table 2	SAE AS4059 Table 1	NAS 1638
> 4 $\mu\text{m}_{(c)}$ 6 $\mu\text{m}_{(c)}$ 14 $\mu\text{m}_{(c)}$	> 4 $\mu\text{m}_{(c)}$ 6 $\mu\text{m}_{(c)}$ 14 $\mu\text{m}_{(c)}$	4-6 6-14 14-21 21-38 38-70 >70	5-15 15-25 25-50 50-100 >100
23 / 21 / 18	13A / 12B / 12C	12	12
22 / 20 / 17	12A / 11B / 11C	11	11
21 / 19 / 16	11A / 10B / 10C	10	10
20 / 18 / 15	10A / 9B / 9B	9	9
19 / 17 / 14	9A / 8B / 8C	8	8
18 / 16 / 13	8A / 7B / 7C	7	7
17 / 15 / 12	7A / 6B / 6C	6	6
16 / 14 / 11	6A / 5B / 5C	5	5
15 / 13 / 10	5A / 4B / 4C	4	4
14 / 12 / 09	4A / 3B / 3C	3	3

6 FILTRATION TECHNOLOGIES

Various mechanisms such as mechanical stoppage, magnetism, gravimetric deposit, or centrifugal separation can be used to reduce the level of contamination.

The mechanical stoppage method is most effective and can take place in two ways:

- SURFACE FILTRATION

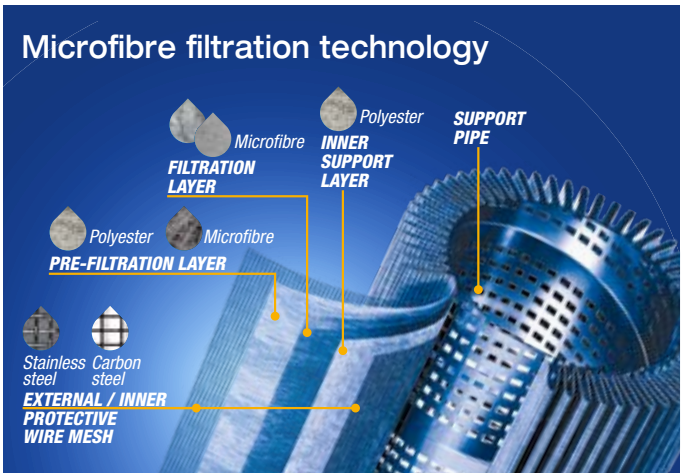
It is by direct interception. The filter prevents particles larger than the pores from continuing in the plant / system. Surface filters are generally manufactured with metal canvases or meshes.

- DEPTH FILTERING

Filters are constructed by fiber interlacing. Such wraps form pathways of different shapes and sizes in which the particles remain trapped when they find smaller apertures than their diameter.

Depth filters are generally produced with papers impregnated with phenolic resins, metal fibers or inorganic fibers.

In inorganic fiber filtration, commonly called microfibre, the filtering layers are often overlapped in order to increase the ability to retain the contaminant.



The filtration efficiency of metallic mesh filtrations is defined as the maximum particle size that can pass through the meshes of the filtering grid. The efficiency of microfibre and paper filtration ($\beta_{x(c)}$) is defined through a lab test called Multipass Test. The efficiency value ($\beta_{x(c)}$) is defined as the ratio between the number of particles of certain dimensions detected upstream and downstream of the filter.

$$\frac{\text{Upstream particles number} > X \mu\text{m}_{(c)}}{\text{Downstream particles number} > X \mu\text{m}_{(c)}} = \beta_{x(c)}$$



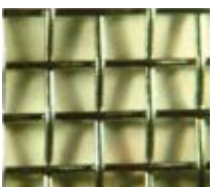
Value ($\beta_{x(c)}$)	2	10	75	100	200	1000
Efficiency	50%	90%	98.7%	99%	99.5%	99.9%

Test conditions, such as type of fluid to be used (MIL-H-5606), type of contaminant to be used (ISO MTD), fluid viscosity, test temperature, are determined by ISO 16889.

In addition to the filtration efficiency value during the Multipass test, other important features, such as filtration stability (β stability) and dirt holding capacity (DHC), are also tested.

Poor filtration stability is the cause of the filtering quality worsening as the filter life rises. Low dirt holding capacity causes a reduction in the life of the filter.

WIRE MESH FILTRATION



PAPER FILTRATION



MICROFIBER FILTRATION



Filtration ISO Standard Comparison

$\beta_{x(c)} > 1000$ ISO 16889	$\beta_x > 200$ ISO 4572	MP Filtri Filter media code
5 $\mu\text{m}_{(c)}$	3 μm	A03
7 $\mu\text{m}_{(c)}$	6 μm	A06
10 $\mu\text{m}_{(c)}$	10 μm	A10
16 $\mu\text{m}_{(c)}$	18 μm	A16
21 $\mu\text{m}_{(c)}$	25 μm	A25

7 RECOMMENDED CONTAMINATION CLASSES

Any are the nature and the properties of fluids, they are inevitably subject to contamination. The level of contamination can be managed by using special components called filters.

Hydraulic components builders, knowing the problem of contamination, recommend the filtration level appropriate to the use of their products.

Example of recommended contamination levels for pressures below 140 bar.

Piston pumps with fixed flow rate	•					
Piston pumps with variable flow rate			•			
Vane pumps with fixed flow rate		•				
Vane pumps with variable flow			•			
Engines	•					
Hydraulic cylinders	•					
Actuators					•	
Test benches						•
Check valve	•					
Directional valves	•					
Flow regulating valves	•					
Proportional valves				•		
Servo-valves					•	
Flat bearings			•			
Ball bearings				•		
ISO 4406 CODE	20/18/15	19/17/14	18/16/13	17/15/12	16/14/11	15/13/10
Recommended filtration $\beta_{x(c)} \geq 1.000$	$\beta_{21(c)} > 1000$	$\beta_{15(c)} > 1000$	$\beta_{10(c)} > 1000$	$\beta_{7(c)} > 1000$	$\beta_{7(c)} > 1000$	$\beta_{5(c)} > 1000$
MP Filtri media code	A25	A16	A10	A06	A06	A03

The common classification of filters is determined by their position in the plant.

8 TYPES OF FILTERS

Suction filters

They are positioned before the pump and are responsible for protecting the pump from dirty contaminants. It also provides additional flow guidance to the pump suction line.

Being subject to negligible working pressures are manufactured with simple and lightweight construction.

They are mainly produced with gross grade surface filtrations, mainly $60 \div 125 \mu\text{m}$.

They can be equipped with a magnetic filter for retaining ferrous particles.

They are generally placed under the fluid head to take advantage of the piezometric thrust of the fluid and reduce the risk of cavitation.

There are two types of suction filters:

- IMMERSION FILTERS

Simple filter element screwed on the suction pipe

- FILTERS WITH CONTAINER

Container filters that are more bulky, but provide easier maintenance of the tank

Delivery (or Pressure) filters

They are positioned between the pump and most sensitive regulating and controlling components, such as servo valves or proportional valves, and are designed to ensure the class of contamination required by the components used in the circuit.

Being subjected to high working pressures are manufactured with more robust and articulated construction. In particular situations of corrosive environments or aggressive fluids can be made of stainless steel.

They are mainly produced with filtering depths of $3 \div 25 \mu\text{m}$.

They can be manufactured with in-line connections, with plate or flange connections or directly integrated into the circuit control blocks / manifolds.

They can also be manufactured in duplex configuration to allow the contaminated section to be maintained even when the plant / system is in operation without interruption of the working cycle.

Return filters

They are positioned on the return line to the tank and perform the task of filtering the fluid from particles entering the system from the outside or generated by the wear of the components.

They are generally fixed to the reservoir (for this reason also called top tank mounted), positioned semi-immersed or completely immersed.

The positioning of the return filters must guarantee in all operating conditions that the fluid drainage takes place in immersed condition; this is to avoid creating foams in the tank that can cause malfunctions or cavitation in the pumps.

For the sizing of the return filters, account must be taken of the presence of accumulators or cylinders that can make the return flow considerably greater than the pump suction flow rate.

Being subject to contained working pressures are manufactured with simple and lightweight construction.

Normally it is possible to extract the filter element without disconnecting the filter from the rest of the system.

Combined filters

They are designed to be applied to systems with two or more circuits. They are commonly used in hydrostatic transmission machines where they have a dual filtration function of the return line and suction line of the hydrostatic transmission pump.

The filter is equipped with a valve that keeps the 0.5 bar pressure inside the filter. A portion of the fluid that returns to the tank is filtered by the return filter element, generally produced with absolute filtration, and returns to the transmission booster pump.

Only excess fluid returns to the tank through the valve.

The internal pressure of the filter and the absolute filtration help to avoid the cavitation phenomenon inside the pump.

Off-line filters

They are generally used in very large systems / plants, placed in a closed circuit independent from the main circuit. They remain in operation regardless of the operation of the main circuit and are crossed by a constant flow rate.

They can also be manufactured in duplex configuration to allow the contaminated section to be maintained even when the unit is in operation without interruption of the work cycle.

Venting filters

During the operation of the plants, the fluid level present in the reservoir changes continuously.

The result of this continuous fluctuation is an exchange of air with the outside environment.

The venting filter function, positioned on the tank, is to filter the air that enters the tank to compensate for fluid level variations.

9 FILTER SIZING PARAMETERS

The choice of the filter system for an hydraulic system is influenced by several factors.

It is necessary to consider the characteristics of the various components present in the plant and their sensitivity to contamination.

It is also necessary to consider all the tasks that the filter will have to do within the plant:

- FLUID PROTECTION FROM CONTAMINATION
- PROTECTION OF OLEODYNAMIC COMPONENTS SENSITIVE TO CONTAMINATION
- PROTECTION OF OLEODYNAMIC PLANTS FROM ENVIRONMENTAL WASTE
- PROTECTION OF OLEODYNAMIC PLANTS FROM CONTAMINATION CAUSED BY COMPONENTS' FAILURES

The advantages of proper positioning and sizing of the filters are

- MORE RELIABILITY OF THE SYSTEM
- LONGER LIFE OF THE FLUID COMPONENTS
- REDUCTION OF STOP TIME
- REDUCTION OF FAILURE CASUALTIES

Each hydraulic filter is described by general features that identify the possibility of use in different applications.

- **MAXIMUM WORKING PRESSURE (P_{max})**

The maximum working pressure of the filter must be greater than or equal to the pressure of the circuit section in which it will be installed.

- **PRESSURE DROP (ΔP)**

The pressure drop depends on a number of factors, such as the working circuit temperature, the fluid viscosity, the filter element cleaning condition.

- **WORKING TEMPERATURE (T)**

The working temperature deeply affect the choice of materials. Excessively high or low temperatures may adversely affect the strength of the materials or the characteristics of the seals.

- **FILTRATION EFFICIENCY (%) / FILTRATION RATIO ($\beta_{x(c)}$)**

Filtration efficiency is the most important parameter to consider when selecting a filter.

When choosing the filtration performances, the needs of the most sensitive components in the system must be considered.

- **FLUID TYPE**

The type of fluid influences the choice of filters in terms of compatibility and viscosity. It is always mandatory to check the filterability.

- **PLACEMENT IN THE PLANT**

The position of the filter in the system conditions the efficiency of all filter performances.

10 APPLICABLE STANDARDS FOR FILTER DEVELOPMENT

In order to obtain unique criteria for development and verification of the filters performance, specific regulations for the filters and filter elements testing have been issued by ISO. These norms describe the target, the methodology, the conditions and the presentation methods for the test results.

ISO 2941

Hydraulic fluid power -- Filter elements -- Verification of collapse/burst pressure rating

This Standard describes the method for testing the collapse / burst resistance of the filter elements.

The test is performed by crossing the contaminated fluid filter element at a predefined flow rate. The progressive clogging of the filter element, determined by contamination, causes an increase in differential pressure.

ISO 2942

Hydraulic fluid power -- Filter elements -- Verification of fabrication integrity and determination of the first bubble point

This Standard describes the method to verify the integrity of the assembled filter elements.

It can be used to verify the quality of the production process or the quality of the materials by verifying the pressure value of the first bubble point.

ISO 2943

Hydraulic fluid power -- Filter elements -- Verification of material compatibility with fluids

This Standard describes the method to verify the compatibility of materials with certain hydraulic fluids.

The test is carried out by keeping the element (the material sample) immersed in the fluid under high or low temperature conditions for a given period of time and verifying the retention of the characteristics.

ISO 3723

Hydraulic fluid power -- Filter elements -- Method for end load test

This Standard describes the method for verifying the axial load resistance of the filter elements.

After performing the procedure described in ISO 2943, the designed axial load is applied to the filter element. To verify the test results, then the test described in ISO 2941 is performed.

ISO 3968

Hydraulic fluid power -- Filters -- Evaluation of differential pressure versus flow characteristics

This Standard describes the method for checking the pressure drop across the filter.

The test is carried out by crossing the filter from a given fluid and by detecting upstream and downstream pressures.

Some of the parameters defined by the Standard are the fluid, the test temperature, the size of the tubes, the position of the pressure detection points.

ISO 16889

Hydraulic fluid power -- Filters -- Multi-pass method for evaluating filtration performance of a filter element

This Standard describes the method to check the filtration characteristics of the filter elements.

The test is performed by constant introduction of contaminant (ISO MTD). The characteristics observed during the test are the filtration efficiency and the dirty holding capacity related to the differential pressure.

ISO 23181

Hydraulic fluid power -- Filter elements -- Determination of resistance to flow fatigue using high viscosity fluid

This Standard describes the method for testing the fatigue resistance of the filter elements. The test is carried out by subjecting the filter to continuous flow variations, thus differential pressure, using a high viscosity fluid.

ISO 11170

Hydraulic fluid power -- Sequence of tests for verifying performance characteristics of filter elements

The Standard describes the method for testing the performance of filter elements. The protocol described by the regulations provides the sequence of all the tests described above in order to verify all the working characteristics (mechanical, hydraulic and filtration).

ISO 10771-1

Hydraulic fluid power -- Fatigue pressure testing of metal pressure-containing envelopes -- Test method

This Standard describes the method to check the resistance of the hydraulic components with pulsing pressure.

It can be applied to all metal components (excluding tubes) subject to cyclic pressure used in the hydraulic field.

Saturation Levels

Since the effects of free (also emulsified) water is more harmful than those of dissolved water, water levels should remain well below the saturation point.

However, even water in solution can cause damage and therefore every reasonable effort should be made to keep saturation levels as low as possible. There is no such thing as too little water. As a guideline, we recommend maintaining saturation levels below 50% in all equipment.

TYPICAL WATER SATURATION LEVEL FOR NEW OILS

Examples:

Hydraulic oil @ 30°C = 200 ppm = 100% saturation

Hydraulic oil @ 65°C = 500 ppm = 100% saturation

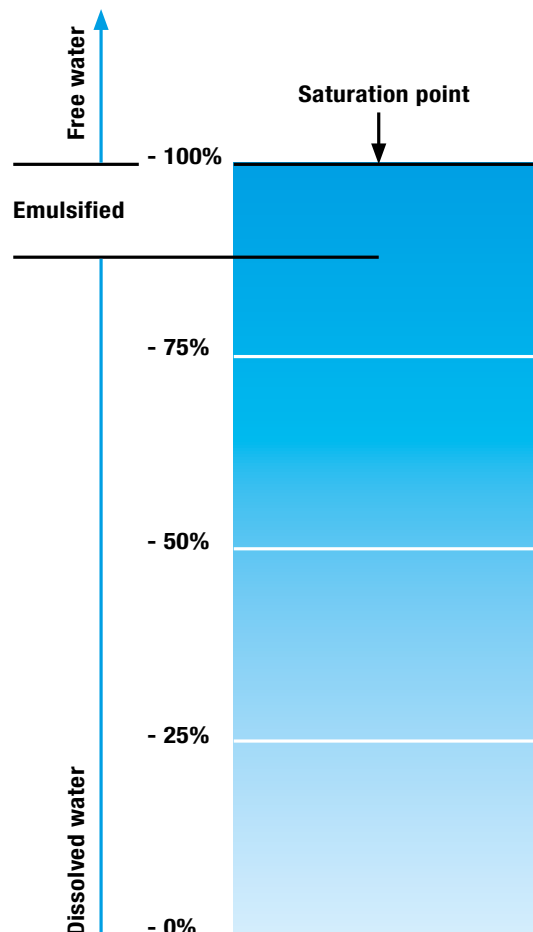
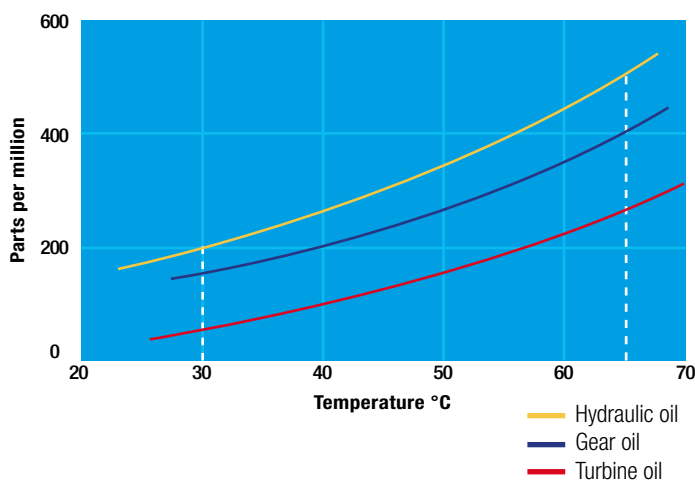
11 WATER IN HYDRAULIC AND LUBRICATING FLUIDS

Water Content

In mineral oils and non aqueous resistant fluids water is undesirable. Mineral oil usually has a water content of 50-300 ppm (@40°C) which it can support without adverse consequences.

Once the water content exceeds about 300ppm the oil starts to appear hazy. Above this level there is a danger of free water accumulating in the system in areas of low flow. This can lead to corrosion and accelerated wear.

Similarly, fire resistant fluids have a natural water which may be different to mineral oil.



WATER REMOVAL

Water is present everywhere, during storage, handling and servicing.

MP Filtri filter elements feature an absorbent media which protects hydraulic systems from both particulate and water contamination.

MP Filtri's filter element technology is available with inorganic microfiber media with a filtration rating 25 μm (therefore identified with media designation WA025), providing absolute filtration of solid particles to $\beta_{x(c)} = 1000$.

Absorbent media is made by water absorbent fibres which increase in size during the absorption process.

Free water is thus bonded to the filter media and completely removed from the system (it cannot even be squeezed out).

Filter Media

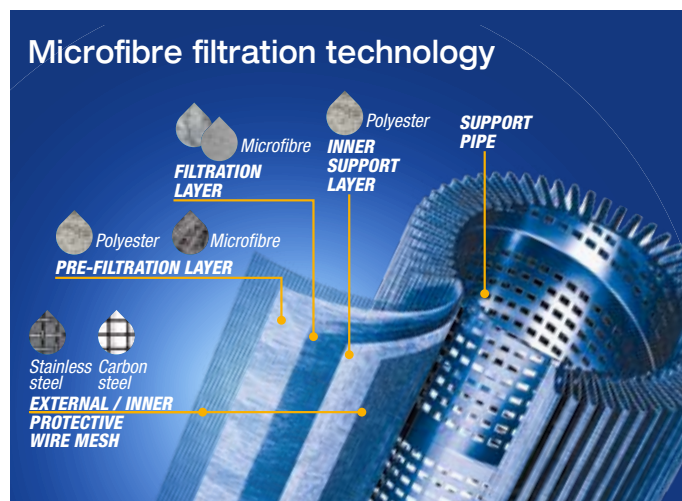


Fabric that absorbs water

Absorber media layer



The Filter Media has absorbed water



By removing water from your fluid power system, you can prevent such key problems as:

- corrosion (metal etching)
- loss of lubricant power
- accelerated abrasive wear in hydraulic components
- valve-locking
- bearing fatigue
- viscosity variance (reduction in lubricating properties)
- additive precipitation and oil oxidation
- increase in acidity level
- increased electrical conductivity (loss of dielectric strength)
- slow/weak response of control systems



Scan or click me!

For more details please refer to our dedicate brochure "WATER REMOVAL"

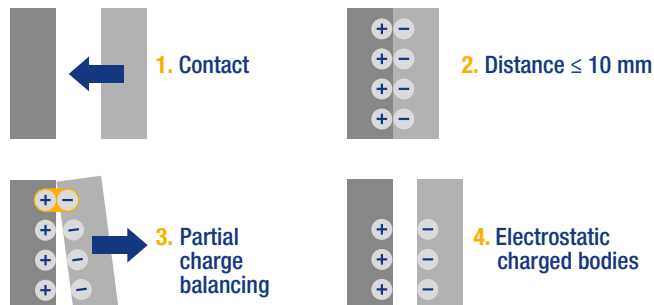
12 THE ANTI-STATIC FILTERS

zerospark®

zerospark is a specialist solution designed to solve the problem of electrostatic discharge inside hydraulic filters. Caused by the electrical charge build-up due to the passage of oil through the filters, this can result in damage to filter elements, oils and circuit components. It can even cause fire hazards in environments where flammable materials are present.

THE TRIBOELECTRIC EFFECT

The body with the most electronegativity strips electrons from the other, generating a build-up of a net negative charge on itself. The other body is charged by the same amount but with the opposite sign, giving rise to very high potential differences. These, if not dissipated, can give rise to electrostatic discharges.



Scan or click me!

For more details please refer to our dedicate brochure "ZEROSPARK"

Filters sizing software

The web-based software program will allow you to select the most suitable MP Filtri's Filters, in accordance with your process design requirements.

The program will automatically check your input design process prior to propose you the acceptable solutions and create an output in PDF report style format.

The MP Filtri Selection Tool software program is easy to use with a flexible fast design method and provides improved layout formats with full descriptions.

The web-based tool is available at MP Filtri website at following link:
<https://www.mpfiltri.com/tools/>

The related, complete user guide is available as Manual and downloadable from the "Download" section of MP Filtri website, as well as scanning the following QR code



Scan or click me!



**ATEX
FILTER**

**STAINLESS STEEL
FILTER**

**RETURN
FILTER**

**RETURN / SUCTION
FILTER**

**DUPLEX FILTER
LOW & MEDIUM PRESSURE**

**HIGH
PRESSURE
FILTER**

**SUCTION
FILTERS**

**LOW & MEDIUM
PRESSURE FILTER**

**DUPLEX FILTER
HIGH PRESSURE**

**DUPLEX
HIGH CAPACITY
INDUSTRIAL FILTERS**

**SIMPLEX
HIGH CAPACITY
INDUSTRIAL FILTERS**

Suction filters are used as safety filters to protect pumps from gross contamination which can cause them to grip.

They are available in 3 families:

- **Suction Strainers (STRC and MPAC)**
- **SFEX ELIXIR® series, for protection of the downstream pump against the coarse contamination**
- **SFMC and SFSC external filters, for mounting semi-immersed under the oil level**

SFMC and SFSC semi-immersed filters, which shut-off oil flow while the filter element is being replaced, replace the butterfly valves usually used for servicing hydraulic pumps.

Suction filters



Filter sizing and corrective factors	page 24
STRC & MPAC	27
SFEX ELIXIR®	35
SFMC	45
SFSC	55
INDICATORS	775

FILTER SIZING Calculation

THE CORRECT FILTER SIZING HAS TO BE BASED ON THE TOTAL PRESSURE DROP DEPENDING ON THE APPLICATION.

The pressure drop calculation is performed by adding together the value of the housing with the value of the filter element. The pressure drop Δp_c of the housing is proportional to the fluid density (kg/dm^3 / lb/ft^3). The filter element pressure drop Δp_e is proportional to its viscosity (mm^2/s / SUS), the corrective factor Y have to be used in case of an oil viscosity different than $30 \text{ mm}^2/\text{s}$ (cSt) / 150 SUS.

Sizing data for single filter element, head at top

Δp_c = Filter housing pressure drop [bar / psi]

Δp_e = Filter element pressure drop [bar / psi]

Y = Corrective factor Y (see correspondent table), depending on the filter type, on the filter element size, on the filter element length and on the filter media

Q = flow rate (l/min - gpm)

V1 reference oil viscosity = $30 \text{ mm}^2/\text{s}$ (cSt) / 150 SUS

V2 = operating oil viscosity in mm^2/s (cSt) / SUS

Filter element pressure drop calculation with an oil viscosity different than $30 \text{ mm}^2/\text{s}$ (cSt) / 150 SUS

International system:

$$\Delta p_e = Y : 1000 \times Q \times (V2:V1)$$

Imperial system:

$$\Delta p_e = Y : 17.2 \times Q \times (V2:V1)$$

$$\Delta p_{\text{Tot.}} = \Delta p_c + \Delta p_e$$

Verification formula

$$\Delta p_{\text{Tot.}} \leq \Delta p_{\text{max allowed}}$$

Maximum total pressure drop (Δp_{max}) allowed by a new and clean filter

Filter family	Δp_{max}	
	[bar]	[psi]
Suction filters	0.08 bar	1.15 psi

Filter pressure drop calculation example

Application data:

Selected filter: SFEX 110 length 10

Selected filter element: FEX 110 length 10

Selected connection: G 1"

Selected filtration rating: 90 μm absolute filtration with wire mesh

Flow rate Q = 60 l/min / 15.85 gpm

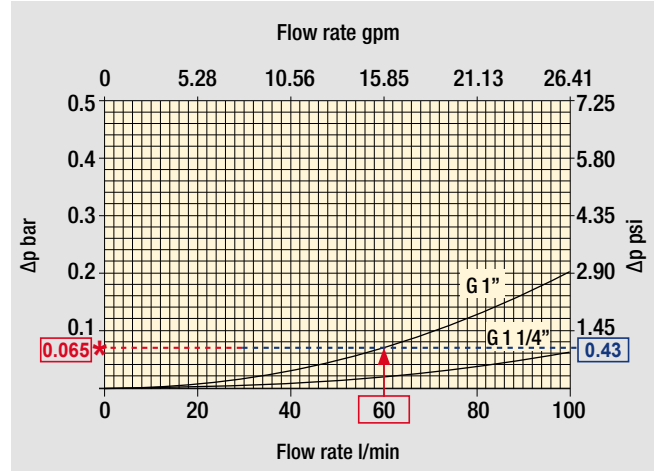
Viscosity V2 = $46 \text{ mm}^2/\text{s}$ (cSt) / 216 SUS

Oil density = 0.86 kg/dm^3 / 53.68 lb/ft^3

Calculation:

Δp_c = 0.065 bar / 0.94 psi (see graphic below)

SFEX 110



Filter housings Δp pressure drop.

The curves are plotted using mineral oil with density of 0.86 kg/dm^3 in compliance with ISO 3968. Δp varies proportionally with density.

Filter element		Nominal filtration Filter Elem. Δp Series: A - C					
Type	Length	P0010	P0025	M0025	M0060	M0090	M0250
FEX 110	10	1.33	1.12	0.22	0.18	0.14	0.14
	20	0.90	0.76	0.15	0.10	0.09	0.09

$$\Delta p_e = (0.14 : 1000) \times 60 \times (46 : 30) = 0.01 \text{ bar}$$

$$\Delta p_e = (0.14 : 17.2) \times 15.8 \times (216 : 150) = 0.19 \text{ psi}$$

$$\Delta p_{\text{Tot.}} = 0.065 + 0.01 = 0.075 \text{ bar}$$

$$\Delta p_{\text{Tot.}} = 0.94 + 0.19 = 1.13 \text{ psi}$$

The selection is correct because the total pressure drop value is inside the admissible range for suction filters.

In case the max allowed total pressure drop is not verified, it is necessary to repeat the calculation changing the filter and/or filter element length/size.

Filter element		Nominal filtration Filter element ΔP Series : A - C					
Type	Length	P0010	P0025	M0025	M0060	M0090	M0250
SMC 250	10	0.65	0.20	0.10	0.08	0.05	0.03
SSC 503	10	-	-	0.17	0.11	0.11	0.11
SSC 504	10	-	-	0.11	0.08	0.08	0.08
SSC 505	10	-	-	0.23	0.18	0.18	0.18
SSC 510	10	-	-	0.18	0.14	0.14	0.14
SSC 535	10	-	-	0.08	0.05	0.05	0.05
SSC 540	10	-	-	0.05	0.04	0.04	0.04
FEX 060	10	4.58	3.22	1.02	0.89	0.63	0.63
	20	1.97	1.38	0.62	0.45	0.29	0.29
FEX 110	10	1.33	1.12	0.22	0.18	0.14	0.14
	20	0.90	0.76	0.15	0.10	0.09	0.09

Corrective factor Y to be used for the filter element pressure drop calculation. The values depend to the filter size and length and to the filter media.
Reference oil viscosity 30 mm²/s

STRC & MPAC series

Flow rate up to 1000 l/min



Description

Technical data

Suction filters

Flow rate up to 1000 l/min

STRC

STRC is a range of suction strainers for protection of the downstream pump against the coarse contamination. They are placed below the oil level directly connected to the suction line of the pump.

Available features:

- Female threaded connections up to 3", for a maximum flow rate of 1000 l/min
- Bypass valve, to relieve excessive pressure drop across the filter media

Common application:

- Mobile machines (Construction and Agriculture machines)
- Industrial equipment

MPAC

MPAC is a range of suction strainers for protection of the downstream pump against the coarse contamination. They are placed below the minimum oil level, directly connected to the suction line of the pump. The robust design allows the use of these filters in any heavy duty application.

Available features:

- Female threaded connections up to 3", for a maximum flow rate of 1000 l/min
- Magnetic filter (MPAC), to hold the ferrous particles

Common application:

Industrial equipment

STRC materials

- 1 - Connection: Polyamide, GF reinforced
- 2 - Core tube: Tinned steel
- 3 - Wire mesh
- 4 - End cap: Polyamide, GF reinforced
- 5 - Bypass valve: Polyamide, GF reinforced - Steel

MPAC materials

- 1 - Connection: Aluminium
- 2 - Magnetic filter
- 3 - Tie rod: Galvanized steel
- 4 - End cap: Galvanized steel
- 5 - Core tube: Galvanized steel
- 6 - Filter media: Wire mesh
- 7 - Bottom: Galvanized steel
- 8 - Washer: Galvanized steel
- 9 - Self-locking nut: Galvanized steel - Polyamide

Bypass valve

Opening pressure 0.03 MPa (0.3 bar)

Filter element features

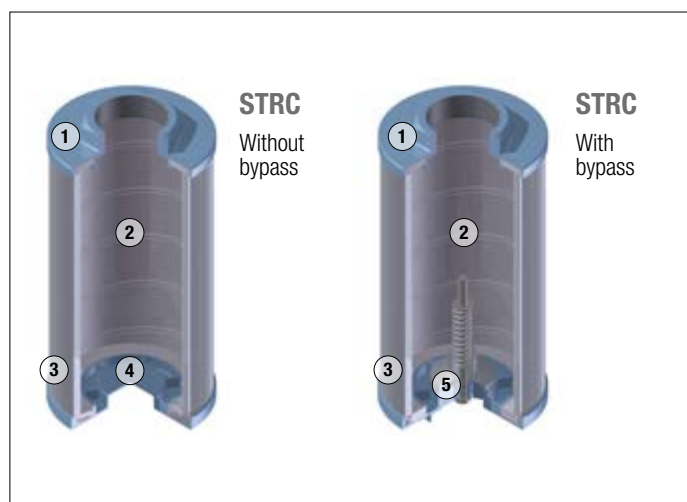
Filter STRC - MPAC		Filter element n.a.	
Δp Element type			
Element media	Construction	Δp Series	Δp
M - Wire mesh	Standard	A	1 bar
Please see ordering code tables to check element Δp series availability based on filter features.			
Flow direction through the filter element:			
From OUT to IN			

Temperature

From -25 °C to +110 °C

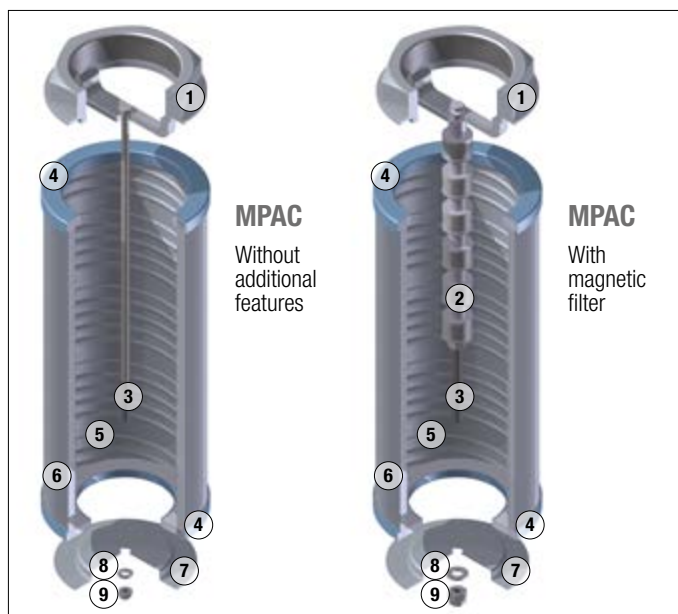
Quantity

Series and size	pcs/pack
STRC 045 - 050	12
STRC 065 - 070 - 086 - 100	6
STRC 140 - 150	1
MPAC 050	12
MPAC 070 - 100	6
MPAC 140	1



Weights [kg]

Filter series	
STRC	see page 31
MPAC	see page 33



Flow rates [l/min]

Filter series	Thread	l/min
STRC & MPAC	3/8"	19
	1/2"	28
	3/4"	67
	1"	126
	1 1/4"	167
	1 1/2"	258
	2"	480
	2 1/2"	854
	3"	995

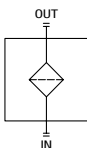
Maximum flow rate for a complete suction filter with a pressure drop $\Delta p = 0.08$ bar.

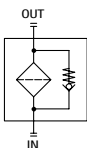
The reference fluid has a kinematic viscosity of 30 mm²/s (cSt) and a density of 0.86 kg/dm³.

For different pressure drop or fluid viscosity we recommend to use our selection software available on www.mpfiltri.com.

You can also calculate the right size using the formulas present on the FILTER SIZING paragraph at the beginning of the full catalogue or at the beginning of the filter family brochure. Please, contact our Sales Department for further additional information.

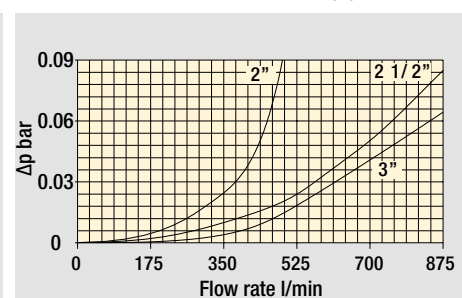
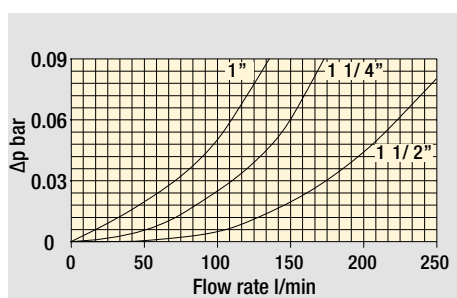
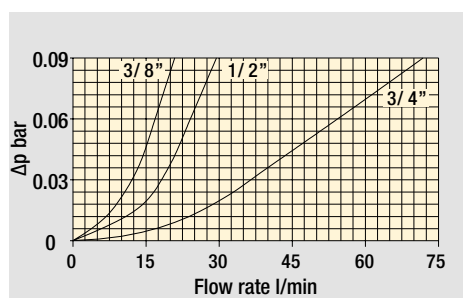
Filter series	00 - without bypass	03 - with bypass 0.3 bar
STRC	•	•
MPAC	•	-





Hydraulic diagram

Pressure drop

Filter housings
 Δp pressure drop

The curves are plotted using mineral oil with density of 0.86 kg/dm³ in compliance with ISO 3968.

Δp varies proportionally with density.

COMPLETE FILTER

Series	Example 1:	STRC	045	10	M0060	A	N	03	FG038	0	ON	NN	P01	NN
STRC	Example 2:	STRC	100	20	M0250	A	N	00	FN200	0	ON	NN	P01	NN

Size	
045	086
050	100
065	140
070	150

Length	Size:	045	050	065	070	086	100	140	150
10		•	•	•	•	•	•	•	•
20		-	-	•	•	•	•	•	•
30		-	-	-	-	•	•	•	•
40		-	-	-	-	-	•	-	-

Filtration rating (filter media)	
M0025 Wire mesh	25 µm
M0090 Wire mesh	90 µm
M0060 Wire mesh	60 µm
M0250 Wire mesh	250 µm

Element Δp	
A	1 bar

Seals and treatments	
N	Without seals

Bypass	
00	Without bypass
03	With bypass 0.03 MPa (0.3 bar)

Connection type	
FG	Thread ISO 1179-2 (GAS)
FN	Thread ANSI/ASME B 1.20.1 (NPT)

Nominal thread																			
Size: Length		045	050	065		070		086			100		140				150		
		10	10	10	20	10	20	10	20	30	10	20	10	20	30	40	10	20	30
038	3/8"	●	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
012	1/2"	●	●	●	-	●	●	-	-	-	-	-	-	-	-	-	-	-	-
034	3/4"	-	-	●	●	●	●	-	-	-	-	-	-	-	-	-	-	-	-
100	1"	-	-	-	●	-	●	-	-	-	-	-	-	-	-	-	-	-	-
114	1 1/4"	-	-	-	-	-	-	-	-	-	●	●	-	-	-	-	-	-	-
112	1 1/2"	-	-	-	-	-	-	●	●	●	●	●	●	-	-	-	-	-	-
200	2"	-	-	-	-	-	-	●	●	●	-	●	●	●	-	-	●	-	-
212	2 1/2"	-	-	-	-	-	-	-	-	-	-	-	-	-	●	-	-	●	-
300	3"	-	-	-	-	-	-	-	-	-	-	-	-	-	●	●	-	●	●

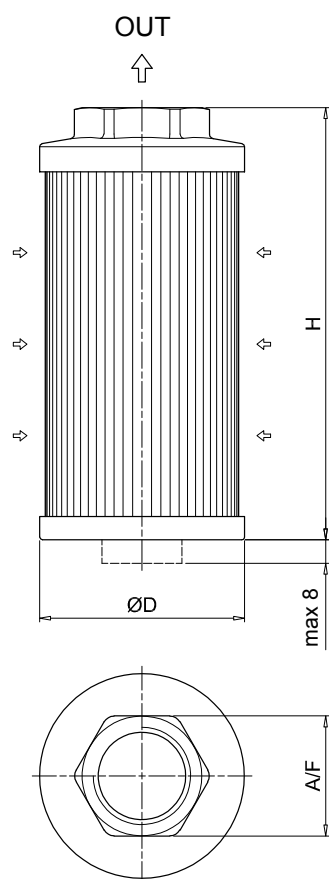
Additional connections	
0	Without additional connections

Connections for clogging indicators	
ON	Without connection

Additional features	
NN	Without additional features

Version	
P01	Standard catalogue item

Certificates	
NN	Without certificates



STRC						
Size	ØD [mm]	Length	Nominal thread		H [mm]	A / F [mm]
045	46	10	3/8"	1/2"	105	30
050	52	10	3/8"	1/2"	79	
065	65	10	1/2"	3/4"	110	41
		20	3/4"	1"	144	
070	70	10	1/2"	3/4"	95	
		20	1/2"	3/4"	141	
086	86	10	1 1/2"	2"	143	69
		20	1 1/2"	2"	201	
		30	1 1/2"	2"	261	
100	99	10	1 1/4"	1 1/2"	137	
		20	1 1/4"	1 1/2"	227	
140	130	10	1 1/2"	2"	160	
		20	2"		262	
		30	2 1/2"	3"	272	101
		40	3"		330	
150	150	10	2"		150	70
		20	2 1/2"		212	90
		30	3"		272	100

Designation & Ordering code

COMPLETE FILTER

Series	Example 1:	MPAC	070	10	M0060	A	N	00	FG034	0	ON	NN	P01	NN
MPAC	Example 2:	MPAC	140	30	M0250	A	N	00	FN300	0	ON	MA	P01	NN

Size	
050	
070	
100	
140	

Length	Size:	050	070	100	140
10		•	•	•	•
20		-	•	•	•
30		-	-	-	•

Filtration rating (filter media)	
M0025 Wire mesh 25 µm	M0090 Wire mesh 90 µm
M0060 Wire mesh 60 µm	M0250 Wire mesh 250 µm

Element Δp	
A 1 bar	

Seals and treatments	
N Without seals	

Bypass	
00 Without bypass	

Connection type	
FG Thread ISO 1179-2 (GAS)	
FN Thread ANSI/ASME B 1.20.1 (NPT)	

Nominal thread								
Size:	050	070	100	140				
Length	10	10	20	10	20	10	20	30
038 3/8"	•	-	-	-	-	-	-	-
012 1/2"	•	•	-	-	-	-	-	-
034 3/4"	-	•	•	-	-	-	-	-
100 1"	-	-	•	•	-	-	-	-
114 1 1/4"	-	-	-	•	•	-	-	-
112 1 1/2"	-	-	-	-	•	•	-	-
200 2"	-	-	-	-	-	•	•	•
212 2 1/2"	-	-	-	-	-	-	•	-
300 3"	-	-	-	-	-	-	-	•

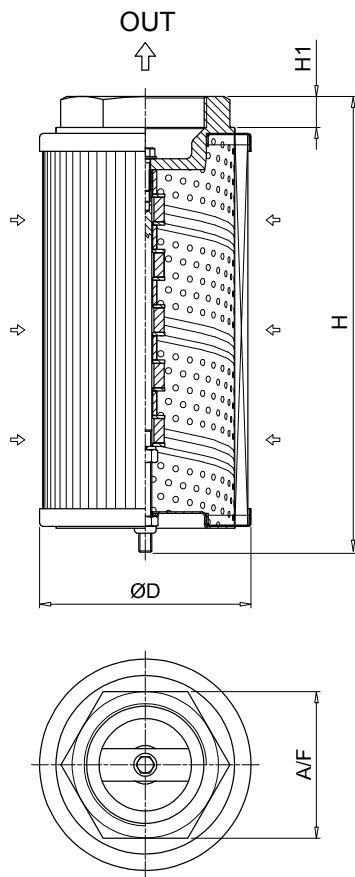
Additional connections	
0 Without additional connections	

Connections for clogging indicators	
ON Without connection	

Additional features	
NN Without additional features	
MA With magnetic filter	

Version	
P01 Standard catalogue item	

Certificates	
NN Without certificates	



MPAC							
Size	ØD [mm]	Length	Nominal thread	H [mm]	H1 [mm]	A/F [mm]	Weight [kg]
050	50	10	3/8"	98	16	28	0.17
			1/2"	113			0.27
070	70	10	3/4"	115	18	42	0.36
		20	1"	145			0.39
			1 1/4"	148			0.54
			1 1/2"	174			0.63
100	99	10	2"	162	20	60	0.95
		20	2 1/2"	272			0.91
			3"	281			0.98
140	136	10	2"	162	13	80	1.00
		20	2 1/2"	272			1.60
			3"	281			1.67
			3"	322			1.60
		30	3"	335		106	1.93



THE **X** CONCEPT FOR OUR FILTERS

Protect the performance of your system with MYclean.
Quality and efficiency are fundamental for MP Filtri:
this exclusive new filter element possesses polygon shape geometry and specific seal
that ensures only original spare parts can be used - ensuring correct operation and
higher system reliability.

SFEX series

with **MYCLEAN** FEX Filter Element



- ◆ **Protects the machine from improper use of non-original products.**
- ◆ **Safety of constant quality protection & reliability**

With exclusive filter element you are sure that only MP Filtri filter elements can be used, ensuring the best cleaning level of the oil due to the use of originals filter elements.

The products identified as SFEX are protected by:

- ◆ Italian Patent n° 102014902261205
- ◆ Canadian Patent n° 2,937,258
- ◆ European Patent n° 3 124 092 B1
- ◆ US Patent n° 20170030384 A1

SFEX series

Flow rate up to 100 l/min



INSTALLATION, SERVICE AND MAINTENANCE MANUAL AND SAFETY INSTRUCTIONS



SFEX060



SFEX110

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Description

Technical data

Suction filters

Flow rate up to 100 l/min

SFEX are range of suction filters for protection of the downstream pump against the coarse contamination.

They are placed below the minimum oil level, directly connected to the suction line of the pump in-line mounted.

Available features:

- Female threaded connections up to 1 1/4" and SAE connections up to 1 5/8", for a maximum flow rate of 100 l/min
- Bypass valve, to relieve excessive pressure drop across the filter media
- Visual, electrical, axial and radial vacuum gauges
- MYclean interface connection for the filter element, to protect the product against non-original spare parts
- External protective wrap, to optimize the flow through the element and to save the element efficiency against non-proper handling

Common application:

- Mobile machines
- Industrial equipment

Filter housing materials

- Head: Aluminium
- Bypass valve: Polyamide - Steel
- Bowl: Polyamide

Bypass valve

Opening pressure 0.03 MPa (0.3 bar) $\pm 10\%$

Filter element features

Filter SFEX		Filter element FEX	
Δp Element type			
Element media	Construction	Δp Series	Δp
M - Wire mesh	Standard	C	8 bar
P - Paper	Standard	C	8 bar
Please see ordering code tables to check element Δp series availability based on filter features.			
Flow direction through the filter element: From OUT to IN			

Seals

Standard NBR series A

Temperature

From -25 °C to +110 °C

Note

SFEX filters are provided for vertical mounting

Weights [kg] and volumes [dm³]

Filter series	Weights [kg]			Volumes [dm ³]		
	Length	10	20	Length	10	20
SFEX 060		1.00	1.15		0.60	0.80
SFEX 110		1.90	2.10		1.60	2.00

Flow rates [l/min]

		Filter element design - C Series				
Filter series	Length	M0060	M0090	M0250	P0010	P0025
SFEX 060	10	31	33	33	13	20
	20	34	35	35	24	30

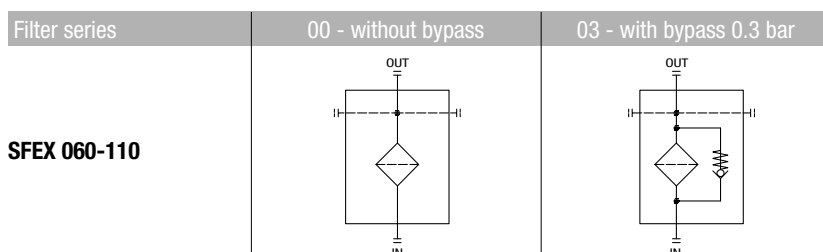
		Filter element design - C Series				
Filter series	Length	M0060	M0090	M0250	P0010	P0025
SFEX 110	10	93	96	96	48	53
	20	98	99	99	60	65

Maximum flow rate for a complete suction filter with a pressure drop $\Delta p = 0.08$ bar.

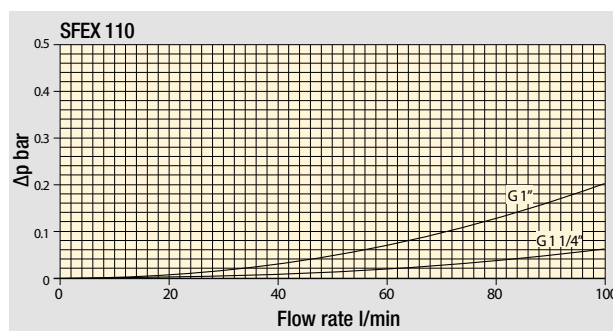
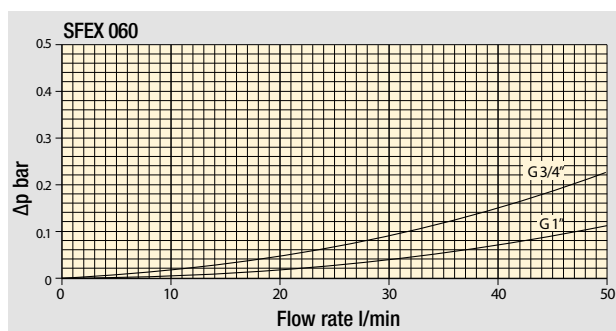
The reference fluid has a kinematic viscosity of 30 mm²/s (cSt) and a density of 0.86 kg/dm³.

For different pressure drop or fluid viscosity we recommend to use our selection software available on www.mpfiltri.com.

Please, contact our Sales Department for further additional information.

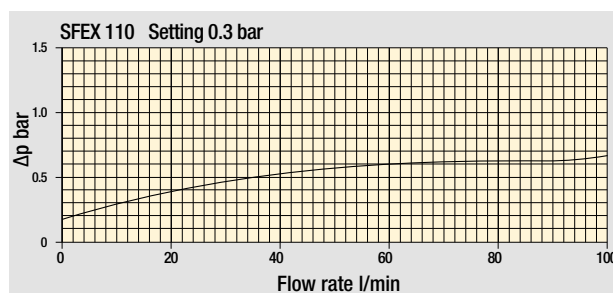
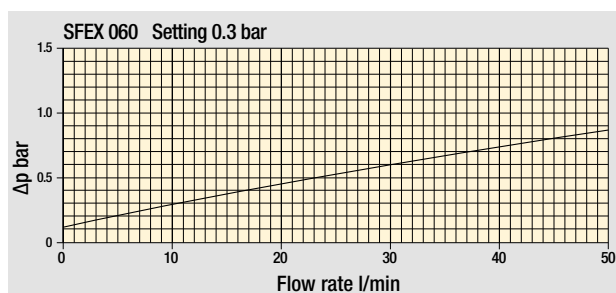


Hydraulic diagram



Pressure drop

Filter housings
 Δp pressure drop



Bypass valve
pressure drop

The curves are plotted using mineral oil with density of 0.86 kg/dm³ in compliance with ISO 3968.

Δp varies proportionally with density.

SFEX SFEX060 - SFEX110

Designation & Ordering code

COMPLETE FILTER

Series	Example 1:	SFEX	060	10	M0060	C	A	03	FG034	0	6T	NN	P01	NN
SFEX	Example 2:	SFEX	110	20	M0060	C	A	00	FS016	0	6T	NN	P01	NN
Filter featuring														
MYCLEAN Filter Element														
Size														
060														
110														
Length														
10														
20														
Filtration rating (filter media)														
M0025 Wire mesh 25 µm		P0010 Resin-impregnated paper 10 µm												
M0060 Wire mesh 60 µm		P0025 Resin-impregnated paper 25 µm												
M0090 Wire mesh 90 µm														
M0250 Wire mesh 250 µm														
Element Δp														
C 8 bar														
Seals and treatments														
A NBR														
Bypass														
00 Without bypass														
03 With bypass 0.03 MPa (0.3 bar)														
Connections														
		060	110		060	110		060	110					
FG034 G 3/4"		•	-		FN034 3/4" NPT	•	-		FS012 SAE 12 - 1 1/16" - 12 UN	•	-			
FG100 G 1"		•	•		FN100 1" NPT	•	•		FS016 SAE 16 - 1 5/16" - 12 UN	•	•			
FG114 G 1 1/4"		-	•		FN114 1 1/4" NPT	-	•		FS020 SAE 20 - 1 5/8" - 12 UN	-	•			
Additional connections														
0 Without additional connections														
Connections for clogging indicators														
6T With both side indicator connections, with metal plugs														
Additional features														
NN Without additional features														
Version														
P01 Standard catalogue item														
Certificates														
NN None														

CLOGGING INDICATORS

See page 775

VEB Electrical vacuum indicator

VVB Axial vacuum gauge

VLB Electrical / visual vacuum indicator

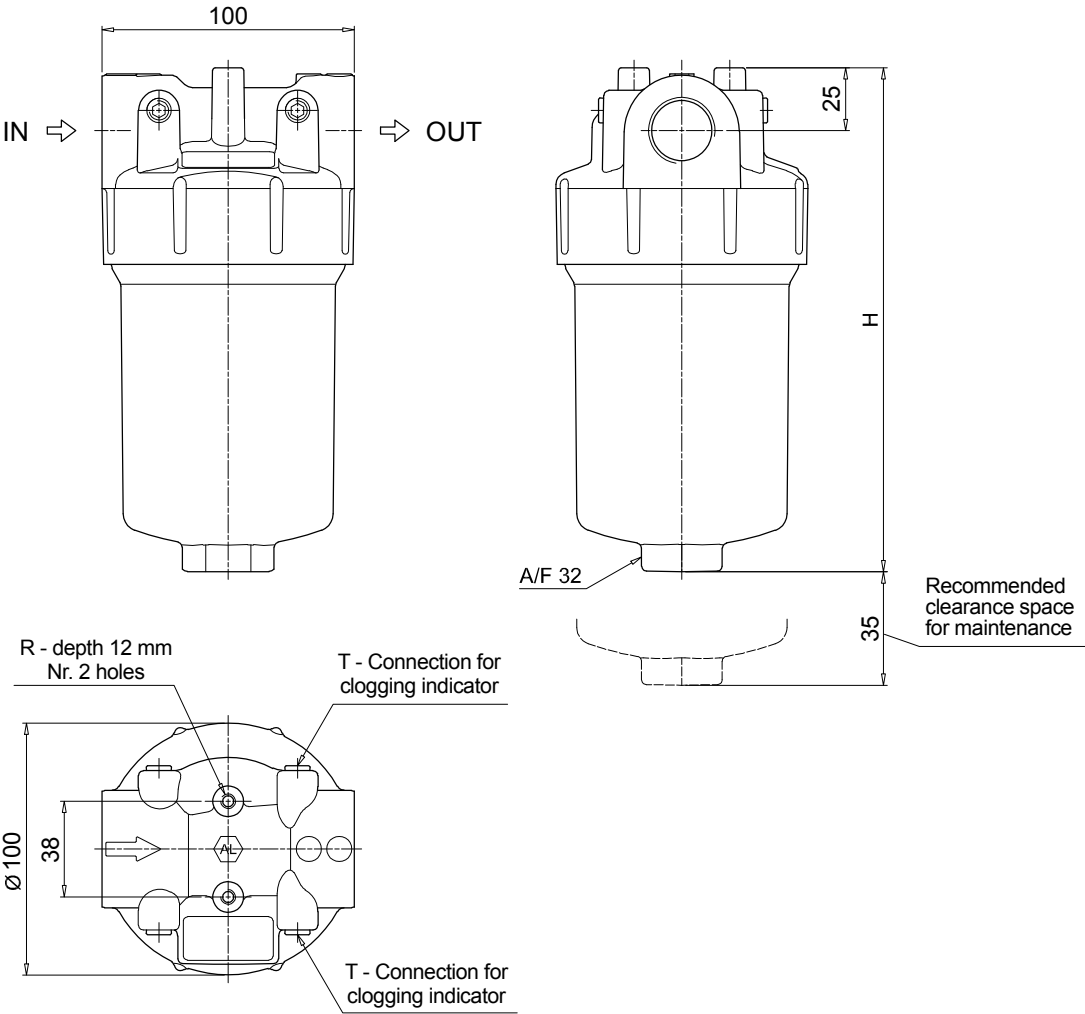
VVS Radial vacuum gauge

FILTER ELEMENT										
Series	Example 1: FEX 060 10 M0060 C A 00 NN P01 NN									
FEX Filter element with MYCLEAN feature	Example 2: FEX 110 20 M0060 C A 00 NN P01 NN									
Size										
060										
110										
Length										
10										
20										
Filtration rating (filter media)										
M0025 Wire mesh 25 µm										
M0060 Wire mesh 60 µm										
M0090 Wire mesh 90 µm										
M0250 Wire mesh 250 µm										
P0010 Resin-impregnated paper 10 µm										
P0025 Resin-impregnated paper 25 µm										
Element Δp										
C 8 bar										
Seals and treatments										
A NBR										
Bypass										
00 Without bypass										
Additional features										
NN Without										
Version										
P01 Standard catalogue item										
Certificates										
NN None										

Dimensions

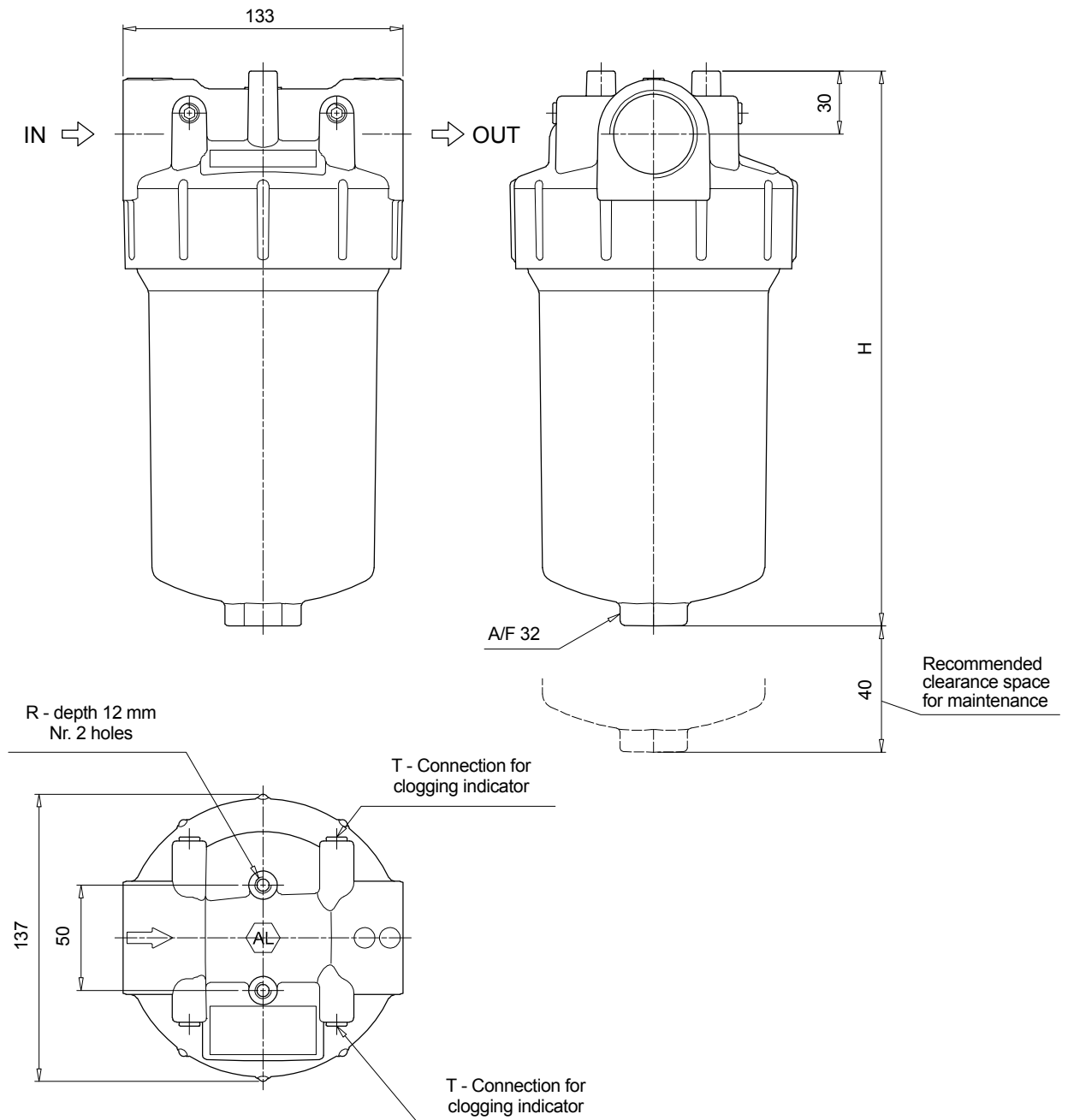
Filter length	H [mm]	
10	202	
20	265	

Connections	T	R
FG034	G 1/8"	M6
FG100	G 1/8"	M6
FN034	1/8" NPT	1/4" UNC
FN100	1/8" NPT	1/4" UNC
FS012	1/8" NPT	1/4" UNC
FS016	1/8" NPT	1/4" UNC



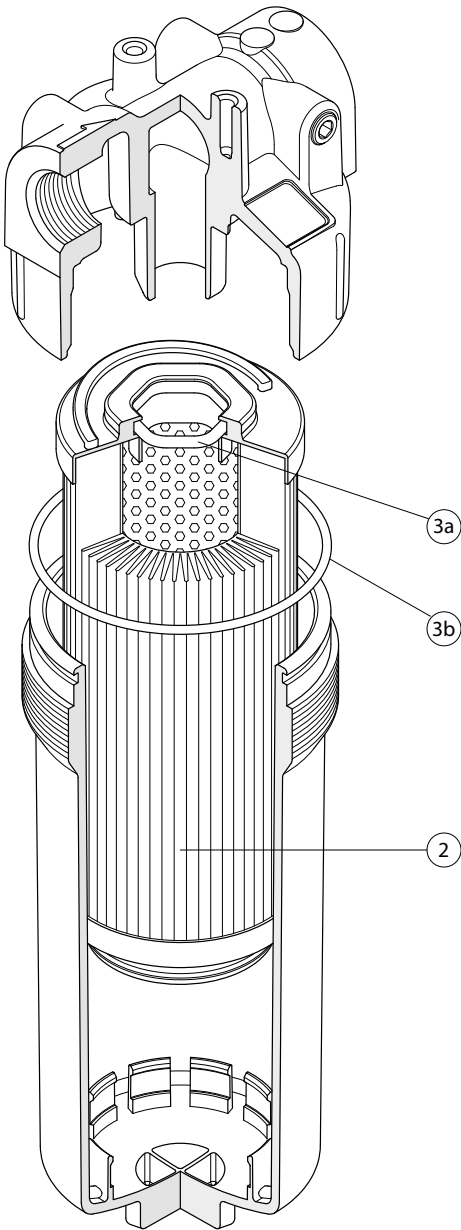
Filter length	H [mm]
10	266
20	315

Connections	T	R
FG100	G 1/8"	M8
FG114	G 1/8"	M8
FN100	1/8" NPT	5/16" UNC
FN114	1/8" NPT	5/16" UNC
FS016	1/8" NPT	5/16" UNC
FS020	1/8" NPT	5/16" UNC



SFEX SPARE PARTS

Order number for spare parts



Item:	Q.ty: 1 pc.	Q.ty: 1 pc.
	2	3 (3a ÷ 3b)
Filter series	Filter element	Seal Kit code number NBR
SFEX 060	See order table	AK021000512
SFEX 110		AK021000513

SFMC 250 series

Flow rate up to 160 l/min



SFMC 250 GENERAL INFORMATION

Description

Suction filters

Flow rate up to 160 l/min

SFMC 250 is a range of suction filters with integrated shut-off valve for protection of the downstream pump against the coarse contamination.

They are placed below the minimum oil level, directly connected to the suction line of the pump.

They can be fitted on the side or below the tank, allowing a more flexible design of the tank.

The shut-off valve closes automatically when the cover is removed, allowing the filter element replacement without the fluid drop.

Available features:

- Female threaded connections up to 1" and flanged connections up to 1 1/2", for a maximum flow rate of 160 l/min
- Multiple connections, to connect several suction lines
- Bypass valve, to relieve excessive pressure drop across the filter media
- Magnetic filter, to hold the ferrous particles
- Visual, electrical and electronic clogging indicators

Common application:

- Mobile machines
- Industrial equipment

Technical data

Filter housing materials

- Filter body: Aluminium
- Cover: Polyamide, GF reinforced
- Valve: Polyamide, GF reinforced - Steel
- Anti-Emptying valve: Steel

Bypass valve

Opening pressure 0.03 MPa (0.3 bar) $\pm 10\%$

Filter element features

Filter SFMC		Filter element SMC	
Δp Element type			
Element media	Construction	Δp Series	Δp
M - Wire mesh	Standard	A	1 bar
P - Paper	Standard	A	1 bar
Please see ordering code tables to check element Δp series availability based on filter features.			
Flow direction through the filter element: From IN to OUT			

Seals

- Standard NBR series A or W
- Optional FPM series V or Z

Temperature

From -25 °C to +110 °C

Note

SFMC 250 filters mounting, see the drawings on page 50 and following.

Weights [kg] and volumes [dm³]

Filter series	Weights [kg]	Volumes [dm ³]
SFMC 250	2.8	2.3
SFMC 250	2.8	2.4

Flow rates [l/min]

Filter series	Filter element design - N Series					
	M0025	M0060	M0090	M0250	P0010	P0025
SFMC 250	147	151	155	160	85	132

Maximum flow rate for a complete suction filter with a pressure drop $\Delta p = 0.08$ bar.

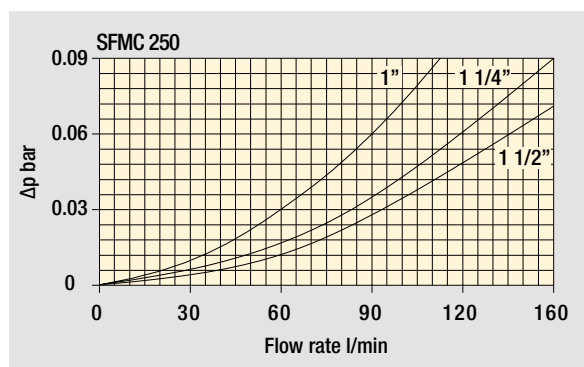
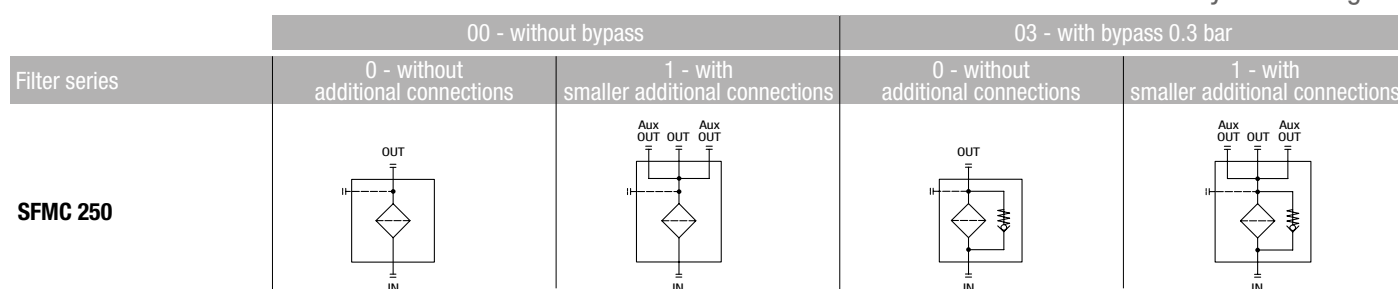
The reference fluid has a kinematic viscosity of 30 mm²/s (cSt) and a density of 0.86 kg/dm³.

For different pressure drop or fluid viscosity we recommend to use our selection software available on www.mpfiltri.com.

You can also calculate the right size using the formulas present on the FILTER SIZING paragraph at the beginning of the full catalogue or at the beginning of the filter family brochure.

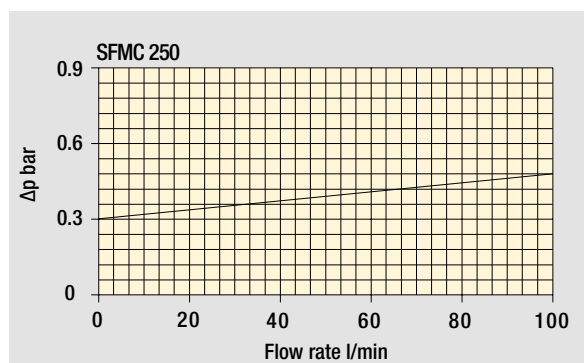
Please, contact our Sales Department for further additional information.

Hydraulic diagram



Pressure drop

Filter housings
 Δp pressure drop



Bypass valve
pressure drop

The curves are plotted using mineral oil with density of 0.86 kg/dm³ in compliance with ISO 3968.

Δp varies proportionally with density.

SFMC 250

Designation & Ordering code

COMPLETE FILTER

Series	Example 1:	SFMC	250	10	M0025	A	A	00	FF112	0	5T	MA	P01	NN
SFMC	Example 2:	SFMC	250	10	P0010	A	V	00	FG112	0	5T	NN	P01	NN

Size	
250	

Length	
10	

Filtration rating (filter media)	
M0025 Wire mesh 25 µm	P0010 Resin-impregnated paper 10 µm
M0060 Wire mesh 60 µm	P0025 Resin-impregnated paper 25 µm
M0090 Wire mesh 90 µm	
M0250 Wire mesh 250 µm	

Element Δp	
A 1 bar	

Seals and treatments	M0xxx	P0xxx
A NBR	•	•
V FPM	•	•
W NBR with filter and components surface treatment	•	-
Z FPM with filter and components surface treatment	•	-

Bypass	
00 Without bypass	
03 With bypass 0.03 MPa (0.3 bar)	

Connections	
FG100 G 1"	FS016 SAE 16 - 1 5/16" - 12 UN
FG114 G 1 1/4"	FS020 SAE 20 - 1 5/8" - 12 UN
FG112 G 1 1/2" G 1"	FS024 SAE 24 - 1 7/8" - 12 UN SAE 16 - 1 5/16" - 12 UN
FN100 1" NPT	FE112 1 1/2" SAE 3000 psi/M
FN114 1 1/4" NPT	FF112 1 1/2" SAE 3000 psi/UNC
FN112 1 1/2" NPT	Available additional connections

Additional connections	FG112	FS024
0 Without additional connections	-	-
1 With smaller additional connections	G1"	SAE 16 - 1 5/16" - 12 UN

Connections for clogging indicators	
5T With rear indicator connection, with metal plugs	

Additional features	
NN Without additional features	
MA With magnetic filter	

Version	
P01 Standard catalogue item	

Certificates	
NN None	

CLOGGING INDICATORS

See page 775

VEA Electrical vacuum indicator

VVA Axial vacuum gauge

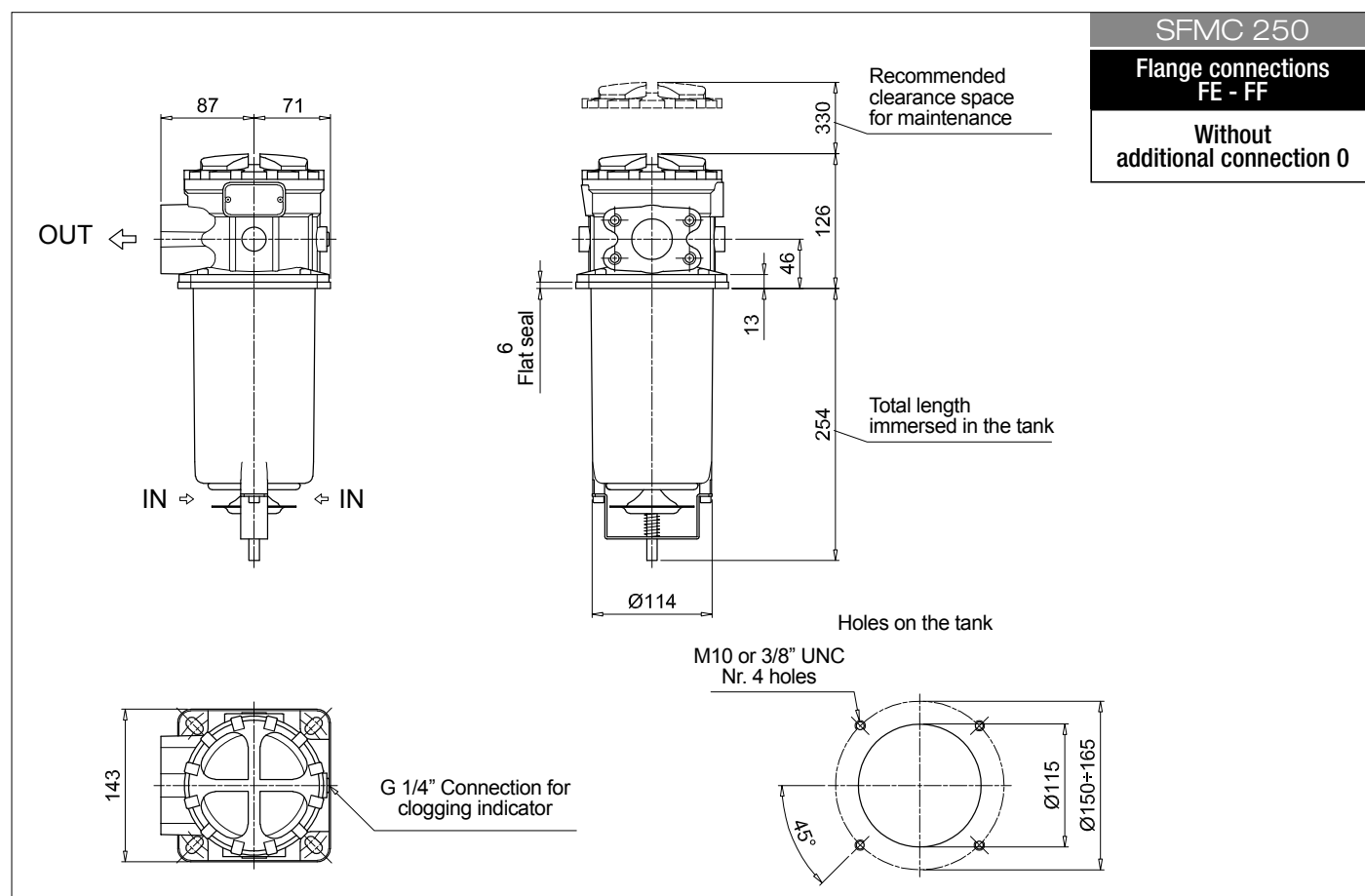
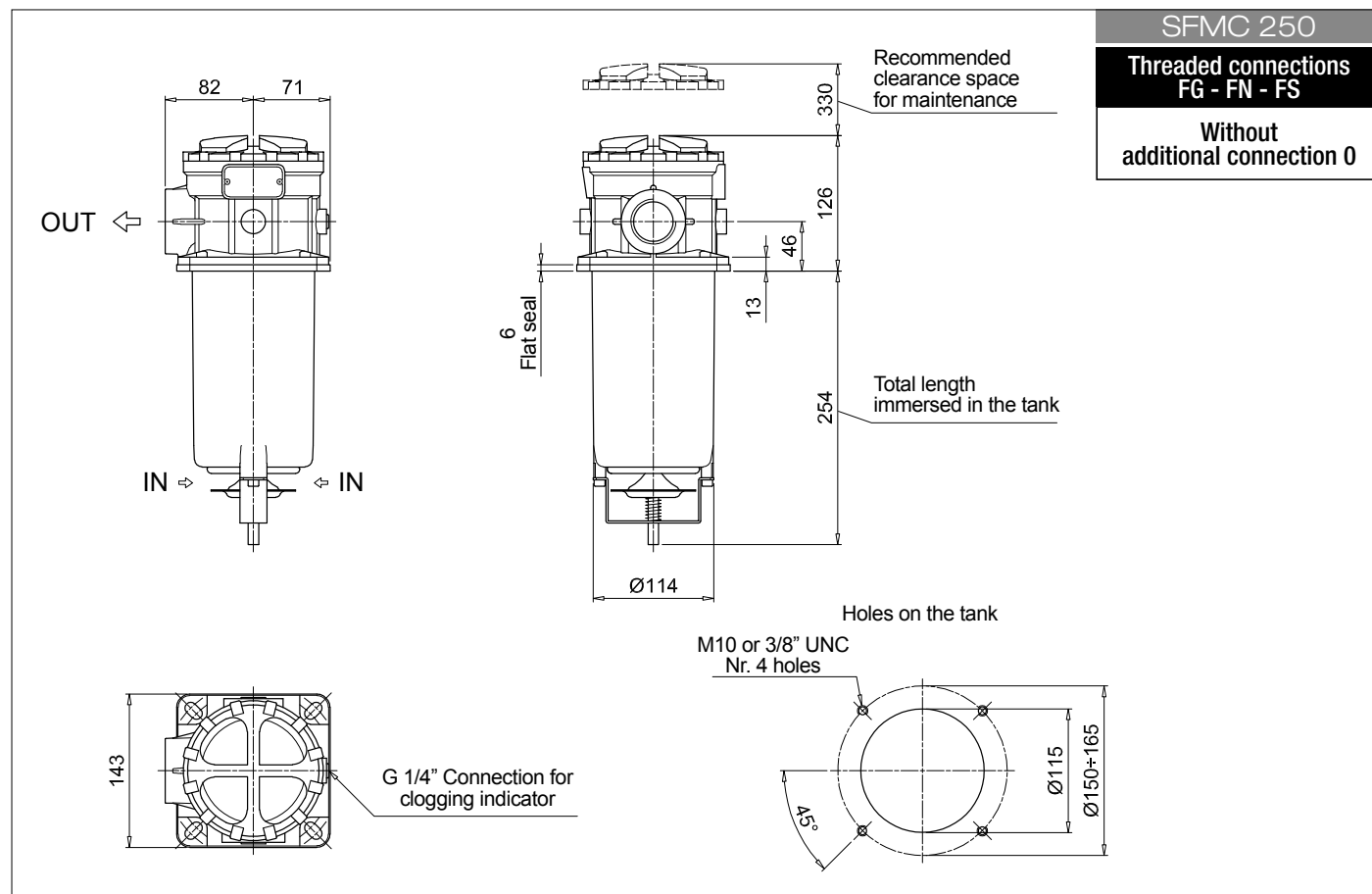
VLA Electrical / visual vacuum indicator

VVR Radial vacuum gauge

FILTER ELEMENT											
Series	Example 1: SMC 250 10 M0025 A A 00 NN P01 NN										
SMC	Example 2: SMC 250 10 P0010 A V 00 NN P01 NN										
Size											
250											
Length											
10											
Filtration rating (filter media)											
M0025 Wire mesh 25 µm	P0010 Resin-impregnated paper 10 µm										
M0060 Wire mesh 60 µm	P0025 Resin-impregnated paper 25 µm										
M0090 Wire mesh 90 µm											
M0250 Wire mesh 250 µm											
Element Δp											
A 1 bar											
Seals and treatments											
A NBR											
V FPM											
Bypass											
00 Without bypass											
Additional features											
NN Without											
Version											
P01 Standard catalogue item											
Certificates											
NN None											

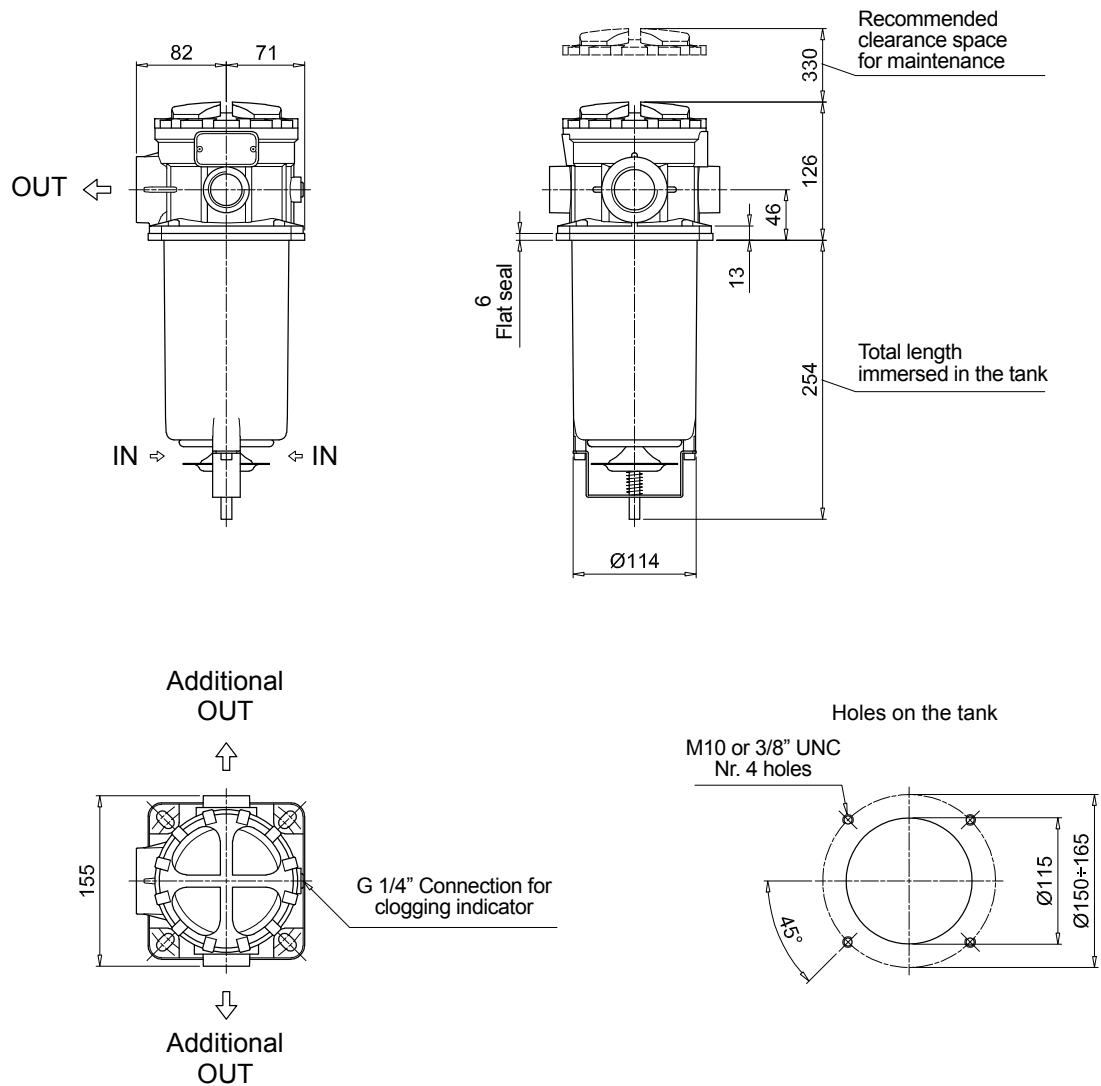
SFMC 250

Dimensions



SFMC 250

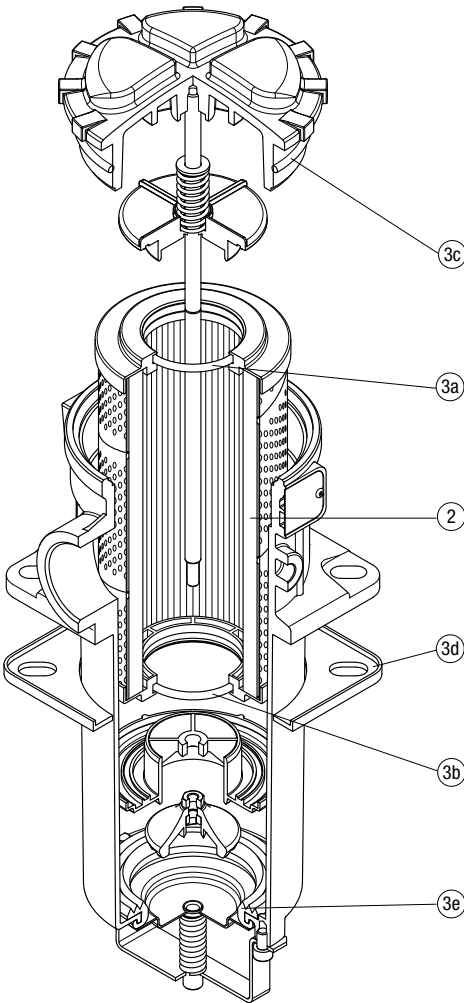
With smaller
additional connection 1



SFMC 250 SPARE PARTS

Order number for spare parts

SFMC 250



Q.ty: 1 pc.		Q.ty: 1 pc.	
Item:	2	3	(3a ÷ 3e)
Filter series	Filter element	Seal Kit code number	
		NBR	FPM
SFMC 250	See order table	AK021000375	AK021000376

SFSC series

Flow rate up to 700 l/min



Description

Technical data

Suction filters

Flow rate up to 700 l/min

SFSC is a range of suction filters with integrated shut-off valve for protection of the downstream pump against the coarse contamination. They are placed below the minimum oil level, directly connected to the suction line of the pump.

They can be fitted on the side or below the tank, allowing a more flexible design of the tank.

The shut-off valve closes automatically when the cover is removed, allowing the filter element replacement without the fluid drop.

Available features:

- Flanged connections up to 4", for a maximum flow rate of 700 l/min
- Optional hose fitting installed, to connect the suction line without the use of flanges
- Magnetic filter, to hold the ferrous particles
- Plastic and metal handle, to close the shut-off valve before the cover removal
- Electrical switch, to signal the closed shut-off valve
- Visual, electrical and electronic clogging indicators

Common application:

Industrial equipment

Filter housing materials

- Housing:
Anodized Aluminium
Steel (chemical heat treatment): only for SFSC 535 - 540
- Cover:
Anodized Aluminium
- Optional hose barb:
Anodized Aluminium

Filter element features

Filter SFSC		Filter element SSC	
Δp Element type			
Element media	Construction	Δp Series	Δp
M - Wire mesh	Standard	A	1 bar
Please see ordering code tables to check element Δp series availability based on filter features.			
Flow direction through the filter element: From IN to OUT			

Seals

- Standard NBR series A or W
- Optional FPM series V or Z

Temperature

From -25 °C to +110 °C

Note

SFSC filters mounting, see the drawings on page 60 and following

Weights [kg] and volumes [dm³]

Filter series	Weights [kg]	Volumes [dm ³]
SFSC 500	4.2	1.8
SFSC 503	6.2	2.9
SFSC 504	7.2	4.0
SFSC 505	4.3	1.6
SFSC 510	5.4	2.1
SFSC 535	16	4.4
SFSC 540	18.6	6.5

Flow rates [l/min]

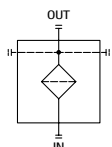
Filter series	Filter element design - N Series	
	M0025	M0060 M0090 M0250
SFSC 500	219	234
SFSC 503	325	390
SFSC 504	484	543
SFSC 505	199	221
SFSC 510	259	282
SFSC 535	439	479
SFSC 540	644	688

Maximum flow rate for a complete suction filter with a pressure drop $\Delta p = 0.08$ bar.

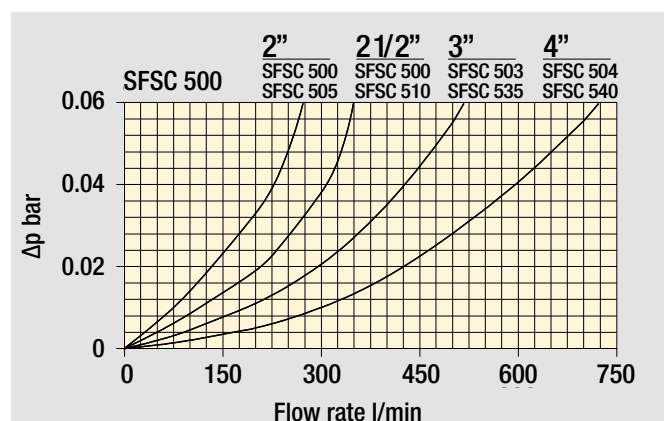
The reference fluid has a kinematic viscosity of 30 mm²/s (cSt) and a density of 0.86 kg/dm³.

For different pressure drop or fluid viscosity we recommend to use our selection software available on www.mpfiltri.com.

You can also calculate the right size using the formulas present on the FILTER SIZING paragraph at the beginning of the full catalogue or at the beginning of the filter family brochure. Please, contact our Sales Department for further additional information.

Filter series	00 - without bypass
SFSC	

Hydraulic diagram



Pressure drop

Filter housings
 Δp pressure drop

The curves are plotted using mineral oil with density of 0.86 kg/dm³ in compliance with ISO 3968.
 Δp varies proportionally with density.

Designation & Ordering code

COMPLETE FILTER

Series	Example 1:	SFSC	500	10	M0025	A	W	00	FE200	0	6T	MA	P01	NN
SFSC	Example 2:	SFSC	535	10	M0060	A	V	00	HB089	0	9T	MC	P01	NN

Size
500 | 503 | 504 | 505 | 510 | 535 | 540

Length
10

Filtration rating (filter media)			
M0025	Wire mesh	25 µm	M0090 Wire mesh 90 µm
M0060	Wire mesh	60 µm	M0250 Wire mesh 250 µm

Element Δp
A 1 bar

Seals and treatments
A NBR
V FPM
W NBR with filter and components surface treatment
Z FPM with filter and components surface treatment

Bypass
00 Without bypass

Connections											
	500	505	510	503-535	504-540		500	505	510	503-535	504-540
FE200 2" SAE 3000 psi/M	•	•	-	-	-	HB063 Hose barb Ø 63 mm	•	•	-	-	-
FE212 2 1/2" SAE 3000 psi/M	•	-	•	-	-	HB075 Hose barb Ø 75 mm	•	-	•	-	-
FE300 3" SAE 3000 psi/M	-	-	-	•	-	HB089 Hose barb Ø 89 mm	-	-	-	•	-
FE400 4" SAE 3000 psi/M	-	-	-	-	•	HB114 Hose barb Ø 114 mm	-	-	-	-	•
FF200 2" SAE 3000 psi/UNC	•	•	-	-	-						
FF212 2 1/2" SAE 3000 psi/UNC	•	-	•	-	-						
FF300 3" SAE 3000 psi/UNC	-	-	-	•	-						
FF400 4" SAE 3000 psi/UNC	-	-	-	-	•						

Additional connections
0 Without additional connections

Connections for clogging indicators			500-503-504-540	505-510-535
6T	With both side indicator connections, with metal plugs	•	-	-
9T	With multiple indicator connections, with metal plugs	-	•	-

Additional features			500-503-504	505-510-535-540
MA	With magnetic filter	•	•	-
MB	With magnetic filter + polyamide handwheel	•	-	-
MC	With magnetic filter + microswitch	-	•	-
MD	With magnetic filter + microswitch + polyamide handwheel	•	-	-
ME	With magnetic filter + microswitch + steel handwheel	•	-	-

Version
P01 Standard catalogue item

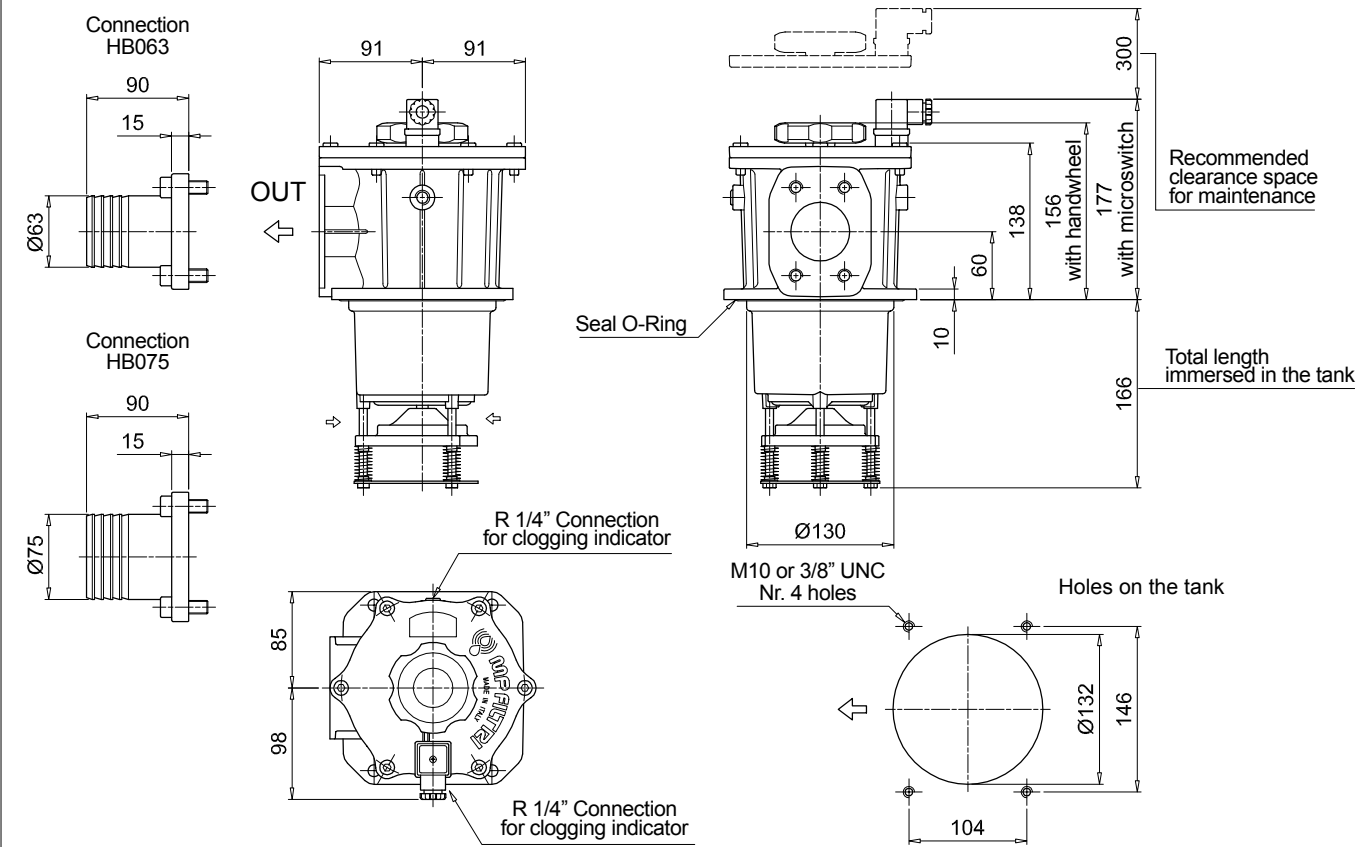
Certificates
NN None

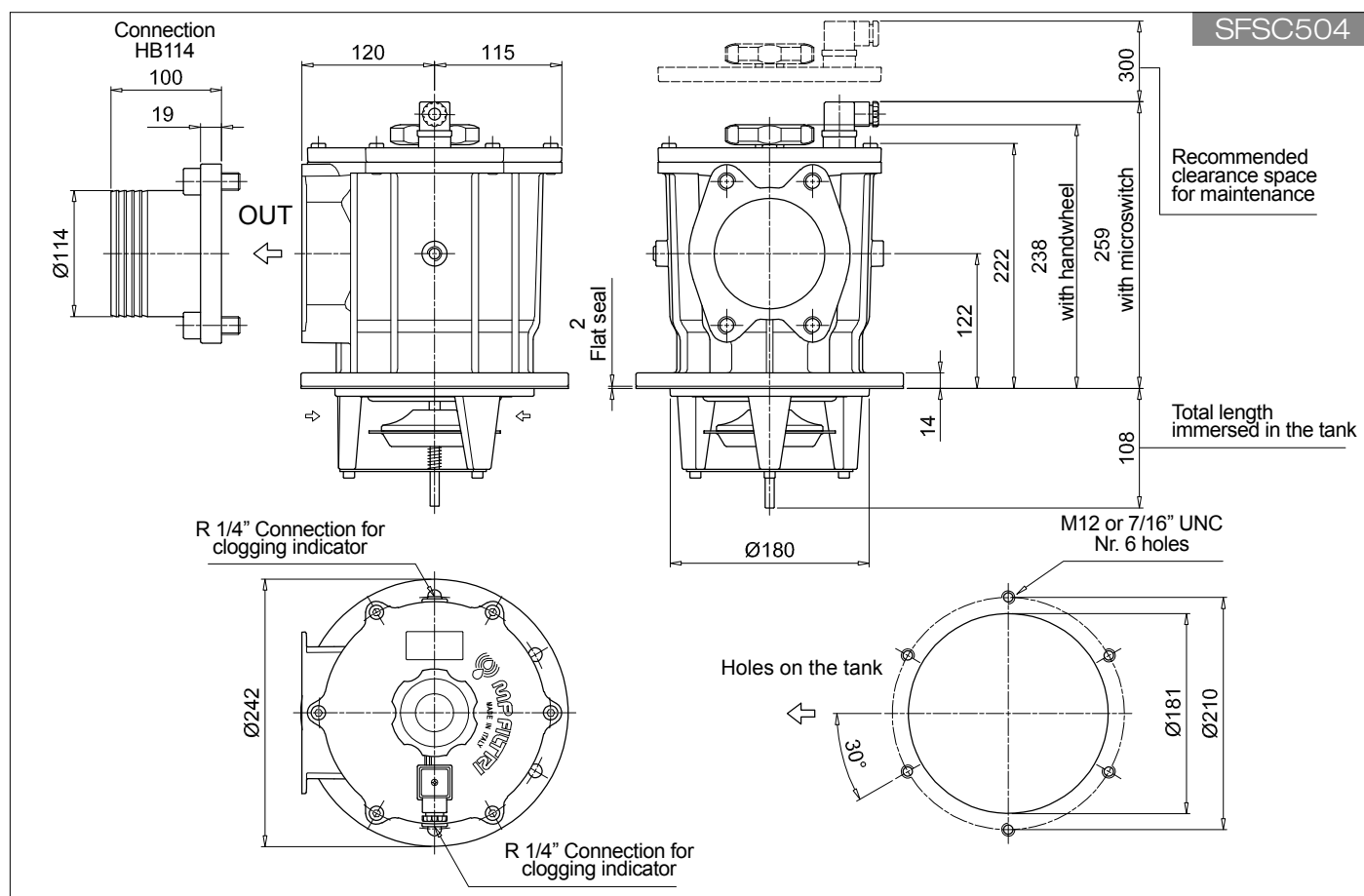
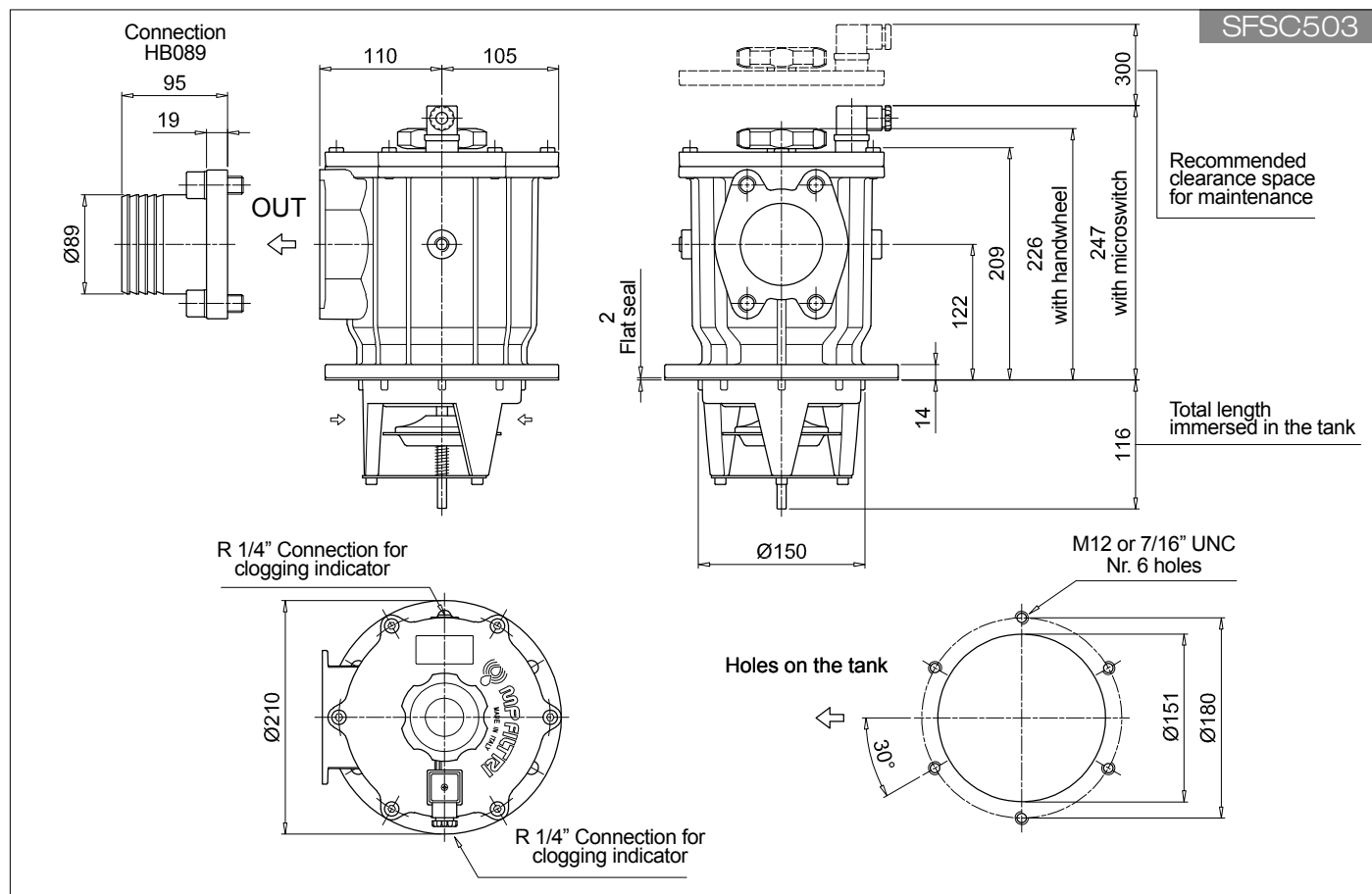
CLOGGING INDICATORS

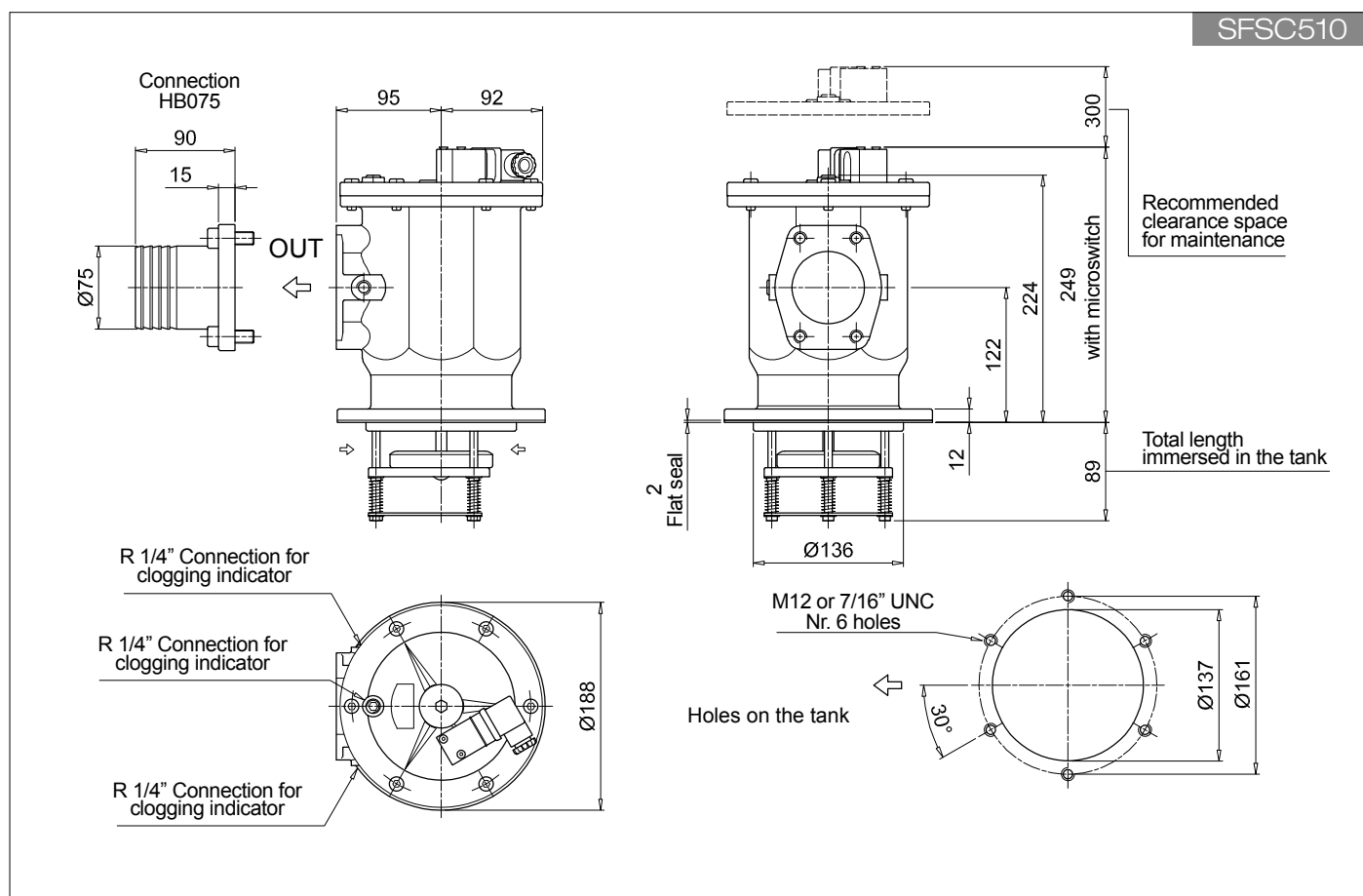
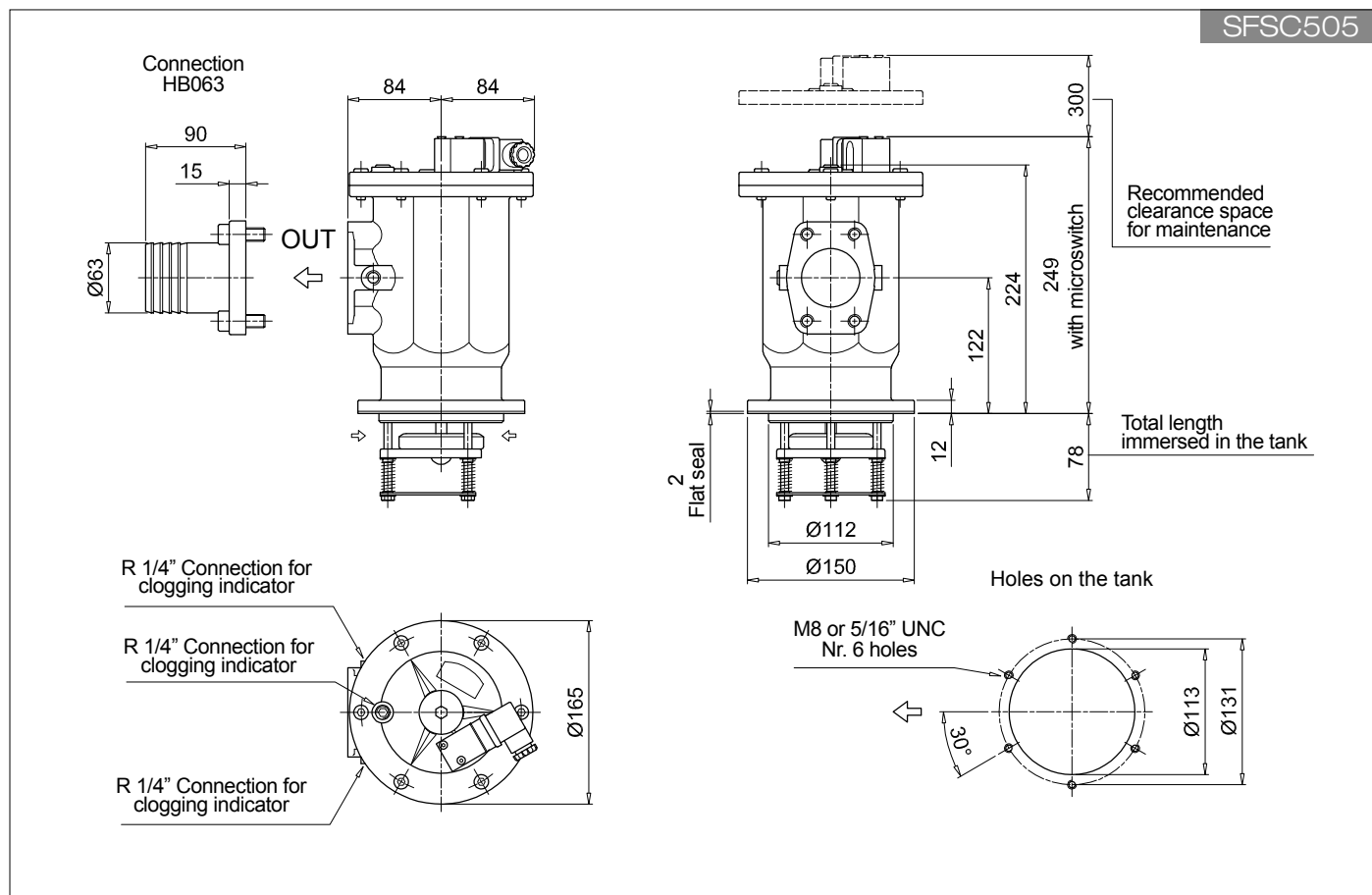
See page 775

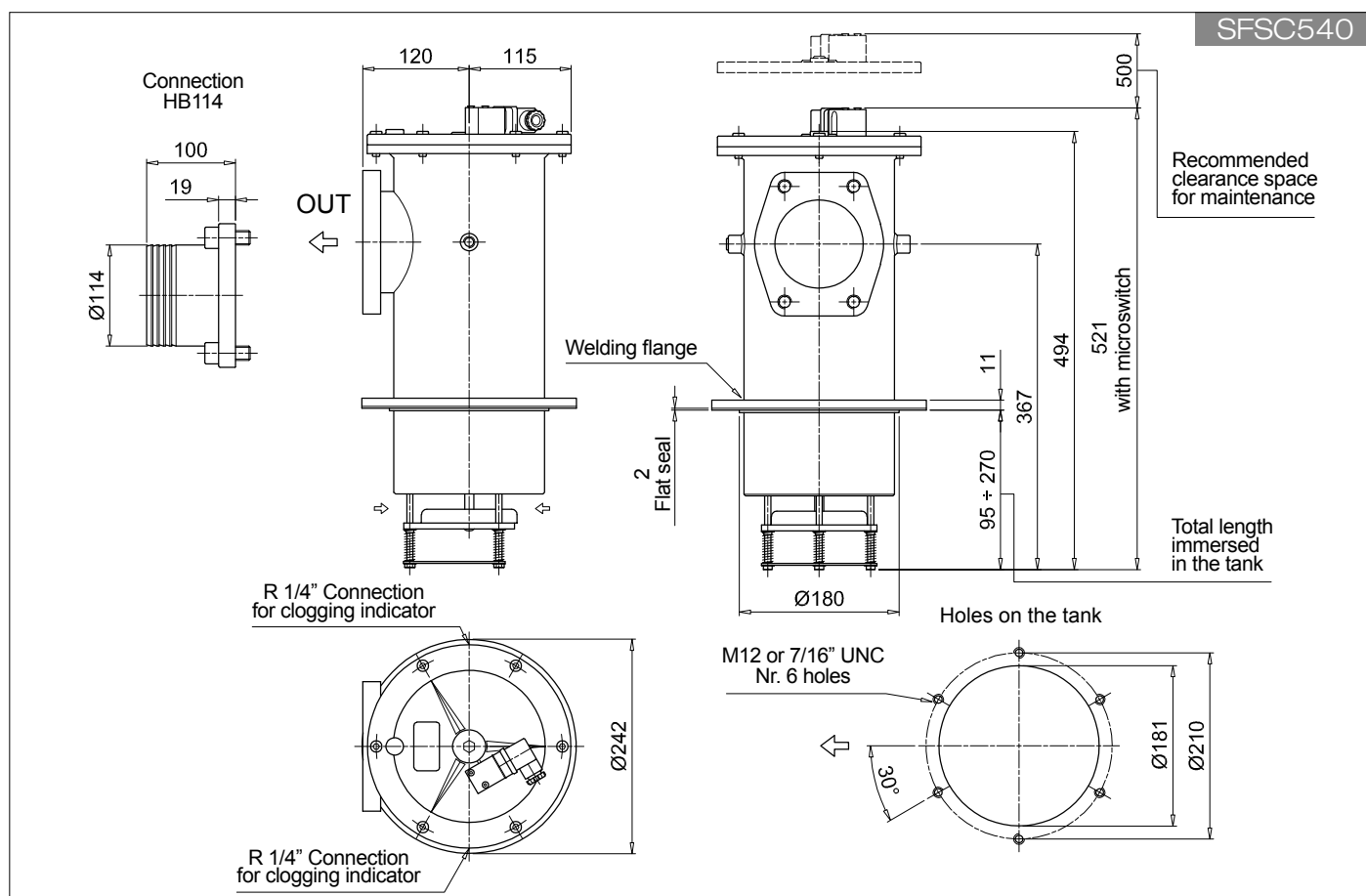
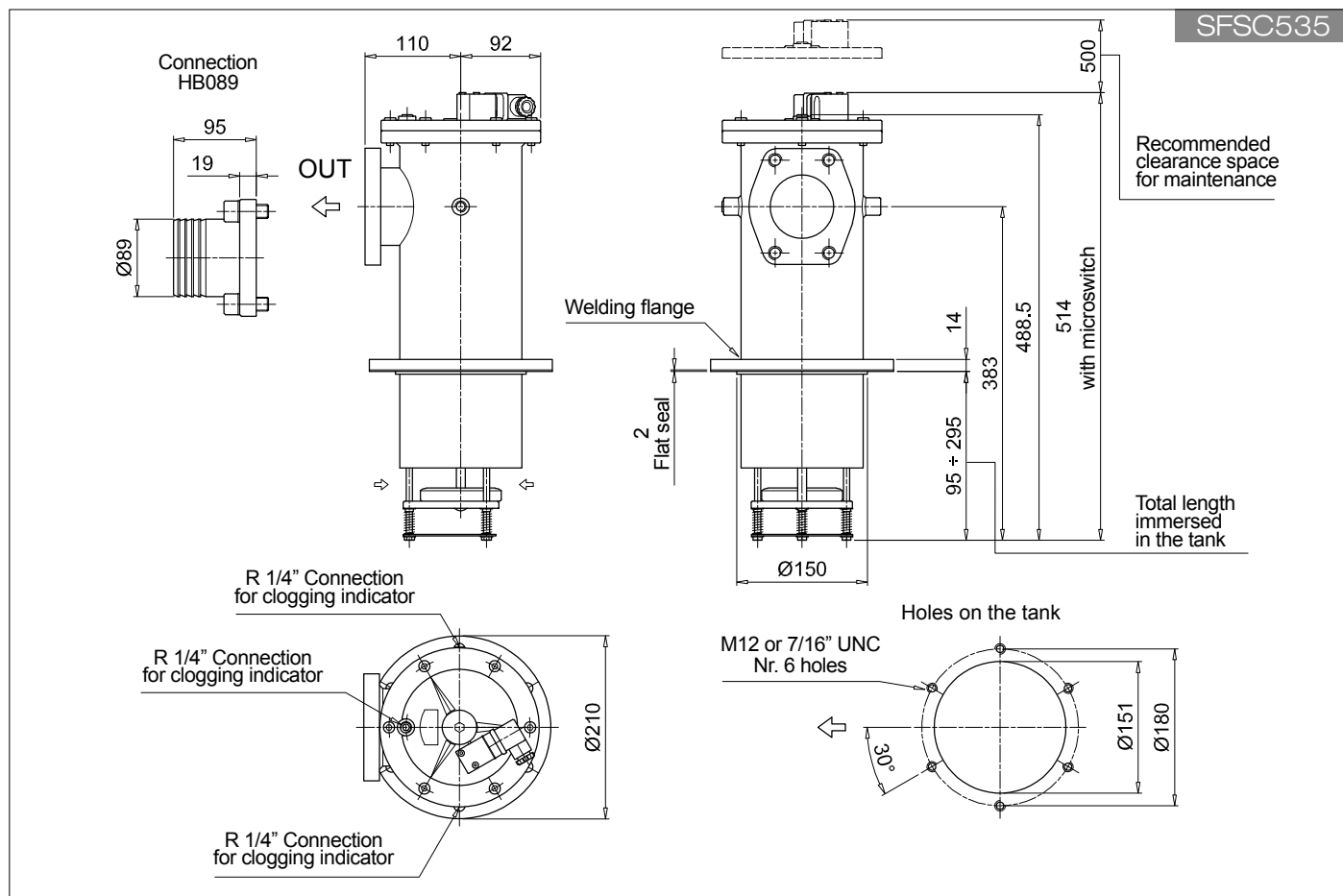
VEB	Electrical vacuum indicator	VVA	Axial vacuum gauge
VLB	Electrical / visual vacuum indicator	VVR	Radial vacuum gauge

FILTER ELEMENT											
Series		Example 1: SSC 510 10 M0025 A N 00 NN P01 NN									
SSC		Example 2: SSC 535 10 M0060 A N 00 NN P01 NN									
Size											
503	SFSC 503	510	SFSC 500	540	SFSC 540						
504	SFSC 504		SFSC 510								
505	SFSC 505	535	SFSC 535								
Length											
10											
Filtration rating (filter media)											
M0025	Wire mesh	25 µm	M0090	Wire mesh	90 µm						
M0060	Wire mesh	60 µm	M0250	Wire mesh	250 µm						
Element Δp											
A 1 bar											
Seals and treatments											
N No seal											
Bypass											
00 Without bypass											
Additional features											
NN Without											
Version											
P01 Standard catalogue item											
Certificates											
NN None											





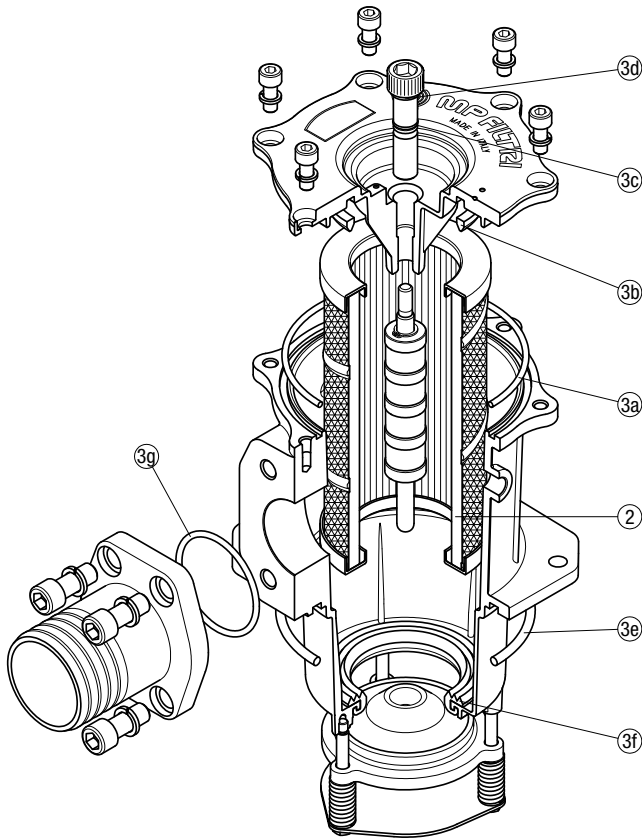




SFSC SPARE PARTS

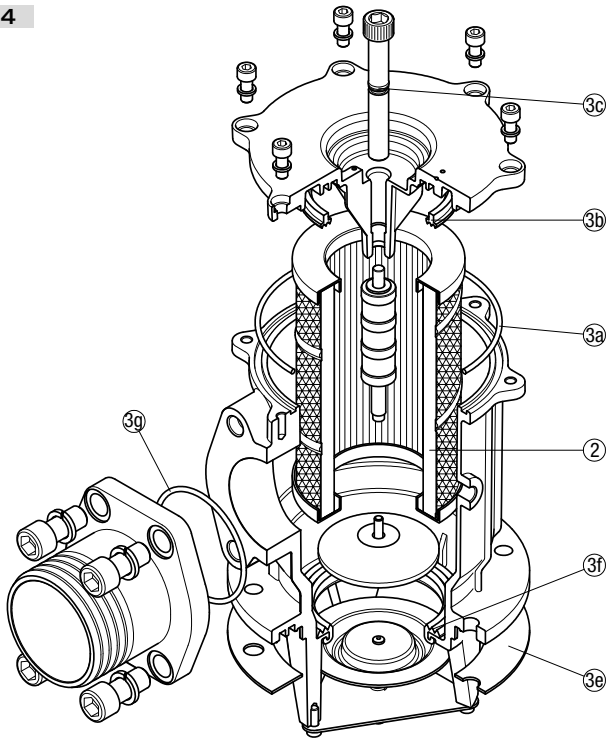
Order number for spare parts

SFSC 500



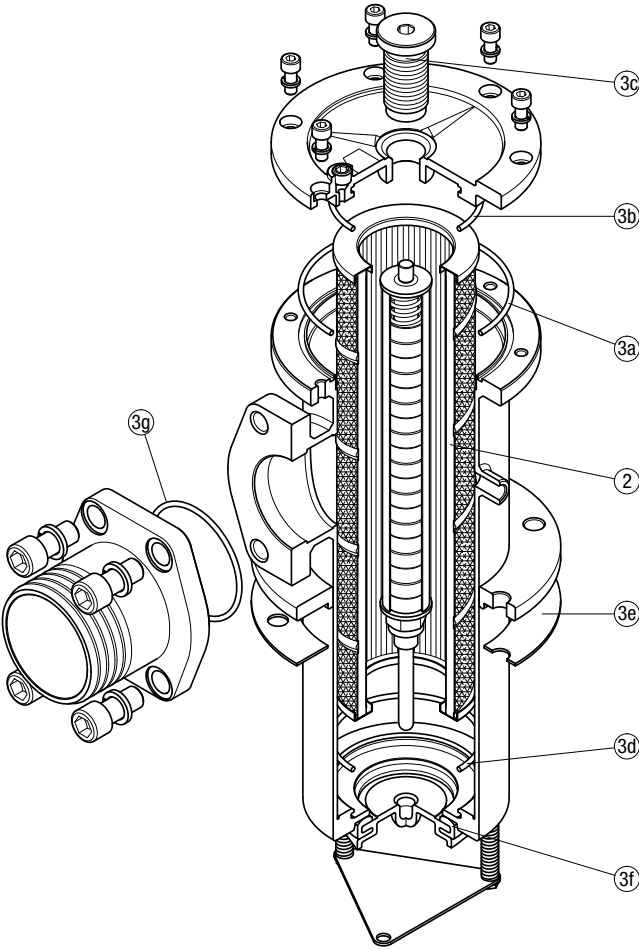
SFSC 503

SFSC 504

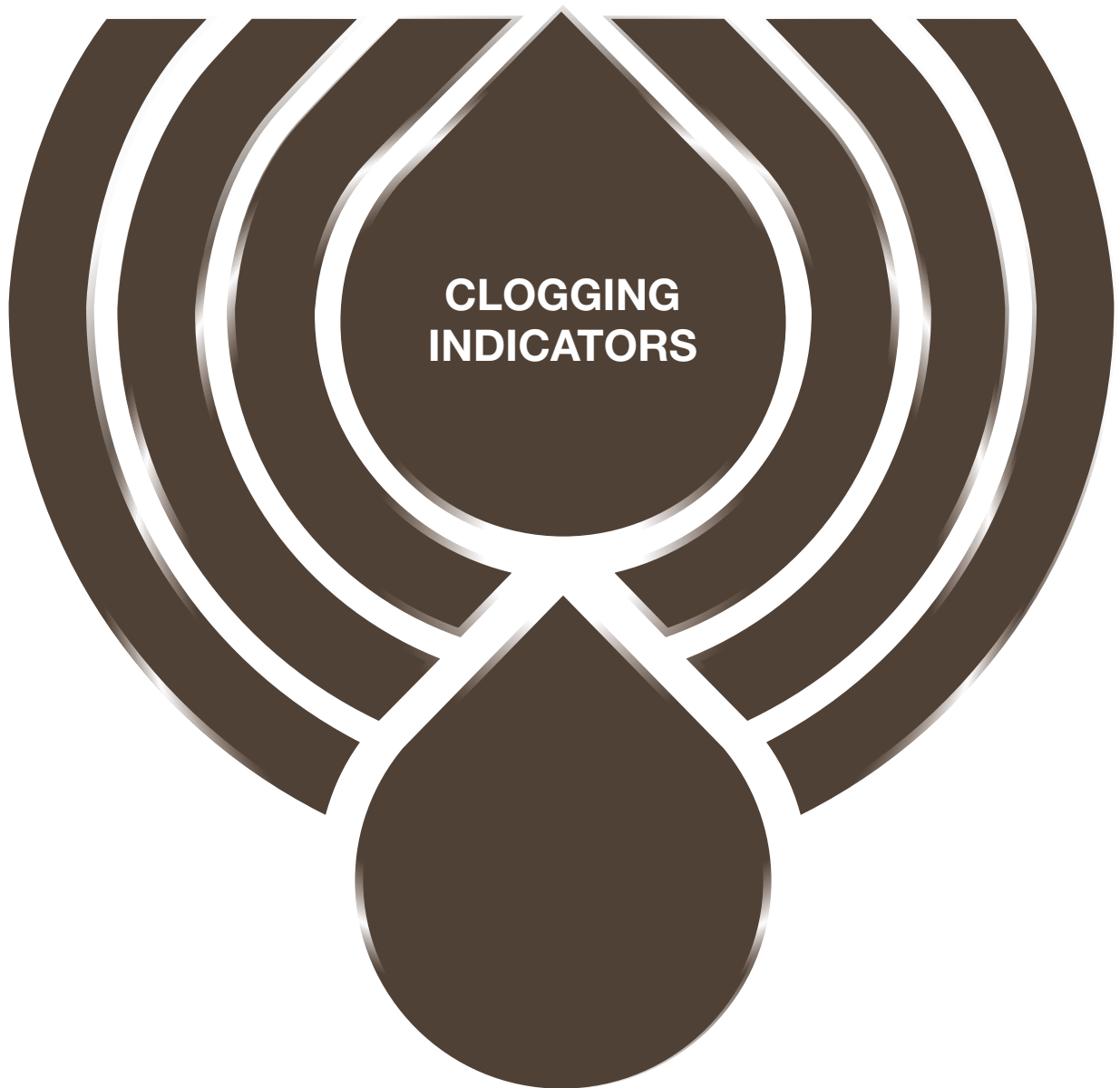


Item:	Q.ty: 1 pc. 2	Q.ty: 1 pc. 3 (3a ÷ 3g)
Filter series	Filter element	Seal Kit code number NBR FPM
SFSC 500	See	AK021000094 AK021000095
SFSC 503	order	AK021000051 AK021000052
SFSC 504	table	AK021000053 AK021000054

- SFSC 505
- SFSC 510
- SFSC 535
- SFSC 540



Q.ty: 1 pc.		Q.ty: 1 pc.	
Item:	2	3	(3a ÷ 3g)
Filter series	Filter element	Seal Kit code number	
		NBR	FPM
SFSC 505	See order table	AK021000027	AK021000028
SFSC 510		AK021000029	AK021000031
SFSC 535		AK021000036	AK021000037
SFSC 540		AK021000038	AK021000039



Clogging indicators are devices that check the life time of the filter elements. They measure the pressure drop through the filter element directly connected to the filter housing.

These devices trip when the clogging of the filter element causes a pressure drop increasing across the filter element.

Filter elements are efficient only if their Dirt Holding Capacity is fully exploited. This is achieved by using filter housings equipped with clogging indicators.

The indicator is set to alarm before the element becomes fully clogged.

MP Filtri can supply indicators of the following designs:

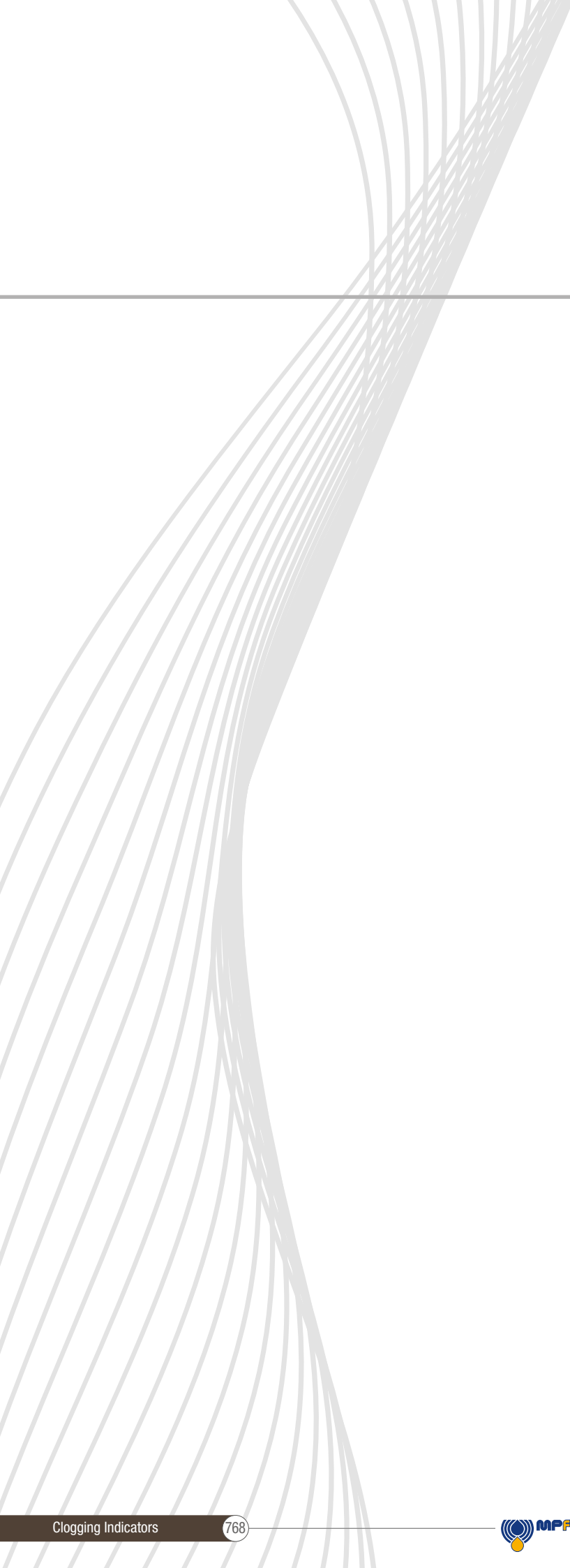
- Vacuum switches and gauges
- Pressure switches and gauges
- Differential pressure indicators

These type of devices can be provided with a visual, electrical or both signals. The electronic differential pressure clogging indicator is also available. It provides both analogical 4-20 mA output and digital warning (75% of clogging) and alarm (clogging) outputs.

In the following pages you can find a reference guide about the types of clogging indicators available in the different families of MP Filtri's Hydraulic Filtration range of products.

Clogging Indicators





DESIGNATION, ORDERING CODES & TECHNICAL DATA

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QUICK REFERENCE GUIDE

Ordering codes

Filter family	Filter series	Visual indicators	Electrical indicators	Electronic / Electrical-Visual indicators
SUCTION FILTERS	ELIXIR® SFEX 060-110	VVB20P01 VVS20P01	VEB21AA50P01	VLB21AA51P01 VLB21AA52P01 VLB21AA53P01 VLB21AA71P01
	Suction Line SFCM250	VVA20P01 VVR20P01	VEA21xA50P01 VEA21xA50P01UL	VLA21xA51P01 VLA21xA52P01 VLA21xA53P01 VLA21xA71P01
	Without bypass SFSC 500 - 503 - 504 - 505 SFSC 510 - 535 - 540	VVA20P01 VVR20P01	VEA21xA50P01 VEA21xA50P01UL	VLA21xA51P01 VLA21xA52P01 VLA21xA53P01 VLA21xA71P01
RETURN FILTERS	With bypass 1.75 bar ELIXIR® RFEX 060-110	BVA14P01 BVR14P01 BVP15HP01 BVQ15HP01	BEA15HA50P01 BEA15HA50P01UL BEM15HA41P01	BLA15HA51P01 BLA15HA52P01 BLA15HA53P01 BLA15HA71P01
	Without bypass ELIXIR® RFEX 060-110	BVA25P01 BVR25P01 BVP20HP01 BVQ20HP01	BEA20HA50P01 BEA20HA50P01UL BEM20HA41P01	BLA20HA51P01 BLA20HA52P01 BLA20HA53P01 BLA20HA71P01
	With bypass 1.75 bar MDHC 250	BVA14P01 BVR14P01 BVP15HP01 BVQ15HP01 DVS12HP01	BEA15HA50P01 BEA15HA50P01UL BEM15HA41P01 DES12HA10P01 DES12HA30P01 DES12HA80P01	BLA15HA51P01 BLA15HA52P01 BLA15HA53P01 BLA15HA71P01
	With bypass 3 bar MDHC 250	BVA25P01 BVR25P01 BVP20HP01 BVQ20HP01 DVS25HP01	BEA20HA50P01 BEA20HA50P01UL BEM20HA41P01 BET20HF10P01 BET20HF30P01 BET25HF10P01 BET25HF30P01 DES25HA10P01 DES25HA30P01 DES25HA80P01	BLA20HA51P01 BLA20HA52P01 BLA20HA53P01 BLA20HA71P01
	With bypass 1.75 bar MPFX MPTX MPHC	BVA14P01 BVR14P01 BVP15HP01 BVQ15HP01	BEA15HA50P01 BEA15HA50P01UL BEM15HA41P01	BLA15HA51P01 BLA15HA52P01 BLA15HA53P01 BLA15HA71P01
	With bypass 3 bar MPFX MPTX	BVA25P01 BVR25P01 BVP20HP01 BVQ20HP01	BEA20HA50P01 BEA20HA50P01UL BEM20HA41P01	BLA20HA51P01 BLA20HA52P01 BLA20HA53P01 BLA20HA71P01
	With bypass 2.5 bar MPHC	BVP20HP01 BVQ20HP01	BET20HF10P01 BET20HF30P01	BLA20HA51P01 BLA20HA52P01 BLA20HA53P01 BLA20HA71P01
	With bypass 4.5 bar MPLX		DEA20xA50P01 DEM20xx10P01 DEM20xx20P01 DEM20xx30P01 DEM20xx35P01	DLA20xA51P01 DLA20xA52P01 DLA20xA71P01 DLE20xA50P01 DLE20xF50P01
	Return line FRIC 025 - 040 - 100 - 250 - 630 - 850	DVA20xP01 DVM20xP01	DEU20VA50P01UL	DTA20xF70P01 DTI20xA70P01
	Return line FRIC 255	BVA25P01 BVR25P01 BVP20HP01 BVQ20HP01	BEA20HA50P01 BEA20HA50P01UL BEM20HA41P01	BLA20HA51P01 BLA20HA52P01 BLA20HA53P01 BLA20HA71P01

Filter family	Filter series	Visual indicators	Electrical indicators	Electronic / Electrical-Visual indicators
RETURN / SUCTION FILTERS	With bypass 2.5 bar	MRSX 116 - 165 - 166 Suction line	VVB20P01 VVS20P01	VEB21AA50P01 VLB21AA51P01 VLB21AA52P01 VLB21AA53P01 VLB21AA71P01
		MRSX 116 - 165 - 166 Return line	BVA25P01 BVR25P01 BVP20HP01 BVQ20HP01	BEA20HA50P01 BEA20HA50P01UL BEM20HA41P01 BET25HF10P01 BET25HF30P01 BET25HF50P01 BLA20HA51P01 BLA20HA52P01 BLA20HA53P01 BLA20HA71P01
	With bypass 2.5 bar	LMP 124 MULTIPORT	BVA25P01 BVR25P01 BVP20HP01 BVQ20HP01 DVA20xP01 DVM20xP01	BEA20HA50P01 BEA20HA50P01UL BEM20HA41P01 BET25HF10P01 BET25HF30P01 BET25HF50P01 DEA20xA50P01 DEM20xx10P01 DEM20xx20P01 DEM20xx30P01 DEM20xx35P01 DEU20VA50P01UL DLA20xA51P01 DLA20xA52P01 DLA20xA53P01 DLA20xA71P01 DLE20xA50P01 DLE20xF50P01 DTA20xF70P01 DTI20xA70P01
SPIN-ON FILTERS	Suction line	MPS 050 - 070 - 100 - 150 MPS 200 - 250 - 300 - 350	VVB20P01 VVS20P01	VEB21AA50P01 VLB21AA51P01 VLB21AA52P01 VLB21AA53P01 VLB21AA71P01
	Return line	MPS 050 - 070 - 100 - 150 MPS 200 - 250 - 300 - 350	BVA14P01 BVR14P01 BVP15HP01 BVQ15HP01	BEA15HA50P01 BEA15HA50P01UL BEM15HA41P01 BLA15HA51P01 BLA15HA52P01 BLA15HA53P01 BLA15HA71P01
	In-line	MPS 051 - 071 - 101 - 151 MPS 301 - 351	DVA12xP01 DVM12xP01 DVA20xP01 DVM20xP01	DEA12xA50P01 DEM12xAxxP01 DEA20xA50P01 DEM20xAxxP01 DEU20VA50P01UL DLA12xA51P01 DLA12xA52P01 DLA12xA71P01 DLA20xA51P01 DLA20xA52P01 DLA20xA71P01 DLE12xA50P01 DLE12xF50P01 DLE20xF50P01 DLE20xF50P01 DTA12xF70P01 DTA20xF70P01 DTI12xA70P01 DTI20xA70P01

QUICK REFERENCE GUIDE

Ordering codes

Filter family	Filter series	Visual indicators	Electrical indicators	Electronic / Electrical-Visual indicators		
LOW & MEDIUM PRESSURE FILTERS	ELIXIR® HFEX 060-110	DVS25HP01	DES25HA50P01			
	ELIXIR® LFEX 060-080-110-160	DVS25HP01	DES25HA10P01 DES25HA30P01 DES25HA50P01 DES25HA80P01			
	With bypass 3.5 bar	LMP 110 LMP 112 - 116 - 118 - 119 MULTIPORT LMP 120 - 122 - 123 MULTIPORT LMP 210 - 211 - LDP LMP 400 - 401 & 430 - 431 LMP 900 - 901 LMP 902 - 903 LMP 950 - 951 LMP 952 - 953 - 954 LMD 211 - 400 - 401 - 431 - 951 - LDD	DVA20xP01 DVM20xP01	DEA20xA50P01 DEM20xx10P01 DEM20xx20P01 DEM20xx30P01 DEM20xx35P01 DEU20VA50P01UL	DLA20xA51P01 DLA20xA52P01 DLA20xA71P01 DLE20xA50P01 DLE20xF50P01 DTA20xF70P01 DTI20xA70P01	
	With bypass 2.5 bar	LPH 630	DVA20xP01 DVM20xP01	DEA20xA50P01 DEM20xx10P01 DEM20xx20P01 DEM20xx30P01 DEM20xx35P01 DEU20VA50P01UL	DLA20xA51P01 DLA20xA52P01 DLA20xA71P01 DLE20xA50P01 DLE20xF50P01 DTA20xF70P01 DTI20xA70P01	
	With bypass 1.75 bar	LPH 630	DVA12xP01 DVM12xP01	DEA12xA50P01 DEM12xx10P01 DEM12xx20P01 DEM12xx30P01 DEM12xx35P01	DLA12xA51P01 DLA12xA52P01 DLA12xA71P01 DLE12xA50P01 DLE12xF50P01 DTA12xF70P01 DTI12xA70P01	
	Without bypass	ELIXIR® HFEX 060-110	DVS40HP01	DES40HA50P01		
		ELIXIR® LFEX 060-080-110-160	DVS40HP01	DES40HA10P01 DES40HA30P01 DES40HA50P01 DES40HA80P01		
		LMP 110 LMP 112 - 116 - 118 - 119 MULTIPORT LMP 120 - 122 - 123 MULTIPORT LMP 210 - 211 - LDP LMP 400 - 401 & 430 - 431 LMP 900 - 901 LMP 902 - 903 LMP 950 - 951 LMP 952 - 953 - 954 LMD 211 - 400 - 401 - 431 - 951 - LDD LPH 630	DVA50xP01 DVM50xP01	DEA50xA50P01 DEM50xx10P01 DEM50xx20P01 DEM50xx30P01 DEM50xx35P01 DEU50VA50P01UL	DLA50xA51P01 DLA50xA52P01 DLA50xA71P01 DLE50xA50P01 DLE50xF50P01 DTA50xF70P01 DTI50xA70P01	
		With bypass 3.5 bar	MLPX MLDX	DVA20xP01 DVM20xP01	DEA20xA50P01 DEM20xx10P01 DEM20xx20P01 DEM20xx30P01 DEM20xx35P01v	DLA20xA51P01 DLA20xA52P01 DLA20xA71P01 DLE20xA50P01 DLE20xF50P01 DTA20xF70P01 DTI20xA70P01
		With bypass 1.75 bar	MLPC MLDC	DVA12xP01 DVM12xP01	DEA12xA50P01 DEM12xx10P01 DEM12xx20P01 DEM12xx30P01 DEM12xx35P01	DLA12xA51P01 DLA12xA52P01 DLA12xA71P01 DLE12xA50P01 DLE12xF50P01 DTA12xF70P01 DTI12xA70P01
	Without bypass	MLDC MLPC	DVA50xP01 DVM50xP01	DEA50xA50P01 DEM50xx10P01 DEM50xx20P01 DEM50xx30P01 DEM50xx35P01	DLA50xA51P01 DLA50xA52P01 DLA50xA71P01 DLE50xA50P01 DLE50xF50P01 DTA50xF70P01 DTI50xA70P01	

Filter family	Filter series	Visual indicators	Electrical indicators	Electronic / Electrical-Visual indicators
HIGH PRESSURE FILTERS	With bypass 6 bar	FMP 039 - 065 - 135 - 320 FHP 010 - 011 - 065 - 135 - 350 - 351 - 500 FMMX 050 - 150 FMM 050 - 150 FHA 051 FHM 050 - 065 - 135 - 320 - 500 FHB 050 - 135 - 320 FHF 325 FHD 051 - 326 - 333	DVA50xP01 DVM50xP01	DEA50xA50P01 DEA50xA51P01 DEA50xA52P01 DEA50xA71P01 DEM50xx10P01 DEM50xx20P01 DEM50xx30P01 DEM50xx35P01 DEU50VA50P01UL DLA50xA51P01 DLA50xA52P01 DLA50xA71P01 DLE50xA50P01 DLE50xF50P01 DTA50xF70P01 DTI50xA70P01
	Without bypass	FMP 039 - 065 - 135 - 320 FHP 010 - 011 - 065 - 135 - 350 - 351 - 500 FMMX 050 - 150 FMM 050 - 150 FHA 051 FHM 006 - 007 - 010 - 050 - 065 - 135 - 320 - 500 FHB 050 - 135 - 320 FHF 325 FHD 021 - 051 - 326 - 333	DVA70xP01 DVA95xP01 DVM70xP01 DVM95xP01	DEA70xA50P01 DEA95xA50P01 DEM70xx10P01 DEM70xx20P01 DEM70xx30P01 DEM70xx35P01 DEU70VA50P01UL DEM95xx10P01 DEM95xx20P01 DEM95xx30P01 DEM95xx35P01 DLA70xA51P01 DLA70xA52P01 DLA70xA71P01 DLA95xA51P01 DLA95xA52P01 DLA95xA71P01 DLE70xA50P01 DLE70xF50P01 DLE95xA50P01 DLE95xF50P01 DTA70xF70P01 DTA95xF70P01 DTI70xA70P01 DTI95xA70P01
STAINLESS STEEL HIGH PRESSURE FILTERS	With bypass 6 bar	FZH 012 - 040	DVZ50xP01	DEZ50xA50P01 DLZ50xA51P01 DLZ50xA52P01
	Without bypass	FZH 012 - 040	DVZ70xP01 DVZ95xP01	DEZ70xA50P01 DEZ95xA50P01 DLZ70xA51P01 DLZ70xA52P01 DLZ95xA51P01 DLZ95xA52P01
	With bypass 6 bar	FZP 039 - 136 FZB 039 FZM 039 FZD 051	DVX50xP01 DYY50xP01	DEX50xA50P01 DLX50xA51P01 DLX50xA52P01
	Without bypass	FZP 039 - 136 FZB 039 FZM 039 FZD 010 - 021 - 051	DVX70xP01 DVX95xP01 DYY70xP01 DYY95xP01	DEX70xA50P01 DEX95xA50P01 DLX70xA51P01 DLX70xA52P01 DLX95xA51P01 DLX95xA52P01
FILTERS FOR POTENTIALLY EXPLOSIVE ATMOSPHERE	With bypass 6 bar	FMMX 050 - 150	DVA50xP01 DVM50xP01	DEH50xA48P01 DEH50xA49P01 DEH50xA70P01
	Without bypass	FMMX 050 - 150	DVA70xP01 DVA95xP01 DVM70xP01 DVM95xP01	DEH70xA48P01 DEH70xA49P01 DEH70xA70P01
	With bypass 6 bar	FZP 039 - 136	DVX50xP01 DYY50xP01	DEH50xA48P01 DEH50xA49P01 DEH50xA70P01
	Without bypass	FZP 039 - 136	DVX70xP01 DVX95xP01 DYY70xP01 DYY95xP01	DEH70xA48P01 DEH70xA49P01 DEH70xA70P01
	With bypass 6 bar	FZH 012 - 040	DVZ50xP01	
	Without bypass	FZH 012 - 040	DVZ70xP01 DVZ95xP01	

Suitable indicator types

V ACUUM INDICATORS

Vacuum indicators are used on the Suction line to check the efficiency of the filter element.

They measure the pressure downstream of the filter element.

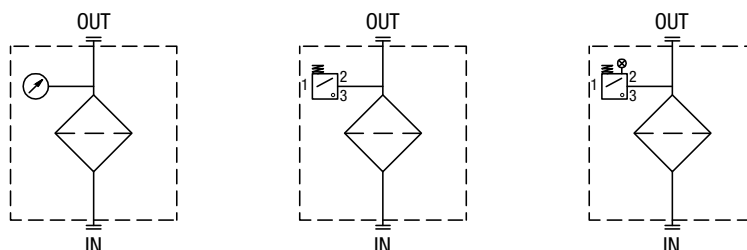
Standard items are produced with R 1/4" EN 10226 connection.

Available products with R 1/8" EN 10226 to be fitted on MPS series.

Vacuum indicators are identified in the Hydraulic Filtration catalogue and in the Quick Reference Guide table by the letter "V".

Example:

V VVB20P01



B BAROMETRIC (PRESSURE) INDICATORS

Pressure indicators are used on the Return line to check the efficiency of the filter element.

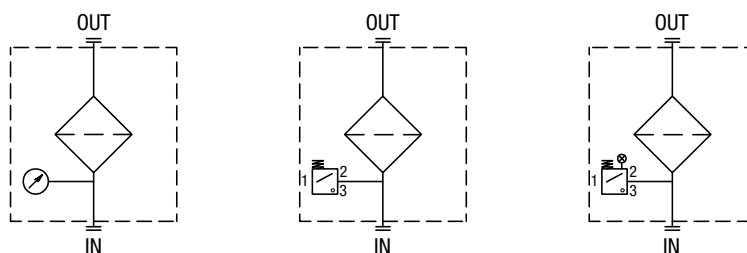
They measure the pressure upstream of the filter element.

Standard items are produced with R 1/8" EN 10226 connection.

Barometric (pressure) indicators are identified in the Hydraulic Filtration catalogue and in the Quick Reference Guide table by the letter "B".

Example:

B BVA14P01



D DIFFERENTIAL PRESSURE INDICATORS

Differential pressure indicators are used on the Pressure line to check the efficiency of the filter element.

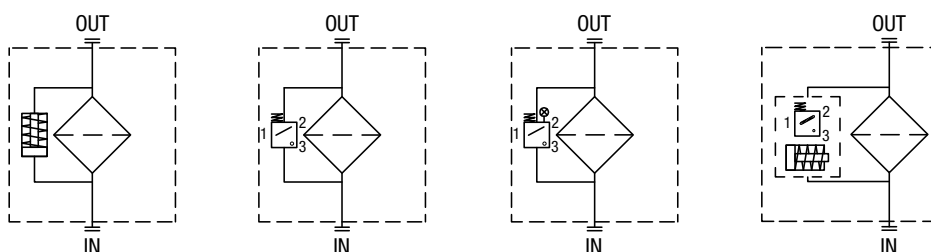
They measure the pressure upstream and downstream of the filter element (differential pressure).

Standard items are produced with special connection G 1/2" size.

Also available in Stainless Steel models. Differential pressure indicators are identified in the Hydraulic Filtration catalogue and in the Quick Reference Guide table by the letter "D".

Example:

D DVA20xP01



Designation & Ordering code

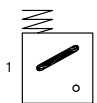
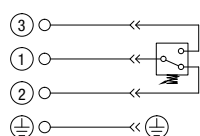
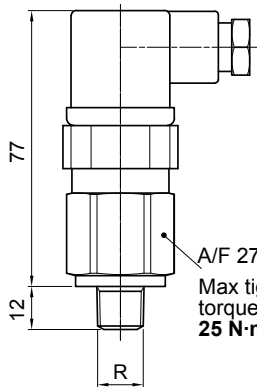
APPLICABLE VACUUM INDICATORS BY FILTER SERIES

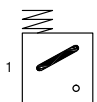
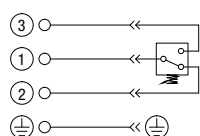
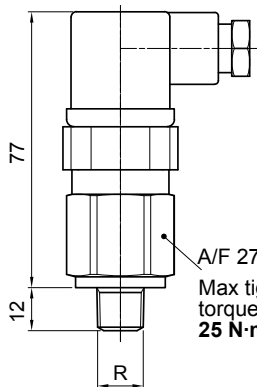
Filter Series	VEA	VEB	VLA	VLB	VVA	VVB	VVR	VVS
STRC	-	-	-	-	-	-	-	-
MPAC	-	-	-	-	-	-	-	-
SFEX	-	•	-	•	-	•	-	•
SFMC	•	-	•	-	•	-	•	-
SFSC	•	-	•	-	•	-	•	-

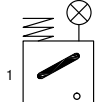
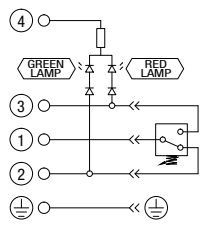
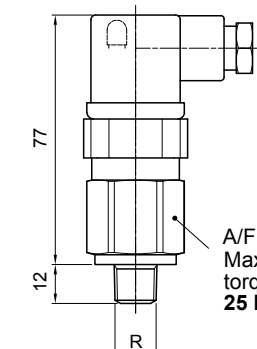
VACUUM INDICATORS

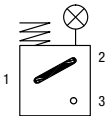
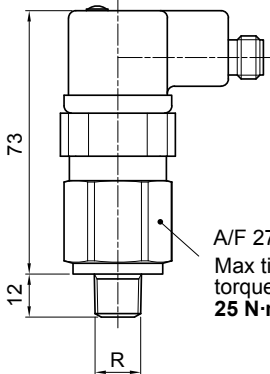
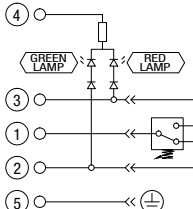
Series		Configuration example 1: VEA21VAB50P01EX									
VE Electrical vacuum indicator		Configuration example 2: VLBR21AA71P01									
VL Electrical/Visual vacuum indicator		Configuration example 3: VVR20P01									
VV Vacuum gauge											
Type VE - VL		Type VV		SFC	SFEX						
A	Connection EN 10226 - R1/4"	A	Axial connection EN 10226 - R1/4"	•	-						
B	Connection EN 10226 - R1/8"	B	Axial connection EN 10226 - R1/8"	-	•						
		R	Radial connection EN 10226 - R1/4"	•	-						
		S	Radial connection EN 10226 - R1/8"	-	•						
Vacuum setting		VE	VL	VVA	VVB	VVR	VVS				
20	0.20 bar	-	-	•	•	•	•				
21	0.21 bar	•	•	-	-	-	-				
Seals				VEA - VLA	VEB - VLB	VV					
A	NBR			•	•	-					
V	FPM			•	-	-					
Thermostat				VE	VL	VV					
A	Without			•	•	-					
Electrical connections				VE	VL	VV					
50	Connection EN 175301-803			•	-	-					
51	Connection EN 175301-803, transparent base with lamps 24 Vdc			-	•	-					
52	Connection EN 175301-803, transparent base with lamps 110 Vdc			-	•	-					
53	Connection EN 175301-803, transparent base with lamps 230 Vac			-	•	-					
71	Connection IEC 61076-2-101 D (M12), black base with lamps 24 Vdc			-	•	-					
Option											
P01 MP Filtri standard											
Pxx Customized											
Certifications				VEA21A	VEA21V	VEB	VL	VV			
Without				•	•	•	•	•			
EX	ATEX certification			•	•	•	-	-			
UL	UL certification			•	-	-	-	-			

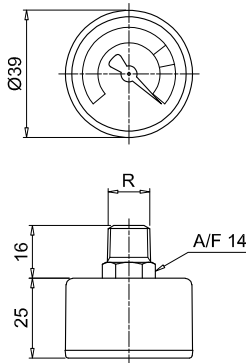
Technical data

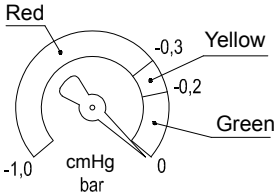
VE*50 (EX) Electrical Vacuum Indicator Connection: EN 175301-803		Hydraulic symbol 		Materials - Body: Brass - Base: Black polyamide - Contacts: Silver - Seal: VEA: NBR/FPM VEB: NBR	
R	Ordering code	Electrical symbol 		Technical data - Vacuum setting: 0.21 bar ±10% - Max working pressure: 10 bar - Proof pressure: 15 bar - Working temperature: From -25 °C to +80 °C - Compatibility with fluids: Mineral oils, Synthetic fluids HFB and HFC according to ISO 2943 - Degree of protection: IP65 according to EN 60529	
EN 10226 - R1/4"	VE A 21 x A 50 P01 VE A 21 x A 50 P01 EX	 - Certification: ATEX, IECEx - Certification included in EX version		Electrical data - Electrical connection: EN 175301-803 - Resistive load: 5 A / 14 Vdc 4 A / 30 Vdc 5 A / 125 Vac 4 A / 250 Vac	
EN 10226 - R1/8"	VE B 21 A A 50 P01 VE B 21 A A 50 P01 EX				
 Max tightening torque: 25 N·m					

VEA50 UL Electrical Vacuum Indicator Connection: EN 175301-803		Hydraulic symbol 		Materials - Body: Brass - Base: Black polyamide - Contacts: Silver - Seal: VEA: NBR/FPM VEB: NBR	
R	Ordering code	Electrical symbol 		Technical data - Vacuum setting: 0.21 bar ±10% - Max working pressure: 10 bar - Proof pressure: 15 bar - Working temperature: From -25 °C to +80 °C - Compatibility with fluids: Mineral oils, Synthetic fluids HFB and HFC according to ISO 2943 - Degree of protection: IP65 according to EN 60529	
EN 10226 - R1/4"	VE A 21 A A 50 P01 UL	 - Certification: UL - Certification included as standard		Electrical data - Electrical connection: EN 175301-803 - Resistive load: 5 A / 14 Vdc 4 A / 30 Vdc 5 A / 125 Vac 4 A / 250 Vac	
 Max tightening torque: 25 N·m					

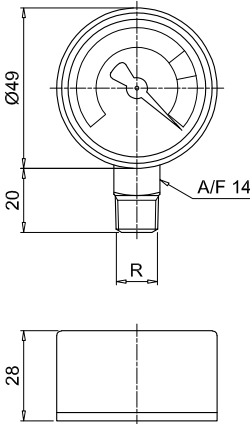
VL*51 - VL*52 - VL*53 Electrical/Visual Vacuum Indicator Connection: EN 175301-803		Hydraulic symbol 		Materials - Body: Brass - Base: Transparent polyamide - Contacts: Brass - Polyamide - Seal: VLA: NBR/FPM VLB: NBR	
51: Transparent base with lamps 24 Vdc 52: Transparent base with lamps 110 Vdc 53: Transparent base with lamps 230 Vac		Electrical symbol 		Technical data - Vacuum setting: 0.21 bar ±10% - Max working pressure: 10 bar - Proof pressure: 15 bar - Working temperature: From -25 °C to +80 °C - Compatibility with fluids: Mineral oils, Synthetic fluids HFB and HFC according to ISO 2943 - Degree of protection: IP65 according to EN 60529	
R	Ordering code	 - Certification: ATEX, IECEx - Certification included in EX version		Electrical data - Electrical connection: EN 175301-803 - Type: 51 52 53 - Lamps: 24 Vdc 110 Vdc 230 Vac - Resistive load: 1 A / 24 Vdc 1 A / 110 Vdc 1 A / 230 Vac	
EN 10226 - R1/4"	VL A 21 x A xx P01				
EN 10226 - R1/8"	VL B 21 A A xx P01				
 Max tightening torque: 25 N·m					

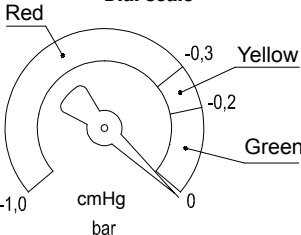
VL*71		Hydraulic symbol	Materials
Electrical/Visual Vacuum Indicator Connection IEC 61076-2-101 D (M12), black base with lamps 24 Vdc			- Body: Brass - Base: Black polyamide - Contacts: Silver - Seal: VLA: NBR/FPM VLB: NBR
Connections	Indicator code	Electrical symbol	Technical data
EN 10226 - R1/4"	VL A 21 x A 71 P01		
EN 10226 - R1/8"	VL B 21 A A 71 P01		
			
		Electrical data	
		- Electrical connection: IEC 61076-2-101 D (M12) - Lamps: 24 Vdc (black base) - Resistive load: 0.4 A / 24 Vdc	

VVA - VVB	
Axial Vacuum Gauge	
R	Ordering code
EN 10226 - R1/4"	VVA 20 P01
EN 10226 - R1/8"	VVB 20 P01
	

Hydraulic symbol	
	
Dial scale	
	
Conversion to SI units	
[cmHg]	[bar]
-12	-0.16
-18	-0.24
-76	-1.01

Materials	
- Case:	Black plastic
- Window:	Clear plastic
- Dial:	White plastic
- Pointer:	Black plastic
- Pressure connection:	Cu-alloy
- Pressure element:	Bourdon tube Cu-alloy soft soldered, C type
- Movement:	Cu-alloy
Technical data	
- Max working pressure:	Steady: -0.7 bar Fluctuating: -0.6 bar Short time: -1.0 bar
- Working temperature:	Ambient from -40 °C to +60 °C Fluid max + 60 °C Storage from -40 °C to +60 °C
- Compatibility with fluids:	Mineral oils, Synthetic fluids HFB and HFC according to ISO 2943
- Accuracy:	Class 2.5 according to EN 13190
- Degree of protection:	IP31 according to EN 60529

VVR - VVS		
Radial Vacuum Gauge		
R	A/F	Ordering code
EN 10226 - R1/4"	14	VVR 20 P01
EN 10226 - R1/8"	11	VVS 20 P01
		

Hydraulic symbol	
	
Dial scale	
	
Conversion to SI units	
[cmHg]	[bar]
-12	-0.16
-18	-0.24
-76	-1.01

Materials	
- Case:	Black plastic
- Window:	Clear plastic
- Dial:	White plastic
- Pointer:	Black plastic
- Pressure connection:	Cu-alloy
- Pressure element:	Bourdon tube Cu-alloy soft soldered, C type
- Movement:	Cu-alloy
Technical data	
- Max working pressure:	Steady: -0.7 bar Fluctuating: -0.6 bar Short time: -1.0 bar
- Working temperature:	Ambient from -40 °C to +60 °C Fluid max + 60 °C Storage from -40 °C to +60 °C
- Compatibility with fluids:	Mineral oils, Synthetic fluids HFB and HFC according to ISO 2943
- Accuracy:	Class 2.5 according to EN 13190
- Degree of protection:	IP31 according to EN 60529

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