CONTAMINATION CONTROL SOLUTIONS

CONTAMINATION MONITORING PRODUCTS

PASSION TO PERFORM
Contamination management

INDEX

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
</tr>
<tr>
<td>12</td>
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<td>13</td>
</tr>
<tr>
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</tbody>
</table>

- HYDRAULIC FLUIDS
- FLUIDS CONTAMINATION
- EFFECTS OF CONTAMINATION ON HYDRAULIC COMPONENTS
- MEASURING THE SOLID CONTAMINATION LEVEL
- RECOMMENDED CONTAMINATION CLASSES
- WATER IN HYDRAULIC AND LUBRICATING FLUIDS
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 incendibility 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.

**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.

**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.
- **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**
  (COMRESSIBILITY 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.

### 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?

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.

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.
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 μm(c). The second number represents the number of particles larger than 6 μm(c). The third scale number represents the number of particles in a millilitre sample of the fluid that are larger than 14 μm(c).

ISO 4406 - Allocation of Scale Numbers

<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>
</tr>
<tr>
<td>26</td>
<td>320 000</td>
</tr>
<tr>
<td>25</td>
<td>160 000</td>
</tr>
<tr>
<td>24</td>
<td>80 000</td>
</tr>
<tr>
<td>23</td>
<td>40 000</td>
</tr>
<tr>
<td>22</td>
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<td>21</td>
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<td>20</td>
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<td>19</td>
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<tr>
<td>18</td>
<td>1 300</td>
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<tr>
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<td>80</td>
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<td>10</td>
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<tr>
<td>7</td>
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<tr>
<td>6</td>
<td>0.32</td>
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<tr>
<td>5</td>
<td>0.16</td>
</tr>
<tr>
<td>4</td>
<td>0.08</td>
</tr>
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<td>3</td>
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</tr>
<tr>
<td>1</td>
<td>0.01</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

> 4 μm(c) = 350 particles
> 6 μm(c) = 100 particles
> 14 μm(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 μm and 15 μm equivalent to the 6 μm(c) and 14 μm(c) of APCs.
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

<table>
<thead>
<tr>
<th>Class</th>
<th>Dimension of contaminant</th>
<th>Maximum Contamination Limits per 100 ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-14 µm</td>
<td>&gt;6 µm</td>
<td>&gt;4 µm</td>
</tr>
<tr>
<td>00</td>
<td>125</td>
<td>22</td>
</tr>
<tr>
<td>0</td>
<td>120</td>
<td>22</td>
</tr>
<tr>
<td>1</td>
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<td>178</td>
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<td>2</td>
<td>2 000</td>
<td>712</td>
</tr>
<tr>
<td>3</td>
<td>3 000</td>
<td>14 25</td>
</tr>
<tr>
<td>4</td>
<td>16 000</td>
<td>2 850</td>
</tr>
<tr>
<td>5</td>
<td>32 000</td>
<td>5 700</td>
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<tr>
<td>6</td>
<td>64 000</td>
<td>11 400</td>
</tr>
<tr>
<td>7</td>
<td>125 000</td>
<td>22 800</td>
</tr>
<tr>
<td>8</td>
<td>256 000</td>
<td>45 600</td>
</tr>
<tr>
<td>9</td>
<td>512 000</td>
<td>91 200</td>
</tr>
<tr>
<td>10</td>
<td>1 024 000</td>
<td>182 400</td>
</tr>
</tbody>
</table>

6 - 14 µm = 15 000 particles
14 - 21 µm = 2 200 particles
21 - 38 µm = 200 particles
> 70 µm = 3 particles
SAE AS4059 REV. F - Class 6

### Table 2 - Class for cumulative measurement

<table>
<thead>
<tr>
<th>Class</th>
<th>Dimension of contaminant</th>
<th>Maximum Contamination Limits per 100 ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-14 µm</td>
<td>&gt;6 µm</td>
<td>&gt;4 µm</td>
</tr>
<tr>
<td>00</td>
<td>195</td>
<td>76</td>
</tr>
<tr>
<td>0</td>
<td>390</td>
<td>152</td>
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<td>1</td>
<td>780</td>
<td>304</td>
</tr>
<tr>
<td>2</td>
<td>1 160</td>
<td>608</td>
</tr>
<tr>
<td>3</td>
<td>1 560</td>
<td>608</td>
</tr>
<tr>
<td>4</td>
<td>1 920</td>
<td>608</td>
</tr>
<tr>
<td>5</td>
<td>2 280</td>
<td>608</td>
</tr>
<tr>
<td>6</td>
<td>2 640</td>
<td>608</td>
</tr>
<tr>
<td>7</td>
<td>2 960</td>
<td>608</td>
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<tr>
<td>8</td>
<td>3 280</td>
<td>608</td>
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<tr>
<td>9</td>
<td>3 560</td>
<td>608</td>
</tr>
<tr>
<td>10</td>
<td>3 840</td>
<td>608</td>
</tr>
</tbody>
</table>

6 - 14 µm = 15 000 particles
14 - 21 µm = 2 200 particles
21 - 38 µm = 200 particles
> 70 µm = 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.
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.

<table>
<thead>
<tr>
<th>Size Range Classes (in microns)</th>
<th>Maximum Contamination Limits per 100 ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
<td>5-15</td>
</tr>
<tr>
<td>00</td>
<td>125</td>
</tr>
<tr>
<td>0</td>
<td>250</td>
</tr>
<tr>
<td>1</td>
<td>500</td>
</tr>
<tr>
<td>2</td>
<td>1,000</td>
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<tr>
<td>3</td>
<td>2,000</td>
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<td>4</td>
<td>4,000</td>
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<td>5</td>
<td>8,000</td>
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<td>6</td>
<td>16,000</td>
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<td>32,000</td>
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<td>9</td>
<td>128,000</td>
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<tr>
<td>10</td>
<td>256,000</td>
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<tr>
<td>11</td>
<td>512,000</td>
</tr>
<tr>
<td>12</td>
<td>1,024,000</td>
</tr>
</tbody>
</table>

- CUMULATIVE DISTRIBUTION OF THE PARTICLE SIZE - ISO 4407

The level of contamination is defined by counting the number of particles collected by a laboratory membrane per unit 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 pre-defined 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

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.

<table>
<thead>
<tr>
<th>ISO 4406</th>
<th>SAE AS4059 Table 2</th>
<th>SAE AS4059 Table 1</th>
<th>NAS 1638</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 4 μm(c)</td>
<td>&gt; 4 μm(c)</td>
<td>4-6</td>
<td></td>
</tr>
<tr>
<td>6 μm(c)</td>
<td>6 μm(c)</td>
<td>14-21</td>
<td></td>
</tr>
<tr>
<td>14 μm(c)</td>
<td>14 μm(c)</td>
<td>21-38</td>
<td></td>
</tr>
<tr>
<td>50-100</td>
<td>&gt;70</td>
<td>&gt;5-15</td>
<td></td>
</tr>
<tr>
<td>&gt;100</td>
<td></td>
<td>15-25</td>
<td></td>
</tr>
<tr>
<td>&gt;200</td>
<td></td>
<td>25-50</td>
<td></td>
</tr>
<tr>
<td>&gt;500</td>
<td></td>
<td>50-100</td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Component</th>
<th>Recommended Contamination Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piston pumps with fixed flow rate</td>
<td>16A/14B/14C</td>
</tr>
<tr>
<td>Piston pumps with variable flow rate</td>
<td>15A/13B/13C</td>
</tr>
<tr>
<td>Vane pumps with fixed flow rate</td>
<td>14A/12B/12C</td>
</tr>
<tr>
<td>Vane pumps with variable flow</td>
<td>13A/11B/11C</td>
</tr>
<tr>
<td>Engines</td>
<td>12A/10B/10C</td>
</tr>
<tr>
<td>Hydraulic cylinders</td>
<td>11A/9B/9C</td>
</tr>
<tr>
<td>Actuators</td>
<td>10A/8B/8C</td>
</tr>
<tr>
<td>Test benches</td>
<td>9A/7B/7C</td>
</tr>
<tr>
<td>Check valve</td>
<td>8A/6B/6C</td>
</tr>
<tr>
<td>Directional valves</td>
<td>7A/5B/5C</td>
</tr>
<tr>
<td>Flow regulatingVALVES</td>
<td>6A/4B/4C</td>
</tr>
<tr>
<td>Proportional valves</td>
<td>5A/3B/3C</td>
</tr>
<tr>
<td>Servo-valves</td>
<td>4A/2B/2C</td>
</tr>
<tr>
<td>Flat bearings</td>
<td>3A/1B/1C</td>
</tr>
<tr>
<td>Ball bearings</td>
<td>2A/0B/0C</td>
</tr>
</tbody>
</table>

ISO 4406 CLOG

Recommended filtration η(c) = 1,000
<table>
<thead>
<tr>
<th>η(c)</th>
<th>η(c)</th>
<th>η(c)</th>
<th>η(c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;1000</td>
<td>&gt;1000</td>
<td>&gt;1000</td>
<td>&gt;1000</td>
</tr>
<tr>
<td>&gt;700</td>
<td>&gt;700</td>
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<tr>
<td>&gt;1</td>
<td>&gt;1</td>
<td>&gt;1</td>
<td>&gt;1</td>
</tr>
</tbody>
</table>

Introduction
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 (°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 are 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 micofiber media with a filtration rating 25 μm (therefore identified with media designation WA025, providing absolute filtration of solid particles to \( \beta_{100} = 1000 \)). 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
You can see right through our results

It's no secret the presence of particles in the hydraulic fluid is the primary cause of failure, unreliability and short component life in hydraulic systems - whether they be fluid power, lubrication or fuel. We have developed an extensive range of products to help you safeguard your machines and systems from potential failure.

Benefits:
- Promptly measures and maintains the appropriate fluid cleanliness level
- Damages and downtime are minimised, reducing costs
- Provides a maintenance regime to immediately respond to an incident

Applications:
- Industrial hydraulic and lubrication systems
- Mobile hydraulics
Portable Particle Counters

LPA3
LPA2 Aviation Edition
CML4

Inline Contamination Monitors

ICM 4.0
ICM 2.0
AZ2
ICU
ACMU
BS110 & BS500
PIK

Sampling Analysis Kit

BS110 & BS500
PIK

Contamination Monitoring Products

FLUID COMPATIBILITY CHARTS  page 85
SPARE PARTS LIST  page 88
ACCESSORIES  page 93
Description

MP Filtri’s new LPA3 is the most advanced portable particle counter in the world. Whether you are working in the lab or in the field, the LPA3 delivers a fast, accurate and comprehensive hydraulic health check in a robust yet portable package.

Its real-time monitoring and predictive maintenance technology safeguards machinery, enhances performance and productivity, and reduces costs and unplanned downtime. Featuring the latest breakthroughs in optical and photodiode technology, the new LPA3 enhances the reliability and longevity of complex hydraulic systems and is ideal for quality control in in-house manufacturing applications. The LPA3 is compatible with the full range of Bottle Samplers.

**Features & Benefits**
- Online/realtime monitoring
- Comprehensive hydraulic health check
- Proactive maintenance capabilities
- High-speed sample times
- Programmable 10.1” (25.6cm) touchscreen display
- Perfectly portable at just 10kg
- Programmable sample volumes
- Precision Instrument
- Live trend analysis option
- Measures and displays the following international standard formats; ISO 4406, NAS 1638, AS 4059E&F, GBT 14039, GJB420B
- Moisture and temperature sensing
- Data logging and enhanced 4000 test result memory
- Key performance information at a glance
- LPA View software (included)
- Ideal for hydraulic, lubrication, and subsea fluids
- Integrated printer
- Full accessories kit included
- Long-life Lithium Ion battery

**Scope of Supply**
1 x LPA3 (*)
1 x M16x2 microbore pressure hose, 1500 mm long, pouch
1 x 2000 mm quick release waste hose for LPA3 and pouch
1 x 1L waste receptacle
1 x Power Lead c/w UK/EU/US/AUS/CN heads
1 x USB cable
1 x Digital USB copy of user guides/software/drivers
2 x Hard copy of calibration certificate
5 x Thermal printer paper
1 x Carry bag

(*) Specific model will be as per ordered item

See Accessories at page 93
## Technical data

### Technology
High precision LED light extinction automatic optical particle counter

### Particle Sizing
>4, 6, 14, 21, 25, 38, 50, 70 μm (c)

### Analysis range
- ISO 4406 Codes 8 to 24
- NAS 1638 Class 2 to 12
- AS4059/ISO 11218 Rev E, Table 1 Size Codes 2-12
- AS4059/ISO 11218 Rev E, Table 2 Size Codes, A: 000 to 12, B: 00 to 12, C: 00 to 12, D: 2 to 12, E: 4-12, F: 7 to 12
- AS4059 Rev F, Table 1 Size Codes 2-12
- AS4059 Rev F, Table 2 Size Codes cpc [000 to 12, 00 to 12, 2 to 12, 4 to 12, 7 to 12]
- GBT14039 Codes 8-24
- GJB420B Size Codes, A: 000 to 12, B: 00 to 12, C: 00 to 12, D: 2 to 12, E: 4-12, F: 7 to 12

Please Note: Lower Limits are Test Volume dependent

### Accuracy
- ± 1/2 ISO code for 4, 6, 14 μm (c)
- ±1 code for 21, 25, 38, 50, 70 μm (c)

### Calibration
Individually calibrated with ISO Medium Test Dust (MTD) based on ISO 11171, on equipment certified by I.F.T.S to ISO 11943

### Viscosity range
Up to 400 cSt

### Fluid temperature
- Minimum: +5 °C
- Maximum: +80 °C

### Ambient temperature
- Minimum: -10 °C
- Maximum: +80 °C

### Pressure
- Minimum: 2.0 bar / 29 psi
- Maximum: 420 bar / 6092 psi static

### Sample Volume
Maximum 100 ml / 3.38 fl oz per pump stroke.

### Test time
Test volumes programmable by end user.
Pre-set volumes also available.

### Moisture Sensing
% RH (Relative Humidity) ±3%

### Temperature Measurement
±3 °C

### Data Storage
Approximately 4000 timestamped tests in the integral LPA3 memory

### System Pressure Measurement
± 0.5% Full Scale Accuracy Min 10 bar

### Communication options
- 2 USB output ports
- 1 x USB B type for direct connection to PC and software
- 1 x USB A type for direct data download to USB memory stick

### Environmental Protection
- IP66 (Lid closed) IP54 (Lid open)

### Weight / Dimensions
10 kg, Height (not inc handle) 350 mm, Depth 170 mm, Width 470 mm

### Supply Voltage
18 - 19VDC

### Power
Long-life Lithium Ion internal rechargeable battery (mains charger)

### Software
- LPA View software (included)
- LPA3 is supplied with a full software package and digital product information

FOCUS ON

Exclusive MP Filtri technology
Featuring the latest breakthroughs in LED and photodiode technology, the LPA3 delivers increased accuracy combined with excellent repeatability.

W-Option
Water Saturation level (RH%) and fluid temperature sensor option.

P-Option
Live Pressure Readout (bar/PSI) on display screen.

LED light source
A single point high accuracy LED measures particles across all sizes giving increased accuracy with excellent repeatability.

LPA View Software

The LPA View software is used with the LPA3, LPA2, CML2, CML4 and ICM particle counters. When connected to LPA View, MP Filtri CMPs can transfer results in realtime, or alternatively, historical results can be downloaded from the CMP’s inbuilt memory.

- Runs on Windows XP, 7, and Windows 10
- Full adjustment & control of product settings, test times and alarms
- Easy test report generation
- Trend analysis
- Graphical display options
- Universal format across our contamination monitoring product range
# LPA3

## Dimensions

![Dimensions Diagram](image)

## Designation & Ordering code

<table>
<thead>
<tr>
<th><strong>AUTOMATIC PARTICLE COUNTER LPA3</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Series</strong></td>
</tr>
<tr>
<td>LPA3 Portable Laser Particle Analyzer</td>
</tr>
<tr>
<td><strong>Moisture Sensor</strong></td>
</tr>
<tr>
<td>0 Without moisture and temperature sensor</td>
</tr>
<tr>
<td>W With moisture and temperature sensor</td>
</tr>
<tr>
<td><strong>Pressure Sensor</strong></td>
</tr>
<tr>
<td>0 Without on-screen inlet pressure display</td>
</tr>
<tr>
<td>P With on-screen inlet pressure display</td>
</tr>
<tr>
<td><strong>Fluid compatibility</strong></td>
</tr>
<tr>
<td>M Mineral oil and synthetic fluid</td>
</tr>
<tr>
<td>N M type fluids &amp; Subsea fluids and water based fluids (*)</td>
</tr>
<tr>
<td>S M &amp; N type fluids &amp; phosphate esters and aggressive fluids (*)</td>
</tr>
<tr>
<td><strong>External Result</strong></td>
</tr>
<tr>
<td>1 With on board printer</td>
</tr>
<tr>
<td><strong>Design Reference</strong></td>
</tr>
<tr>
<td>0 Std option with full accessory kit and carry bag</td>
</tr>
<tr>
<td><strong>Country Plug Type</strong></td>
</tr>
<tr>
<td>1 UK, EU, US, AUS/CN</td>
</tr>
</tbody>
</table>

(*# N and S version, moisture sensor (W) not available
Available with Screen Protector (Part number 63.095000). Consult your local branch for further details

## Configuration example:

LPA3 W P M 1 0 1
LPA2 Aviation Edition

Twin Laser Particle Analyser

Airbus sampling valve adaptor and C spanner
Twin Laser Particle Analyser - LPA2PSTA30

The Airbus-approved LPA2 Aviation Edition is a highly precise, lightweight & fully portable instrument that has been created exclusively for the Aviation industry. It can automatically measure and display particulate contamination, moisture and temperature levels in various hydraulic fluids. The LPA2 can be connected to the MP range of bottle sampler products to enable laboratory based particle counting. The LPA2 is a solution for online monitoring of contamination in your hydraulic fluid, providing an immediate hydraulic health check. It employs predictive maintenance procedures to help reduce downtime and in turn costs.

**Features & Benefits**
- Airbus-approved
- LPA2 saves time: online/realtime monitoring
- Immediate hydraulic health check
- Predictive maintenance procedures can be employed
- Reduced downtime for MRO teams
- Reduced costs associated with downtime
- The lightest machine in its class
- Fully portable
- Precision Instrument
- Full Calibration based on ISO11171
- Measures and displays the following international standard formats; ISO 4406, NAS 1638, AS 4059E
- Moisture and temperature sensing
- Data logging and 600 test result memory
- Manual and remote control flexibility
- Full size QWERTY keyboard
- Various test programme settings
- Full accessories kit included
- Internal rechargeable battery capable of performing 100 tests between charges

**Scope of Supply**
1 x LPA2 (Model: LPA2PSTA030)
1 x Airbus sampling valve adapter* and C spanner
1 x M16x2 microbore pressure hose, 2500mm long
(For the Airbus Sampling Adaptor)
1 x EN6123-04 to M16x2 microbore pressure hose
2500mm long (compatible with A350 sampling valve)
1 x 1L waste receptacle
1 x 12V, 2A power adapter c/w UK/EU/US/AUS/CN heads
1 x 9 pin serial cable
1 x USB to serial converter
1 x 3 pin socket for external signals
1 x Hard copy of product user guide
1 x Digital copy of user guides/software/drivers
2 x Hard copy of calibration certificate
2 x Thermal printer paper
1 x Carry bag
1 x Airbus Operator’s Guide

(*) Specific model will be as per ordered item
See Accessories page 93.
Technical data

**Technology**
- Twin laser and twin optical diode detectors
- Based Light Extinction
- Automatic Optical Particle Analyser

**Particle Sizing**
- $>4,6,14,21,25,38,50,70$ μm to ISO 4406 Standard

**Analysis range**
- ISO 4406 Codes 8 to 24
- NAS 1638 Class 2 to 12
- AS4059/ISO 11218 Rev E, Table 1 Size Codes 2-12
- AS4059/ISO 11218 Rev E, Table 2 Size Codes, A: 000 TO 12, B: 00 to 12, C: 00 to 12, D: 2 to 12, E: 4-12, F: 7 to 12
- AS4059 Rev F, Table 1 Size Codes 2-12
- AS4059 Rev F, Table 2 Size Codes cpc
  - [000 to 12, 00 to 12, 00 to 12, 2 to 12, 4 to 12, 7 to 12]
- GBT14039 Codes 8-24
- GJB420B Size Codes, A: 000 to 12, B: 00 to 12, C: 00 to 12, D: 2 to 12, E: 4-12, F: 7 to 12

- Please Note: Lower Limits are Test Volume dependent

**Accuracy**
- Better than 3% typical

**Calibration**
- Each unit individually calibrated with ISO Medium Test Dust (MTD) based on ISO 11171, on equipment certified by I.F.T.S. to ISO 11943

**Viscosity range**
- Up to 400 cSt

**Fluid temperature**
- Minimum: +5 °C
- Maximum: +80 °C

**Ambient Temperature**
- Minimum: -10 °C
- Maximum: +80 °C

**Pressure Max**
- 400 bar / 5800 psi (gauge)
- Minimum 2.0 bar / 29 psi (gauge) required

**Sample Volume / Test time**
- 8 ml. (short): 2:50 - Recommended for set up only
- 15 ml. (normal): 5:00
- 30 ml. (dynamic): 10:00
- 24 ml. (bottle sampler): 8:00
- 15 ml. (continuous): 5:00

**Moisture Sensing**
- % RH (Relative Humidity) ±3%

**Temperature Measurement**
- ±3%

**Data Storage**
- Up to 600 tests

**Communication options**
- RS232 9 pin D plug

**System Pressure Measurement**
- ± 0.5% Full Scale Accuracy Min 10 bar

**Environmental Protection**
- IP51 (lid open)

**Weight / Dimensions**
- **LPA2:** 9.8 kg, Height 218 mm, Depth 268 mm, Width 436 mm
- **LPA2 Aviation Edition with travel case - packed:** 18.5 kg, Height 500 mm, Length 600 mm, Width 400 mm

**Supply Voltage**
- 9-36VDC

**Power**
- Internal rechargeable battery (mains charger)

**Outer Casing Finish**
- Anodised Aluminium

**Wetted parts**
- S - 316 stainless steel, perfluoro elastomer, sapphire, EPDM

**Software**
- LPA View software (included)

**LPA2 is supplied with a full software package and digital product information**
LPA2

AVIATION EDITION

FOCUS ON

Exclusive MP Filtri technology
The combination of the two lasers with a unique optics and photodiode package enables the LPA2 to give increased accuracy combined with excellent repeatability.

P-Option
Live Pressure Readout (bar) on display screen.

Laser 1
A single point high accuracy laser measures particles of contamination at 4 μm(c) and 6 μm(c) giving increased accuracy with excellent repeatability.

Laser 2
Standard accuracy laser specifically designed for system contaminants between 6 μm(c) and 70 μm(c).

LPA View Software
The LPA View software is used with the LPA3, LPA2, CML2, CML4 and ICM particle counters. When connected to LPA View, MP Filtri CMPs can transfer results in realtime, or alternatively, historical results can be downloaded from the CMP’s inbuilt memory.

- Runs on Windows XP, 7, and Windows 10
- Full adjustment & control of product settings, test times and alarms
- Easy test report generation
- Trend analysis
- Graphical display options
- Universal format across our contamination monitoring product range
LPA2 Aviation Edition: 9.8 kg, Height 218 mm, Depth 268 mm, Width 436 mm
LPA2 Aviation Edition with travel case (packed): 18.5 kg, Height 500 mm, Length 600 mm, Width 400 mm

**Designation & Ordering code**

<table>
<thead>
<tr>
<th>Series</th>
<th>Configuration example</th>
<th>Moisture Sensor</th>
<th>Pressure Sensor</th>
<th>Fluid compatibility</th>
<th>Accessories</th>
<th>Bottle sampling options</th>
<th>Design reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPA2</td>
<td>LPA2 0 P S T A 30</td>
<td>0</td>
<td>P</td>
<td>S</td>
<td>T</td>
<td>A</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Twin Laser Particle Analyser</td>
<td>Without moisture and temperature sensor</td>
<td>With on-screen inlet pressure display</td>
<td>Phosphate ester and aggressive fluids</td>
<td>Standard unit with travel case</td>
<td>With Airbus adaptor</td>
<td></td>
</tr>
</tbody>
</table>

**Configuration example:** LPA2 0 P S T A 30
Compact Portable Contamination Monitor - CML4W0M001

A compact and portable contamination monitor that delivers a fast, accurate assessment of contamination in the field and is the perfect solution for the mobile, construction and plant hire sectors. Easy to master, the new CML4 features cutting-edge contamination control technology to anyone wishing to protect their critical systems. The CML4 features a metering pump which enables analysis of both ‘live’ and unpressurised systems, delivering comprehensive contamination checks on any machine in any condition.

- High-resolution 7” (178 mm) touchscreen display
- Real-time contamination results at-a-glance
- High-speed sample times
- Predictive maintenance enabled
- Unpressurised and pressurised sampling up to 350 bar
- Fully portable at just 8.5 kg
- Precision Instrument
- Easy to master - operators can get up and running in minutes
- Measures and displays the following international standard formats: ISO 4406, NAS 1638, AS 4059E&F Tables 1 and 2, ISO 11218, GBT 14039, GJB 4208, GOST 17216
- Moisture and temperature sensing
- Data logging and 4000 test result memory
- CMP View software (included on Data stick)
- Bluetooth printer (optional equipment)
- Full accessories kit included
- Work-all-day battery that can handle up to 140 tests on a single charge

Scope of Supply
1 x CML4 (Model: CML4W0M001)
1 x M16 x 2 Microbore pressure hose, 1500 mm long + pouch
1 x 2000 mm Quick release waste hose + pouch
1 x 1L Waste container
1 x Power cable and regional adaptors (UK/EU/US/CN/AUS) (Plug type dependent on order specification)
1 x USB Stick with digital copies of product user guides, CMP View software, accessory products, drivers and product brochures
2 x Hard copy certificate of calibration
1 x 1500 mm quick-release offline hose and pouch (Low pressure)
1 x USB C to USB A cable

See Accessories at page 93
Technical data

**Technology**
High precision LED light extinction automatic optical contamination monitor

**Particle Sizing**
>4, >6, >14, >21, >25, >38, >50, >70 μm (c)

**Analysis range**
- ISO 4406
- NAS 1638
- AS4059 Rev E, Table 1
- AS4059 Rev E, Table 2
- AS4059 Rev F, Table 1
- AS4059 Rev F, Table 2
- GBT 14039
- GJB 420 B
- GOST 17216

**Accuracy**
- ± 1/2 ISO code for 4, 6, 14 μm (c)
- ±1 code for larger sizes

**Calibration**
Calibrated with ISOMTD in accordance with ISO 21018 Part 1 and Part 4

**Viscosity range**
Up to 400 cSt

**Fluid temperature**
- Minimum: +5 °C
- Maximum: +80 °C

**Ambient Temperature**
- Minimum: -10 °C
- Maximum: +60 °C

**Pressure**
- Offline: Maximum 2.0 bar / 29 psi
- Online: Maximum 350 bar / 5076 psi

**Moisture Sensing**
% RH (Relative Humidity) ±3%

**Temperature Measurement**
±3 °C

**Data Storage**
Up to 4000 tests

**Environmental Protection**
IP65 (Lid closed) - IP54 (Lid open)

**Weight / Dimensions**
- 8.5 kg (unit only)
- Height 149 mm (not including handle), Depth 155 mm, Width 350 mm

**Power**
Lithium-Ion rechargeable battery

**Battery Life**
Up to 8hrs

**Software**
CMP View (Provided)

CML4 is supplied with a full software package and digital product information
FOCUS ON

**Exclusive MP Filtri technology**
Featuring the latest breakthroughs in LED and photodiode technology, the CML4 delivers outstanding accuracy combined with exceptional repeatability.

**W-Option**
Water Saturation level (RH%) and fluid temperature sensor option.

**LED light source**
A single point high accuracy LED measures particles across all sizes.

---

CML4

**CMP View Software**

Our new CMP View software is used with the LPA3, LPA2 (Aviation Edition), CML2, CML4 and ICM contamination monitors. When connected to CMP View, MP Filtri CMP devices can transfer results in realtime, or alternatively, historical results can be downloaded from each device’s in-built memory.

- Runs on Windows XP, 7, and Windows 10
- Included free with CMP Products
- Brand new design, created in-house for ease of use
- Comprehensive functionality
- Can be mastered quickly without the need for formal training
- Key results and data available at-a-glance
- Full adjustment and control of product settings, test times and alarms
- Easy test report generation
- Full trend analysis
- Universal format across our contamination monitoring product range
- Multi-machine monitoring
### Designation & Ordering code

**AUTOMATIC CONTAMINATION MONITOR CML4**

<table>
<thead>
<tr>
<th>Series</th>
<th>Configuration example: CML4 W 0 M 00 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>CML4</td>
<td>Light extinction Contamination monitor</td>
</tr>
<tr>
<td>Moisture Sensor</td>
<td>With moisture and temperature sensor</td>
</tr>
<tr>
<td>Design Reference</td>
<td>Standard option</td>
</tr>
<tr>
<td>Fluid compatibility</td>
<td>Mineral oil and synthetic fluids</td>
</tr>
<tr>
<td>Design Reference</td>
<td>Standard option with full accessory kit and carry bag</td>
</tr>
<tr>
<td>Country Plug Type</td>
<td>UK</td>
</tr>
<tr>
<td>2</td>
<td>US</td>
</tr>
<tr>
<td>3</td>
<td>EU</td>
</tr>
<tr>
<td>4</td>
<td>CN/AUS</td>
</tr>
</tbody>
</table>

#### Dimensions

- **Contamination Monitoring Products**
- **CML4**
- **Design Reference 00**
- **Standard option with full accessory kit and carry bag**

![Product Dimensions Diagram]
ICM 4.0

In-Line Contamination Monitor - WiFi technology integrated
In-Line Contamination Monitor - WiFi technology integrated

The ICM 4.0 automatically measures and displays particulate contamination, moisture and temperature levels in various hydraulic fluids. It is designed specifically to be mounted directly to systems, where ongoing measurement or analysis is required, and where space and costs are limited.

**Features & Benefits**
- Integrated WiFi
- Mobile APP
- 8 channel contamination measurement & display
- Measures and displays the following international standard formats: ISO 4406, NAS 1638, AS 4059E
- Moisture and temperature sensing fluid dependent
- Data logging and 4000 test result memory
- Manual, automatic and remote control flexibility
- Multicolour indicators via LCD (K versions) and LED with output alarm signals as standard
- Robust die cast aluminium construction
- Pressure max. 420 bar
- Environmental protection IP65/67 versatile
- Secondary connector to allow the simultaneous control/download of results during operation
- 4-20mA analogue output as standard

Status LED
All ICM 4.0 versions have a multicolour indicator on the front panel, which is used to indicate the status or alarm state.
ICM-K versions also have a screen that changes colour. The alarm thresholds can be set from LPA-View via the serial interface.

Screen and multicolor indicators
- Green indicates that the test result passed, i.e. none of the alarm thresholds were exceeded
- Yellow indicates that the lower cleanliness limit was exceeded, but not the upper one
- Red indicates that the upper cleanliness limit was exceeded
- Blue indicates that the upper water content limit was exceeded
- Red/Blue Alternating indicates both cleanliness and water content upper limits exceeded
- Violet indicates that the upper temperature limit was exceeded

Scope of Supply
1 x ICM 4.0 (Specific model will be as per ordered item)
1 x 3m Twisted Pair Cable Assembly
1 x Hard copy Quick start/wiring installation guide
1 x Hard copy Fluid Condition Handbook
1 x Digital copy of user guides/software/drivers
1 x Hard copy of calibration certificate
See Accessories at page 93
**Technical data**

### Technology
LED based Light Extinction Automatic Optical Particle Counter

### Particle Sizing
>4, 6, 14, 21, 25, 38, 50, 70 μm

### Analysis range
- **ISO 4406 Codes** 8 to 24
- **NAS 1638 Class** 2 to 12
- **AS4059/ISO 11218** Rev E, Table 1 Size Codes 2-12
- **AS4059/ISO 11218** Rev E, Table 2 Size Codes, A: 000 to 12, B: 00 to 12, C: 00 to 12, D: 2 to 12, E: 4-12, F: 7 to 12
- **AS4059 Rev F, Table 1 Size Codes** 2-12
- **AS4059 Rev F, Table 2 Size Codes** cpc
- [000 to 12, 00 to 12, 00 to 12, 2 to 12, 4 to 12, 7 to 12]
- **GBT14039 Codes** 8-24
- **GJB420B Size Codes**, A: 000 to 12, B: 00 to 12, C: 00 to 12, D: 2 to 12, E: 4-12, F: 7 to 12

Please Note: Lower Limits are Test Volume dependent

### Accuracy
- ± 1/2 ISO code for 4, 6, 14 μm
- ±1 code for 21, 25, 38, 50, 70 μm

### Calibration
Individually calibrated with ISO Medium Test Dust (MTD) based on ISO 11171, on equipment certified by I.F.T.S. ISO 11943

### Operating Flow Rate
20 - 400 ml/minute

### Viscosity range
Up to 1000 cSt

### Fluid temperature
- Minimum: -25 °C
- Maximum: +80 °C

### Ambient Temperature
- Minimum: -10 °C
- Maximum: +55 °C

### Pressure
- Minimum: 0.5 bar / 7.25 psi
- Maximum: 420 bar / 6092 psi static

### Test time
Adjustable 10 - 3600 seconds. Factory set to 120 seconds. Start delay & programmable test intervals available as standard

### Flow rate measurement
Indicator only

### Moisture Sensing
% RH (Relative Humidity) ±3%

### Temperature Measurement
±3 °C

### Data Storage
Up to 4000 tests

### Communication options
RS485, MODBUS, CANBUS, 4-20mA time multiplex as standard

### Relays
Two solid state relays fitted to “R” version for output to alarm circuits

### Environmental Protection
IP 65/67 versatile IK04 Impact Protection

### Weight / Dimensions
1.6 kg, Height 123 mm, Depth 65 mm, Width 142 mm

### Supply Voltage
9-36VDC

### Power consumption
<2.2 W

### Outer Casing Finish
Polyurethane BS X34B. Colour BS381-638 (Dark Sea Grey)
Industry 4.0 ready with appropriate accessory product

### Wetted parts
- **M** - C46400 Cu alloy, 316 stainless steel, FPM, FR4, sapphire.
- **N** - 316 stainless steel, FPM, sapphire.
- **S** - 316 stainless steel, perfluoro elastomer, sapphire, EPDM.

### Software
LPA View software (included)

ICM 4.0 is supplied with a full software package and digital product information
**Wifi Connectivity**

Wifi connectivity ensures you can access and share real-time data and analysis instantly via a number of different platforms.

- All connections from ICM 4.0: Modbus, Canbus, 4-20mA signal and Switched alarm relay outputs (WiFi replaces the need for the remote connector).
- Non-WiFi Connections also available.

- Cloud based systems:
  - Capability to connect to customers own cloud-based systems via Modbus.
  - User access to all ICMs on the same network, including remotely via VPN.

- Web browser readouts:
  - Generated from the unique IP address of each ICM 4.0.

- Mobile App:
  - Available for Apple iOS and Android devices.

**Hydraulic Circuit**

**TYPICAL PRESSURE LINE**

- Check valve 0.5 - 2.0 bar typical

**TYPICAL RETURN LINE**

- Check valve 0.5 - 2.0 bar typical

For installation guidance please visit:

**LPA View Software**

The LPA View software is used with the LPA3, LPA2, CML2, CML4 and ICM particle counters. When connected to LPA View, MP Filtri CMPs can transfer results in realtime, or alternatively, historical results can be downloaded from the CMP’s inbuilt memory.

- Runs on Windows XP, 7, and Windows 10
- Full adjustment & control of product settings, test times and alarms
- Easy test report generation
- Trend analysis
- Graphical display options
- Universal format across our contamination monitoring product range
The ICM 4.0 can be used as a standalone product or can be controlled by external PC, PLC.

**AUTOMATIC PARTICLE COUNTER ICM 4.0**

<table>
<thead>
<tr>
<th>Series</th>
<th>Configuration example</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICM In-Line Contamination Monitor</td>
<td>ICM W M K R G1 4.0</td>
</tr>
</tbody>
</table>

**Moisture Sensor (RH%)**

| 0 | Without moisture and temperature sensor |
| W | With moisture and temperature sensor |

**Fluid compatibility**

| M | Mineral/synthetic oils |
| N | Subsea and water based fluids (*) |
| S | M & N type fluids & phosphate esters/aviation fluids (*) - G3 port option only |

**Keypad / Display**

| 0 | Without LCD and keypad control |
| K | With LCD and keypad control |

**Device output**

| R | With relays / external alarm outputs |

**Connections**

| G1 | M16x2 test points |
| G3 | 1/4"BSPP female ports |
| G4 | 7/16th UNF female ports |

**Series**

| 4.0 | ICM 4.0 with integral WiFi |

(*) N and S version, moisture sensor (W) not available

It is important to ensure a minimum 0.5 bar differential across the ICM4.0

The ICM 4.0 can be used as a standalone product or can be controlled by external PC, PLC.
ICM 2.0
In-Line Contamination Monitor
In-Line Contamination Monitor

The ICM 2.0 automatically measures and displays particulate contamination, moisture and temperature levels in various hydraulic fluids. It is designed specifically to be mounted directly to systems, where ongoing measurement or analysis is required, and where space and costs are limited.

Features & Benefits
- 8 channel contamination measurement & display
- Measures and displays the following international standard formats: ISO 4406, NAS 1638, AS 4059E
- Moisture and temperature sensing fluid dependent
- Data logging and 4000 test result memory
- Manual, automatic and remote control flexibility
- Multicolour indicators via LCD (K versions) and LED with output alarm signals as standard
- Robust die cast aluminium construction
- LPA View software (included)
- Pressure max. 420 bar
- Environmental protection IP65/67 versatile
- Secondary connector to allow the simultaneous control/download of results during operation
- Option available to download all results onto a USB stick, direct from the ICM
- 4-20mA analogue output as standard

Scope of Supply
- 1 x ICM 2.0 (Specific model will be as per ordered item)
- 1 x 3m Twisted Pair Cable Assembly
- 1 x Hard copy Quick start/wiring installation guide
- 1 x Hard copy Fluid Condition Handbook
- 1 x Digital copy of user guides/software/drivers
- 1 x Hard copy of calibration certificate

See Accessories at page 93

Status LED
All ICM 2.0 versions have a multicolour indicator on the front panel, which is used to indicate the status or alarm state. ICM-K versions also have a screen that changes colour. The alarm thresholds can be set from LPA-View via the serial interface.

Screen and multicolor indicators
- Green indicates that the test result passed, i.e. none of the alarm thresholds were exceeded
- Yellow indicates that the lower cleanliness limit was exceeded, but not the upper one
- Red indicates that the upper cleanliness limit was exceeded
- Blue indicates that the upper water content limit was exceeded
- Red/Blue Alternating indicates both cleanliness and water content upper limits exceeded
- Violet indicates that the upper temperature limit was exceeded
### Technical data

<table>
<thead>
<tr>
<th><strong>Technology</strong></th>
<th>LED Based Light Extinction Automatic Optical Contamination Monitor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Particle Sizing</strong></td>
<td>&gt;4, 6, 14, 21, 25, 38, 50, 70 μm(c)</td>
</tr>
<tr>
<td><strong>Analysis range</strong></td>
<td>ISO 4406 Codes 8 to 24, NAS 1638 Class 2 to 12, AS4059/ISO 11218 Rev E, Table 1 Size Codes 2-12, AS4059/ISO 11218 Rev E, Table 2 Size Codes, A: 000 TO 12, B: 00 to 12, C: 00 to 12, D: 2 to 12, E: 4-12, F: 7 to 12, AS4059 Rev F, Table 1 Size Codes 2-12, AS4059 Rev F, Table 2 Size Codes cpc, [000 to 12, 00 to 12, 00 to 12, 2 to 12, 4 to 12, 7 to 12], GBT14039 Codes 8-24, GJB420B Size Codes, A: 000 to 12, B: 00 to 12, C: 00 to 12, D: 2 to 12, E: 4-12, F: 7 to 12, Note: Lower Limits are Test Volume dependent</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>± 1/2 ISO code for 4, 6, 14 μm(c), ±1 code for 21, 25, 38, 50, 70 μm(c)</td>
</tr>
<tr>
<td><strong>Calibration</strong></td>
<td>Individually calibrated with ISO Medium Test Dust (MTD) based on ISO 11171, on equipment certified by I.F.T.S. ISO 11943</td>
</tr>
<tr>
<td><strong>Operating Flow Rate</strong></td>
<td>20 - 400 ml/minute</td>
</tr>
<tr>
<td><strong>Viscosity range</strong></td>
<td>Up to 1000 cSt</td>
</tr>
<tr>
<td><strong>Fluid temperature</strong></td>
<td>Minimum: -25 °C, Maximum: +80 °C</td>
</tr>
<tr>
<td><strong>Ambient Temperature</strong></td>
<td>From -25 °C to +80 °C (non K version), From -25 °C to +55 °C (K version)</td>
</tr>
<tr>
<td><strong>Pressure</strong></td>
<td>Maximum: 420 bar / 6092 psi</td>
</tr>
<tr>
<td><strong>Test time</strong></td>
<td>Adjustable 10 - 3600 seconds. Factory set to 120 seconds. Start delay &amp; programmable test intervals available as standard</td>
</tr>
<tr>
<td><strong>Flow rate measurement</strong></td>
<td>Indicator only</td>
</tr>
<tr>
<td><strong>Moisture Sensing</strong></td>
<td>% RH (Relative Humidity) ±3%</td>
</tr>
<tr>
<td><strong>Temperature Measurement</strong></td>
<td>±3 °C</td>
</tr>
<tr>
<td><strong>Data Storage</strong></td>
<td>Up to 4000 tests</td>
</tr>
<tr>
<td><strong>Communication options</strong></td>
<td>RS485, MODBUS, CANBUS, 4-20mA time multiplex as standard</td>
</tr>
<tr>
<td><strong>Relays</strong></td>
<td>Two solid state relays fitted to “R” version for output to alarm circuits</td>
</tr>
<tr>
<td><strong>Environmental Protection</strong></td>
<td>IP 65/67 versatile IK04 Impact Protection</td>
</tr>
<tr>
<td><strong>Weight / Dimensions</strong></td>
<td>1.6 kg, Height 123 mm, Depth 65 mm, Width 142 mm</td>
</tr>
<tr>
<td><strong>Supply Voltage</strong></td>
<td>9-36VDC</td>
</tr>
<tr>
<td><strong>Power consumption</strong></td>
<td>&lt;2.2 W</td>
</tr>
<tr>
<td><strong>Outer Casing Finish</strong></td>
<td>Polyurethane BS X34B. Colour BS381-638 (Dark Sea Grey)</td>
</tr>
<tr>
<td><strong>Wetted parts</strong></td>
<td>Industry 4.0 ready with appropriate accessory product</td>
</tr>
<tr>
<td><strong>Software</strong></td>
<td>LPA View software (included)</td>
</tr>
<tr>
<td><strong>ICM 2.0</strong></td>
<td>Supplied with a full software package and digital product information</td>
</tr>
</tbody>
</table>
LPA View Software

The LPA View software is used with the LPA3, LPA2, CML2, CML4 and ICM particle counters. When connected to LPA View, MP Filtri CMPs can transfer results in realtime, or alternatively, historical results can be downloaded from the CMP’s inbuilt memory.

- Runs on Windows XP, 7, and Windows 10
- Full adjustment & control of product settings, test times and alarms
- Easy test report generation
- Trend analysis
- Graphical display options
- Universal format across our contamination monitoring product range

Hydraulic Circuit

TYPICAL PRESSURE LINE

Check valve 0.5 - 2.0 bar typical

PC/Laptop power supply USBi

M

TYPICAL RETURN LINE

Check valve 0.5 - 2.0 bar typical

PC/Laptop power supply USBi

Check valve value dependent on system pressure

Δp >0.3 bar typical

Δp 0.5 to 2.0 bar typical

For installation guidance please visit www.mpfiltri.co.uk/ICM-2_0/#Home
The ICM 2.0 can be used as a standalone product or can be controlled by external PC, PLC or the ICMRDU2.0 (Remote Display Unit. 10 m control cable supplied as standard).

It is important to ensure a 0.5 - 2.0 bar differential across the ICM 2.0

The ICM 2.0 can be used as a standalone product or can be controlled by external PC, PLC or the ICMRDU2.0 (Remote Display Unit. 10 m control cable supplied as standard).

### Automatic Particle Counter ICM 2.0

**Series**

**ICM** In-Line Contamination Monitor

**Moisture Sensor (RH%)**

**0** Without moisture and temperature sensor

**W** With moisture and temperature sensor

**Fluid compatibility**

**M** Mineral/synthetic oils

**N** Subsea fluids and water based fluids (*)

**S** Phosphate ester and aggressive fluids (*)

**Keypad / Display**

**O** Without keypad / display

**K** With keypad / display

**Device output**

**R** With relays / external alarm outputs

**U** Test record transfer (direct to USB stick) plus relays/external alarm outputs

**Connections**

**G1** ICM complete with M16x2 pressure test point connections fitted

**G3** 1/4” BSP - Female port

**G4** 7/16” UNF - Female port

**Series**

**2.0**

(*) **N** and **S** version, moisture sensor (W) not available
ATEX Fluid Contamination Monitors

AZ2
AZ2
GENERAL INFORMATION

Description

Contamination Monitoring Products

Atex Zone 2, Cat 3G, Fluid Contamination Monitors

Our AZ2 contamination monitor can automatically measure and save particulate contamination, moisture and temperature levels in various hydraulic fluids. They are designed specifically to be mounted directly to systems where ongoing measurement or analysis is required in high risk or explosive environments.

Features & Benefits
- 8 channel contamination measurement & display
- Measures and displays the following international standard formats:
  - ISO 4406, NAS 1638, AS 4059E
  - RS485, MODBUS, CANBUS
- Moisture and temperature sensing fluid dependent
- Data logging and 4000 test result memory
- Automatic and remote control flexibility
- Multicolour indicators via onboard LED with output alarm signals as standard
- LPA View software (included)

Scope of Supply
1 x ICMKAZ2 (*)
1 x Atex approved non wired cable connector and gland
1 x Hard copy Fluid Condition Handbook
1 x Digital copy of user guides/software/drivers
1 x Hard copy of calibration certificate
1 x Hard copy of atex certificate

(*) Specific model will be as per ordered item

See Accessories at page 93

Status LED

All AZ2 versions have a multicolour indicator on the front panel, which is used to indicate the status or alarm state. The alarm thresholds can be set from LPA-View via the serial interface and bespoke connector (available on request).

Multicolour indicators

- Green indicates that the test result passed, i.e. none of the alarm thresholds were exceeded
- Yellow indicates that the lower cleanliness limit was exceeded, but not the upper one
- Red indicates that the upper cleanliness limit was exceeded
- Blue indicates that the upper water content limit was exceeded
- Red/Blue Alternating indicates both cleanliness and water content upper limits exceeded
- Violet indicates that the upper temperature limit was exceeded
# Technical data

**Technology**  
LED Based Light Extinction Automatic Optical Contamination Monitor

**Particle Sizing**  
>4, 6, 14, 21, 25, 38, 50, 70 μm(c)

**Analysis range**  
ISO 4406 Code 0 to 25  
NAS 1638 Class 00 to 12  
AS4059 Rev. E Table 1&2 Sizes A-F: 000 to 12

**Accuracy**  
± 1/2 ISO code for 4, 6, 14 μm(c)  
±1 code for 21, 25, 38, 50, 70 μm(c)

**Calibration**  
Individually calibrated with ISO Medium Test Dust (MTD) based on ISO 11171, on equivalent certified by I.F.T.S. ISO 11943

**Operating Flow Rate**  
20 - 400 ml/minute

**Viscosity range**  
Up to 1000 cSt

**Fluid temperature**  
Minimum: -25 °C  
Maximum: +80 °C

**Ambient Temperature**  
Minimum: -25 °C  
Maximum: +80 °C

**Pressure**  
Maximum: 400 bar / 5802 psi (for high frequency pressure pulse and out range temperature applications contact MP Filtri)

**Test time**  
Adjustable 10 - 3600 seconds. Factory set to 120 seconds. Start delay & programmable test intervals available as standard

**Flow rate measurement**  
Indicator only

**Moisture Sensing**  
% RH (Relative Humidity) ±3%

**Temperature Measurement**  
≤3 °C

**Data Storage**  
Up to 4000 tests

**Communication options**  
RS485, RS232, MODBUS, CANBUS as standard

**Relays**  
Two solid state relays fitted to “R” version for output to alarm circuits

**Environmental Protection**  
IP66

**Weight / Dimensions**  
10.5 kg, Height 320 mm, Depth 130 mm, Width 186 mm

**Supply Voltage**  
9-36VDC

**Current Supply**  
12V - 150mA  
24V - 80mA  
36V - 60mA

**Power consumption**  
<2.2 W

**Outer Casing Finish**  
Stainless Steel

**Wetted parts**  
M - C46400 Cu alloy, 316 stainless steel, FPM, FR4, sapphire.  
N - 316 stainless steel, FPM, sapphire.  
S - 316 stainless steel, perfluoro elastomer, sapphire, EPDM.

**Software**  
LPA View software (included)

**Atex classification**  
CE 3 G EX nR IIB T5 GC IP66

**ICM AZ2 cable wiring details**  
MP Filtri do not supply an ATEX approved cable with the ICM AZ2 products as customers may run such cables through varying ATEX zones. Wiring diagrams supplied, please consult product user guide for full information. Note: an adapter cable and ICMUSBi product will be required should LPA View be utilised as the control software. These accessories are only suitable for use outside of the zoned areas

AZ2 is supplied with a full software package and digital product information
All of MP Filtri’s AZ2 products are designed to be run via PLC control & the Modbus communication protocol.
Note: All units are fully compatible with and can be programmed via our bespoke windows based LPA View software.
ICU

In-line Contamination Monitoring Unit
In-line Contamination Monitoring Unit

The ICU automatically measures particulate contamination levels in various hydraulic fluids and is designed for industrial applications. It is designed to be manifold mounted directly to systems, where ongoing measurement or analysis is required, and where space and costs are limited.

**Features & Benefits**
- Manifold mounting
- 3 channel contamination measurement
- Measures ISO 4406
- Robust design and construction
- Pressure max. 350 bar
- Environmental protection IP65/67 versatile
- 4-20mA analogue output as standard

**Scope of Supply**
- 1 x ICU0M00G5P01
- 1 x Installation kit:
  - 4 x M8x1.0x60 mm long fixing bolts
  - 2 x 6.50 ID x 1.5 CSD FKM o-ring seals
- 1 x Hard copy of calibration certificate
Technical data

<table>
<thead>
<tr>
<th>Technology</th>
<th>LED Based Light Extinction Automatic Optical Contamination Monitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particle Sizing</td>
<td>&gt;4, 6, 14 μm\textsubscript{c(i)}</td>
</tr>
<tr>
<td>Analysis range</td>
<td>ISO 4406 Code 0 to 20</td>
</tr>
<tr>
<td>Accuracy</td>
<td>± 1/2 ISO code for 4, 6, 14 μm\textsubscript{c(i)} across the analysis range</td>
</tr>
<tr>
<td>Calibration</td>
<td>Individually calibrated with ISO Medium Test Dust (MTD) based on ISO 11171, on equipment certified by I.F.T.S. ISO 11943</td>
</tr>
<tr>
<td>Operating Flow Rate</td>
<td>200 ml/minute controlled by the built in flow control valve</td>
</tr>
<tr>
<td>Viscosity range</td>
<td>Up to 1000 cSt</td>
</tr>
<tr>
<td>Fluid temperature</td>
<td>Minimum: 0 °C, Maximum: +80 °C</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>Minimum: 0 °C, Maximum: +60 °C</td>
</tr>
<tr>
<td>Pressure</td>
<td>Minimum: 25 bar / 362 psi, Maximum: 350 bar / 5075 psi</td>
</tr>
<tr>
<td>Test time</td>
<td>Adjustable 10 - 3600 seconds</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Communication options</th>
<th>4-20 mA time multiplex as standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Protection</td>
<td>IP 65/67 versatile</td>
</tr>
<tr>
<td>Weight / Dimensions</td>
<td>1.4 Kg, Height 70 mm, Depth 50 mm, Width 93 mm</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>24VDC ± 20%</td>
</tr>
<tr>
<td>Power consumption</td>
<td>&lt;2.2 W</td>
</tr>
<tr>
<td>Cable</td>
<td>Electrical cable has to be ordered separately (optional accessory), MP Filtri item no. 13.061000 - ICU Cable M12 4 pin 1.5m long</td>
</tr>
<tr>
<td>ICU is supplied with a full software package and digital product information</td>
<td></td>
</tr>
</tbody>
</table>
Dimensions

REQUIRED SURFACE FINISH OF MATING PIECE

'B' PORT

'A' PORT

MOUNTING INTERFACE
<table>
<thead>
<tr>
<th>Configuration</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU 0 M 0 O G5 P01</td>
<td>Without moisture sensor, Mineral oil, Without keypad/display, 4 to 20mA timed multiplex, Manifold mounted, Standard option</td>
</tr>
<tr>
<td>ICU 0 M 0 O G5 Pxx</td>
<td>Customized version</td>
</tr>
</tbody>
</table>
Auxiliary Contamination Monitoring Unit

Incorporating the ICM, the ACMU is specifically designed for aerated, viscous and/or un-pressurized hydraulic/lubrication systems.

Where can it be used?
- Wind/Tidal/Wave Energy
- Gearbox applications
- Gearbox monitoring
- Offshore & ship systems
- Lubrication & Oil systems
- Mobile Equipment
- Test Benches

When should it be used?
- Entrained air or turbulent flows
- Higher viscosity fluids
- Unpressurized systems

Why should it be used?
- Easy to retro-fit
- Exceptional communication & 4000 test memory
- Reliable & accurate performance

Available versions:
- Cabinet version
- Plate version

Scope of supply
- 1 x ACMU (Specific model will be as per ordered item, 1/4" BSP inlet/outlet ports as standard)
- 1 x 3m Twisted Pair Cable Assembly (Plate version)
- 1 x 5m length twisted pair cable (Cabinet version)
- 2 x 1/4" BSP to 7/16 JIC coupling
- 1 x Hard copy Quick start/wiring installation guide
- 1 x Hard copy Fluid Condition Handbook
- 1 x Digital copy of user guides/software/drivers
- 1 x Hard copy of calibration certificate

See Accessories at page 93

Hydraulic Hoses (External)
Customer to source their own

Re-calibration
Defined by customer Quality Controls recommended 1 year
Technical data

**In-Line contamination monitor**
ICM with keypad and backlit display and relays

**Analysis Range**
- ISO 4406 Codes 8 to 24
- NAS 1638 Class 2 to 12
- AS4059/ISO 11218 Rev E, Table 1 Size Codes 2-12
- AS4059/ISO 11218 Rev E, Table 2 Size Codes, A: 000 to 12, B: 00 to 12, C: 00 to 12, D: 2 to 12, E: 4-12, F: 7 to 12
- AS4059 Rev F, Table 1 Size Codes 2-12
- AS4059 Rev F, Table 2 Size Codes cpc
- GBT14039 Codes 8-24
- GJB420B Size Codes, A: 000 to 12, B: 00 to 12, C: 00 to 12, D: 2 to 12, E: 4-12, F: 7 to 12

Please Note: Lower Limits are Test Volume dependent

**Fluid Compatibility / Corrosion Resistance**
- Hydrocarbon based & Synthetic hydraulic fluids

**Circuit Flow Rate**
40 ml/min to 400 ml/min

**Viscosity range**
- Max. 1000 cSt - Min. 10 cSt

**Communication Options**
- PLC compatible. RS485, RS232 & CanBus (J1939 typical)

**Fluid Temperature (Start Up)**
- Minimum: Viscosity dependant. Not greater than 1000 cSt
- Maximum: +80 °C

**Fluid Temperature (Continuous)**
- Minimum: Viscosity dependant. Not greater than 1000 cSt
- Maximum: +80 °C

**Ambient Temperature (Start Up)**
- Minimum: -40 °C
- Maximum: +50 °C

**Inlet Pressure**
- Min. Positive pressure
- Max. 50 bar / 725 psi gauge pressure (pump option dependant)

**Outlet Pressure**
- Min. Atmosphere (1013 bar at sea level)
- Max. 3.0 bar / 43.5 psi (gauge pressure)

**Moisture Sensing (RH%)**
- Available with or without moisture sensor

**Weight**
- 21 Kg (cabinet version) - 13 Kg (plate version)

**Dimensions**
- Cabinet version:
  - Height 562 mm, Depth 226 mm, Width 482 mm
- Plate version:
  - Height 410 mm, Depth 166 mm, Width 395 mm

**Electric Motor**
- 110V AC, 230V AC, 415V AC, 690V AC

**Power Consumption**
- 0.25 kW max

**USBi Comms Junction Box**
- See USBi user guide - cabinet version
- No junction box - plate version
- Industry 4.0 ready with appropriate accessory product

ACMU is supplied with a full software package and digital product information
LPA View Software

The LPA View software is used with the LPA3, LPA2, CML2, CML4 and ICM particle counters. When connected to LPA View, MP Filtri CMPs can transfer results in realtime, or alternatively, historical results can be downloaded from the CMP’s inbuilt memory.

- Runs on Windows XP, 7, and Windows 10
- Full adjustment & control of product settings, test times and alarms
- Easy test report generation
- Trend analysis
- Graphical display options
- Universal format across our contamination monitoring product range

Type of applications

Designation & Ordering code

<table>
<thead>
<tr>
<th>AUTOMATIC PARTICLE COUNTER ACMU</th>
<th>Configuration example: ACMU W D C S 230V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series</td>
<td>ACMU</td>
</tr>
<tr>
<td>Moisture Sensor (RH%)</td>
<td></td>
</tr>
<tr>
<td>0 Without moisture and temperature sensor</td>
<td></td>
</tr>
<tr>
<td>W With moisture and temperature sensor</td>
<td></td>
</tr>
<tr>
<td>Pressure Sensor</td>
<td></td>
</tr>
<tr>
<td>D Up to 50 bar inlet (gauge pressure), atmosphere outlet</td>
<td></td>
</tr>
<tr>
<td>B 0.5 bar (gauge pressure) (1.0 bar max inlet), 3.0 bar (gauge pressure) max outlet</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>C</td>
</tr>
<tr>
<td>C Cabinet version (supplied with 5 metre communication lead)</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>Plate mounted version (supplied with ICM 3 metre cable)</td>
</tr>
<tr>
<td>Version</td>
<td>S</td>
</tr>
<tr>
<td>S Standard version</td>
<td></td>
</tr>
<tr>
<td>Motor option</td>
<td></td>
</tr>
<tr>
<td>110V</td>
<td>110V Motor (Dual frequency 50Hz/60Hz, single phase)</td>
</tr>
<tr>
<td>230V</td>
<td>230V Motor (single phase)</td>
</tr>
<tr>
<td>400V</td>
<td>400V Motor (3 phase)</td>
</tr>
<tr>
<td>690V</td>
<td>690V Motor (3 phase)</td>
</tr>
</tbody>
</table>

(*) Gauge pressure
- Priming of pump prior to start up recommended
- Install below level of head of tank
- Keep hose length, inlet and outlet, to minimum lengths
- Max 1000cSt

**PLATE VERSION**

**CABINET VERSION**

INLET G1/4" BSP or 7/16 JIC

OUTLET G1/4" BSP or 7/16 JIC

Contamination Monitoring Products

Contamination Monitoring Products
BS110 & BS500

Bottle Samplers - For use with MP Filtri’s portable APC
BS110 GENERAL INFORMATION

Description

Bottle Samplers

The 110 ml bottle samplers are suitable for off-line and laboratory applications where fluid sampling at point of use is inaccessible or impractical.

A fluid de-aeration facility comes as standard.

Features & Benefits

- Vacuum feature for de-aeration of fluids
- Compatible with all portable MP Filtri Contamination Monitoring Products
- Strong Laboratory aesthetic
- Transparent outer for visual indication
- Full accessories kit included
- Includes carry case (BS110)
- Contact MP Filtri for use with fluids other than those stated

Scope of Supply

- 1 x 110 ml Bottle Sampling unit
- 1 x Pressure cap
- 1 x Vacuum cap
- 1 x M16x2 microbore pressure hose, 600 mm long
- 1 x 1L waste receptacle
- 1 x 12V, 2A power adapter c/w UK/EU/US/AUS/CN heads
- 1 x pack of disposable dip tubes
- 1 x hand pump
- 1 x length of hose for hand pump
- 3 x 100 ml clear plastic bottles
- 1 x Hard copy of product user guide
- 1 x Digital copy of user guides/software/drivers
- 2 x Thermal printer paper
- 1 x Carry case

See Accessories at page 93
Technical data

Max. Chamber Pressure
2.5 bar / 36.3 psi only

Min. Chamber Pressure
0.61 bar / 8.85 psi to 0.81 bar / 11.75 psi

For use with….
MP Filtri Portable Contamination Monitoring Products

Supply Voltage
12V, 2 amp

Wetted Parts (Internal)
Aluminium HE30, 303 Stainless Steel, Polyurethane, FPM, Acrylic

On/Off & Stop/Start signals
Switch (Manual Operation)

Hydraulic Hoses (External)
600 mm x 2 mm ID M16x2 microbore pressure hose

Max Flow Rate (ml/min)
Viscosity dependant

Min Flow Rate (ml/min)
Viscosity dependant

Visual Pressure Indicator
No

Weight / Dimensions
7 kg, Height 212 mm, Depth 163 mm, Width 130 mm

Pressure Gauge
No

Pressure Ranges
2.0 bar / 29 psi options

IP Rating
IP50

Fluid Compatibility / Corrosion Resistance
Industrial Hydrocarbon based fluids (typical)

Min Outlet Pressure
1013 bar / 14.7 psi

Max. Fluid Temperature (Continuous)
80 °C / 176 °F

Min Fluid Temperature
Viscosity dependant

Max. Viscosity
400 cSt

Min. Viscosity
1 cSt

Max outlet pressure
2.0 bar / 29 psi options

Min. Continuous Ambient Temperature
10 °C / 50 °F

Max. Continuous Ambient Temperature
55 °C / 131 °F

Power Consumption
24W

Warranty
12 months

Installation
Indoor Use / Laboratory Use

Connection to use with Particle Analyser

Vacuum cap (not illustrated)
Pressure cap (as illustrated)
Sample bottle
Disposable dip tube

PARTICLE ANALYSER
HP connector
Waste connector
To waste bottle
BS110 Bottle Samplers

Dimensions

Configuration example:

BS110 OM O

Designation & Ordering code

<table>
<thead>
<tr>
<th>Series</th>
<th>Fluid compatibility</th>
<th>Pressure rating</th>
<th>Pressure cylinder option</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS110</td>
<td>M Mineral oil and synthetic fluids</td>
<td>0 2.0 bar</td>
<td>0 Acrylic cylinder assembly</td>
</tr>
</tbody>
</table>

Contamination Monitoring Products
The 500 ml bottle samplers are suitable for off-line and laboratory applications where fluid sampling at point of use is inaccessible or impractical.

A fluid de-aeration facility comes as standard.

### Features & Benefits
- Vacuum feature for de-aeration of fluids
- Compatible with all portable MP Filtri Contamination Monitoring Products
- Strong Laboratory aesthetic
- Transparent outer for visual indication
- Full accessories kit included
- Contact MP Filtri for use with fluids other than those stated

### Scope of Supply
- 1 x 500 ml Bottle Sampling base unit (*)
- 1 x Top cap, pressure/vacuum chamber (*)
- 1 x M16x2 microbore pressure hose, 600 mm long
- 1 x Power adapter
- 1 x UK/EU/US/AUS/CN power lead*
- 3 x 210 ml clear glass bottles
- 2 x 500 ml clear glass bottles
- 1 x Digital copy of user guides/software/drivers

(*) Specific model will be as per ordered item

See Accessories at page 93
### Technical data

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
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<tbody>
<tr>
<td><strong>Max. Chamber Pressure</strong></td>
<td>2.5 bar / 36.3 psi (standard), 4.5 bar / 65.3 psi (high pressure)</td>
</tr>
<tr>
<td><strong>Min. Chamber Pressure</strong></td>
<td>0.61 bar / 8.85 psi to 0.81 bar / 11.75 psi</td>
</tr>
<tr>
<td><strong>For use with</strong></td>
<td>MP Filtri Portable Contamination Monitoring Products</td>
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<tr>
<td><strong>Supply Voltage</strong></td>
<td>12V, 5 amp</td>
</tr>
<tr>
<td><strong>Wetted Parts (Internal)</strong></td>
<td>Aluminium 6082 T6, 303 Stainless Steel, 316 Stainless Steel. Seal &amp; Cylinder material optional</td>
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<tr>
<td><strong>On/Off &amp; Stop/Start signals</strong></td>
<td>Switch (Manual Operation)</td>
</tr>
<tr>
<td><strong>Hydraulic Hoses (External)</strong></td>
<td>600 mm x 2 mm ID M16x2 microbore pressure hose</td>
</tr>
<tr>
<td><strong>Max Flow Rate (ml/min)</strong></td>
<td>Viscosity dependant</td>
</tr>
<tr>
<td><strong>Min Flow Rate (ml/min)</strong></td>
<td>Viscosity dependant</td>
</tr>
<tr>
<td><strong>Visual Pressure Indicator</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Weight / Dimensions</strong></td>
<td>9 kg, Height 333 mm, Depth 341 mm, Width 264 mm</td>
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<tr>
<td><strong>Pressure Gauge</strong></td>
<td>Yes (only on 4.5 bar / 65.3 psi version)</td>
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<tr>
<td><strong>Pressure Ranges</strong></td>
<td>4.5 bar / 65.3 psi or 2.5 bar / 36.3 psi options</td>
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<tr>
<td><strong>IP Rating</strong></td>
<td>IP50</td>
</tr>
<tr>
<td><strong>Fluid Compatibility / Corrosion Resistance</strong></td>
<td>Industrial, aerospace &amp; off-shore control fluids (typical)</td>
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<tr>
<td><strong>Min Outlet Pressure</strong></td>
<td>1013 bar / 14.7 psi</td>
</tr>
<tr>
<td><strong>Max. Fluid Temperature (Continuous)</strong></td>
<td>10 °C / 50 °F</td>
</tr>
<tr>
<td><strong>Min Fluid Temperature</strong></td>
<td>Viscosity dependant</td>
</tr>
<tr>
<td><strong>Max. Viscosity</strong></td>
<td>Not greater than 400cSt (on 2.5 bar version)</td>
</tr>
<tr>
<td><strong>Min. Viscosity</strong></td>
<td>1 cSt</td>
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<tr>
<td><strong>Max outlet pressure</strong></td>
<td>Version dependant: 2.5 bar / 36.3 psi for 0 version</td>
</tr>
<tr>
<td></td>
<td>4.5 bar / 65.3 psi for H version</td>
</tr>
<tr>
<td><strong>Min. Continuous Ambient Temperature</strong></td>
<td>10 °C / 50 °F</td>
</tr>
<tr>
<td><strong>Max. Continuous Ambient Temperature</strong></td>
<td>55 °C / 131 °F</td>
</tr>
<tr>
<td><strong>Power Consumption</strong></td>
<td>60W</td>
</tr>
<tr>
<td><strong>Warranty</strong></td>
<td>12 months</td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>Indoor Use / Laboratory Use</td>
</tr>
<tr>
<td><strong>Connection to use with Particle Analyser</strong></td>
<td>Sample bottle, Dip tube, Removable top unit, Bayonet locking mechanism, Operating mode selector</td>
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</tbody>
</table>

---

**Diagram**

- **Top handle**
- **Top valve**
- **Hose connection to Analyser**
- **Visiwink**
- **On/Off switch**
- **BASE UNIT**
- **Sample bottle**
- **Dip tube**
- **Removable top unit**
- **Bayonet locking mechanism**
- **Operating mode selector**
BS500 Bottle Samplers

Dimensions

Designation & Ordering code

<table>
<thead>
<tr>
<th>Series</th>
<th>BS500</th>
<th>500 ml fluid volume</th>
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<tr>
<td>V</td>
<td>Mineral oil and synthetic fluids, Subsea and water based fluids</td>
</tr>
<tr>
<td>E</td>
<td>Phosphate ester and aggressive fluids</td>
</tr>
<tr>
<td>S</td>
<td>Phosphate ester and aggressive fluids, Subsea and water based fluids</td>
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</table>

<table>
<thead>
<tr>
<th>Pressure rating</th>
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</thead>
<tbody>
<tr>
<td>O</td>
<td>2.0 bar, standard option</td>
</tr>
<tr>
<td>H</td>
<td>4.0 bar, high pressure option (*)</td>
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</table>

<table>
<thead>
<tr>
<th>Pressure cylinder option</th>
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</thead>
<tbody>
<tr>
<td>O</td>
<td>Acrylic cylinder assembly</td>
</tr>
<tr>
<td>S</td>
<td>Glass cylinder assembly (**)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power adapter options</th>
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</thead>
<tbody>
<tr>
<td>UK</td>
<td>UK power adapter</td>
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<tr>
<td>EU</td>
<td>European power adapter</td>
</tr>
<tr>
<td>US</td>
<td>USA power adapter</td>
</tr>
<tr>
<td>AU/CN</td>
<td>Australasia power adapter</td>
</tr>
</tbody>
</table>

(*) = H version only available in BS500 V version
(**) = Glass version only available in BS500 E & S version
At MP Filtri we offer a range of standard & ultra-clean glass bottles for your sampling needs:

100 ml, 210 ml & 500 ml Standard Bottles (not certified clean)
- 100 ml, available in amber glass or clear plastic varieties
- 210 ml, available in clear glass
- 500 ml, available in clear glass

100 ml & 210 ml Ultra Clean Glass Bottles
- Certified to ISO 3722 Hydraulic fluid power
- Fluid sample containers
- Qualifying and controlling cleaning methods
  NAS 0 to NAS 00/ AS4059E Table 1 Class 0

Glass Colour
Clear glass provides better visibility of the sample, making de-aeration easier to monitor. Amber glass may reduce the effect of UV light on the sample, reducing the risk of microbial growth and FAME (fatty acid methyl esters) which can be significant in fuel analysis.

DE-AERATION & CLEANLINESS

Samples should be shaken vigorously before use however this causes the sample to become aerated which means leaving it to settle.

The BS500 & BS110 de-aeration facility reduces this settling time, allowing more samples to be analysed thereby increasing productivity.

SAMPLING FACTORS

Below are some of the factors which should be considered when taking a sample. For guidance on sampling procedures refer to ISO 4021 & the product user guide.

- Location of the take-off point
- Homogeneity of the sample
- Local area cleanliness
- Bottle cleanliness
- Equipment cleanliness
- Flushing / Cleaning fluid cleanliness
- Operator clothing & cleanliness
- Air cleanliness

<table>
<thead>
<tr>
<th>100 µm</th>
<th>40 µm</th>
<th>24 µm</th>
<th>10 µm</th>
<th>8 µm</th>
<th>3 µm</th>
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</thead>
<tbody>
<tr>
<td>Dust particle (dead skin)</td>
<td>Pollen</td>
<td>White blood cell</td>
<td>Dust mite faeces</td>
<td>Red blood cell</td>
<td>E-coli bacteria</td>
</tr>
</tbody>
</table>
For systems where there is no practical access to a test point, a sample may need to be taken from an un-pressurized reservoir.

For this occurrence we offer a simple **hand pump device with both off-line sampling products which provides for clean and efficient sampling**.

The design ensures that only the hose is in contact with the sample fluid, providing greater confidence in analysis, and we provide a range of adapters to suit our various bottle sizes.

The pump can be fully dismantled for cleaning and the sample hose plus main seal can be replaced to further improve clean practise.

Ultra clean bottles cleaned to and in accordance with DIN/ISO 5884.

Ultra clean bottles cleanliness verified to ISO 3722.

NAS 1638 cleanliness certification of between Class 00 and Class 0.

<table>
<thead>
<tr>
<th>Descriptions</th>
<th>Part Code</th>
<th>Dimensions (mm)</th>
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<tbody>
<tr>
<td>100 ml - Ultra Clean Bottle (Certified)</td>
<td>P02</td>
<td>Ø 50x92</td>
</tr>
<tr>
<td>100 ml - Standard Bottle Brown Glass</td>
<td>BS0016</td>
<td>Ø 50x91</td>
</tr>
<tr>
<td>100 ml - Clear Plastic Bottle</td>
<td>7.111</td>
<td>Ø 51x92</td>
</tr>
<tr>
<td>100 ml - Standard Bottle Tray (72 bottles)</td>
<td>BS0072</td>
<td>N/A</td>
</tr>
<tr>
<td>210 ml - Ultra Clean Bottle (Certified)</td>
<td>P03</td>
<td>Ø 65x130</td>
</tr>
<tr>
<td>210 ml - Standard Bottle</td>
<td>8.054</td>
<td>Ø 65x122</td>
</tr>
<tr>
<td>500 ml - Standard Bottle</td>
<td>8.328</td>
<td>Ø 82x152</td>
</tr>
</tbody>
</table>

**How it works**

- Priming the pump causes a vacuum inside the bottle, syphoning fluid from the reservoir.
- The design of the pump means that only the hose is in contact with the fluid protecting the quality of the sample.
- The sample level should always finish below the level of the hose. The bottle can now be removed and capped.

**Electric vacuum pump**

MP Filtri’s Patch Imaging Kit is available with an optional electric pump (spares number: 444.009000). The pump is available with power options for the UK, EU, US, AUS/CN.

See page 93
PIK - Patch Imaging Kit
Patch Sampling and Digital Imaging Kit

Optional Electric Vacuum Pump
MP Filtri’s new Patch Imaging Kit enables sample-testing of fluids, followed by a full analysis of the contaminants - not only recording and measuring the size and shape of particles under magnification (up to 400x) - but also delivers recording and storage of data and results to your laptop or PC.

Rugged and robust yet perfectly portable, the new Patch Imaging Kit enables fast and accurate testing outside the laboratory.

**Features & Benefits**

- High-performance digital microscope, enabling magnification up to 400x
- Sophisticated software enables the measurement and analysis of individual particles
- Full patch testing kit apparatus making it easy to take samples quickly and accurately
- Windows-based software for problem-free installation onto PCs and laptops
- Easy to use without the need for formal training
- Heavy-duty peli-case and laser-cut foam surround for maximum protection and portability
- Simple, step-by-step instructional videos
- Perfectly complements MP Filtri’s acclaimed range of portable particle counter products

**KIT COMPOSITION**

- Heavy-duty orange pelicase
- Pelicase foam insert
- Self-adhesive patch test covers
- Patch test membranes - 1.2 µm
- Spray bottle
- 2 x Stainless steel tweezers
- Hand-pump
- Waste bottle
- 3 x Clean bottles
- Reusable Nalgene filter assembly
- 0.01mm Calibration slides
- Microscope power adaptor
- USB Data stick (includes microscope software and PDF manual)
- Hose pouch
- 1 x Hose - 8 x 6 mm Nalgene vacuum cable
- 1 x Hose - 6 x 4 mm Hand pump sampling cable
- Swift Microscope SW150 and accessories including cable and viewer
- Microscope camera - 1.3MP
- Serial plate for patch imaging kit
- A5 document wallet
- Patch test report cards
- Optional Electric Vacuum Pump - (see page 90)

See Accessories at page 93

(*) pour plus de renseignements, veuillez contacter votre équipe de ventes MP Filtri locale
Technical data

Sampling
Hand pump
Optional Electric Vacuum Pump

Patch test
Patch test membranes - 1.2 µm

Digital analysis
Swift Microscope SW150 and accessories including cable and viewer.
Microscope camera - 1.3MP
Easy-View software for digital analysis

Samples Filtration System
Reusable Nalgene filter assembly
Waste bottle
3 x Clean bottles
Spray bottle

Accessories for identification and test report
Patch test report cards
0.01 mm Calibration slides
Self-adhesive patch test covers

Rigid carrying case
Heavy-duty orange Pelicase

Weight and dimensions
12.5 kg, Height 265 mm, Depth 390 mm, Width 519 mm

Designation & Ordering code

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Configuration example:</th>
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<td>PIK</td>
<td>Patch Imaging Kit</td>
<td>PIK P01</td>
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Pump and Electric supply options

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tr>
<td>P01</td>
<td>Hand pump only</td>
</tr>
<tr>
<td>P02</td>
<td>Electric Vacuum Pump - UK supply</td>
</tr>
<tr>
<td>P03</td>
<td>Electric Vacuum Pump - EU supply</td>
</tr>
<tr>
<td>P04</td>
<td>Electric Vacuum Pump - US supply</td>
</tr>
<tr>
<td>P05</td>
<td>Electric Vacuum Pump - AUS/CN supply</td>
</tr>
</tbody>
</table>
For special applications or for fluids not mentioned in this table, please contact MP Filtri Technical and Sales Department.

Alternatively, visit the services section of our website where we have details on fluid testing and analysis.

For guidance on moisture sensing compatibility, contact MP Filtri Technical and Sales Department.

Typically conductive fluids are not compatible with the moisture sensor.

Please note that compatibility is based product performance with fluid viscosity at 20 °C in standard dye colourant or natural state. Tests are conducted with the suitable fluid in its pure state. Performance of solutions or mixed emulsions cannot be guaranteed. “Compatibility” is defined as a liquid which does not suffer short or long term degradation as a result of coming into contact with the wetted materials contained within the product. It is also a confirmation that the transparency of the liquid is suitable for the sensitivity of the product range.

For details on the specific product code required for your fluid, contact contact MP Filtri Technical and Sales Department.
## OFFSHORE & SELECTED WATER BASED FLUIDS

<table>
<thead>
<tr>
<th>Fluid type</th>
<th>Fluid spec.</th>
<th>ICM (W)</th>
<th>LPA (N)</th>
<th>CML (S)</th>
<th>BS110</th>
<th>BSS00</th>
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<tbody>
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<td>HW443</td>
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<td>M</td>
<td>N</td>
<td>S</td>
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<td>HW443R</td>
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<td>N</td>
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<td>FRESH WATER</td>
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<td>M</td>
<td>N</td>
<td>S</td>
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<tr>
<td>DE-IONISED WATER</td>
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<td>N</td>
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<td>M</td>
<td>N</td>
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<td>LF2100 (99% WATER, 1% MIX)</td>
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<td>N</td>
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<td>SV3</td>
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## AGGRESSIVE FLUIDS

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<th>BSS00</th>
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<td>S</td>
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- Compatible
- Not compatible
- Contact MP Filtri

For special applications or for fluids not mentioned in this table, please contact MP Filtri Technical and Sales Department. Alternatively, visit the services section of our website where we have details on fluid testing and analysis. For guidance on moisture sensing compatibility, contact MP Filtri Technical and Sales Department. Typically conductive fluids are not compatible with the moisture sensor.

Please note that compatibility is based on product performance with fluid viscosity at 20 °C in standard dye colourant or natural state. Tests are conducted with the suitable fluid in its pure state. Performance of solutions or mixed emulsions cannot be guaranteed. “Compatibility” is defined as a liquid which does not suffer short or long term degradation as a result of coming into contact with the wetted materials contained within the product. It is also a confirmation that the transparency of the liquid is suitable for the sensitivity of the product range.

For details on the specific product code required for your fluid, contact contact MP Filtri Technical and Sales Department.
### FUELS

<table>
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<td>M (W)</td>
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<td>S</td>
<td>M (W)</td>
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### BIO FLUIDS

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<th>BS110</th>
<th>BS500</th>
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<td></td>
<td></td>
<td>M (W)</td>
<td>N</td>
<td>S</td>
<td>M (W)</td>
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<td>CAT BIO HYDO HEES</td>
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</tbody>
</table>

For special applications or for fluids not mentioned in this table, please contact MP Filtri Technical and Sales Department. Alternatively, visit the services section of our website where we have details on fluid testing and analysis.

For guidance on moisture sensing compatibility, contact MP Filtri Technical and Sales Department.

Typically conductive fluids are not compatible with the moisture sensor.

Please note that compatibility is based on product performance with fluid viscosity at 20 °C in standard dye colourant or natural state. Tests are conducted with the suitable fluid in its pure state. Performance of solutions or mixed emulsions cannot be guaranteed. “Compatibility” is defined as a liquid which does not suffer short or long term degradation as a result of coming into contact with the wetted materials contained within the product. It is also a confirmation that the transparency of the liquid is suitable for the sensitivity of the product range.

For details on the specific product code required for your fluid, contact contact MP Filtri Technical and Sales Department.
### SPARE PARTS LIST

<table>
<thead>
<tr>
<th>Description (product types)</th>
<th>Ordering Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calibration Verification Fluid (requires use of Bottle Sampling device)</td>
<td>PCCF</td>
</tr>
<tr>
<td><strong>CMP Hydraulic connections / options:</strong></td>
<td></td>
</tr>
<tr>
<td>M16x2 microbore pressure hose. plated steel. 600 mm (M versions)</td>
<td>95.Y30Y30X261060</td>
</tr>
<tr>
<td>M16x2 microbore pressure hose. plated steel. 1500 mm (M versions)</td>
<td>95.Y30Y30X261150</td>
</tr>
<tr>
<td>M16x2 microbore pressure hose. stainless steel. 600 mm (N versions)</td>
<td>95.Y30Y30X161060</td>
</tr>
<tr>
<td>M16x2 microbore pressure hose. stainless steel. 1500 mm (N versions)</td>
<td>95.Y30Y30X161150</td>
</tr>
<tr>
<td>Waste Hose (M versions). 2000 mm - Brass / FKM</td>
<td>SK0014S30</td>
</tr>
<tr>
<td>Waste Hose (N versions). 2000 mm - Stainless Steel / FKM</td>
<td>SK0014S30N</td>
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<tr>
<td>Waste Hose (S versions). 2000 mm - Stainless Steel / FFKM</td>
<td>SK0014S30S</td>
</tr>
<tr>
<td>Offline Hose Assembly</td>
<td>481.027000</td>
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<tr>
<td>Pouch for pressure hose/waste hose</td>
<td>7.106</td>
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<tr>
<td>M16x2 M to F Coarse Screen Filter (M and N versions)</td>
<td>SK0040</td>
</tr>
<tr>
<td>G1/4 F to F coarse screen filter (M/N/S versions)</td>
<td>11.615</td>
</tr>
<tr>
<td>M16x2 F to F Coarse Screen Filter (S versions)</td>
<td>SK0041</td>
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<tr>
<td>Airbus adaptor with test point</td>
<td>SKAA02</td>
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<tr>
<td><strong>Waste Bottle:</strong></td>
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</tr>
<tr>
<td>1 Litre - Round</td>
<td>SK0012</td>
</tr>
<tr>
<td>1 Litre - Square (for use with CB0001)</td>
<td>SK0013</td>
</tr>
<tr>
<td><strong>Communications:</strong></td>
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<tr>
<td>Serial cable to USB converter</td>
<td>SK0026</td>
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<tr>
<td>PC Download cable</td>
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<tr>
<td>USB A-B cable</td>
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<tr>
<td>Bluetooth Portable Printer</td>
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<tr>
<td>1m USB A to C Cable</td>
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<tr>
<td>ICMKAZ2 to USBi conversion kit - not to be used in zoned areas</td>
<td>11.645</td>
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<tr>
<td>USB stick with all user guides and LPA-View Software</td>
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<tr>
<td><strong>Offline sampling equipment:</strong></td>
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<tr>
<td>Disposable Dip tubes - pack of 50</td>
<td>BS0018</td>
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<tr>
<td>Hand Pump</td>
<td>BS0020</td>
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<tr>
<td>Hand Pump Hose - 1000 mm</td>
<td>BS0022</td>
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<tr>
<td>Bottle Sampler hand pump and hose kit</td>
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<tr>
<td>100 ml Standard Brown Glass Bottle</td>
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<td>Tray of 72 x 100 ml Standard Brown Glass Bottles</td>
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<tr>
<td>250 ml Standard Clear Glass Bottle</td>
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<td>Box of 20 x 250 ml Standard Clear Glass Bottles</td>
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<td>DIN/ISO5584/ISO3722 certified clean. 250 ml clear glass bottle</td>
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<td>P.0320</td>
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<td>LPA2</td>
<td>LPA3</td>
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Contamination Monitoring Products

SPARE PARTS LIST
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<th>Description (product types)</th>
<th>Ordering Code</th>
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<tr>
<td><strong>Power Options:</strong></td>
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<tr>
<td>12V. 2A Power Adapter - UK/EU/US/CN/AUS</td>
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<td>19V. 3A Power Adapter</td>
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<td>12V. 5A Power Adapter for 500 ml Bottle Sampler</td>
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<td>UK Lead for 8.029</td>
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<tr>
<td>EU Lead for 8.029</td>
<td>8.032</td>
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<tr>
<td>US Lead for 8.029</td>
<td>8.030</td>
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<tr>
<td>CN/AUS Lead for 8.029</td>
<td>8.072</td>
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<td><strong>Other:</strong></td>
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<tr>
<td>Thermal printer paper 57x33 mm</td>
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<tr>
<td>Thermal paper roll 57x51 mm</td>
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<tr>
<td>LPA2 Aviation Edition travel case without foam</td>
<td>TC0005</td>
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<tr>
<td>Replacement foam insert for TC0005</td>
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<tr>
<td>Heavy-duty orange pelicase</td>
<td>443.061E20</td>
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<tr>
<td>Pelicase foam insert</td>
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<td>Patch test membranes - 1.2 micron filter</td>
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<tr>
<td>Spray bottle</td>
<td>444.018J10</td>
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<td>Stainless steel tweezers</td>
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<td>Waste bottle</td>
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<td>0.01 mm Calibration slides</td>
<td>444.025000</td>
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<tr>
<td>Microscope power adaptor</td>
<td>444.033000</td>
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<td>Hose - 8 x 6 mm Nalgene vacuum cable</td>
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<td>Hose - 6 x 4 mm Hand pump sampling cable</td>
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<td>Microscope camera - 1.3 MP</td>
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<td>A5 document wallet</td>
<td>444.027001</td>
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<td>Patch test report card</td>
<td>444.028001</td>
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<tr>
<td>Electric vacuum pump</td>
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<td>CML Carry Bag</td>
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<td>LPA3 Carry Bag</td>
<td>63.088000</td>
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<tr>
<td>LPA2 Carry Bag</td>
<td>CB0001</td>
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<td>Black support case (without contents)</td>
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<tr>
<td>Heavy Duty Travel Case for Bottle Sampler</td>
<td>TC00055B</td>
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<td>LPA2</td>
<td>LPA3</td>
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Accessories

Contamination Monitoring Products

RDU 2.0
ICM-USBi
ICM-ETHi
ICM-FC1
SK0040

FLUID SAMPLING BOTTLES
PRESSURE & WASTE HOSES

444.009000
Remote Display Unit

Depending on your application, access and visibility of particle counting equipment can sometimes be an issue. The ICM-RDU has specially been developed to dovetail with its parent ICM 2.0. So you have the option to control and monitor the ICM 2.0 remotely. Supplied with a 10m cable as standard.

Features & Benefits
- Large backlit display
- Keypad interface
- Robust die-cast aluminium construction

Scope of Supply
1 x ICMRDU2.0
1 x 10m Twisted Pair Cable Assembly
1 x Digital copy of user guides/software/drivers

Status LED
All RDU 2.0 versions have a multicolour indicator on the front panel, which is used to indicate the status or alarm state. RDU-K versions also have a screen that changes colour. The alarm thresholds can be set from LPA-View via the serial interface.

Screen and multicolor indicators
- Green indicates that the test result passed, i.e. none of the alarm thresholds were exceeded
- Yellow indicates that the lower cleanliness limit was exceeded, but not the upper one
- Red indicates that the upper cleanliness limit was exceeded
- Blue indicates that the upper water content limit was exceeded
- Red/Blue Alternating indicates both cleanliness and water content upper limits exceeded
- Violet indicates that the upper temperature limit was exceeded

Dimensions

<table>
<thead>
<tr>
<th>Configuration:</th>
<th>ICM</th>
<th>RDU 2.0</th>
</tr>
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<tbody>
<tr>
<td>RDU 2.0</td>
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<tr>
<td>Measurement</td>
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<tr>
<td>Depth</td>
<td>26.00</td>
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</table>
ACCESSORIES

Electric Vacuum Pump
MP Filter’s Patch Imaging Kit is available with an optional electric pump (spares number: 444.009000). The pump is available with power options for the UK, EU, US, AUS/CN.

Used with PIK

Designation & Ordering code

<table>
<thead>
<tr>
<th>Description</th>
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<td>Used with PIK</td>
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</table>

Designation & Ordering code

<table>
<thead>
<tr>
<th>Configuration</th>
<th>444.009000</th>
</tr>
</thead>
</table>

ICM-FC1

Flow Control Valve
The FC1 is a pressure compensated flow control valve which can operate across a range of fluid types and is compatible with the ICM where flow rate exceeds operating parameters. Max pressure rating 400 bar at normal hydraulic system temperatures.

Features & Benefits
- Pressure compensated
- Regulates flow to within ICM specification
- Various connection options
- Viscosity independent
- Hexagonal form for ease of installation

Dimensions

Designation & Ordering code

<table>
<thead>
<tr>
<th>Configuration example:</th>
<th>ICM-FC1 M G1</th>
</tr>
</thead>
</table>

Contamination Monitoring Products
Auxiliary Communication Options
We offer four auxiliary communication devices to operate with the ICM 2.0:

ICM-USBi:
Two auxiliary communication devices are available to order with the ICM. A USB interface which allows for communication via a laptop (RS485 to RS232 converter) & an ethernet device for remote access via a network hub.

ICM-ETHi:
An ethernet device enables remote access via a network hub via Com Port redirection software.

Both devices can transmit power to the ICM/RDU electrical circuit using a DC power adapter. The USBi has the additional benefit of supplying power via the USB cable directly. Both devices come with a DC Power adapter and 3m twisted pair cable as standard.

Features & Benefits
- Compact
- Off the shelf solution
- Robust aluminium construction

Plug and play technology
- Robust aluminium construction
- Compact
- Provided with a twisted cable conductors 8, length 3m.
- All devices can transmit power to the ICM/RDU electrical circuit using the supplied DC power adapter.
The SK0040 coarse screen filter adapter is designed to limit the ingress of large particles into MP Filtri’s range of Contamination Monitoring Products (CMP).

**Features & Benefits**
- Part number: SK0040
- Inlet connection: M16x2 male test point
- Outlet connection: M16x2 female thread form
- Pressure rating: 400 bar
- Mesh rating: 600 µm

**Description**
- Used with LPA3, LPA2, CML2, CML4 and ICM2.0

**Dimensions**

**Designation & Ordering code**

<table>
<thead>
<tr>
<th>Configuration</th>
<th>SK0040</th>
</tr>
</thead>
</table>
**PRESSURE & WASTE HOSES**

**Description**

**Features & Benefits**

We supply laboratory standard and certified clean sampling bottles. 100 ml, 210 ml and 500 ml bottle sizes are available and are easily incorporated into our range of bottle samplers.

**Designation & Ordering code**

<table>
<thead>
<tr>
<th>BS110 - BS500</th>
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<tbody>
<tr>
<td>For Ordering Codes see page 88-91</td>
</tr>
</tbody>
</table>

**PRESSURE & WASTE HOSES**

**Description**

**Features & Benefits**

Replacement hoses.

- **Pressure Hose**
  - M16x2 Micro bore pressure hose by length (various available) long
  - Plated steel (alternative material options available)
  - Pressure hoses are able to connect MP Filtri products directly to your hydraulic systems.

- **Waste Hose**
  - Length: 2000 mm
  - OD: 8 mm
  - ID: 5 mm
  - Standard material: Polyurethane*
  - Fitting type: Quick release coupling (brass as standard)
  - *Other versions available to suit the M, N and S versions of CMP

**Designation & Ordering code**

<table>
<thead>
<tr>
<th>HOSES</th>
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<tr>
<td>For Ordering Codes see page 88-91</td>
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</table>
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MP Filtri reserves the right to make modifications to the models and versions of the described products at any time for both technical and/or commercial reasons.

For updated information please visit our website: www.mpfiltri.com

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