MOBILE FILTRATION UNITS
GRF SERIES
**Disclaimer**
The details in this manual are for informational purposes only. MP Filtri assumes no responsibility for use of the information provided.

<table>
<thead>
<tr>
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<th>Page</th>
</tr>
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</table>
CONTA�NATION MANAGEMENT

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.
- CINEMATIC 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.
  Cinematic 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.

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.

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.

#### 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.

#### 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\mu m)  
**HUMAN HAIR**

![Minimum Dimension Visible Human Eyes](40\mu m)  
**MINIMUM DIMENSION VISIBLE HUMAN EYES**

![Typical Contaminant Dimension in a Hydraulic Circuit](4÷14\mu m)  
**TYPICAL CONTAMINANT DIMENSION IN A 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 code refers to the number of particles of the same size or greater than 4, 6 or 14 μm in a 1 ml fluid.

<table>
<thead>
<tr>
<th>Class</th>
<th>Number of particles per ml</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Over</td>
</tr>
<tr>
<td>28</td>
<td>1 300 000</td>
</tr>
<tr>
<td>27</td>
<td>640 000</td>
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<tr>
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<td></td>
</tr>
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</table>

> 4 μm = 350 particles
> 6 μm = 100 particles
> 14 μm = 25 particles
16 / 14 / 12

ISO 4406:2017 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 μm and 15 μm equivalent to the 6 μm(c) and 14 μm(c) of APCs.

Over Up to 4
class = 1000
6 class = 100
14 class = 25
16 / 14 / 12

New ISO 4406 standard μm(c)
Old standard

Number of particles per 100 ml larger than indicated size

Number of particles per 100 ml sample volume

Cleanliness Code Chart with 100 ml sample volume

Example Code 22/19/14

> 4 μm = 350 particles
> 6 μm = 100 particles
> 14 μm = 25 particles
16 / 14 / 12
Classification example according to SAE AS 4059-1 and SAE AS 4059-2

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).

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

### Table 1 - Class for differential measurement

<table>
<thead>
<tr>
<th>Class</th>
<th>6÷14 µm</th>
<th>14÷21 µm</th>
<th>21÷38 µm</th>
<th>38÷70 µm</th>
<th>&gt;70 µm</th>
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<td>4</td>
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<td>0</td>
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</tr>
<tr>
<td>2</td>
<td>500</td>
<td>89</td>
<td>16</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1 000</td>
<td>178</td>
<td>32</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>2 000</td>
<td>356</td>
<td>63</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>4 000</td>
<td>712</td>
<td>126</td>
<td>22</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>8 000</td>
<td>1 425</td>
<td>253</td>
<td>45</td>
<td>8</td>
</tr>
<tr>
<td>7</td>
<td>16 000</td>
<td>2 850</td>
<td>506</td>
<td>90</td>
<td>16</td>
</tr>
<tr>
<td>8</td>
<td>32 000</td>
<td>5 700</td>
<td>1 012</td>
<td>180</td>
<td>32</td>
</tr>
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<td>9</td>
<td>64 000</td>
<td>11 400</td>
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<td>360</td>
<td>64</td>
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<td>10</td>
<td>128 000</td>
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<td>720</td>
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<td>182 400</td>
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### Table 2 - Class for cumulative measurement

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<th>&gt;6 µm</th>
<th>&gt;14 µm</th>
<th>&gt;21 µm</th>
<th>&gt;38 µm</th>
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<td>10 244</td>
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</table>

### Table 2 - Class for cumulative measurement

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

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 100ml volume at various size intervals (differential counts) rather than using cumulative counts as in ISO 4406:1999. 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.

### Table 3 - Maximum Contamination Limits per 100 ml

<table>
<thead>
<tr>
<th>Class</th>
<th>5÷15</th>
<th>15÷25</th>
<th>25÷50</th>
<th>50÷100</th>
<th>&gt;100</th>
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</thead>
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<td>1</td>
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<td>1</td>
<td>250</td>
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<td>8</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>500</td>
<td>89</td>
<td>16</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
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<td>1 000</td>
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<td>32</td>
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</tr>
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<tr>
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<td>4 000</td>
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<tr>
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<td>2 850</td>
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<td>16</td>
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<td>64 000</td>
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<tr>
<td>10</td>
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<td>22 800</td>
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<td>182 400</td>
<td>32 400</td>
<td>5 760</td>
<td>1 024</td>
</tr>
</tbody>
</table>

- **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.
CONTAMINATION MANAGEMENT

- CLEANLINESS CODE COMPARISON

Although ISO 4406:2017 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.

<table>
<thead>
<tr>
<th>ISO 4406:2017</th>
<th>SAE AS4059 Table 2</th>
<th>SAE AS4059 Table 1</th>
<th>NAS 1638</th>
</tr>
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<td>&gt; 4 µm (c)</td>
<td>&gt; 4 µm (c)</td>
<td>4-6</td>
<td>5-15</td>
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<tr>
<td>6 µm (c)</td>
<td>6-14</td>
<td>14-21</td>
<td>15-25</td>
</tr>
<tr>
<td>14 µm (c)</td>
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<td>38-70</td>
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<td>50-100</td>
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</table>

5 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

Recommended filtration (β200) > 1000

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.

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 = 200ppm = 100% saturation
- Hydraulic oil @ 65°C = 500ppm = 100% saturation

Piston pumps
- Piston pumps
- Vane pumps
- Vane pumps
- Engines
- Hydraulic cylinders
- Actuators
- Test benches
- Check valve
- Directional valves
- Flow regulating valves
- Proportional valves
- Servo-valves
- Flat bearings
- Ball bearings

ISO 4406 CODE

Recommended filtration (β200) > 1000

- 100% Emulsified
- 75%
- 50%
- 25%
- 0%

Piston pumps
- Piston pumps
- Vane pumps
- Vane pumps
- Engines
- Hydraulic cylinders
- Actuators
- Test benches
- Check valve
- Directional valves
- Flow regulating valves
- Proportional valves
- Servo-valves
- Flat bearings
- Ball bearings

ISO 4406 CODE

Recommended filtration (β200) > 1000

- 100% Emulsified
- 75%
- 50%
- 25%
- 0%
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 $d_{98} = 1000$).

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 - GRF Series:
GRF 015
GRF 1
GRF 3
GRF 5
GRF 6
GRF 015

Mobile filtration unit 4 gpm flow rate
The GRF 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 utilizes Spin-On element (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 micron 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

<table>
<thead>
<tr>
<th><strong>Pump</strong></th>
<th><strong>Protection Class</strong></th>
<th><strong>Seal</strong></th>
<th><strong>Fluid Compatibility</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gear pump</td>
<td>IP 55</td>
<td>NBR</td>
<td>Mineral Oil - Other on request</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Electric Motor</strong></th>
<th><strong>Flow (l/min)</strong></th>
<th><strong>Max. Operation Pressure</strong></th>
<th><strong>Viscosity range</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>.25 hp 115 V single phase electric motor</td>
<td>4 gpm at 1800 rpm</td>
<td>58 psi</td>
<td>Min. operation 10 cSt</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Max. operation 200 cSt</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Max. only for cold start 400 cSt</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Suction Filter</strong></th>
<th><strong>Filtration Rating</strong></th>
<th><strong>Bypass valve</strong></th>
<th><strong>Fluid Temperature</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Type Y filtration 500 μm</td>
<td>1/3/6/10/25 μm θ&gt;1000 flow through the element Out/In</td>
<td>Rating 58 psi</td>
<td>From 41° to 140 °F</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Pressure hose</strong></th>
<th><strong>Weight</strong></th>
<th><strong>Equipment</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>DN18 length 100 in</td>
<td>32.6 lb</td>
<td>Visual clogging indicator (gauge)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Lance</strong></th>
<th><strong>Diameter</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>DN/OD20 length 16 in</td>
<td>DN/OD18 length 16 in</td>
</tr>
</tbody>
</table>
**MOBILE FILTRATION UNIT GRF 015**

**Series**
- GRF

**Size**
- 015 4 gpm

**Electric motor**
- M 115 single phase

**Seals**
- A NBR

**Pressure gauges and Color coded gauge**
- 1

**Spin-on Element**
- Note: Element ordered separately
- 0 Without element

**Option**
- 0 No options

**P01** MP Filtri standard

**Pxx** Customized

---

**Element Options**

### SPIN ON ELEMENT STANDARD LENGTH

<table>
<thead>
<tr>
<th>Inorganic microfibre</th>
<th>Wire mesh element</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSG100A01AP01</td>
<td>CSG100M25AP01</td>
</tr>
<tr>
<td>CSG100A03AP01</td>
<td>CSG100M60AP01</td>
</tr>
<tr>
<td>CSG100A06AP01</td>
<td></td>
</tr>
<tr>
<td>CSG100A10AP01</td>
<td></td>
</tr>
<tr>
<td>CSG100A25AP01</td>
<td></td>
</tr>
</tbody>
</table>

### SPIN ON ELEMENT EXTENDED LENGTH

<table>
<thead>
<tr>
<th>Inorganic microfibre</th>
<th>Wire mesh element</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSG150A01AP01</td>
<td>CSG150M25AP01</td>
</tr>
<tr>
<td>CSG150A03AP01</td>
<td></td>
</tr>
<tr>
<td>CSG150A06AP01</td>
<td></td>
</tr>
<tr>
<td>CSG150A10AP01</td>
<td></td>
</tr>
<tr>
<td>CSG150A25AP01</td>
<td></td>
</tr>
</tbody>
</table>

**WATER REMOVAL - ELEMENT EXTENDED LENGTH**

<table>
<thead>
<tr>
<th>Multi-Layer water absorber</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSGW100P10A</td>
</tr>
<tr>
<td>CSGW150P10A</td>
</tr>
<tr>
<td>CSGW150P25A</td>
</tr>
<tr>
<td>CSGW150A03A</td>
</tr>
</tbody>
</table>
GRF 1 General Information

Technical Data

Applications
- Filtering contaminated systems
- Collecting oil samples for analysis
- Dispensing new oil

Performance
For filtering mineral and synthetic based oils (hydraulic oils, gear oils, and turbine oils) with a maximum operating viscosity range of 3000ssu/648cSt at 100°F within ambient temperature ranges of -15°F to 150°F

> Features
- Carbon steel frame with drip tray
- 1 HP, 115 VAC, 60 Hz motor
- Low pressure aluminum heads
- Aluminum gear pump - available in 5 and 10 gpm
- Pop-up indicator triggers at 20 psid when elements need to be changed
- Pump relief opens at 150 psi
- Approximate weight 75-80 lbs
- Approximate dimensions 24"L x 12"W X 18"H

Replacement spin-on element options:

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Beta Rating</th>
<th>Desired Cleaniness Level (ISO Code)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSG150A01A</td>
<td>β1(c)=1000</td>
<td>13/11/8 - 12/10/7</td>
</tr>
<tr>
<td>CSG150A03A</td>
<td>β3(c)=1000</td>
<td>14/12/19 - 13/11/18</td>
</tr>
<tr>
<td>CSG150A06A</td>
<td>β6(c)=1000</td>
<td>17/15/12 - 14/12/19</td>
</tr>
<tr>
<td>CSG150A10A</td>
<td>β10(c)=1000</td>
<td>18/16/13 - 17/15/12</td>
</tr>
<tr>
<td>CSG150A25A</td>
<td>β25(c)=1000</td>
<td>21/19/16 - 20/18/15</td>
</tr>
<tr>
<td>CSGW150A03A</td>
<td>Water Removal</td>
<td></td>
</tr>
</tbody>
</table>
### STATIONARY FILTRATION UNIT GRF 1

<table>
<thead>
<tr>
<th>Series</th>
<th>Configuration Example:</th>
<th>GRF 105</th>
<th>A</th>
<th>1</th>
<th>1</th>
<th>-</th>
<th>A03</th>
<th>P01</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRF 105</td>
<td>5 GPM</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>GRF 110</td>
<td>10 GPM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Seal</th>
<th></th>
<th>A</th>
<th>Buna</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Phase</th>
<th></th>
<th>1</th>
<th>110 Volt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td></td>
<td>230 Volt</td>
</tr>
</tbody>
</table>

**Auto-Shut Down Control Feature**
- No auto-shut down control
- With auto-shut down control *

*Note: Auto shutdown feature is only applicable with optional ICM*

<table>
<thead>
<tr>
<th>Clogging Indicator</th>
<th></th>
<th>-</th>
<th>No strobe light indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td></td>
<td>With strobe light indicator</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Discharge Side Element</th>
<th></th>
<th>A01</th>
<th>CSG150A01A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A03</td>
<td>CSG150A03A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A06</td>
<td>CSG150A06A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A10</td>
<td>CSG150A10A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A25</td>
<td>CSG150A25A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WA03</td>
<td>CSGW150A03A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WP10</td>
<td>CSGW150P10A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WP25</td>
<td>CSGW150P25A</td>
</tr>
</tbody>
</table>

**ICM Contamination Monitor**

ICM contamination monitor is not include and should consult factory

<table>
<thead>
<tr>
<th>ICM contamination Monitor</th>
<th></th>
<th>ICM 0-M-K-R-G1</th>
<th>Without moisture and temperature sensor, with screen, with relays/external alarm outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ICM 0-M-K-R-G1</td>
<td>ICM-W-M-K-R-G1</td>
<td>With moisture and temperature sensor with screen, with relays/external alarm outputs</td>
</tr>
<tr>
<td></td>
<td>ICM-W-M-K-U-G1</td>
<td>ICM-W-M-K-U-G1</td>
<td>Without moisture and temperature sensor, with screen, with test record transfer plus relays/external alarm outputs</td>
</tr>
<tr>
<td></td>
<td>ICM-W-M-K-U-G1</td>
<td>ICM-W-M-K-U-G1</td>
<td>With moisture and temperature, with screen, with test record transfer plus relays/external alarm outputs</td>
</tr>
</tbody>
</table>

**Execution**

<table>
<thead>
<tr>
<th>P01</th>
<th>MP Filtri Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pxx</td>
<td>Customize</td>
</tr>
</tbody>
</table>

**Note:** Consult factory for options not listed

MP Filtri reserves the right to make improvements in design, product features and specifications at anytime without notice.
GRF1 Series

Dimensions

- 29.00
- 25.00
- 12.00
- 45.00
- 34.00
Applications
- Oil transfer from bulk drums to tank
- Reservoir clean-up

> Features
- 1 HP, 120 VAC, 1-Phase TEFC motor with cord and plug
- Rugged 5 gpm or 10 gpm gear pump with integral relief valve
- 10 ft. wire reinforced clear suction and discharge hoses with stainless steel wands
- Heavy Duty hand truck with pneumatic tires powder coated MP Filtri blue
- Large drip pan under filter element assemblies
- 2 pc 4ft. stainless steel wands
- Wand storage brackets with accommodations to contain excess in drip pan
- 25 ft. electrical cord with end plug, includes cord storage hook
- On-board sealed on/off switch

Suction Side
- 1 pc CSG100M90A - 90 micron wire mesh element

Discharge Side - 1
- 1 pc MPS350 Dual Spin-on with 25 psid bypass
- Choice of 1, 3, 6, 10, & 25 micron elements available
- With indicator

Discharge Side - 2
- 1 pc LMP 2102 housing with 50 psid bypass
- Choice of 1, 3, 6, 10, & 25 micron elements available
- With indicator
## MOBILE FILTRATION GRF 3

### Configuration Example 1:

<table>
<thead>
<tr>
<th>Series</th>
<th>GRF 305</th>
<th>5 GPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRF 310</td>
<td>10 GPM</td>
<td></td>
</tr>
</tbody>
</table>

### Type
1. MPS300 assembly on discharge
2. LMP2112 assembly on discharge

### Suction Side Spin-on Element
- M90: 90 micron wire mesh

### Seal Material
- A: Buna

### Discharge Side Element (Spin-On Type 1 only)
- MPS300:
  - A01: CSG150A01AP01
  - A03: CSG150A03AP01
  - A06: CSG150A06AP01
  - A10: CSG150A10AP01
  - A25: CSG150A25AP01
  - WA03: CSGW150A03AP01
  - WP10: CSGW150P10AP01
  - WP25: CSGW150P25AP01

### Execution
- P01: MP Filtri Standard
- Pxx: Customize

Note: Consult factory for options not listed
MP Filtri reserves the right to make improvements in design, product features and specifications at anytime without notice.
GRF 3 Series
Dimensions

Mobile filtration units

Dimensions:

Height: 52”
Width: 23”
Depth: 22”
Applications
- Oil transfer from bulk drums to tank
- Reservoir clean-up

> Features
- 1 HP, 115 VAC, 1-Phase TEFC motor with motor start/stop, cord and plug
- Rugged 5 gpm or 10 gpm gear pump with integral relief valve
- 10 ft. wire reinforced clear suction and discharge hoses with stainless steel wands
- Mounted inline contamination monitoring (ICM) unit to measure fluid cleanliness
- Heavy duty hand truck with pneumatic tires, powder coated in MP Filtri Blue
- 2 pc 4ft. stainless steel wands
- Wand Storage brackets with accommodation to contain excess in drip pan
- 25 ft. electrical cord with end plug, includes cord storage hook
- On-board sealed on/off switch

Suction Side
- 1 pc CSG100M90A - 90 micron wire mesh element

Discharge Side
- 1 pc LMP2112 housing with 50 psid bypass
- Choice of 1, 3, 6, 10, & 25 micron elements available

ICM
- 8 channel contamination measurement
- International standard formats ISO 4406:1999, NAS 1638 AS 4059E and ISO 11218
- Data logging and 4000 test result memory
- Mineral oil fluid compatibility
- Optional water/temperature sensor
- Optional 6-key keypad and 128 x 64 back-lit display
- Optional relays
- LPA View software included
### MOBILE FILTRATION GRF 5

<table>
<thead>
<tr>
<th>Series</th>
<th>Configuration Example 1:</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRF 505</td>
<td>GRF 510 2 M90 A A03 ICMW M K U 2.0 P01</td>
</tr>
<tr>
<td>GRF 510</td>
<td>5 GPM</td>
</tr>
<tr>
<td>5 GPM</td>
<td>10 GPM</td>
</tr>
</tbody>
</table>

**Type**
- 2: LMP2112 assembly on discharge

**Suction Side Spin-on Element**
- M90: 90 micron wire mesh

**Seal**
- A: Buna

**Discharge Side Cartridge Element**
- A01: CU2102A01ANP01
- A03: CU2102A03ANP01
- A06: CU2102A06ANP01
- A10: CU2102A10ANP01
- A25: CU2102A25ANP01
- WA25: CU2102WA25ANP01

**ICM Water/Temperature Sensor**
- ICM0: Without water/temperature sensor
- ICMW: With water/temperature sensor

**Fluid Compatibility**
- M: Mineral Oil

**Keypad**
- K: With 6-keypad with display

**Relays**
- A: With relays/external alarms

**Design Reference**
- 2.0: ICM 2.0
- 4.0: ICM 4.0 with integral WiFi

**Execution**
- P01: MP Filtri Standard
- PxX: Customize

---

Note: Consult factory for options not listed
MP Filtri reserves the right to make improvements in design, product features and specifications at anytime without notice.
GRF 5 Series
Dimensions

Mobile filtration units

ICM contamination monitor

52”

23”

22”
Performance Data

For filtering mineral and synthetic based oils (hydraulic oils, gear oils and turbine oils) with a maximum operating viscosity range of 300ssu / 648cSt at 100°F within ambient temperature ranges of -15°F to 150°F.

Standard Features

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frame</strong></td>
<td>Carbon steel, 30 gallon tank with 4 wheels</td>
</tr>
<tr>
<td><strong>Paint</strong></td>
<td>Blue</td>
</tr>
<tr>
<td><strong>Motor</strong></td>
<td>1 HP or 120vac 60Hz</td>
</tr>
<tr>
<td><strong>Filter Options</strong></td>
<td>MPS 300 Dual Spin-on or LMP211 Cartridge Style</td>
</tr>
<tr>
<td><strong>Pumps</strong></td>
<td>Heavy Duty Cast Iron Gear Pump: Available in 5 and 10 GPM</td>
</tr>
<tr>
<td><strong>Connections</strong></td>
<td>3/4” JIC</td>
</tr>
<tr>
<td><strong>Hoses</strong></td>
<td>10 ft. Suction and Return</td>
</tr>
<tr>
<td><strong>Power Switch</strong></td>
<td>Sealed on/off power switch</td>
</tr>
<tr>
<td><strong>Cord</strong></td>
<td>40 ft. retractable cord reel</td>
</tr>
<tr>
<td><strong>Breather</strong></td>
<td>Desiccant breather</td>
</tr>
<tr>
<td><strong>Filter Indicators</strong></td>
<td>Pop up indicator triggers when elements need to be changed</td>
</tr>
<tr>
<td><strong>Pump Relief</strong></td>
<td>Opens at 150psi</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>Approx. 125 lbs (will vary depending on options)</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>Approx. 30”L x 19”W x 35”H</td>
</tr>
</tbody>
</table>

Components:

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Description</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tank</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Motor</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Pump</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Filter Head</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Filter Element</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Filter Indicator</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Switch On/Off</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Sample Port</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>Retractable Reel</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Sight Gauge</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Breather Adapter</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Breather</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Brake</td>
<td>2</td>
</tr>
</tbody>
</table>
**GRF 6 Series**

**Designation & Ordering Code**

### MOBILE FILTRATION GRF 6

<table>
<thead>
<tr>
<th>Series</th>
<th>Configuration Example 1:</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRF 605</td>
<td>GRF 605 1 A SA03 1 P01</td>
</tr>
<tr>
<td>GRF 610</td>
<td>GRF 610 3 A CA03 CA10 1 P01</td>
</tr>
</tbody>
</table>

#### Type

1. MPS300 Dual Spin-On assembly on discharge (2) elements required
2. LMP2112 Single Cartridge assembly on discharge (1) element required
3. LMP2112 + LMP2112 (2) each Cartridge assemblies on discharge in series (2) elements required

#### Seal Material

- A: Buna

#### Discharge Side Element (Spin-On Type 1 only)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA01</td>
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<tr>
<td>SA03</td>
<td>CSG150A03A</td>
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<tr>
<td>SA06</td>
<td>CSG150A06A</td>
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<td>SA10</td>
<td>CSG150A10A</td>
</tr>
<tr>
<td>SA25</td>
<td>CSG150A25A</td>
</tr>
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</table>

#### Discharge Side Element (Cartridge Type 2 & 3 only)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA01</td>
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<tr>
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<tr>
<td>CWA25</td>
<td>CU2102WA25ANP01</td>
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</tbody>
</table>

#### SWP25

- Cellulosic water removal

#### Contamination Monitor Options

- 0: Without ICM unit
- 1: ICM-W-M-K-U-G3-2.0 - mineral oil fluid moisture and temperature sensor with screen, and USB download capability
- 2: ICM-W-M-K-R-G3-4.0 - mineral oil fluid moisture and temperature sensor with screen, and USB download capability

**Note:** (1) each: ICM-USBi module required for programming ICM (Refer to ICM operator guide for selectable program options)

Fluids other than mineral oil consult factory

**Note:** Consult factory for options not listed

MP Filtri reserves the right to make improvements in design, product features and specifications at anytime without notice.
The Drum Adapter Kit helps keep your lubricants free of moisture and particulate contamination while in storage or during the fluid transfer process. It also allows you to easily pre-filter your lubricant, ensuring you’re only putting clean dry oil into your equipment.

Benefits:
- Easily modify your equipment for seamless connection to various filtration systems
- Prevents the ingress of dirt and moisture by utilizing a desiccant breather
- Customizable to fit all your needs

Features:
- Various quick disconnects with steel dust plugs allow for various configurations
- 2” NPT connection easily replaces standard drum bungs
- Replaceable desiccant breather with 3/4” NPT adapter

Ordering Information:
- GRF-DAK
Our heavy-duty stainless steel hose wand kit is great for those applications that require them. Hose wands aren’t ideal, but some applications may require them. They can also be used for short term, while quick disconnects are being added to equipment.

Benefits:
- A quick connect tool that allows you to draw fluids from tanks, buckets, drums or open reservoirs when this is the only option
- Allows you to reach down into tanks for oil transport

Features:
- (2) Stainless steel 3/4” tube, 4 ft. long
- 90 degree female JIC swivel end

Ordering Information:
- GRF-HWKIT-SS

Pictured photo is cropped for visibility. Tubes are 4 ft. long.
Our Hydraulic Adapter Kit allows you to easily adapt your equipment with a desiccant breather and quick connects with the use of your system to remain completely sealed to atmospheric ingression, while allowing for easy access during offline filtration or topping reservoirs off.

Benefits:
- Easily modify your equipment for seamless connection to various filtration systems
- Prevents the ingestion of dirt and moisture by utilizing a desiccant breather
- Customizable to fit all your needs

Features:
- Various quick disconnects with steel dust plugs allow for various configurations
- 6 bolt adapter fits most OEM connections
- Replaceable desiccant breather
- Customizable to fit your specific needs

Ordering Information:
- GRF - HAK
Our Tote Adapter Kit allows you to easily adapt your equipment with a desiccant breather and quick connects with the use of a 2” NPT threaded adapter. This allows your system to remain completely sealed to atmospheric ingress, while allowing for easy access during offline filtration or topping reservoirs off.

Benefits:
- Easily modify your equipment for seamless connection to various filtration systems
- Prevents the ingestion of dirt and moisture by utilizing a desiccant breather
- Customizable to fit all your needs

Features:
- Various quick disconnects with steel dust plugs
- 2” NPT connects to most poly totes
- Replaceable desiccant breather
- Customizable to fit your specific needs
- Spring loaded faucet for easy dispensing

Ordering Information:
- GRF-TAK
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