



CONTAMINATION CONTROL SOLUTIONS

MOBILE FILTRATION UNITS



PASSION TO 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 popular classification criterion divides them into the following families:

- MINERAL OILS

Commonly used oil deriving fluids.

- FIRE RESISTANT FLUIDS

Fluids with intrinsic characteristics of incombustibility or high flash point.

- SYNTHETIC FLUIDS

Modified chemical products to obtain specific optimized features.

- ECOLOGICAL FLUIDS

Synthetic or vegetable origin fluids with high biodegradability characteristics.

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 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



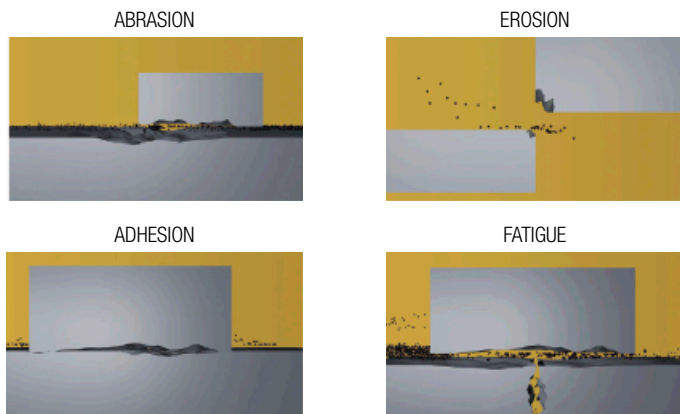
CONTAMINATION IN PRESENCE OF NARROW TOLERANCES



Solid contamination mainly causes surface damage and component wear.

- 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.

- 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
Maintenance activities, spare parts, machine stop costs
- ENERGY AND EFFICIENCY
Efficiency and performance reduction due to friction, drainage, cavitation.



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.

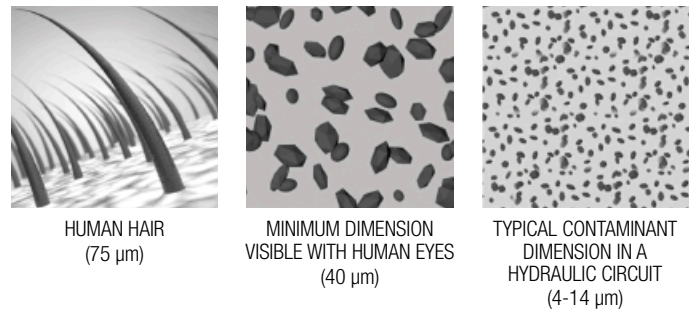
4 MEASURING THE SOLID CONTAMINATION LEVEL

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?



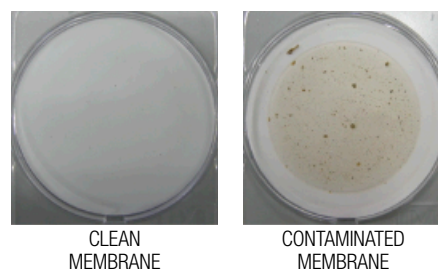
Contamination level analysis is significant only if performed with a uniform and repeatable method, conducted with standard test methods and suitably calibrated equipment.

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.



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 Automatic Particle Counters (APC).

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 Organisation standard ISO 4406 is the preferred method of quoting the number of solid contaminant particles in a sample.

The code is constructed from the combination of three scale numbers selected from the following table.

The first number represents the number of particles that are larger than $4 \mu\text{m}_{(c)}$.

The second number represents the number of particles larger than $6 \mu\text{m}_{(c)}$.

The third scale number represents the number of particles in a millilitre sample of the fluid that are larger than $14 \mu\text{m}_{(c)}$.

ISO 4406 - Allocation of Scale Numbers

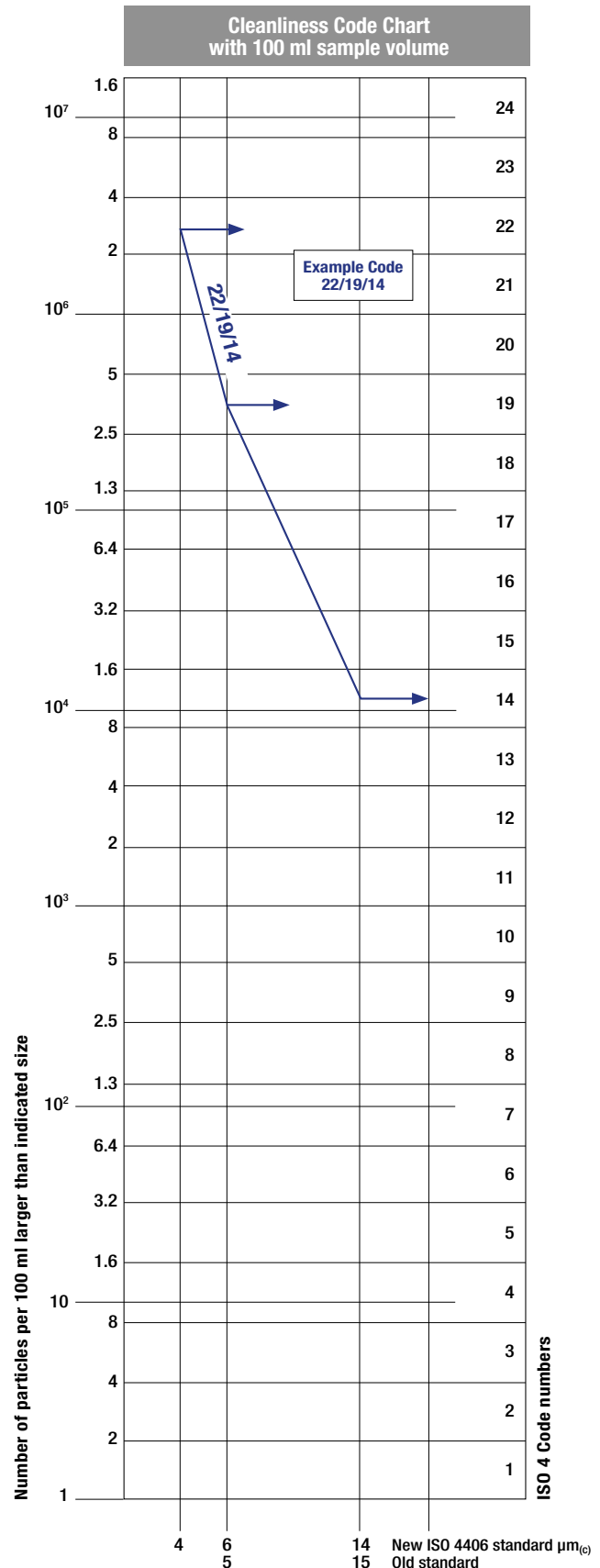
| Class | Number of particles per ml | |
|-------|----------------------------|-----------|
| | Over | Up to |
| 28 | 1 300 000 | 2 500 000 |
| 27 | 640 000 | 1 300 000 |
| 26 | 320 000 | 640 000 |
| 25 | 160 000 | 320 000 |
| 24 | 80 000 | 160 000 |
| 23 | 40 000 | 80 000 |
| 22 | 20 000 | 40 000 |
| 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 APCs and the code is given with two scale numbers only.

These are at $5 \mu\text{m}$ and $15 \mu\text{m}$ equivalent to the $6 \mu\text{m}_{(c)}$ and $14 \mu\text{m}_{(c)}$ of APCs.



- CUMULATIVE DISTRIBUTION OF THE PARTICLES SIZE - SAE AS 4059-1 and SAE AS 4059-2

Classification example according to

SAE AS4059 - Rev. E and SAE AS4059-2 - Rev. F

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).

SAE AS4059 - REV. E

It can be made a differential measurement (Table 1) or a cumulative measurement (Table 2)

Table 1 - Class for differential measurement

| Class | Dimension of contaminant Maximum Contamination Limits per 100 ml | | | | |
|-------|---|---------------------------|---------------------------|---------------------------|-------------------------|
| | 6-14 $\mu\text{m}_{(c)}$ | 14-21 $\mu\text{m}_{(c)}$ | 21-38 $\mu\text{m}_{(c)}$ | 38-70 $\mu\text{m}_{(c)}$ | >70 $\mu\text{m}_{(c)}$ |
| 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 |

| |
|---|
| 6 - 14 $\mu\text{m}_{(c)}$ = 15 000 particles |
| 14 - 21 $\mu\text{m}_{(c)}$ = 2 200 particles |
| 21 - 38 $\mu\text{m}_{(c)}$ = 200 particles |
| 38 - 70 $\mu\text{m}_{(c)}$ = 35 particles |
| > 70 $\mu\text{m}_{(c)}$ = 3 particles |
| SAE AS4059 REV E - Class 6 |

Table 2 - Class for cumulative measurement

| Class | Dimension of contaminant Maximum Contamination Limits per 100 ml | | | | | |
|-------|---|------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| | >4 $\mu\text{m}_{(c)}$ | >6 $\mu\text{m}_{(c)}$ | >14 $\mu\text{m}_{(c)}$ | >21 $\mu\text{m}_{(c)}$ | >38 $\mu\text{m}_{(c)}$ | >70 $\mu\text{m}_{(c)}$ |
| 000 | 195 | 76 | 14 | 3 | 1 | 0 |
| 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 $\mu\text{m}_{(c)}$ = 45 000 particles |
| > 6 $\mu\text{m}_{(c)}$ = 15 000 particles |
| > 14 $\mu\text{m}_{(c)}$ = 1 500 particles |
| > 21 $\mu\text{m}_{(c)}$ = 250 particles |
| > 38 $\mu\text{m}_{(c)}$ = 15 particles |
| > 70 $\mu\text{m}_{(c)}$ = 3 particle |
| SAE AS4059 REV E 6A/6B/5C/5D/4E/2F |

The information reproduced on this page is a brief extract from SAE AS4059 Rev.E, revised in May 2005. For further details and explanations refer to the full Standard.

SAE AS4059 - REV. F

It can be made a differential measurement (Table 1) or a cumulative measurement (Table 2)

Table 1 - Class for differential measurement

| Class | Dimension of contaminant Maximum Contamination Limits per 100 ml | | | | |
|-------|---|---------------------------|---------------------------|---------------------------|-------------------------|
| | 5-15 μm | 15-25 μm | 25-50 μm | 50-100 μm | >100 μm |
| | 6-14 $\mu\text{m}_{(c)}$ | 14-21 $\mu\text{m}_{(c)}$ | 21-38 $\mu\text{m}_{(c)}$ | 38-70 $\mu\text{m}_{(c)}$ | >70 $\mu\text{m}_{(c)}$ |
| 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 |

| |
|---|
| 6 - 14 $\mu\text{m}_{(c)}$ = 15 000 particles |
| 14 - 21 $\mu\text{m}_{(c)}$ = 2 200 particles |
| 21 - 38 $\mu\text{m}_{(c)}$ = 200 particles |
| 38 - 70 $\mu\text{m}_{(c)}$ = 35 particles |
| > 70 $\mu\text{m}_{(c)}$ = 3 particles |
| SAE AS4059 REV F - Class 6 |

- (1) Size range, microscope particle counts, based on longest dimension as measured per AS598 or ISO 4407.
- (2) Size range, APC 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 μm | >5 μm | >15 μm | >25 μm | >50 μm | >100 μm |
| | >4 $\mu\text{m}_{(c)}$ | >6 $\mu\text{m}_{(c)}$ | >14 $\mu\text{m}_{(c)}$ | >21 $\mu\text{m}_{(c)}$ | >38 $\mu\text{m}_{(c)}$ | >70 $\mu\text{m}_{(c)}$ |
| 000 | 195 | 76 | 14 | 3 | 1 | 0 |
| 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 |
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| 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 $\mu\text{m}_{(c)}$ = 45 000 particles |
| > 6 $\mu\text{m}_{(c)}$ = 15 000 particles |
| > 14 $\mu\text{m}_{(c)}$ = 1 500 particles |
| > 21 $\mu\text{m}_{(c)}$ = 250 particles |
| > 38 $\mu\text{m}_{(c)}$ = 15 particles |
| > 70 $\mu\text{m}_{(c)}$ = 3 particle |
| SAE AS4059 REV F cpc* Class 6 G/6/5/5/4/2 |

* cumulative particle count

- (1) Size range, optical microscope, based on longest dimension as measured per AS598 or ISO 4407.
- (2) Size range, APC calibrated per ISO 11171 or an optical or electron microscope with image analysis software, based on projected area equivalent diameter.

CONTAMINATION MANAGEMENT

- 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 APC's.

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

ISO 4406
SAE AS4059E Table 1
NAS 1638
SAE AS4059E Table 2

COMPARISON PHOTOGRAPH'S
1 graduation = 10µm

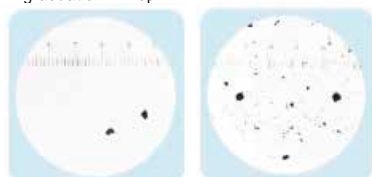


Fig. 1

Fig. 2

Class 16/14/11
Class 5
Class 5
Class 6A/5B/5C

Class 22/20/17
Class 11
Class 11
Class 12A/11B/11C

For other comparison photographs for contamination classes see the "Fluid Condition and Filtration 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 µm _(c) 6 µm _(c) 14 µm _(c) | > 4 µm _(c) 6 µm _(c) 14 µm _(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 / 9C | 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 |

5 RECOMMENDED CONTAMINATION CLASSES

The table below, gives a selection of maximum contamination levels that are typically issued by component manufacturer.

These relate to the use of the correct viscosity mineral fluid. An even cleaner level may be needed if the operation

is severe, such as high frequency fluctuations in loading, high temperature or high failure risk.

| | | | | | | |
|--|------------------------|------------------------|------------------------|-----------------------|-----------------------|-----------------------|
| 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 $\beta_{x(c)} \geq 1.000$ | $\beta_{20(c)} > 1000$ | $\beta_{15(c)} > 1000$ | $\beta_{10(c)} > 1000$ | $\beta_{7(c)} > 1000$ | $\beta_{7(c)} > 1000$ | $\beta_{5(c)} > 1000$ |

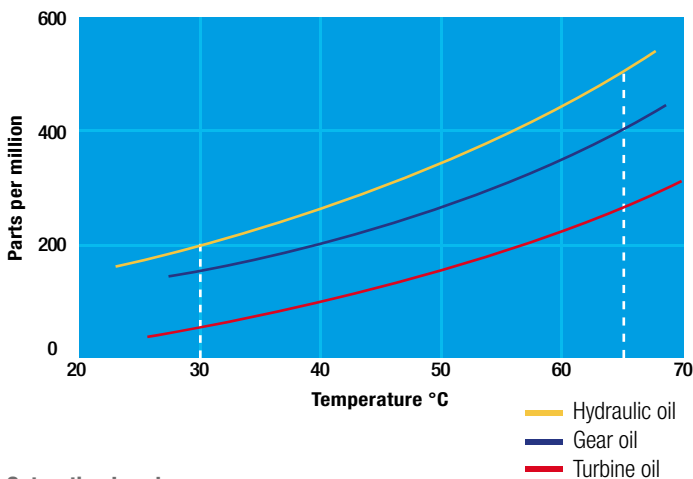
6 WATER IN HYDRAULIC AND LUBRICATING FLUIDS

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 300 ppm 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.



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.

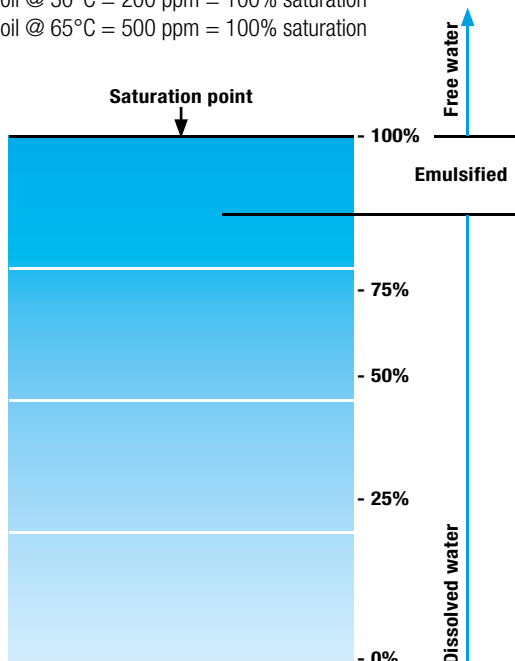
However, even water in solution can cause damage and therefore every reasonable effort should be made to keep saturation levels as low as possible. There is no such thing as too little water. As a guideline, we recommend maintaining saturation levels below 50% in all equipment.

TYPICAL WATER SATURATION LEVEL FOR NEW OILS

Examples:

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

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



W - Water and Temperature Sensing

“W” option, in MP Filtri Contamination Monitoring Products, indicates water content as a percentage of saturation and oil temperature in degrees centigrade. 100% RH corresponds to the point at which free water can exist in the fluid. i.e. the fluid is no longer able to hold the water in a dissolved solution.

The sensor can help provide early indication of costly failure due to free water, including but not exclusive to corrosion, metal surface fatigue e.g. bearing failure, reduced lubrication & load carrying characteristics.

Different oils have different saturation levels and therefore RH (relative humidity) % is the best and most practical measurement.

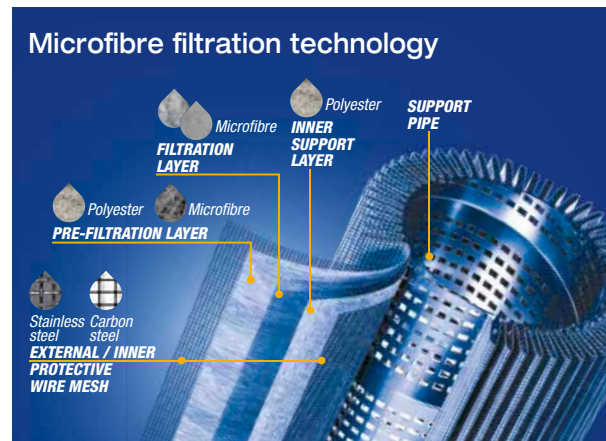
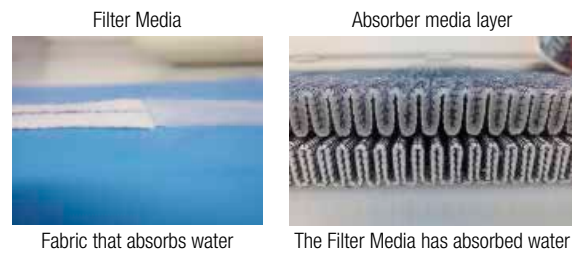
Water absorber

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).



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

Product availability - UFM Series:

UFM 041 - UFM 051 - UFM 091 - UFM 181 - UFM 919

Filtered to perfection

Our mobile filtration units provide the perfect solution for the oil maintenance of your lubrication and hydraulic fluids in off-line filtration applications.

Benefits:

- **Versatile and compact design**
- **Filtering and continuous cleaning of systems**
- **Removal of water from hydraulic systems (when fitted with a spin on filter)**
- **Particle counting to determine the Contamination Class according to ISO 4406, NAS 1638, AS4059**

Applications:

- **For oil changes, initial filling and flushing cycles in hydraulic and lubrication systems**
- **Pulp and paper mill equipment**
- **Construction machinery**
- **Large central hydraulic power units**
- **Injection moulding equipment**
- **Stamping presses**

Mobile filtration units

UFM 015



UFM 041



UFM 051



UFM 091-181-919



FTU



| | |
|---------|----------|
| UFM 015 | page 103 |
| UFM 041 | 113 |
| UFM 051 | 119 |
| UFM 091 | 125 |
| UFM 181 | 131 |
| UFM 919 | 137 |
| FTU 080 | 143 |

UFM 015

Mobile filtration unit 15 l/min flow rate



Description

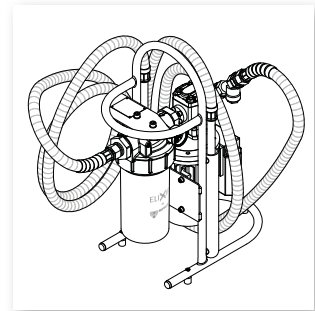
Mobile filtration units

The UFM 015 is a portable oil transfer/filtration unit, specifically designed for both filling/transferring hydraulic oils from containers to the hydraulic tank as well as filtering and cleaning hydraulic systems.

The unit utilises Spin-On standard cartridge (supplied as option), available in two lengths, thus increasing the dirt holding capacity and lowering pressure drop of the unit.

The unit has the flexibility in being able to offer a wide range of medias and micro ratings to suit any application.

The unit is very compact and lightweight.



> Features & Benefits

- Handle size
- Light
- Easy to use
- Easy maintenance
- Reliable
- Absolute filtration



Technical data

| | |
|---|--|
| <p>Pump Gear pump</p> | <p>Protection Class IP55</p> |
| <p>Electric Motor 0.18 kW 230 V single phase electric motor</p> | <p>Seal NBR</p> |
| <p>Flow (l/min) 15 l/min - 1450 r.p.m.</p> | <p>Fluid Compatibility Mineral Oil - Other on request</p> |
| <p>Max. Operation Pressure 4.0 bar</p> | <p>Suction hose lance DN18 length 2500 mm DN/OD20 length 400 mm</p> |
| <p>Viscosity range Min. operation 10 cSt Max. operation 200 cSt Max. only for cold start 400 cSt</p> | <p>Pressure hose lance DN18 length 2500 mm DN/OD18 length 400 mm</p> |
| <p>Suction Filter Type Y filtration 500 µm</p> | <p>Weight 14.8 kg</p> |
| <p>Filtration Rating 3, 6, 10, 16, 25 µm $\beta > 1000$ flow through the element Out/In</p> | <p>Equipment Visual clogging indicator (gauge)</p> |
| <p>Bypass valve Δp set Rating 3.5 bar</p> | <p>CE Standard</p> |
| <p>Fluid Temperature From +5 °C to 60 °C</p> | |
| <p>Ambient Temperature From +5 °C to 40 °C</p> | |

The new concept of filtration



ELIXIR®

RFX 160 - RETURN FILTER

Lighter, easier to use, and kinder to the environment - MP Filtri's new ELIXIR low pressure concept filters have been specially designed for in-line connections and to handle working pressures up to 1.6 MPa (16 bar).

The cast aluminium head and polyamide design reduces weight by 10% compared to the Spin-on range.

Less waste reduces both your carbon footprint and protects the environment. Replacement is fast and easy, just disassemble the bowl with a 32 mm fixed wrench, take out the FEX filter element and replace.

UFM 015

Designation & Ordering code

| MOBILE FILTRATION UNIT UFM 015 | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|
| Series | Configuration example: UFM 015 M A 1 0 0 0 P01 | | | | | | | | |
| UFM | | | | | | | | | |
| Size | | | | | | | | | |
| 015 | 15 l/min | | | | | | | | |
| Electric motor | | | | | | | | | |
| M | 230 V single phase | | | | | | | | |
| Seals | | | | | | | | | |
| A | NBR | | | | | | | | |
| Pressure gauges and Clogging indicators (see below) | | | | | | | | | |
| 1 | Manometer (*) | | | | | | | | |
| Filter element | | | | | | | | | |
| 0 | Without element (for ordering, see page 26) | | | | | | | | |
| Filtration surface | | | | | | | | | |
| 0 | Not provided | | | | | | | | |
| Option | | | | | | | | | |
| 0 | No options | | | | | | | | |
| Option | | | | | | | | | |
| P01 | MP Filtri standard | | | | | | | | |

Filtration element should be ordered separately

FILTRATION SURFACE - STANDARD

| Inorganic microfibre | Wire mesh element |
|----------------------|---------------------|
| FEX 160 A03 A N P01 | FEX 160 M25 A N P01 |
| FEX 160 A06 A N P01 | FEX 160 M60 A N P01 |
| FEX 160 A10 A N P01 | |
| FEX 160 A16 A N P01 | |
| FEX 160 A25 A N P01 | |

WATER REMOVAL - FILTRATION SURFACE - STANDARD

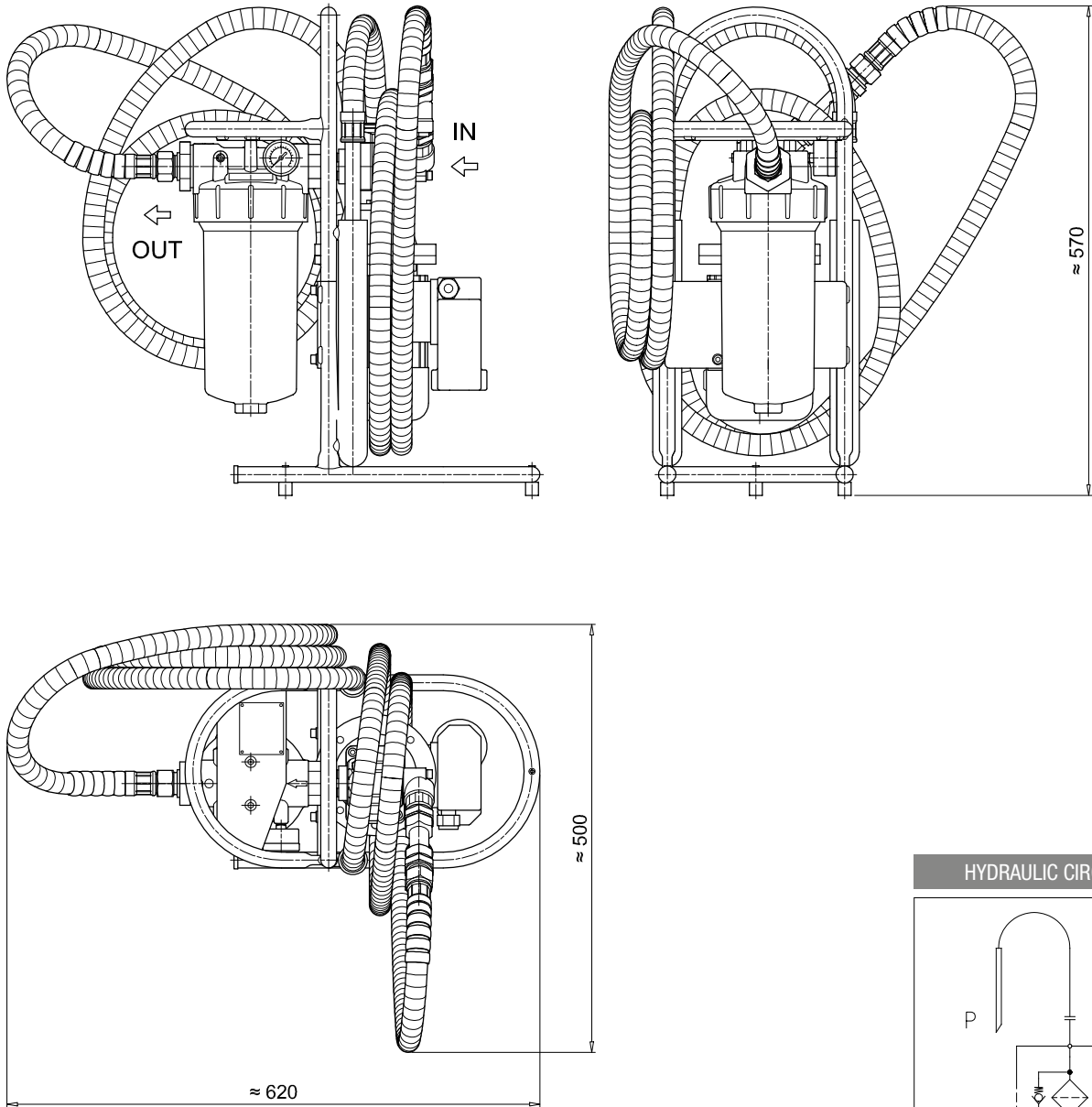
| Multi-Layer water absorber |
|----------------------------|
| FEX 160 WA025 A N P01 |

CLOGGING INDICATORS (*)

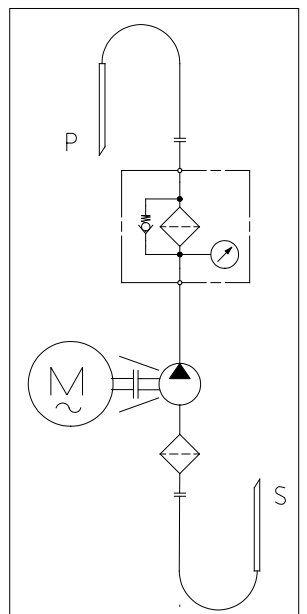
BVA Axial pressure gauge

| Settings | Ordering code |
|--------------|---------------|
| 2.5 bar ±10% | BVA 25 P01 |

Dimensions



HYDRAULIC CIRCUIT



Designation & Ordering code

COMPLETE BODY

Configuration example : **RFEX160** **E** **A** **B** **6** **P01**

Series and size
RFEX160

Bypass valve
S Without bypass
E 3 bar

Seals and treatments
A NBR

Connections
B G 1 1/4"

Connection for clogging indicator
6 With plugged connections

Execution
P01 MP Filtri standard

FILTER ELEMENT

Configuration example: **FEX160** **A10** **A** **P01**

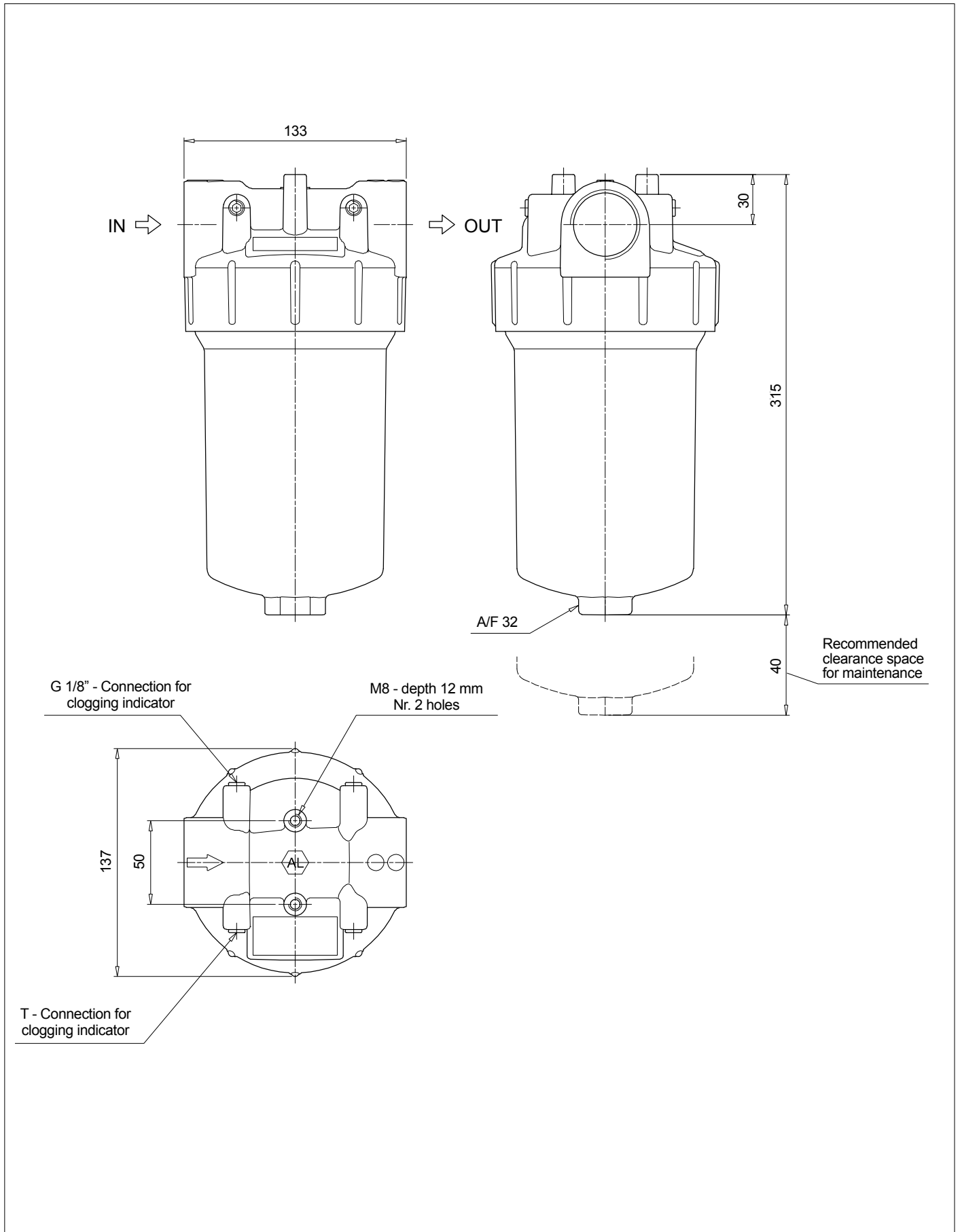
Element series and size
FEX160

| Filtration rating | |
|---------------------------------------|--|
| A03 Inorganic microfiber 3 µm | M25 Wire mesh 25 µm |
| A06 Inorganic microfiber 6 µm | M60 Wire mesh 60 µm |
| A10 Inorganic microfiber 10 µm | M90 Wire mesh 90 µm |
| A16 Inorganic microfiber 16 µm | P10 Resin impregnated paper 10 µm |
| A25 Inorganic microfiber 25 µm | P25 Resin impregnated paper 25 µm |

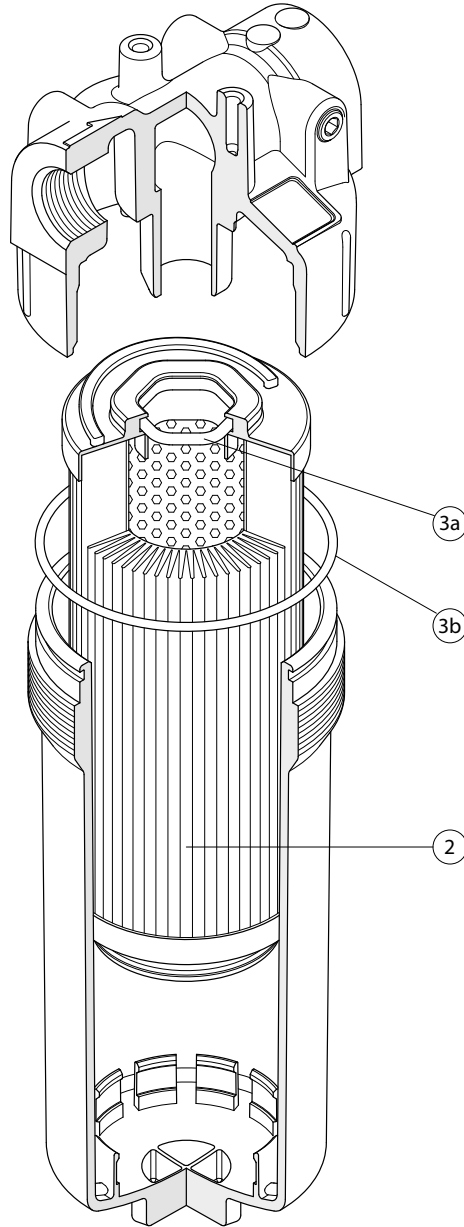
Seals and treatments
A NBR

Execution
P01 MP Filtri standard

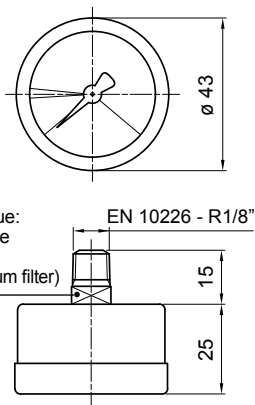

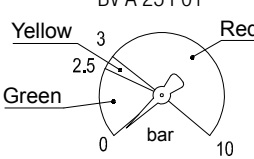
Dimensions



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 |
| RFEX 160 | See order table | 02050772 |

| BVA | |
|---|---------------|
| Axial Pressure Gauge | |
| Settings | Ordering code |
| 2.5 bar $\pm 10\%$ | BV A 25 P01 |
| <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>A/F 11 Max tightening torque: 3 N·m (on polyamide filter cover) 6.5 N·m (on aluminium filter)</p>  </div> <div style="width: 45%;"> <p style="text-align: center;">Hydraulic symbol</p>  <p style="text-align: center;">Dial scale</p> <p style="text-align: center;">BV A 25 P01</p>  </div> </div> | |
| <p>Materials</p> <ul style="list-style-type: none"> - Case: Painted Steel - Window: Transparent plastic - Dial: Painted Steel - Pointer: Painted Aluminium - Pressure connection: Brass - Pressure element: Bourdon tube Cu-alloy soft soldered | |
| <p>Technical data</p> <ul style="list-style-type: none"> - Max working pressure: Static: 7 bar Fluctuating: 6 bar Short time: 10 bar - Working temperature: From -40 °C to +60 °C - Compatibility with fluids: Mineral oils, Synthetic fluids HFA, HFB, HFC according to ISO 2943 - Accuracy: Class 2.5 according to EN 13190 - Degree of protection: IP31 according to EN 60529 | |

UFM 041

Mobile filtration unit 34 l/min flow rate



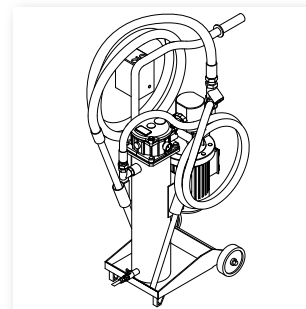
Description

Mobile filtration units

UFM 041 mobile filtration units suitable for filling and refilling of filtered hydraulic fluids and lubrication tanks.

The filter unit connected to off-line to the tank (recommended maximum volume of 350/500 L.), can be used as a support to the filtration plant on start-up for fast flushing action, either as additional filtration systems with a high incidence of contamination.

Continued use is recommended for the version with three phase electric motor.



> Features & Benefits

- Compact size
- Light
- Easy to use
- Easy maintenance
- Reliable
- Absolute filtration



Technical data

Pump

Gear pump

Electric Motor

0.75 kW 230 V single phase electric motor

0.75 kW 400/230 V three phase electric motor

Flow (l/min)

34 l/min - 1450 r.p.m.

Max. Operation Pressure

5.0 bar

Viscosity range

Min. operation 10 cSt

Max. operation 200 cSt

Max. only for cold start 800 cSt

Suction Filter

Type Y filtration 350 µm

Filtration Rating

1, 3, 6, 10, 25 µm $\beta > 1000$ flow through the element In/Out

Bypass valve Δp set

Rating 3 bar

Fluid Temperature

From -10 °C to +80 °C

Ambient Temperature

From -20 °C to +45 °C

Protection Class

IP55

Seal

NBR

Fluid Compatibility

Mineral Oil & Synthetic Oil - Other on request

Suction hose

DN25 length 3000 mm

lance

DN/OD25 length 700 mm

Pressure hose

DN20 length 3000 mm

lance

DN/OD20 length 700 mm

Weight

45 kg

Equipment

Visual clogging indicator (gauge)

 Standard

UFM 041

Designation & Ordering code

| MOBILE FILTRATION UNIT UFM 041 | | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|--|
| Series UFM | Configuration example: UFM 041 T A 1 0 1 0 P01 | | | | | | | | | |
| Size 041 34 l/min | | | | | | | | | | |
| Electric motor M 230 V single phase T 400/230 V three phase | | | | | | | | | | |
| Seals A NBR | | | | | | | | | | |
| Pressure gauges and Clogging indicators (see below) 1 Manometer (*) | | | | | | | | | | |
| Filter element 0 Without element (for ordering, see below) | | | | | | | | | | |
| Filtration surface 1 Standard | | | | | | | | | | |
| Option 0 No options | | | | | | | | | | |
| Option P01 MP Filtri standard Pxx Customized | | | | | | | | | | |

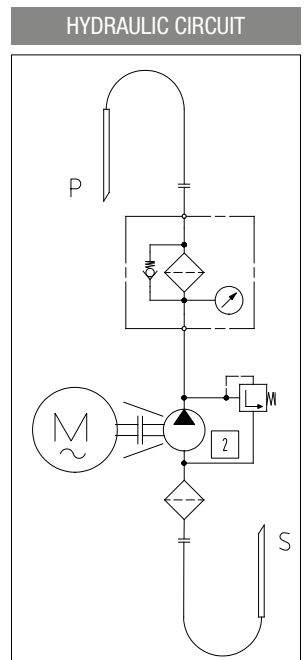
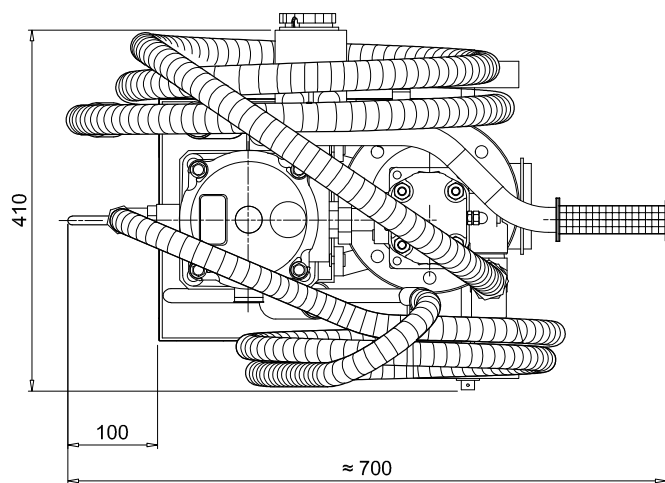
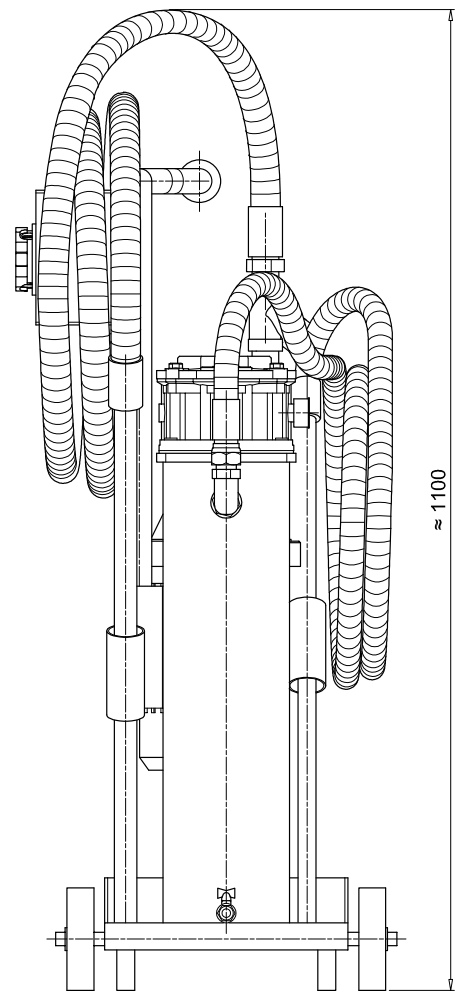
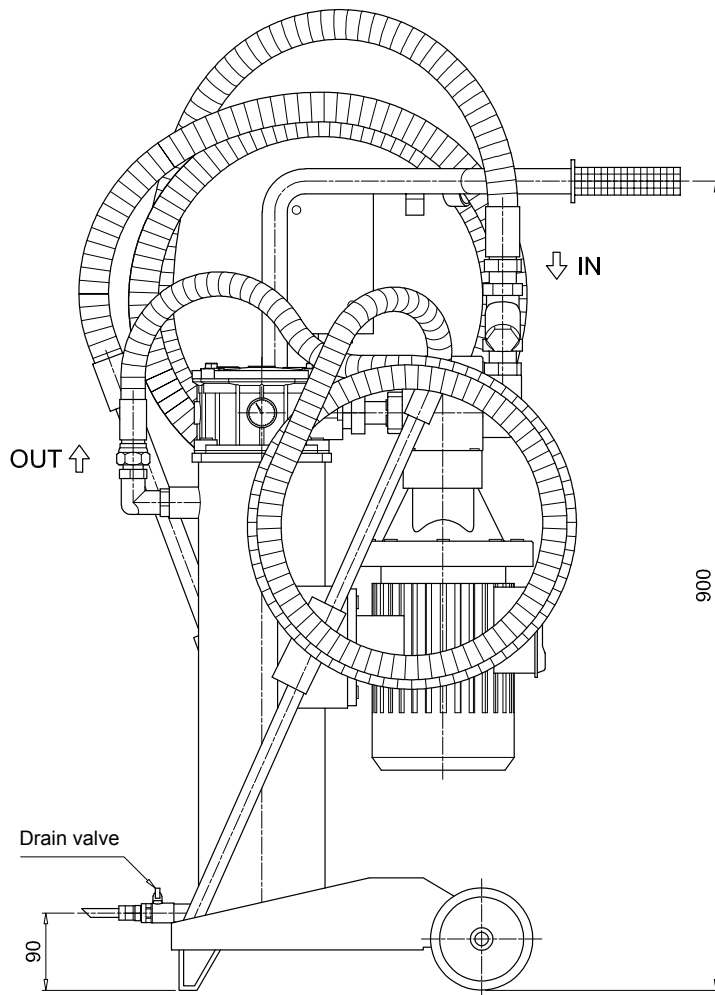
Filtration element should be ordered separately

| FILTRATION SURFACE - STANDARD | | WATER REMOVAL |
|-------------------------------|--------------------------|-----------------------------------|
| Inorganic microfibre | Wire mesh element | Multi-Layer water absorber |
| MR 250 4 A01 A P01 | MR 250 4 M25 A P01 | MR2504WA025AP01 |
| MR 250 4 A03 A P01 | MR 250 4 M60 A P01 | |
| MR 250 4 A06 A P01 | | |
| MR 250 4 A10 A P01 | | |
| MR 250 4 A16 A P01 | | |
| MR 250 4 A25 A P01 | | |

CLOGGING INDICATORS (*)

| | |
|---------------------------------|-------------------------------------|
| BVA Axial pressure gauge | |
| Settings 2.5 bar ±10% | Ordering code BV A 25 P01 |

Dimensions



UFM 051

Mobile filtration unit 50 l/min flow rate



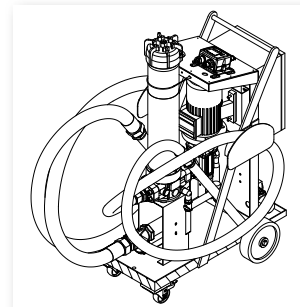
Description

Mobile filtration units

UFM 051 mobile filtration units suitable for filling and refilling of filtered hydraulic fluids and lubrication tanks.

The filter unit connected to off-line to the tank (recommended maximum volume of 500/750 L.), can be used as a support to the filtration plant on start-up for fast flushing action, either as additional filtration systems with a high incidence of contamination.

Continued use is recommended for the version with three phase electric motor.



> Features & Benefits

- Compact size
- Continue Operation Pressure 10 bar
- Easy to use
- Easy maintenance
- Reliable
- Absolute filtration
- In-line Contamination Monitor

Available in three configurations:

- configuration with start / stop differential pressure indicator - visual
- configuration with start / stop automatic motor
- cut-out from differential pressure indicator - electrical / visual
- configuration with start / stop phase inverter automatic motor
- cut-out from differential pressure indicator - electrical / visual
- in-line Particle Counter ICM



Technical data

Pump

Gear pump

Electric Motor

1.5 kW 230 V single phase electric motor

1.5 kW 400/230 V three phase electric motor with ICM 2.0

Flow (l/min)

50 l/min - 1450 r.p.m.

Max. Operation Pressure

10 bar

Viscosity range

Min. operation 10 cSt

Max. operation 300 cSt

Max. only for cold start 800 cSt

Suction Filter

Type Y filtration 800 µm

Filtration Rating

1, 3, 6, 10, 25 µm $\beta > 1000$ flow through the element Out/In

Bypass valve Δp set

Rating 3.5 bar

The bypass can be blocked through the spigot

Fluid Temperature

From -10 °C to +80 °C

Ambient Temperature

From -20 °C to +45 °C

Protection Class

IP55

Fluid Compatibility

Mineral Oil & Synthetic Oil - Other on request

Suction hose

DN32 length 3000 mm

lance

DN/OD42 length 700 mm

Pressure hose

DN25 length 3000 mm

lance

DN/OD30 length 700 mm

Weight

70 kg

Equipment

- Differential Clogging indicator - Visual (setting 3.0 bar $\pm 10\%$)
- Differential Clogging indicator - Electrical / Visual (setting 3.0 bar $\pm 10\%$)
- Differential Clogging indicator - Electrical / Visual - with ICM 2.0 (setting 3.0 bar $\pm 10\%$)

CE Standard

UFM 051

Designation & Ordering code

MOBILE FILTRATION UNIT UFM 051

| | | | | | | | | | | |
|--|--|--|-------------------------|---|--|--|--|--|--|--|
| Series | Configuration example: UFM 051 T A 2 0 1 0 P01 | | | | | | | | | |
| UFM | | | | | | | | | | |
| Size | 051 50 l/min | | | | | | | | | |
| Electric motor | M 230 V Single phase T 400/230 V Three phase | | | | | | | | | |
| Seals | A NBR | | | | | | | | | |
| Pressure gauges and clogging indicators (see below) | | | particle counter option | | | | | | | |
| | | | 0 | 1 | | | | | | |
| 2 | Manometer (*) + Visual diff. clogging indicator | | • | - | | | | | | |
| 3 | Manometer (*) + Electrical diff. clogging indicator (visual indication on panel) | | • | • | | | | | | |
| Filter element | 0 Without element (for ordering, see below) | | | | | | | | | |
| Filtration surface | 1 Standard 2 Higher | | | | | | | | | |
| Particle counter option | | | Electric motor | | | | | | | |
| | | | M | T | | | | | | |
| 0 | Without ICM | | • | • | | | | | | |
| 1 | With ICM 2.0 | | • | • | | | | | | |
| | Option | | | | | | | | | |
| | P01 MP Filtri standard | | | | | | | | | |
| | Pxx Customized | | | | | | | | | |

Filtration element should be ordered separately

FILTRATION SURFACE 1 - STANDARD

| |
|-----------------------------|
| Inorganic microfibre |
| CU 400 5 A01 A N P01 |
| CU 400 5 A03 A N P01 |
| CU 400 5 A06 A N P01 |
| CU 400 5 A10 A N P01 |
| CU 400 5 A16 A N P01 |
| CU 400 5 A25 A N P01 |

Wire mesh element

| |
|----------------------|
| CU 400 5 M25 A N P01 |
| CU 400 5 M60 A N P01 |

WATER REMOVAL

Multi-Layer water absorber

CU4005WA025ANP01

FILTRATION SURFACE 2 - HIGHER

| |
|-----------------------------|
| Inorganic microfibre |
| CU 400 6 A01 A N P01 |
| CU 400 6 A03 A N P01 |
| CU 400 6 A06 A N P01 |
| CU 400 6 A10 A N P01 |
| CU 400 6 A16 A N P01 |
| CU 400 6 A25 A N P01 |

Wire mesh element

| |
|----------------------|
| CU 400 6 M25 A N P01 |
| CU 400 6 M60 A N P01 |

WATER REMOVAL

Multi-Layer water absorber

CU4006WA025ANP01

CLOGGING INDICATORS (*)

DVM Visual Differential Indicator

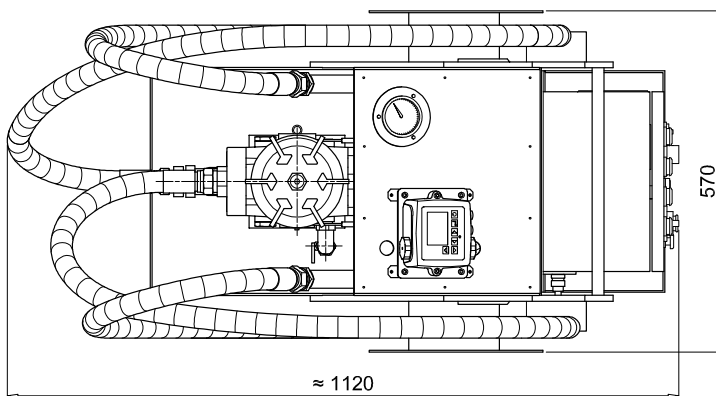
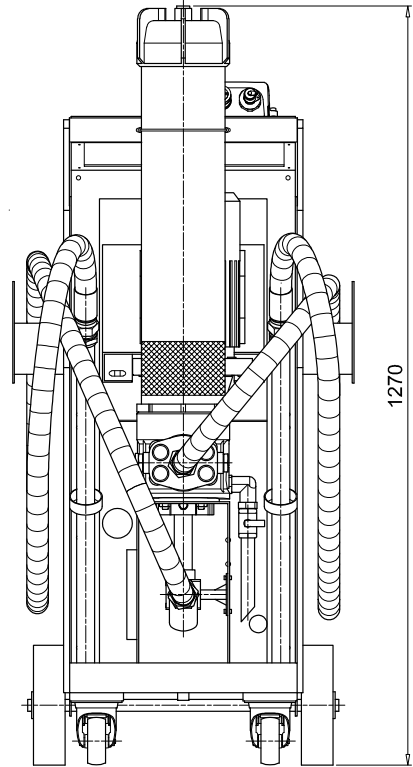
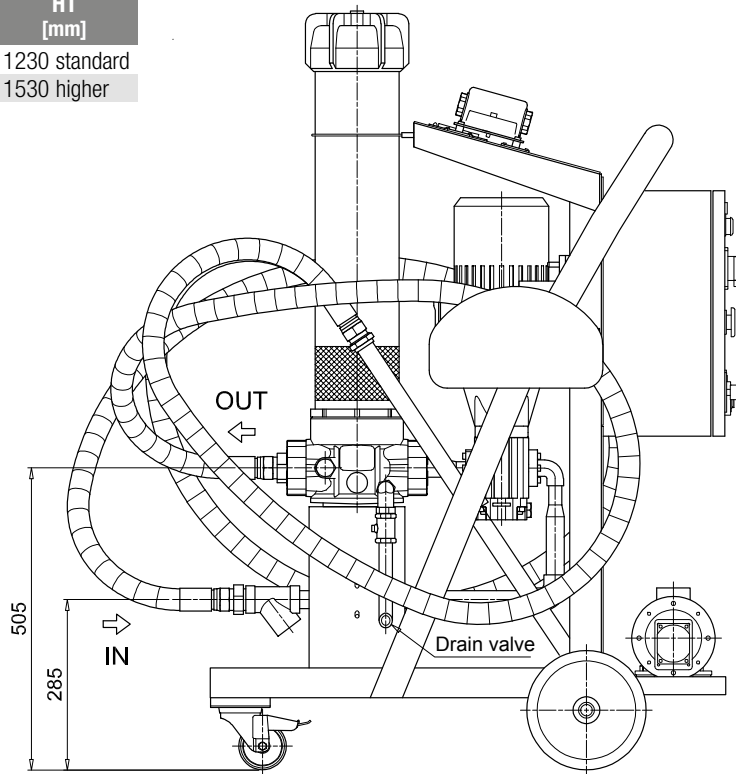
| Settings | Ordering code |
|--------------|---------------|
| 3.0 bar ±10% | DV M 30 P01 |

DEA Electrical Differential Indicator (visual indication on panel)

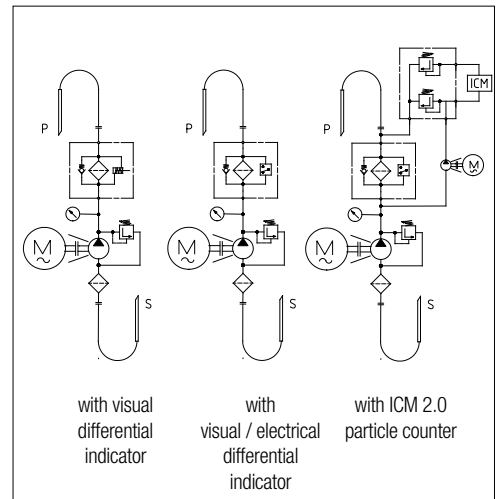
| Settings | Ordering code |
|--------------|---------------|
| 3.0 bar ±10% | DE A 30 P01 |

Dimensions

| Filter length | H1 [mm] |
|---------------|---------------|
| 1 | 1230 standard |
| 2 | 1530 higher |



HYDRAULIC CIRCUIT



UFM 091

Mobile filtration unit 90 l/min flow rate



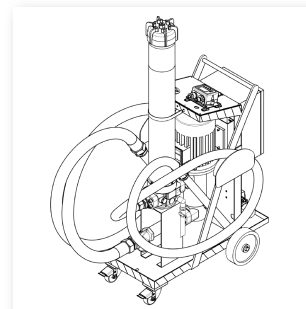
Description

Mobile filtration units

UFM 091 mobile filtration units suitable for filling and refilling of filtered hydraulic fluids and lubrication tanks.

The filter unit connected to off-line to the tank, can be used as a support to the filtration plant on start-up for fast flushing action, either as additional filtration systems with a high incidence of contamination.

Recommended maximum tank volume of 1500/1800L.



> Features & Benefits

- Compact size
- High flow
- Continue Operation Pressure 10 bar
- Easy to use
- Easy maintenance
- Reliable
- Absolute filtration
- In-line Contamination Monitor

Available in three configurations:

- configuration with start / stop differential pressure indicator - visual
- configuration with start / stop automatic motor
- cut-out from differential pressure indicator - electrical / visual
- configuration with start / stop phase inverter automatic motor
- cut-out from differential pressure indicator - electrical / visual
- in-line Particle Counter ICM



Technical data

Pump

Screw pump

Electric Motor

2.2 kW 400/230V three phase 4-pole

Flow (l/min)

90 l/min - 1450 r.p.m.

Max. Operation Pressure

10 bar

Viscosity range

Min. operation 10 cSt

Max. operation 800 cSt

Max. only for cold start 2000 cSt

Suction Filter

Type Y filtration 800 µm

Filtration Rating

1, 3, 6, 10, 25 µm $\beta > 1000$ flow through the element Out/In

Bypass valve Δp set

Rating 3.5 bar with bypass.

The bypass can be blocked through the spigot

Fluid Temperature

From -10 °C to +80 °C

Ambient Temperature

From -20 °C to +45 °C

Protection Class

IP55

Seal

NBR

Fluid Compatibility

Mineral Oil & Synthetic Oil - Water Glycol

Suction hose

DN50 length 3000 mm

lance

DN/OD50 length 700 mm

Pressure hose

DN38 length 3000 mm

lance

DN/OD42 length 700 mm

Weight

105 kg

Equipment

- Differential Clogging indicator - Visual (setting 3.0 bar $\pm 10\%$)
- Differential Clogging indicator - Electrical / Visual (setting 3.0 bar $\pm 10\%$)
- Differential Clogging indicator - Electrical / Visual - with ICM 2.0 (setting 3.0 bar $\pm 10\%$)

 Standard

Designation & Ordering code

| MOBILE FILTRATION UNIT UFM 091 | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|
| Series UFM | Configuration example: UFM 091 T A 2 0 2 0 P01 | | | | | | | | | |
| Size 091 90 l/min | | | | | | | | | | |
| Electric motor T 400/230 V Three phase | | | | | | | | | | |
| Seals A NBR | | | | | | | | | | |
| Pressure gauges and Clogging indicators (see below) | | | | | | | | | | |
| 2 | Manometer (*) + Visual differential clogging indicator | | | | | | | | | |
| 3 | Manometer (*) + Electrical diff. clogging indicator (visual indication on panel) | | | | | | | | | |
| Filter element | | | | | | | | | | |
| 0 | Without element (for ordering, see below) | | | | | | | | | |
| Filtration surface | | | | | | | | | | |
| 2 | Higher | | | | | | | | | |
| Option | | | | | | | | | | |
| 0 | No options | | | | | | | | | |
| 1 | ICM 2.0 particle counter | | | | | | | | | |
| Option | | | | | | | | | | |
| P01 | MP Filtri standard | | | | | | | | | |
| Pxx | Customized | | | | | | | | | |

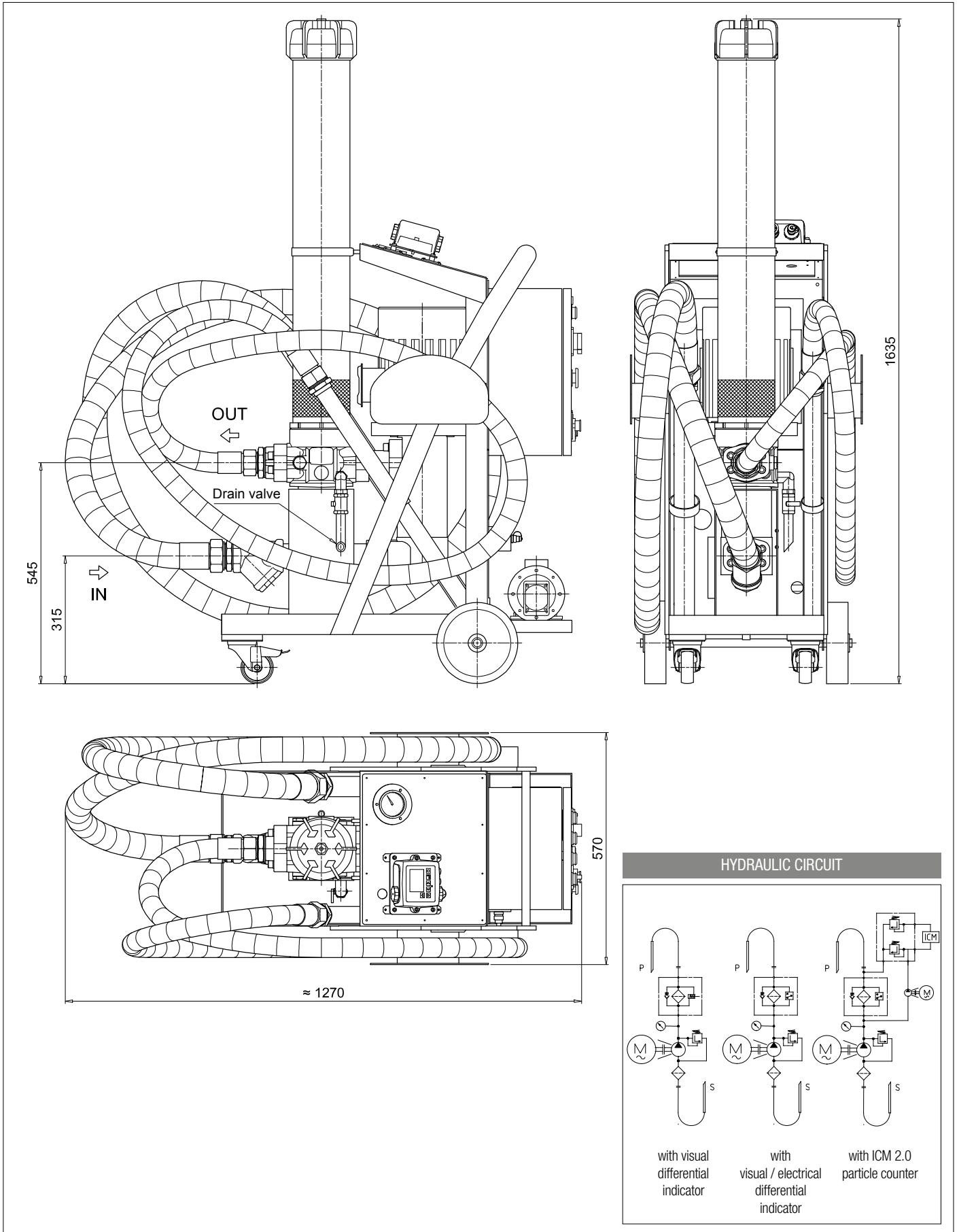
Filtration element should be ordered separately

| FILTRATION SURFACE - HIGHER | | WATER REMOVAL |
|-----------------------------|--------------------------|-----------------------------------|
| Inorganic microfibre | Wire mesh element | Multi-Layer water absorber |
| CU 400 6 A01 A N P01 | CU 400 6 M25 A N P01 | CU4006WA025ANP01 |
| CU 400 6 A03 A N P01 | CU 400 6 M60 A N P01 | |
| CU 400 6 A06 A N P01 | | |
| CU 400 6 A10 A N P01 | | |
| CU 400 6 A16 A N P01 | | |
| CU 400 6 A25 A N P01 | | |

CLOGGING INDICATORS (*)

| | | | |
|--|----------------------|---|----------------------|
| DVM Visual Differential Indicator | | DEA Electrical Differential Indicator (visual indication on panel) | |
| Settings | Ordering code | Settings | Ordering code |
| 3.0 bar ±10% | DV M 30 P01 | 3.0 bar ±10% | DE A 30 P01 |

Dimensions



UFM 181

Mobile filtration unit 180 l/min flow rate



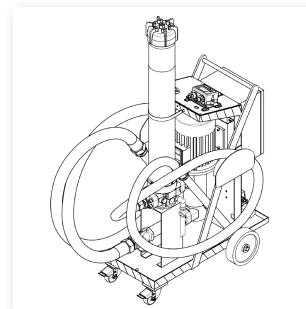
Description

Mobile filtration units

UFM 181 mobile filtration units suitable for filling and refilling of filtered hydraulic fluids and lubrication tanks.

The filter unit connected to off-line to the tank, can be used as a support to the filtration plant on start-up for fast flushing action, either as additional filtration systems with a high incidence of contamination.

Recommended maximum tank volume of 1800/2700 L.



> Features & Benefits

- Compact size
- High flow
- Continue Operation Pressure 10 bar
- Easy to use
- Easy maintenance
- Reliable
- Absolute filtration
- In-line Contamination Monitor

Available in two configurations:

- configuration with start / stop automatic motor
- cut-out from differential pressure indicator - electrical / visual
- configuration with start / stop phase inverter automatic motor
- cut-out from differential pressure indicator - electrical / visual
- in-line Particle Counter ICM



Technical data

| | |
|---|--|
| <p>Pump Screw pump</p> | <p>Protection Class IP55</p> |
| <p>Electric Motor 4 kW 400/230V three phase 2-pole</p> | <p>Seal NBR</p> |
| <p>Flow (l/min) 180 l/min - 2900 r.p.m.</p> | <p>Fluid Compatibility Mineral Oil & Synthetic Oil - Water Glycol</p> |
| <p>Max. Operation Pressure 10 bar</p> | <p>Suction hose lance DN50 length 3000 mm DN/OD50 length 700 mm</p> |
| <p>Viscosity range Min. operation 10 cSt Max. operation 800 cSt Max. only for cold start 2000 cSt</p> | <p>Pressure hose lance DN38 length 3000 mm DN/OD42 length 700 mm</p> |
| <p>Suction Filter Type Y filtration 800 µm</p> | <p>Weight 109 kg</p> |
| <p>Filtration Rating 1, 3, 6, 10, 25 µm $\beta > 1000$ flow through the element Out/In</p> | <p>Equipment - Differential Clogging indicator - Electrical / Visual (setting 3.0 bar $\pm 10\%$) - Differential Clogging indicator - Electrical / Visual - with ICM 2.0 (setting 3.0 bar $\pm 10\%$)</p> |
| <p>Bypass valve Δp set Rating 3.5 bar with bypass. The bypass can be blocked through the spigot</p> | <p>CE Standard</p> |
| <p>Fluid Temperature From -10 °C to +80 °C</p> | |
| <p>Ambient Temperature From -20 °C to +45 °C</p> | |

UFM 181

Designation & Ordering code

MOBILE FILTRATION UNIT UFM 181

| Series | Configuration example: | UFM | 181 | T | A | 3 | 0 | 2 | 0 | P01 |
|--|--|-----|-----|---|---|---|---|---|---|-----|
| UFM | | | | | | | | | | |
| Size | | | | | | | | | | |
| 181 | 180 l/min | | | | | | | | | |
| Electric motor | | | | | | | | | | |
| T | 400/230 V Three phase | | | | | | | | | |
| Seals | | | | | | | | | | |
| A | NBR | | | | | | | | | |
| Pressure gauges and Clogging indicators (see below) | | | | | | | | | | |
| 3 | Manometer (*) + Electrical diff. clogging indicator (visual indication on panel) | | | | | | | | | |
| Filter element | | | | | | | | | | |
| 0 | Without element (for ordering, see below) | | | | | | | | | |
| Filtration surface | | | | | | | | | | |
| 2 | Higher | | | | | | | | | |
| Option | | | | | | | | | | |
| 0 | No options | | | | | | | | | |
| 1 | ICM 2.0 particle counter | | | | | | | | | |
| Option | | | | | | | | | | |
| P01 | MP Filtri standard | | | | | | | | | |
| Pxx | Customized | | | | | | | | | |

Filtration element should be ordered separately

FILTRATION SURFACE - HIGHER

| Inorganic microfibre | Wire mesh element |
|----------------------|----------------------|
| CU 400 6 A01 A N P01 | CU 400 6 M25 A N P01 |
| CU 400 6 A03 A N P01 | CU 400 6 M60 A N P01 |
| CU 400 6 A06 A N P01 | |
| CU 400 6 A10 A N P01 | |
| CU 400 6 A16 A N P01 | |
| CU 400 6 A25 A N P01 | |

WATER REMOVAL

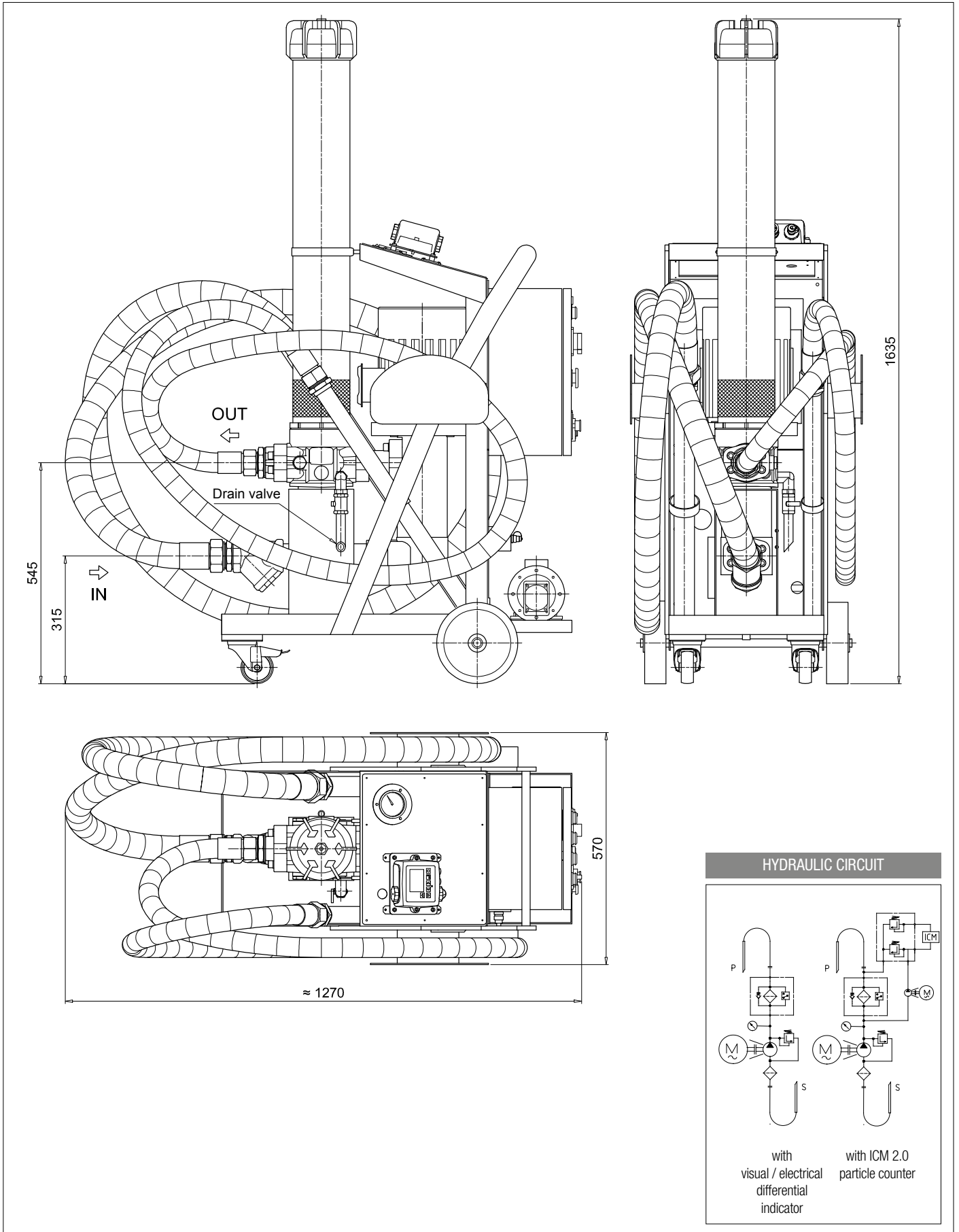
| Multi-Layer water absorber |
|----------------------------|
| CU4006WA025ANP01 |

CLOGGING INDICATORS (*)

DEA Electrical Differential Indicator (visual indication on panel)

| Settings | Ordering code |
|--------------|---------------|
| 3.0 bar ±10% | DE A 30 P01 |

Dimensions



UFM 919

Mobile filtration unit 90/180 l/min flow rate



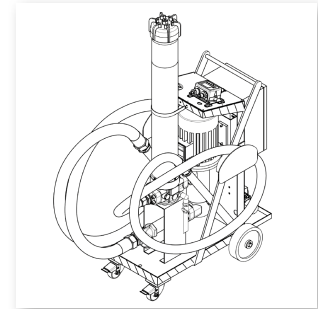
Description

Mobile filtration units

UFM 919 mobile filtration units suitable for filling and refilling of filtered hydraulic fluids and lubrication tanks.

The filter unit connected to off-line to the tank, can be used as a support to the filtration plant on start-up for fast flushing action, either as additional filtration systems with a high incidence of contamination.

Two-speed electric motor with programmable flow of 90 or 180 l/min.



> Features & Benefits

- Compact size
- High flow
- Continue Operation Pressure 10 bar
- Easy to use
- Easy maintenance
- Reliable
- Absolute filtration
- In-line Contamination Monitor

Possible applications

- Flow rate 90 l/min for filling or topping up tanks with a volume of less than 1000 liters
- Flow rate 90 l/min for depollution of tanks with a volume of less than 1000 liters
- Flow rate 90 l / min for the treatment of high viscosity oils
- Flow rate 90 l / min for a cold start phase then flow rate 180 l/min after temperature rise.

- Flow rate 180 l/min for filling or topping up tanks with a volume greater than 2000 liters
- Flow rate 180 l/min for the depollution of tanks with a volume of less than 2000 liters

Available in two configurations:

- configuration with start / stop automatic motor
- cut-out from differential pressure indicator - electrical / visual
- configuration with start / stop phase inverter automatic motor
- cut-out from differential pressure indicator - electrical / visual
- in-line Particle Counter ICM 2.0



Technical data

| | |
|---|--|
| <p>Pump Screw pump</p> | <p>Protection Class IP55</p> |
| <p>Electric Motor 3.7/5 kW 400/230V three phase 2/4-pole</p> | <p>Seal NBR</p> |
| <p>Flow (l/min) 90 l/min - 1450 r.p.m. / 180 l/min - 2900 r.p.m.</p> | <p>Fluid Compatibility Mineral Oil & Synthetic Oil - Water Glycol</p> |
| <p>Max. Operation Pressure 10 bar</p> | <p>Suction hose lance lance 90° DN50 length 3000 mm DN/OD50 length 700 mm DN/OD40 length 700 mm</p> |
| <p>Viscosity range Min. operation 10 cSt Max. operation 800 cSt Max. only for cold start 2000 cSt</p> | <p>Pressure hose lance DN38 length 3000 mm DN/OD42 length 700 mm</p> |
| <p>Suction Filter Type Y filtration 800 µm</p> | <p>Weight 120 kg</p> |
| <p>Filtration Rating 1, 3, 6, 10, 25 µm $\beta > 1000$ flow through the element Out/In</p> | <p>Equipment - Differential Clogging indicator - Electrical / Visual (setting 3.0 bar $\pm 10\%$) - Differential Clogging indicator - Electrical / Visual - with ICM 2.0 (setting 3.0 bar $\pm 10\%$)</p> |
| <p>Bypass valve Δp set Rating 3.5 bar with bypass. The bypass can be blocked through the spigot</p> | <p>CE Standard</p> |
| <p>Fluid Temperature From -10 °C to +80 °C</p> | |
| <p>Ambient Temperature From -20 °C to +45 °C</p> | |

UFM 919

Designation & Ordering code

| MOBILE FILTRATION UNIT UFM 919 | | | | | | | | | | |
|--|------------------------|-----|-----|---|---|---|---|---|---|-----|
| Series UFM | Configuration example: | UFM | 919 | T | A | 3 | 0 | 2 | 0 | P01 |
| Size 919 90-180 l/min | | | | | | | | | | |
| Electric motor T 400/230V Three phase - 2/4 pole | | | | | | | | | | |
| Seals A NBR | | | | | | | | | | |
| Pressure gauges and Clogging indicators (see below) 3 Manometer (*) + Electrical diff. clogging indicator (visual indication on panel) | | | | | | | | | | |
| Filter element 0 Without element (for ordering, see below) | | | | | | | | | | |
| Filtration surface 2 Higher | | | | | | | | | | |
| Option 0 No options 1 ICM 2.0 particle counter | | | | | | | | | | |
| Option P01 MP Filtri standard Pxx Customized | | | | | | | | | | |

Filtration element should be ordered separately

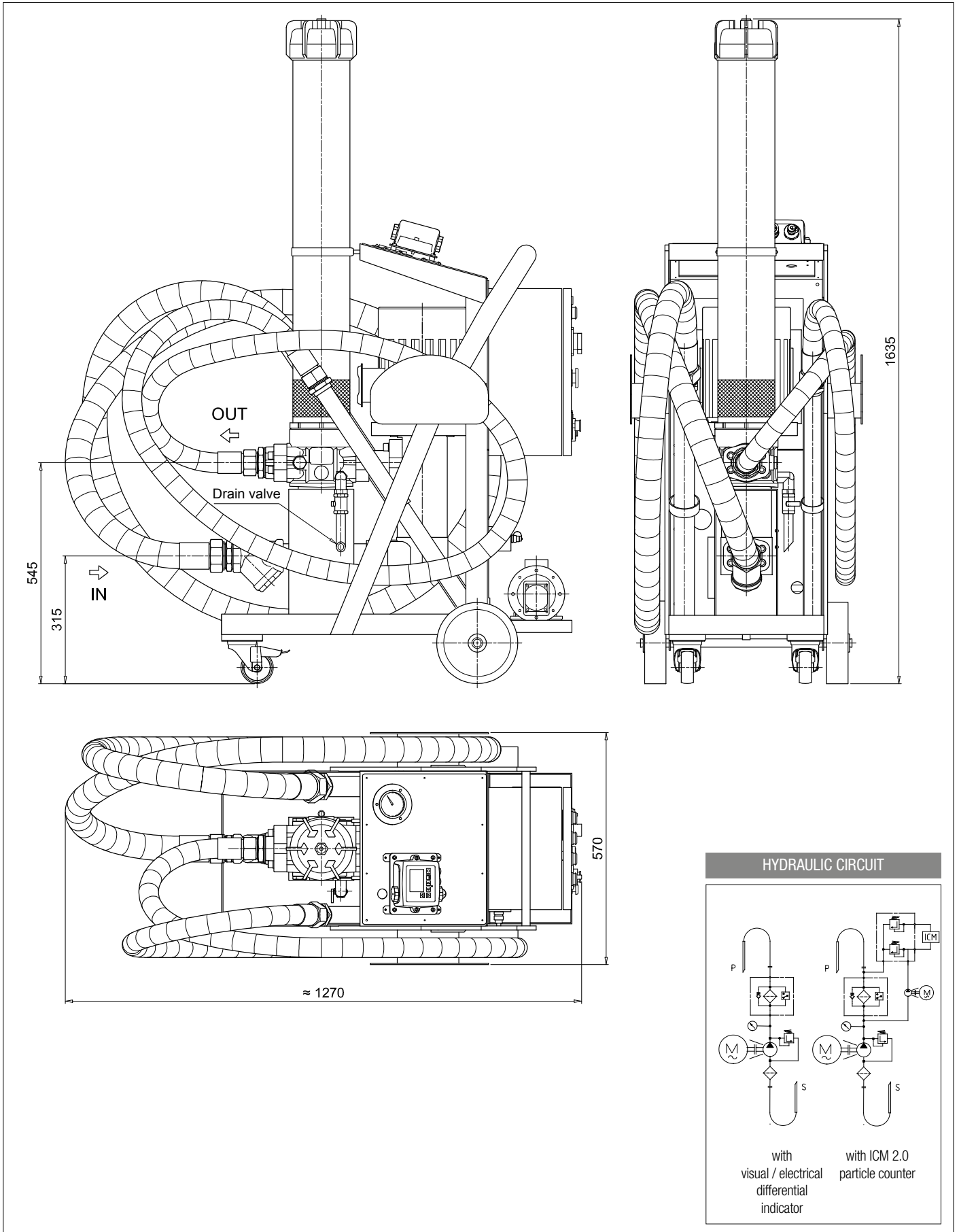
| FILTRATION SURFACE - HIGHER | | WATER REMOVAL |
|-----------------------------|--------------------------|-----------------------------------|
| Inorganic microfibre | Wire mesh element | Multi-Layer water absorber |
| CU 400 6 A01 A N P01 | CU 400 6 M25 A N P01 | CU4006WA025ANP01 |
| CU 400 6 A03 A N P01 | CU 400 6 M60 A N P01 | |
| CU 400 6 A06 A N P01 | | |
| CU 400 6 A10 A N P01 | | |
| CU 400 6 A16 A N P01 | | |
| CU 400 6 A25 A N P01 | | |

CLOGGING INDICATORS (*)

DEA Electrical Differential Indicator (visual indication on panel)

| Settings | Ordering code |
|--------------|---------------|
| 3.0 bar ±10% | DE A 30 P01 |

Dimensions



FTU 080

Fluid transfer unit with ICM 2.0 (In-line Contamination Monitor)



Description

Fluid Transfer Unit

FTU 080 Fluid Transfer unit suitable for filling, recirculation - via onboard 80L reservoir - and emptying of filtered hydraulic fluids and lubrication tanks.

The FTU can be utilised either as additional filtration to a system with a high incidence of contamination, or can be used as a standalone recirculating filtration circuit to clean fluid to a predetermined contamination level - monitored by the onboard ICM - prior to transfer of fluid to the system.

> Features & Benefits

- Compact size
- Easy to use
- Easy maintenance
- Reliable
- Absolute filtration
- In-line Contamination Monitor

Possible applications

- Low flow rate for filling of reservoirs
- Low-flow filtration for off-line tanks
- Pre filtration ability of fluid prior to filling of hydraulic system



Technical data

Pump

Gear pump

Electric Motor

0.75 kW 1400 rpm, 110/230 V single phase

Flow (l/min)

15 l/min

Max. Operation Pressure

3.5 bar

Inlet

Inlet (pump protection) filtration steel 250 µm strainer

Viscosity

150 cSt maximum fluid viscosity

Suction Filter

250 µm metal mesh strainers

Bypass valve Δp set

Rating 3.5 bar with bypass

Filtration

Water removal "spin-on" type, bypass set at 1.75 bar.

In-line filtration 3 µm absolute β 1000 element bypass set at 3.0 bar.

Filtration rating

See designation order for cartridge and filter elements

Control

Electrical Control Box

Indicator

Delivery line electric cut out switch

Ambient Temperature

From -10 °C to 80 °C

Working temperature

From 0 °C to 40 °C

Protection Class

IP55

Seal

NBR

Fluid Compatibility

Mineral oil compatible - please contact sales team for queries about other fluids

Hoses

Flexible hoses - SAE100R4 1" BSP swaged females 2mtr long hose

Oil level

Sight glass and filler with integrated electric float cut out switch

Weight

200 kg

Mounting

Heavy duty trolley and wheels

CE Standard

Designation & Ordering code

FLUID TRANSFER UNIT FTU

| Mobile filtration unit | | Configuration example: | | | | | | | |
|---|--|------------------------|---|---|----|---|---|------|--------|
| FTU Fluid Transfer Unit | | FTU | 1 | 1 | 15 | 2 | 1 | M250 | SL4305 |
| Onboard reservoir | | | | | | | | | |
| 1 80 litres | | | | | | | | | |
| In-line contamination monitor | | | | | | | | | |
| 1 With ICM | | | | | | | | | |
| Flow rate | | | | | | | | | |
| 15 15 l/min | | | | | | | | | |
| Motor power | | | | | | | | | |
| 2 0.75 kW, 1400 rpm | | | | | | | | | |
| Vage | | | | | | | | | |
| 1 110 V - 50 Hz single phase | | | | | | | | | |
| 2 240 V - 50 Hz single phase | | | | | | | | | |
| Inlet filtration | | | | | | | | | |
| M250 250 µm suction strainer (internal of reservoir) | | | | | | | | | |
| Outlet filtration | | | | | | | | | |
| SL4305 Single spin on plus LMP length 5 | | | | | | | | | |

Filtration element is not included and should be ordered separately.

Outlet filtration options:

LMP: CU400 5 A03, A06, A10, A16, A25 - **SPIN-ON:** CS150 A03, A06, A10, A25 - CS150 P10, P25 - **WATER REMOVAL:** CW150 P10, P25

CARTRIDGE STANDARD LENGTH

| Inorganic microfibre | Wire mesh element |
|----------------------|-------------------|
| CS 100 A01 A P01 | CS 100 M25 A P01 |
| CS 100 A03 A P01 | CS 100 M60 A P01 |
| CS 100 A06 A P01 | |
| CS 100 A10 A P01 | |
| CS 100 A25 A P01 | |

CARTRIDGE EXTENDED LENGTH

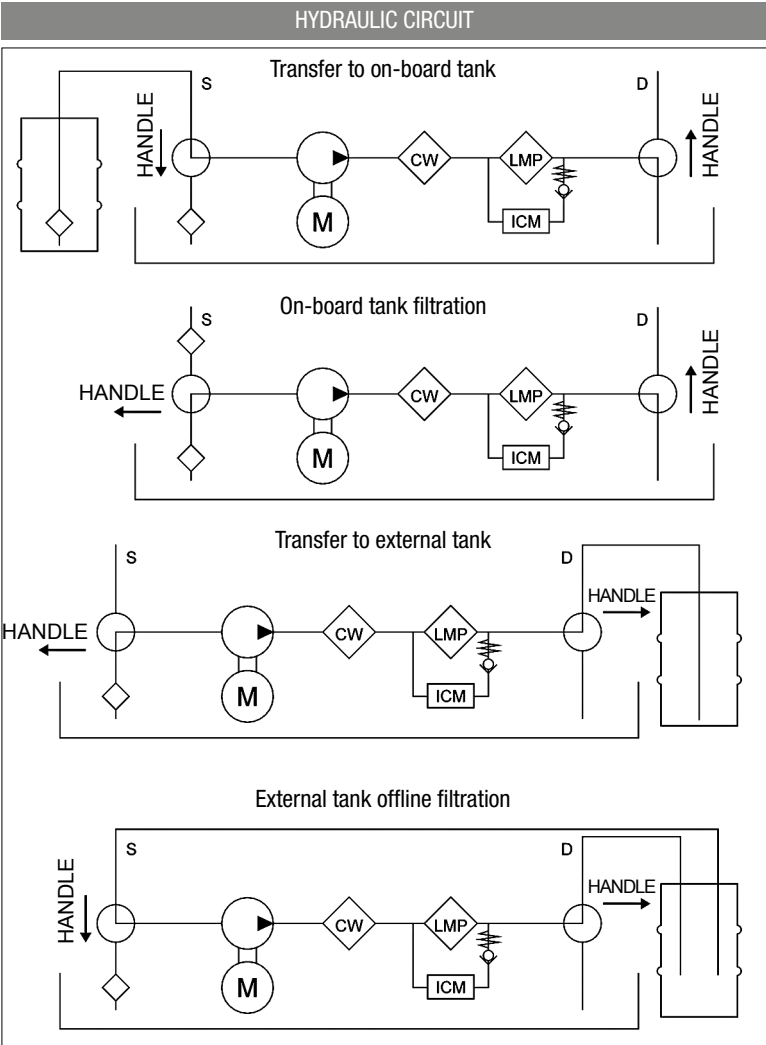
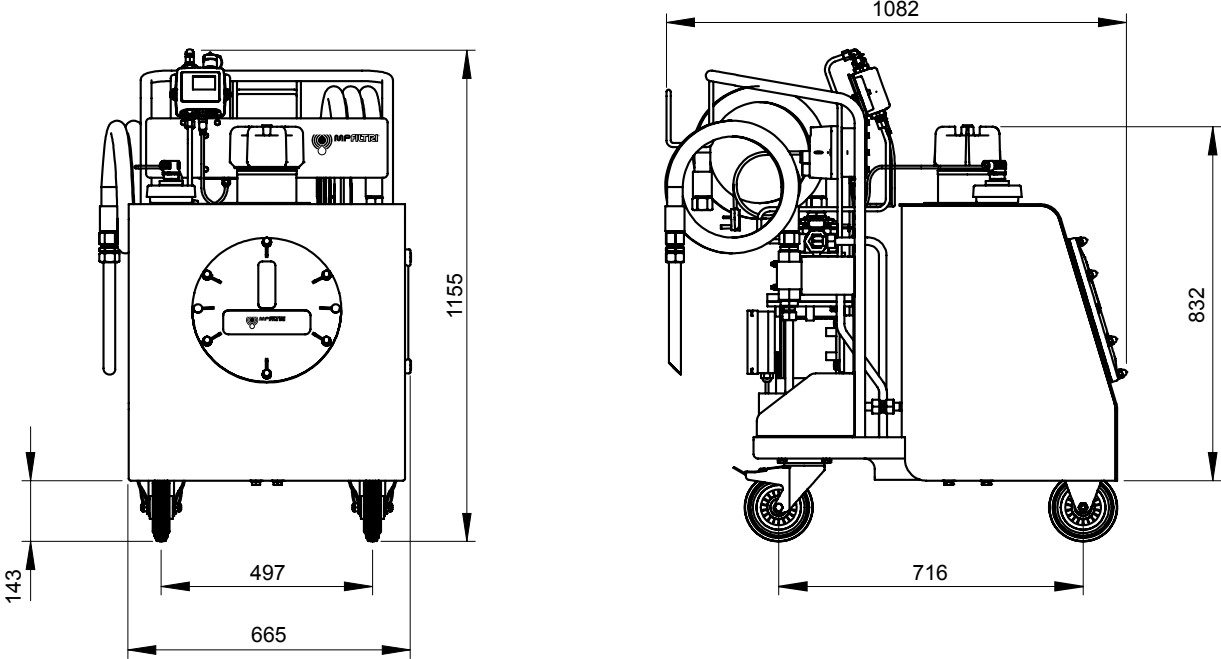
| Inorganic microfibre | Wire mesh element |
|----------------------|-------------------|
| CS 150 A01 A P01 | CS 150 M25 A P01 |
| CS 150 A03 A P01 | CS 150 M60 A P01 |
| CS 150 A06 A P01 | |
| CS 150 A10 A P01 | |
| CS 150 A25 A P01 | |

LMP FILTER ELEMENT - LENGTH 5

| Inorganic microfibre |
|----------------------|
| CU 400 5 A03 A N P01 |
| CU 400 5 A10 A N P01 |
| CU 400 5 A16 A N P01 |
| CU 400 5 A25 A N P01 |

WATER REMOVAL - CARTRIDGE EXTENDED LENGTH

| Multi-Layer water absorber |
|----------------------------|
| CW150P10A |



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