

# CONTAMINATION CONTROL SOLUTIONS

AUTOMATIC PARTICLE COUNTERS



PASSION TO PERFORM



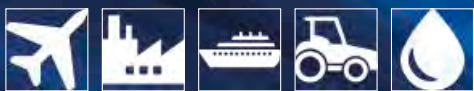




## A WORLDWIDE LEADER IN THE FIELD OF HYDRAULIC FILTRATION EQUIPMENT.

Our company started life in 1964, when Bruno Pasotto decided to attempt to cater for the requests of a market still to be fully explored, with the study, design, development, production and marketing of a vast range of filters for hydraulic equipment, capable of satisfying the needs of manufacturers in all sectors. The quality of our products, our extreme competitiveness compared with major international producers and our constant activities of research, design and development has made us a worldwide leader in the field of hydraulic circuit filtering. Present for 50 years in the market, we have played a truly decisive role in defining our sector, and by now we are a group capable of controlling our entire chain of production, monitoring all manufacturing processes to guarantee superior quality standards and to provide concrete solutions for the rapidly evolving needs of customers and the market.

## MARKET **LEADER**



Our work is based on a skillful interaction between advanced technology and fine workmanship, **customizing products according to specific market requests**, focusing strongly on innovation and quality, and following every step in the manufacturing of both standard and special products, fully respecting customer expectations.



Our customer-oriented philosophy, which enables us to satisfy all customer requests **rapidly and with personalized products**, makes us a **dynamic and flexible enterprise**. The possibility of constantly controlling and monitoring the entire production process is essential to allow us to guarantee the quality of our products.

## WORLDWIDE PRESENCE

Our foreign Branches enable us to offer a diversified range of products that allow us to successfully face the aggressive challenge of international competition, and also to maintain a stable presence at a local level.

The Group boasts **9** business branches





## TECHNOLOGY

Our constant **quest for excellence in quality and technological innovation** allows us to offer only the best solutions and services for applications in many fields, including general industry, test rigs, lubrication, heavy engineering, renewable energies, naval engineering, offshore engineering, aviation systems, emerging technologies and mobile plant (i.e. tractors, excavators, concrete pumps, platforms).



## AND PRODUCTION

Our high level of technological expertise means **we can rely entirely on our own resources, without resorting to external providers.** This in turn enables us to satisfy a growing number of customer requests, also exploiting our constantly updated range of machines and equipment, featuring **fully-automated workstations** capable of **24-hour production.**





## SUCTION FILTERS

Flow rates  
up to 875 l/min

Mounting:  
- Tank immersed  
- In-Line  
- In tank with  
shut off valve  
- In tank  
with flooded suction



## RETURN FILTERS

Flow rates  
up to 3000 l/min

Pressure  
up to 20 bar

Mounting:  
- In-Line  
- Tank top  
- In single  
and duplex designs



## RETURN / SUCTION FILTERS

Flow rates  
up to 300 l/min

Pressure  
up to 80 bar

Mounting:  
- In-Line  
- Tank top



## SPIN-ON FILTERS

Flow rates  
up to 365 l/min

Pressure  
up to 35 bar

Mounting:  
- In-Line  
- Tank top



## LOW & MEDIUM PRESSURE FILTERS

Flow rates  
up to 3000 l/min

Pressure  
up to 80 bar

Mounting:  
- In-Line  
- Parallel manifold version  
- In single  
and duplex designs



## HIGH PRESSURE FILTERS

Flow rates  
up to 750 l/min

Pressure from 110 bar  
up to 560 bar

Mounting:  
- In-Line  
- Manifold  
- In single  
and duplex designs



## PRODUCT RANGE

MP Filtri can offer a vast and articulated range of products for the global market, suitable for all industrial sectors using hydraulic equipment.

This includes filters (suction, return, return/suction, spin-on, pressure, stainless steel pressure) and structural components (motor/pump bell-housings, transmission couplings, damping rings, foot brackets, aluminium tanks, cleaning covers).

We can provide all the skills and solutions required by the modern hydraulics industry to monitor contamination levels and other fluid conditions.

Mobile filtration units and a full range of accessories allow us to supply everything necessary for a complete service in the hydraulic circuits.



### STAINLESS STEEL HIGH PRESSURE FILTERS

Flow rates up to 125 l/min  
Pressure from 320 bar  
up to 1000 bar

Mounting:

- In-Line
- Manifold
- In single and duplex designs

### CONTAMINATION MONITORING PRODUCTS

- Off-line, in-line particle counters
- Off-line bottle sampling products
- Fully calibrated using relevant ISO standards
- A wide range of variants to support fluid types and communication protocols

### MOBILE FILTRATION UNITS

Flow rates from 15 l/min  
up to 200 l/min

### POWER TRANSMISSION PRODUCTS

- Aluminium bell-housings for motors from 0.12 kW to 400 kW
- Couplings in Aluminium Cast Iron - Steel
- Damping rings
- Foot bracket
- Aluminium tanks
- Cleaning covers

### TANK ACCESSORIES

- Oil filler and air breather plugs
- Optical and electrical level gauges
- Pressure gauge valve selectors
- Pipe fixing brackets
- Pressure gauges

# CONTAMINATION CONTROL SOLUTIONS

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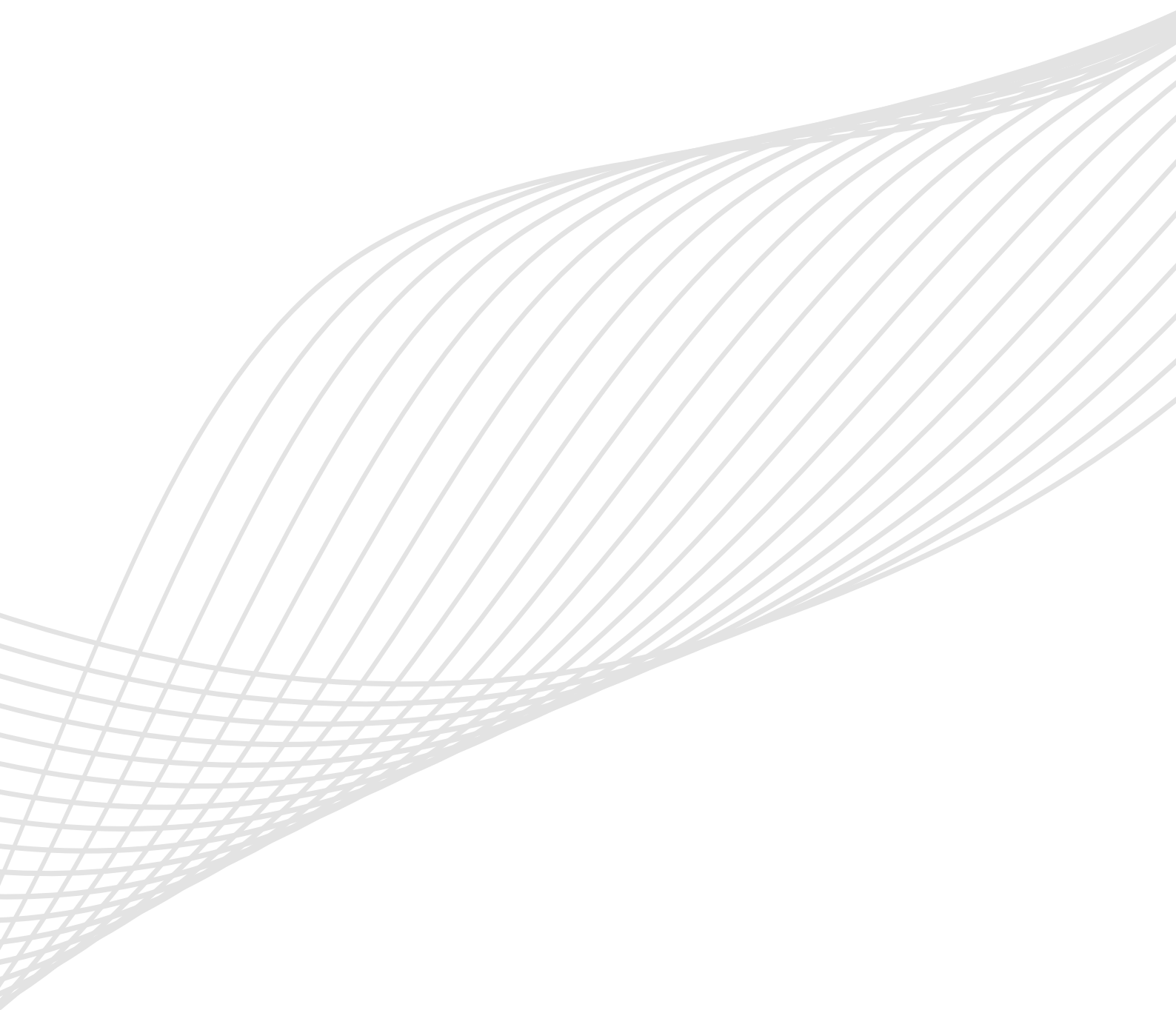


**...because contamination costs!**

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# Contamination management

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## 1 HYDRAULIC FLUIDS

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

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

The most popular classification criterion divides them into the following families:

- MINERAL OILS

Commonly used oil deriving fluids.

- FIRE RESISTANT FLUIDS

Fluids with intrinsic characteristics of incombustibility or high flash point.

- SYNTHETIC FLUIDS

Modified chemical products to obtain specific optimized features.

- ECOLOGICAL FLUIDS

Synthetic or vegetable origin fluids with high biodegradability characteristics.

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

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

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

- DYNAMIC VISCOSITY

It identifies the fluid's resistance to sliding due to the impact of the particles forming it.

- KINEMATIC VISCOSITY

It is a widespread formal dimension in the hydraulic field.

It is calculated with the ratio between the dynamic viscosity and the fluid density.

Kinematic viscosity varies with temperature and pressure variations.

- VISCOSITY INDEX

This value expresses the ability of a fluid to maintain viscosity when the temperature changes.

A high viscosity index indicates the fluid's ability to limit viscosity variations by varying the temperature.

- FILTERABILITY INDEX

It is the value that indicates the ability of a fluid to cross the filter materials. A low filterability index could cause premature clogging of the filter material.

- WORKING TEMPERATURE

Working temperature affects the fundamental characteristics of the fluid. As already seen, some fluid characteristics, such as cinematic viscosity, vary with the temperature variation.

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

- COMPRESSIBILITY MODULE

Every fluid subjected to a pressure contracts, increasing its density.

The compressibility module identifies the increase in pressure required to cause a corresponding increase in density.

- HYDROLYTIC STABILITY

It is the characteristic that prevents galvanic pairs that can cause wear in the plant/system.

- ANTIOXIDANT STABILITY AND WEAR PROTECTION

These features translate into the capacity of a hydraulic oil to avoid corrosion of metal elements inside the system.

- HEAT TRANSFER CAPACITY

It is the characteristic that indicates the capacity of hydraulic oil to exchange heat with the surfaces and then cool them.

## 2 FLUID CONTAMINATION

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

- INITIAL CONTAMINATION

Caused by the introduction of contaminated fluid into the circuit, or by incorrect storage, transport or transfer operations.

- PROGRESSIVE CONTAMINATION

Caused by factors related to the operation of the system, such as metal surface wear, sealing wear, oxidation or degradation of the fluid, the introduction of contaminants during maintenance, corrosion due to chemical or electrochemical action between fluid and components, cavitation. The contamination of hydraulic systems can be of different nature:

- SOLID CONTAMINATION

For example rust, slag, metal particles, fibers, rubber particles, paint particles or additives

- LIQUID CONTAMINATION

For example, the presence of water due to condensation or external infiltration or acids

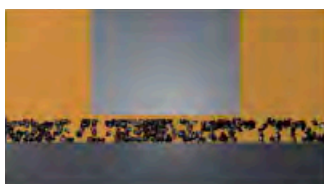
- GASEOUS CONTAMINATION

For example, the presence of air due to inadequate oil level in the tank, drainage in suction ducts, incorrect sizing of tubes or tanks.

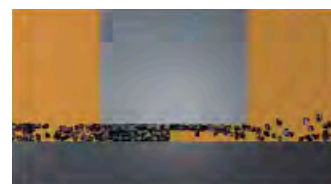
## 3 EFFECTS OF CONTAMINATION ON HYDRAULIC COMPONENTS

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

CONTAMINATION IN PRESENCE OF  
LARGE TOLERANCES



CONTAMINATION IN PRESENCE OF  
NARROW TOLERANCES

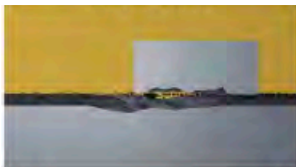


Solid contamination mainly causes surface damage and component wear.

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

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

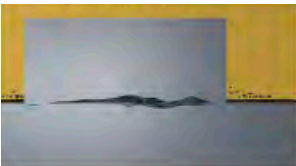
ABRASION



EROSION



ADHESION



FATIGUE



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

## DISSOLVED WATER

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

## FREE WATER - ADDITIONAL EFFECTS

- **DECAY OF LUBRICANT PERFORMANCE**  
Cause of rust and sludge formation, metal corrosion and increased solid contamination
- **BATTERY COLONY CREATION**  
Cause of worsening in the filterability feature
- **ICE CREATION AT LOW TEMPERATURES**  
Cause damage to the surface
- **ADDITIVE DEPLETION**  
Free water retains polar additives

Gaseous contamination mainly results in decay of system performance.

- **CUSHION SUSPENSION**  
Cause of increased noise and cavitation.
- **FLUID OXIDATION**  
Cause of corrosion acceleration of metal parts.

## 4 MEASURING THE SOLID CONTAMINATION LEVEL

The level of contamination of a system identifies the amount of contaminant contained in a fluid.

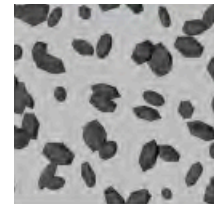
This parameter refers to a unit volume of fluid.

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.

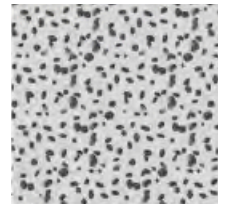
What is the size of the contaminating particles that we must handle in our hydraulic circuit?



HUMAN HAIR  
(75 µm)



MINIMUM DIMENSION  
VISIBLE WITH HUMAN EYES  
(40 µm)



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

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

To this end, ISO has issued a set of standards that allow tests to be conducted and express the measured values in the following ways.

- **GRAVIMETRIC LEVEL - ISO 4405**

The level of contamination is defined by checking the weight of particles collected by a laboratory membrane. The membrane must be cleaned, dried and desiccated, with fluid and conditions defined by the Standard.

The volume of fluid is filtered through the membrane by using a suitable suction system. The weight of the contaminant is determined by checking the weight of the membrane before and after the fluid filtration.



CLEAN  
MEMBRANE



CONTAMINATED  
MEMBRANE

# CONTAMINATION MANAGEMENT

## - CUMULATIVE DISTRIBUTION OF THE PARTICLES SIZE - ISO 4406

The level of contamination is defined by counting the number of particles of certain dimensions per unit of volume of fluid. Measurement is performed by Automatic Particle Counters (APC).

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

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

NAS 1638 is still used although obsolete.

### Classification example according to ISO 4406

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

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

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

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

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

ISO 4406 - Allocation of Scale Numbers

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

>  $4 \mu\text{m}_{(c)}$  = 350 particles

>  $6 \mu\text{m}_{(c)}$  = 100 particles

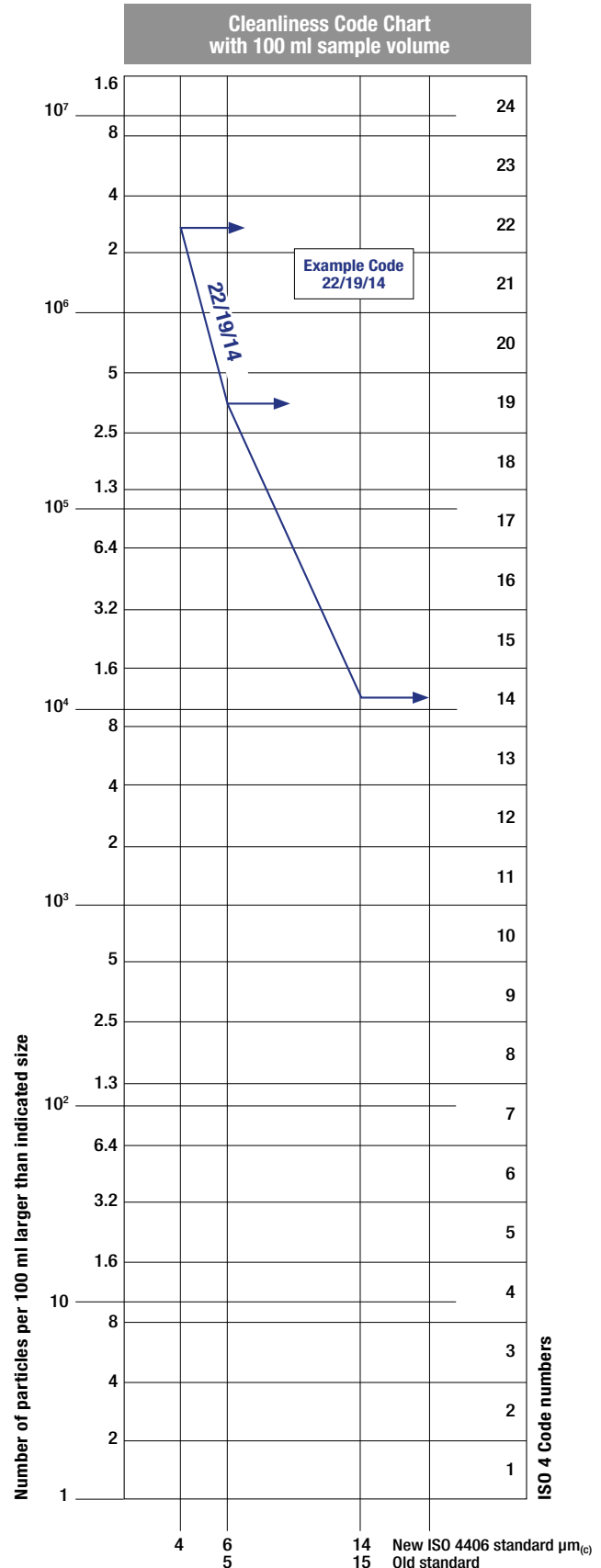
>  $14 \mu\text{m}_{(c)}$  = 25 particles

16 / 14 / 12

## ISO 4406 Cleanliness Code System

Microscope counting examines the particles differently to APCs and the code is given with two scale numbers only.

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





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

Classification example according to

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

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

## SAE AS4059 - REV. E

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

Table 1 - Class for differential measurement

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

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

Table 2 - Class for cumulative measurement

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

> 4 $\mu\text{m}_{(c)}$ = 45 000 particles
> 6 $\mu\text{m}_{(c)}$ = 15 000 particles
> 14 $\mu\text{m}_{(c)}$ = 1 500 particles
> 21 $\mu\text{m}_{(c)}$ = 250 particles
> 38 $\mu\text{m}_{(c)}$ = 15 particles
> 70 $\mu\text{m}_{(c)}$ = 3 particle
SAE AS4059 REV E 6A/6B/5C/5D/4E/2F

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

## SAE AS4059 - REV. F

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

Table 1 - Class for differential measurement

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

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

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

Table 2 - Class for cumulative measurement

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

> 4 $\mu\text{m}_{(c)}$ = 45 000 particles
> 6 $\mu\text{m}_{(c)}$ = 15 000 particles
> 14 $\mu\text{m}_{(c)}$ = 1 500 particles
> 21 $\mu\text{m}_{(c)}$ = 250 particles
> 38 $\mu\text{m}_{(c)}$ = 15 particles
> 70 $\mu\text{m}_{(c)}$ = 3 particle
SAE AS4059 REV F cpc* Class 6 6/6/5/5/4/2

\* cumulative particle count

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

# CONTAMINATION MANAGEMENT

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

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

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

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

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

Size Range Classes (in microns)

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

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

## - CUMULATIVE DISTRIBUTION OF THE PARTICLES SIZE - ISO 4407

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

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

MICROSCOPE CONTROL AND MEASUREMENT



Example figure 1 and 2

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

COMPARISON PHOTOGRAPH'S  
1 graduation = 10µm



Fig. 1



Fig. 2

Class 16/14/11

Class 5

Class 5

Class 22/20/17

Class 11

Class 11

Class 6A/5B/5C

Class 12A/11B/11C

For other comparison photographs for contamination classes see the "Fluid Condition and Filtration Handbook".

## - CLEANLINESS CODE COMPARISON

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

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

## 5 RECOMMENDED CONTAMINATION CLASSES

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

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

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

Piston pumps with fixed flow rate	•					
Piston pumps with variable flow rate			•			
Vane pumps with fixed flow rate		•				
Vane pumps with variable flow			•			
Engines	•					
Hydraulic cylinders	•					
Actuators					•	
Test benches						•
Check valve	•					
Directional valves	•					
Flow regulating valves	•					
Proportional valves				•		
Servo-valves					•	
Flat bearings			•			
Ball bearings				•		
ISO 4406 CODE	20/18/15	19/17/14	18/16/13	17/15/12	16/14/11	15/13/10
Recommended	B <sub>20(c)</sub>	B <sub>15(c)</sub>	B <sub>10(c)</sub>	B <sub>7(c)</sub>	B <sub>7(c)</sub>	B <sub>5(c)</sub>
filtration B <sub>x(c)</sub> ≥1.000	>1000	>1000	>1000	>1000	>1000	>1000

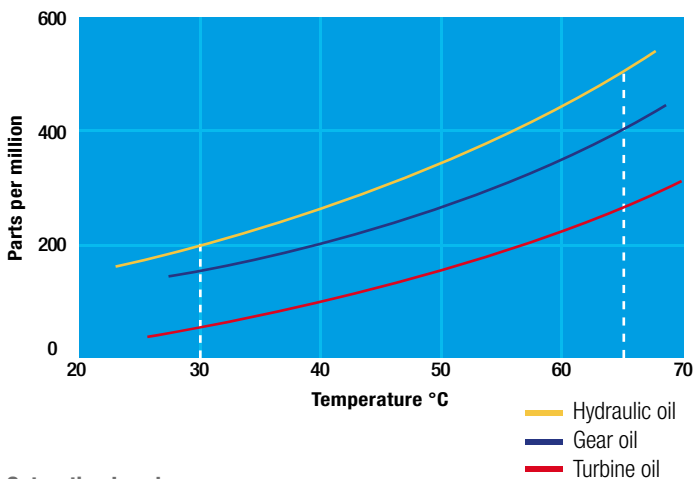
## 6 WATER IN HYDRAULIC AND LUBRICATING FLUIDS

### Water Content

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

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

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



### Saturation Levels

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

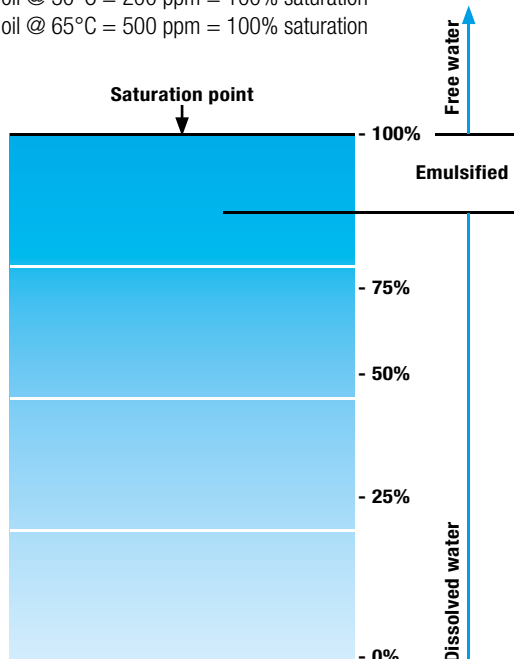
However, even water in solution can cause damage and therefore every reasonable effort should be made to keep saturation levels as low as possible. There is no such thing as too little water. As a guideline, we recommend maintaining saturation levels below 50% in all equipment.

### TYPICAL WATER SATURATION LEVEL FOR NEW OILS

Examples:

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

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



### W - Water and Temperature Sensing

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

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

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

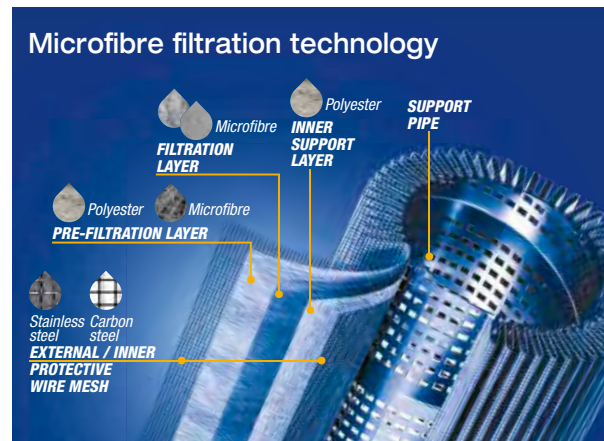
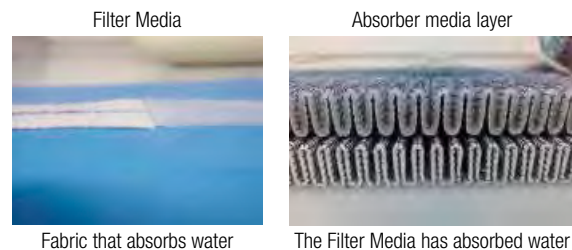
### Water absorber

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

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

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

Absorbent media is made by water absorbent fibres which increase in size during the absorption process. Free water is thus bonded to the filter media and completely removed from the system (it cannot even be squeezed out).



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

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

Product availability - UFM Series:

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

## **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**



# Automatic Particle Counters



LPA3	page 21
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CML2	33
ICM 4.0	39
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ICU	57
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BS110 & BS500	69
HOW SAMPLING	78
PIK - Patch Imaging Kit	81

FLUID COMPATIBILITY CHARTS	page 85
SPARE PARTS LIST	88
ACCESSORIES	91



# LPA3

Portable Particle Counters



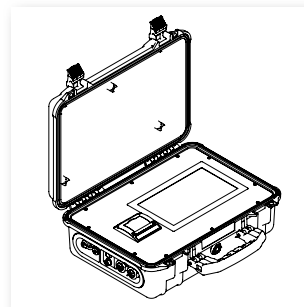
## Description

### Automatic Particle Counters

#### Portable Particle Counter

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 91



Front facing view



Right facing view



Closed case  
Front facing view



Closed case  
Side view

## Technical data

### Technology

High precision LED light extinction automatic optical particle counter

### Particle Sizing

>4, 6, 14, 21, 25, 38, 50, 70  $\mu\text{m}_{(c)}$

### 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, 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

$\pm 1/2$  ISO code for 4, 6, 14  $\mu\text{m}_{(c)}$

$\pm 1$  code for 21, 25, 38, 50, 70  $\mu\text{m}_{(c)}$

### 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)  $\pm 3\%$

### Temperature Measurement

$\pm 3$  °C

### Data Storage

Approximately 4000 timestamped tests in the integral LPA3 memory

### System Pressure Measurement

$\pm 0.5\%$  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 292 mm, Depth 155 mm, Width 435 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



How LPA3 works - [www.mpfilttri.com/index.php/products/oil-service/lpa-3.html](http://www.mpfilttri.com/index.php/products/oil-service/lpa-3.html)



## 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

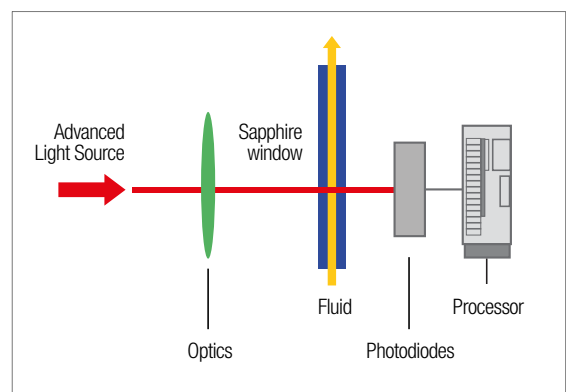
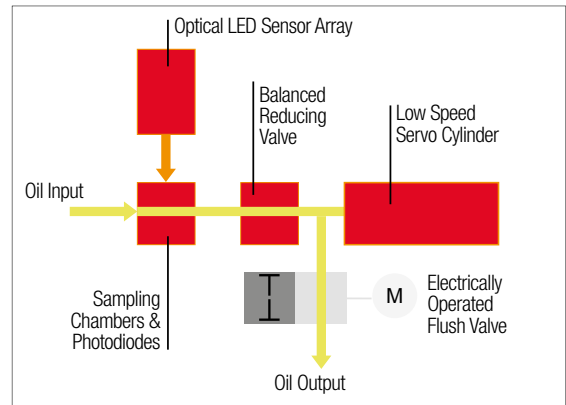
Water Saturation level (RH%) and fluid temperature sensor option.

### P-Option

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

### LED light source

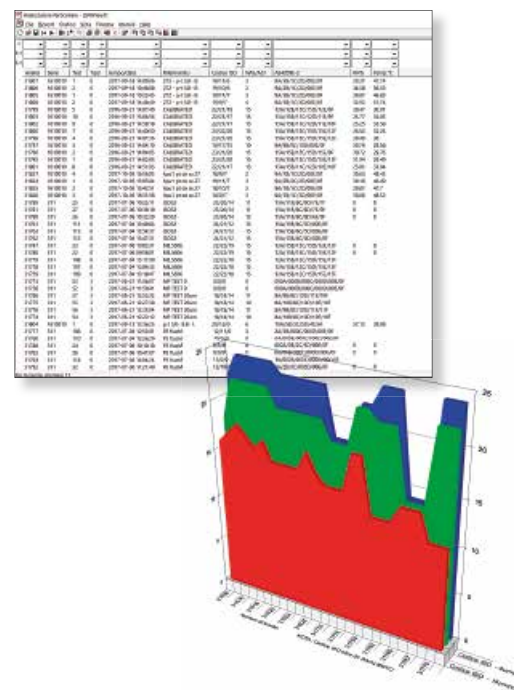
A single point high accuracy LED measures particles across all sizes giving increased accuracy with excellent repeatability.



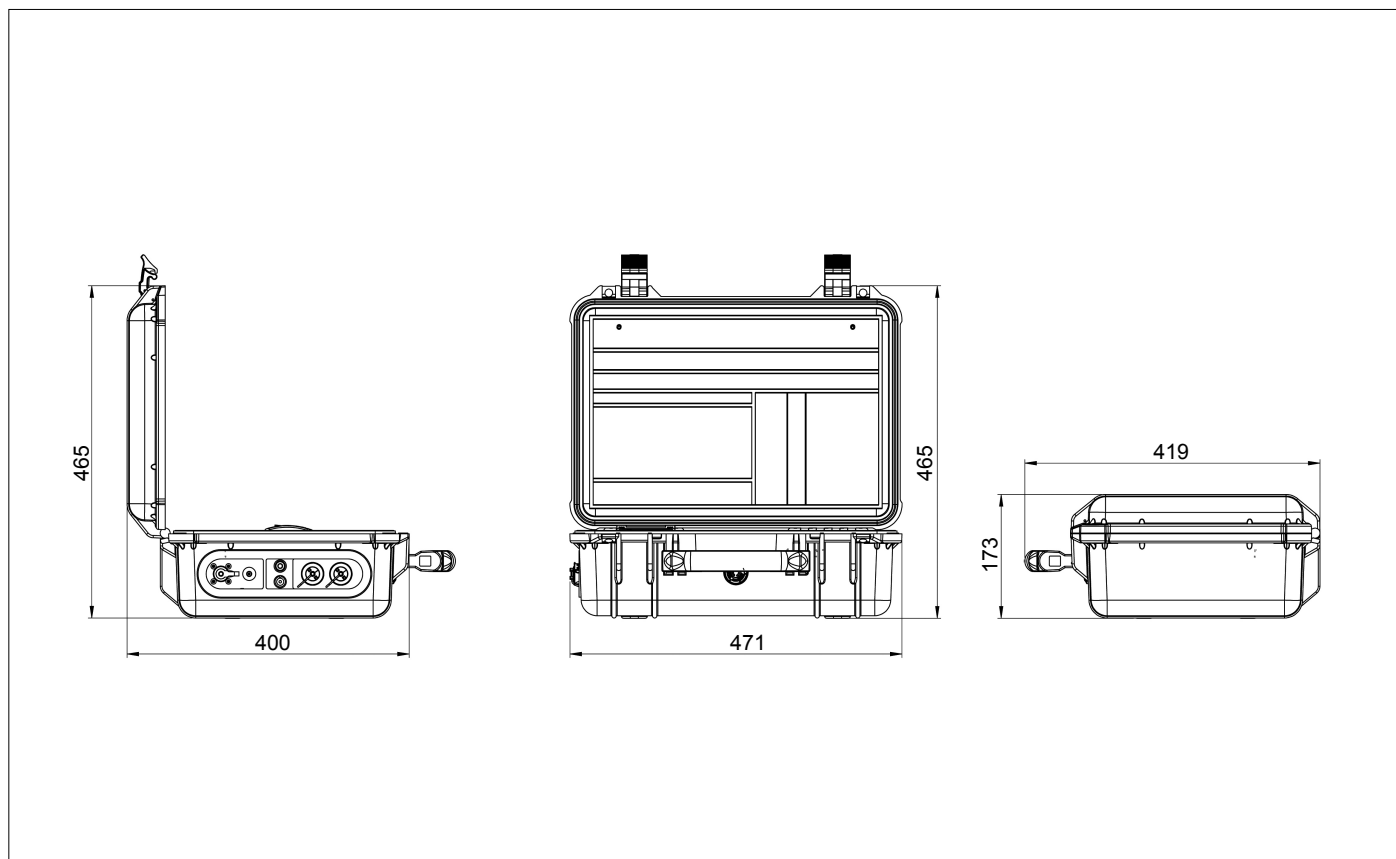
## LPA View Software

The LPA View software is used with the LPA3, LPA2, CML2 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



## Dimensions



## Designation & Ordering code

AUTOMATIC PARTICLE COUNTER LPA3									
<b>Series</b>	Configuration example: LPA3 W P M 1 0 1								
<b>LPA3</b>	Light extinction particle counter								
<b>Moisture Sensor</b>									
<b>0</b>	Without moisture and temperature sensor								
<b>W</b>	With moisture and temperature sensor								
<b>Pressure Sensor</b>									
<b>0</b>	Without on-screen inlet pressure display								
<b>P</b>	With on-screen inlet pressure display								
<b>Fluid compatibility</b>									
<b>M</b>	Mineral oil and synthetic fluid								
<b>N</b>	M type fluids & Subsea fluids and water based fluids (*)								
<b>S</b>	M & N type fluids & phosphate esters and aggressive fluids (*)								
<b>External Result</b>									
<b>1</b>	With on board printer								
<b>Design Reference</b>									
<b>0</b>	Std option with full accessory kit and carry bag								
<b>Country Plug Type</b>									
<b>1</b>	UK, EU, US, AUS/CN								

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

Available with Screen Protector (Part number 63.095000). Consult your local branch for further details



# LPA2 Aviation Edition

Twin Laser Particle Analyser

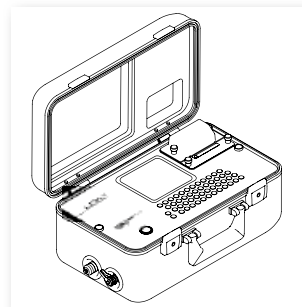


### Description

#### Automatic Particle Counters

##### Twin Laser Particle Analyser - LPA20PSTA30

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: LPA20PSTA030)
- 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 91.

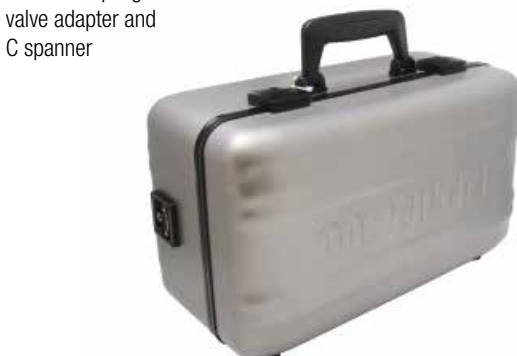


Front facing view



Right facing view

Airbus sampling  
valve adapter and  
C spanner



Closed case  
Right facing view



Closed case  
Left facing view



## 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  $\mu\text{m}_{(c)}$  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)  $\pm 3\%$

**Temperature Measurement**

$\pm 3\%$

**Data Storage**

Up to 600 tests

**Communication options**

RS232 9 pin D plug

**System Pressure Measurement**

$\pm 0.5\%$  Full Scale Accuracy Min 10 bar

**Ambient Temperature min / max**

-10 °C to +80 °C

**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

### 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

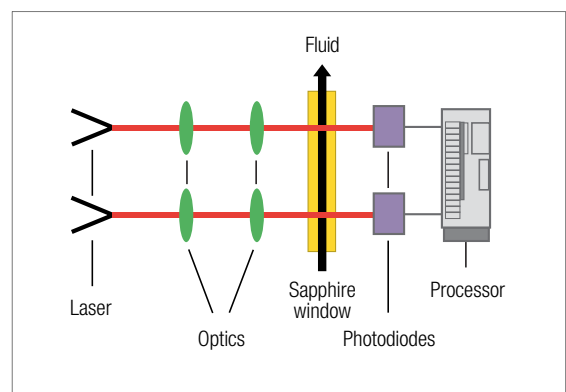
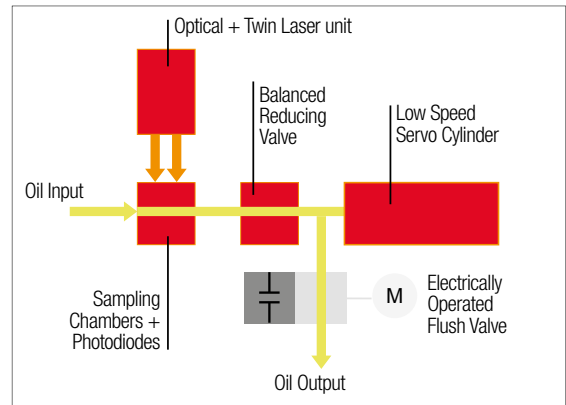
Live Pressure Readout (bar) on display screen.

#### Laser 1

A single point high accuracy laser measures particles of contamination at  $4 \mu\text{m}_{(c)}$  and  $6 \mu\text{m}_{(c)}$  giving increased accuracy with excellent repeatability.

#### Laser 2

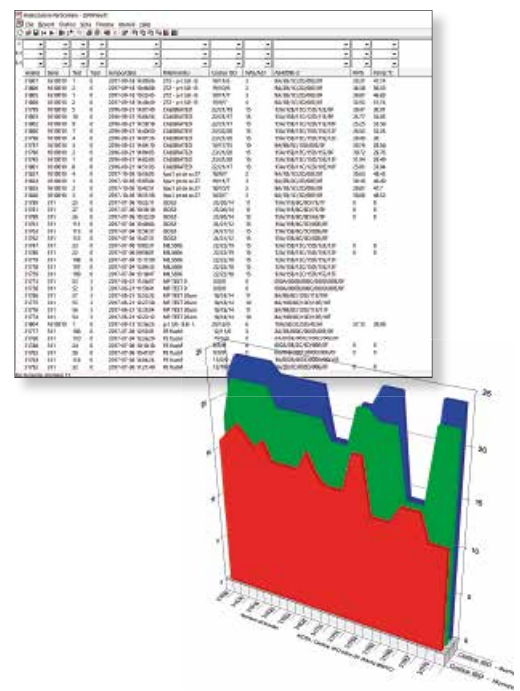
Standard accuracy laser specifically designed for system contaminants between  $6 \mu\text{m}_{(c)}$  and  $70 \mu\text{m}_{(c)}$ .



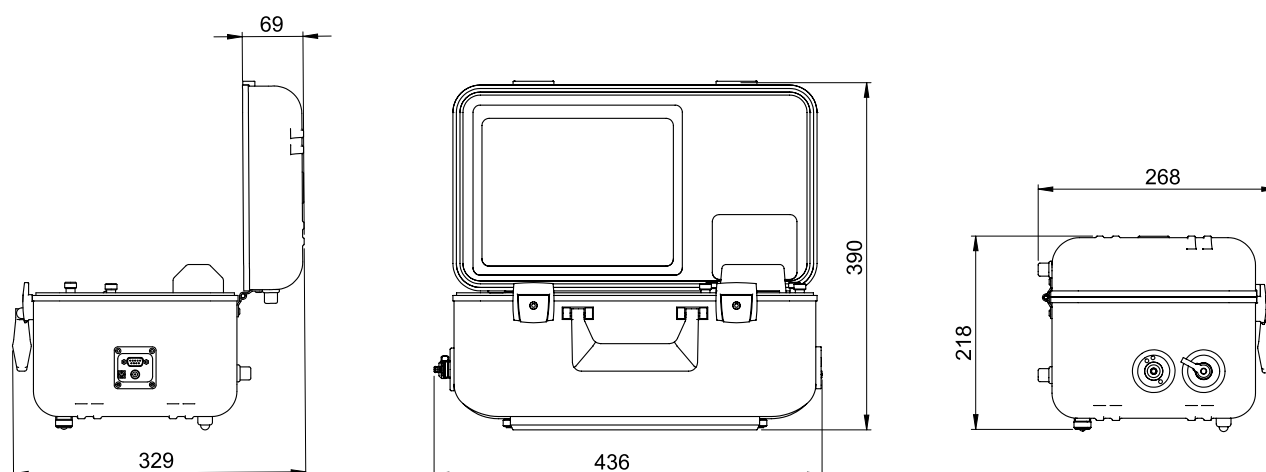
### LPA View Software

The LPA View software is used with the LPA3, LPA2, CML2 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



### Dimensions



LPA2 Aviation Edition: 9.8 kg, Height 218mm, Depth 268mm, Width 436mm

LPA2 Aviation Edition with travel case (packed): 18.5 kg, Height 500mm, Length 600mm, Width 400mm

### Designation & Ordering code

#### AUTOMATIC PARTICLE COUNTER LPA20PSTA30

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



# CML2

Compact Twin Laser Contamination Monitor





## Description

### Automatic Particle Counters

#### Compact Twin Laser Contamination Monitor

The CML is a portable, accurate instrument-suitable for 'on-site' applications. It can automatically measure and display particulate contamination, moisture and temperature levels in various hydraulic fluids.



### > Features & Benefits

- Compact
- Light and portable
- Mains Operated/battery (if fitted)
- Full Calibration based on ISO11171
- Measures and displays the following international standard formats: ISO 4406, NAS 1638, AS 4059E and ISO 11218
- Data logging and 600 test result memory
- Manual and remote control flexibility

### Scope of Supply

- 1 x CML2 (Specific model will be as per ordered item)
- 1 x M16x2 microbore pressure hose, 1500 mm long
- 1 x Quick release waste hose for LPA2
- 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 Hard copy of product user guide
- 1 x Digital copy of user guides/software/drivers
- 2 x Hard copy of calibration certificate
- 1 x Carry bag

See Accessories at page 91



Front facing view



Right facing view



Closed case  
Right facing view



Closed case  
Left facing view

## Technical data

### Technology

Twin laser and twin optical diode detectors Based Light Extinction  
Automatic Optical Contamination Monitor

### Particle Sizing

>4, 6, 14, 21, 25, 38, 50, 70  $\mu\text{m}_{(c)}$

### 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, 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

$\pm 1/2$  ISO code for 4, 6, 14  $\mu\text{m}_{(c)}$   
 $\pm 1$  code for 21, 25, 38, 50, 70  $\mu\text{m}_{(c)}$

### 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: +60 °C

### Pressure

Minimum: 2.0 bar / 29 psi  
Maximum: 400 bar / 5800 psi

### 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)  $\pm 3\%$

### Temperature Measurement

$\pm 3$  °C

### Data Storage

Up to 600 tests

### Communication options

RS232 9 pin D plug

### Environmental Protection

IP51 (lid open)

### Weight / Dimensions

6 kg, Height 149 mm, Depth 298 mm, Width 345 mm

### Supply Voltage

9-36VDC

### Power

Internal rechargeable battery (series 41)

### Outer Casing Finish

Injection Molded Ultra High Impact structural copolymer

### 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)

**CML2 is supplied with a full software package and digital product information**

## FOCUS ON

### Exclusive MP Filtri technology

The combination of the two lasers with the unique optics and photodiode package enables the CML2 to give increased accuracy combined with excellent repeatability.

### W-Option

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

### P-Option

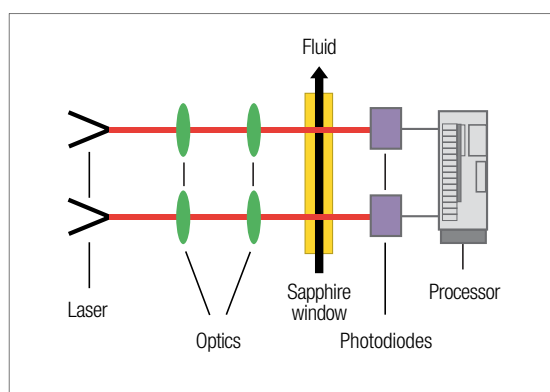
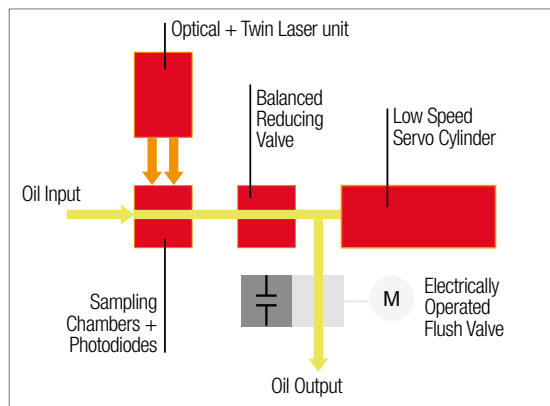
Live Pressure Readout (bar) on display screen.

### Laser 1

A single point high accuracy laser measures particles of contamination at 4  $\mu\text{m}_{(c)}$  and 6  $\mu\text{m}_{(c)}$  giving increased accuracy with excellent repeatability.

### Laser 2

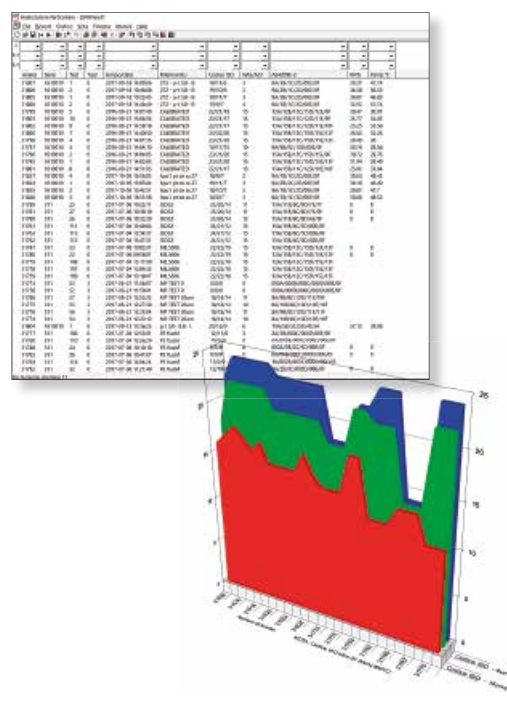
Standard accuracy laser specifically designed for system contaminants between 6  $\mu\text{m}_{(c)}$  and 70  $\mu\text{m}_{(c)}$ .



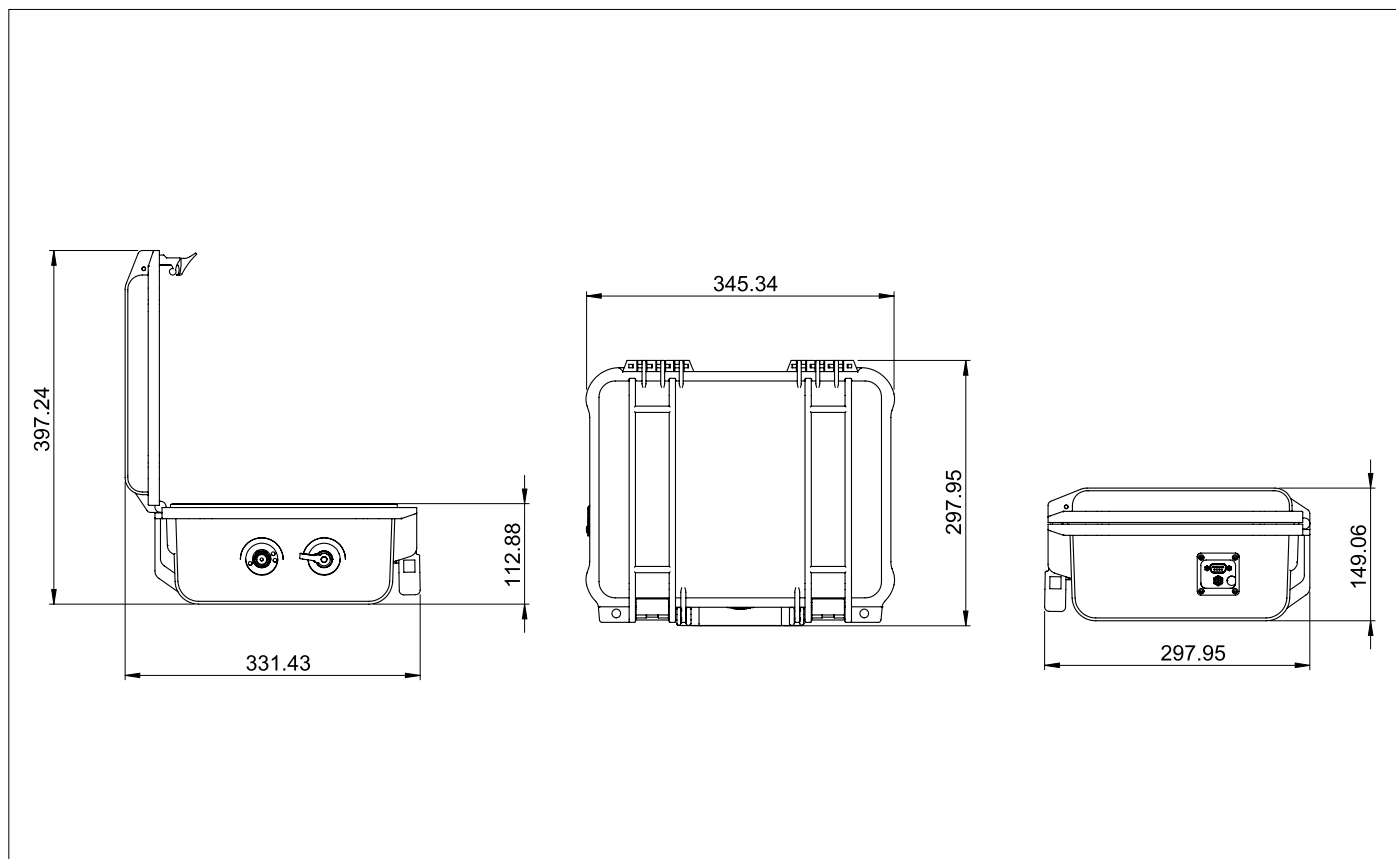
## LPA View Software

The LPA View software is used with the LPA3, LPA2, CML2 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



## Dimensions



## Designation & Ordering code

AUTOMATIC PARTICLE COUNTER CML2					
Series	Configuration example: CML2				
<b>CML2</b> Compact twin laser contamination monitor	W	M	S	X	41
Moisture Sensor (RH%)					
<b>0</b> Without moisture and temperature sensor					
<b>W</b> With moisture and temperature sensor					
Fluid compatibility					
<b>M</b> Mineral / synthetic oil					
<b>N</b> Subsea fluids and water based fluids (*)					
<b>S</b> Phosphate ester and aggressive fluids (*)					
Option					
<b>S</b> Standard units					
Option bottle sampler					
<b>X</b> Without bottle sampling					
Series					
<b>41</b> With display and push buttons, with internal rechargeable battery					

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





# ICM 4.0

In-Line Contamination Monitor - WiFi technology integrated



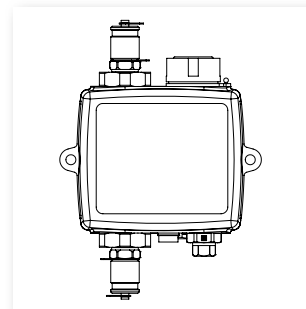
## Description

### Automatic Particle Counters

#### 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
- 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
- 4-20mA analogue output as standard

### 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 91

### 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



Left facing view

Right facing view



Top view

Bottom view

## Technical data

### Technology

LED based Light Extinction Automatic Optical Particle Counter

### Particle Sizing

>4, 6, 14, 21, 25, 38, 50, 70  $\mu\text{m}_{(c)}$

### 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, 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

$\pm 1/2$  ISO code for 4, 6, 14  $\mu\text{m}_{(c)}$

$\pm 1$  code for 21, 25, 38, 50, 70  $\mu\text{m}_{(c)}$

### 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)  $\pm 3\%$

### Temperature Measurement

$\pm 3$  °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

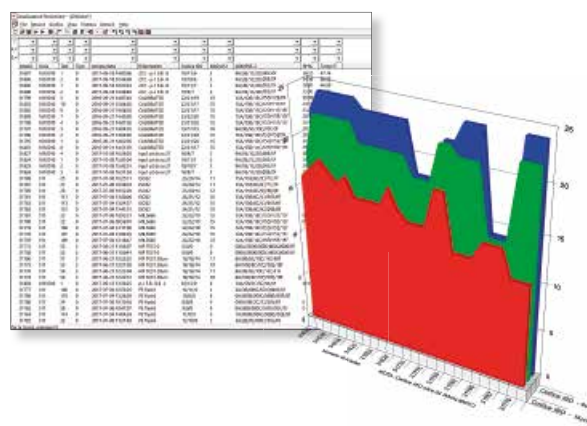
Wifi connectivity ensures you can access and share real-time data and analysis instantly via a number of different platforms.

- 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.

## LPA View Software

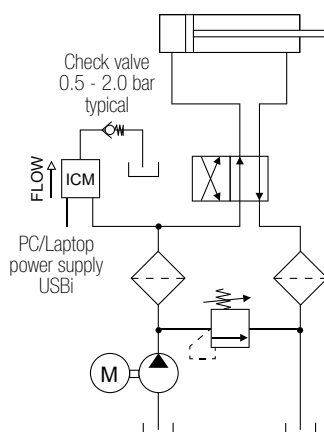
The LPA View software is used with the LPA3, LPA2, CML2 and ICM particle counters. When connected to LPA View, MP Filtri CMPs can transfer results in realtime, or alternatively, historical results can be downloaded from the CMP's inbuilt memory.

- 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

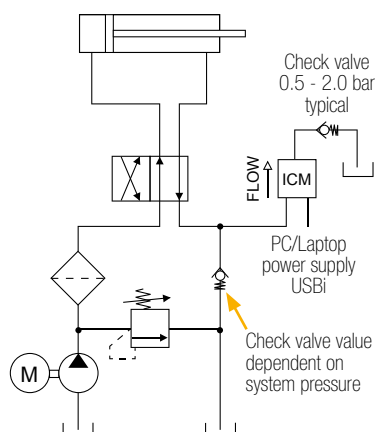


## Hydraulic Circuit

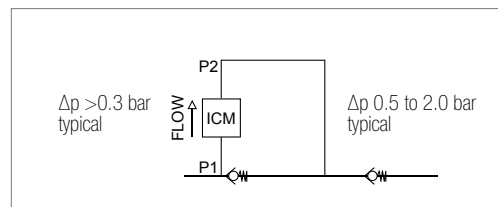
TYPICAL PRESSURE LINE



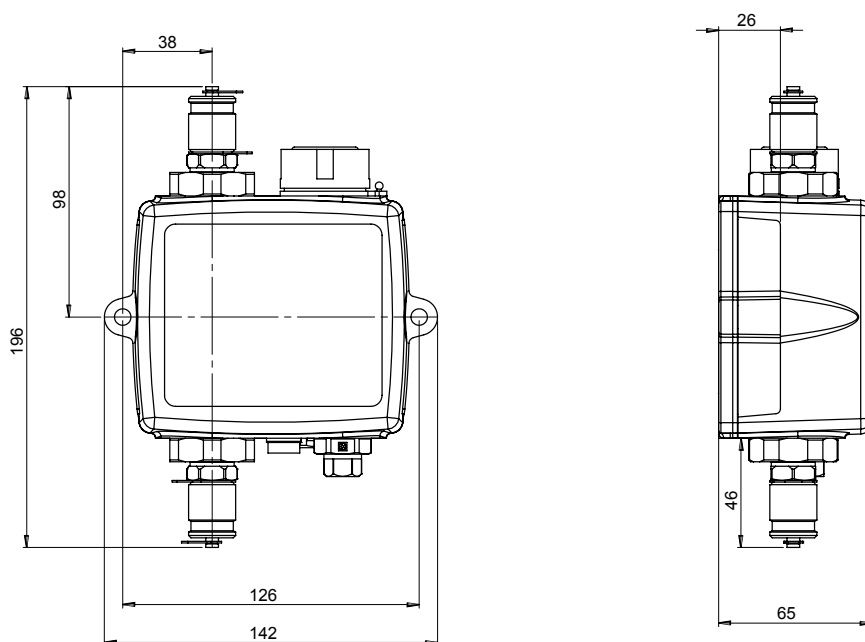
TYPICAL RETURN LINE



For installation guidance please visit:  
[www.mpfiltri.com/products/contamination-monitoring-products/icm-40-118.html#cont](http://www.mpfiltri.com/products/contamination-monitoring-products/icm-40-118.html#cont)



## Dimensions



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.

## Designation & Ordering code

### AUTOMATIC PARTICLE COUNTER ICM 4.0

Series	Configuration example:	ICM	W	M	K	R	G1	4.0
<b>ICM</b> In-Line Contamination Monitor								
<b>Moisture Sensor (RH%)</b>								
<b>0</b> Without moisture and temperature sensor								
<b>W</b> With moisture and temperature sensor								
<b>Fluid compatibility</b>								
<b>M</b> Mineral/synthetic oils								
<b>N</b> Subsea and water based fluids (*)								
<b>S</b> M & N type fluids & phosphate esters/aviation fluids (*) - G3 port option only								
<b>Keypad / Display</b>								
<b>0</b> Without LCD and keypad control								
<b>K</b> With LCD and keypad control								
<b>Device output</b>								
<b>R</b> With relays / external alarm outputs								
<b>Connections</b>								
<b>G1</b> M16x2 test points								
<b>G3</b> 1/4"BSPP female ports								
<b>G4</b> 7/16th UNF female ports								
<b>Series</b>								
<b>4.0</b> ICM 4.0 with integral WiFi								

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





# ICM 2.0

In-Line Contamination Monitor



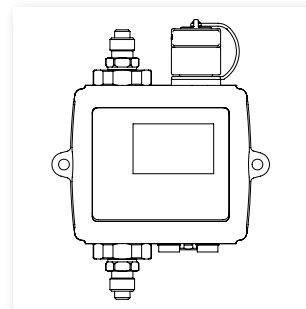
## Description

### Automatic Particle Counters

#### 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 91

### 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

### Technology

LED Based Light Extinction Automatic Optical Contamination Monitor

### Particle Sizing

>4, 6, 14, 21, 25, 38, 50, 70  $\mu\text{m}_{(c)}$

### 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, 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

$\pm 1/2$  ISO code for 4, 6, 14  $\mu\text{m}_{(c)}$

$\pm 1$  code for 21, 25, 38, 50, 70  $\mu\text{m}_{(c)}$

### 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

From -25 °C to +80 °C (non K version)

From -25 °C to +55 °C (K version)

### Pressure

Maximum: 420 bar / 6092 psi

### 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)  $\pm 3\%$

### Temperature Measurement

$\pm 3$  °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

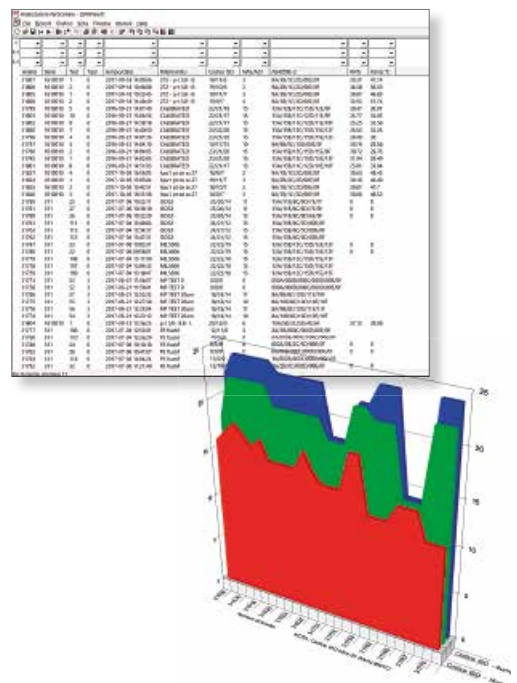
LPA View software (included)

ICM 2.0 is supplied with a full software package and digital product information

## LPA View Software

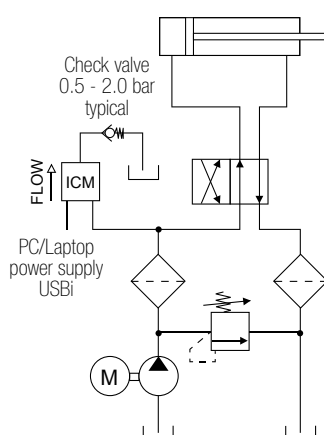
The LPA View software is used with the LPA3, LPA2, CML2 and ICM particle counters. When connected to LPA View, MP Filtri CMPs can transfer results in realtime, or alternatively, historical results can be downloaded from the CMP's inbuilt memory.

- 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

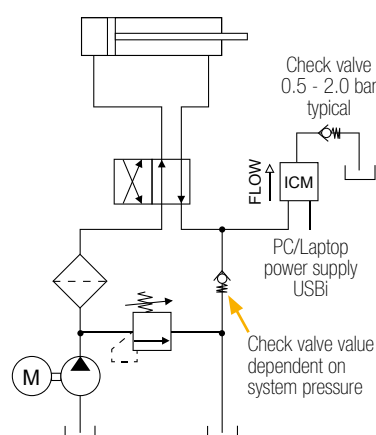


## Hydraulic Circuit

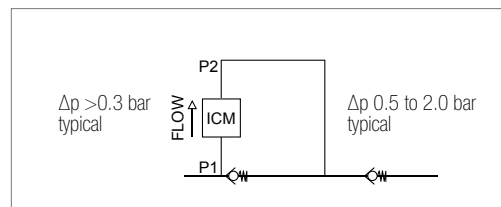
TYPICAL PRESSURE LINE



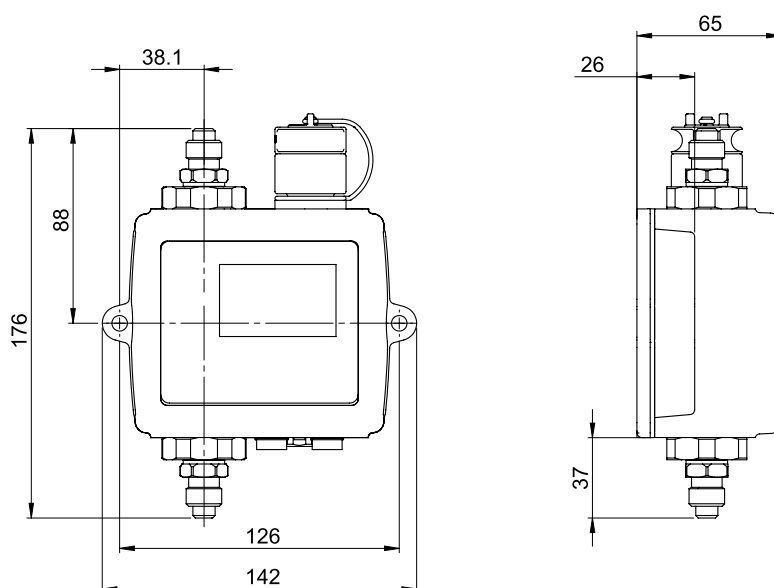
TYPICAL RETURN LINE



For installation guidance please visit [www.mpfiltri.co.uk/ICM-2\\_0/#Home](http://www.mpfiltri.co.uk/ICM-2_0/#Home)



## Dimensions



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. 10m control cable supplied as standard).

## Designation & Ordering code

### AUTOMATIC PARTICLE COUNTER ICM 2.0

Series	Configuration example:	ICM	W	M	K	R	G1	2.0
<b>ICM</b> In-Line Contamination Monitor								
<b>Moisture Sensor (RH%)</b>								
<b>0</b> Without moisture and temperature sensor								
<b>W</b> With moisture and temperature sensor								
<b>Fluid compatibility</b>								
<b>M</b> Mineral/synthetic oils								
<b>N</b> Subsea fluids and water based fluids (*)								
<b>S</b> Phosphate ester and aggressive fluids (*)								
<b>Keypad / Display</b>								
<b>0</b> Without keypad / display								
<b>K</b> With keypad / display								
<b>Device output</b>								
<b>R</b> With relays / external alarm outputs								
<b>U</b> Test record transfer (direct to USB stick) plus relays/external alarm outputs								
<b>Connections</b>								
<b>G1</b> ICM complete with M16x2 pressure test point connections fitted								
<b>G3</b> 1/4" BSP - Female port								
<b>G4</b> 7/16" UNF - Female port								
<b>Series</b>								
<b>2.0</b>								

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





# AZ2



ATEX Fluid Contamination Monitors

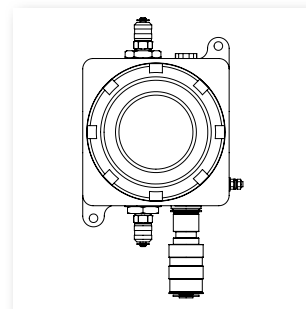


## Description

### Particle Counters

#### 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 91

### 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).

### 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



Front facing view



Right facing view



Top facing view



Bottom facing view

## Technical data

### Technology

LED Based Light Extinction Automatic Optical Contamination Monitor

### Particle Sizing

>4, 6, 14, 21, 25, 38, 50, 70  $\mu\text{m}_{(c)}$

### 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

$\pm 1/2$  ISO code for 4, 6, 14  $\mu\text{m}_{(c)}$

$\pm 1$  code for 21, 25, 38, 50, 70  $\mu\text{m}_{(c)}$

### 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)  $\pm 3\%$

### Temperature Measurement

$\pm 3$  °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

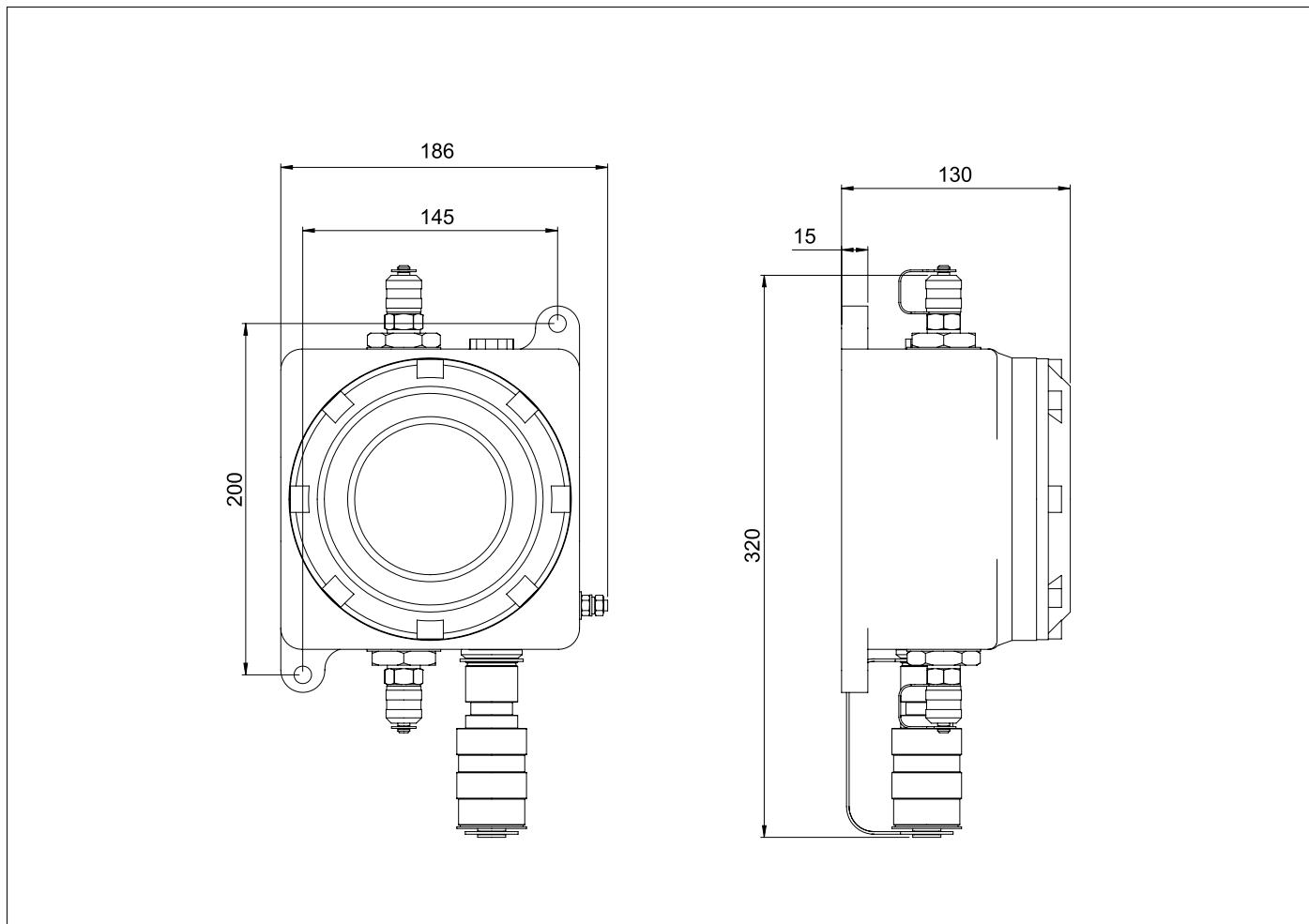
### ICM AZ2 cable wiring details

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**

## Dimensions



## Designation & Ordering code

### AUTOMATIC PARTICLE COUNTER AZ2

Configurations :

ICM	W	M	K	R	G1	AZ2	Moisture Sensor, Mineral / Petroleum based fluids, LCD Display, Relays, M16x2 test point connections
ICM	O	M	K	R	G1	AZ2	Mineral / Petroleum based fluids, LCD Display, Relays, M16x2 test point connections
ICM	O	N	K	R	G1	AZ2	Off shore / Water based fluids, LCD Display, Relays, M16x2 test point connections
ICM	O	S	K	R	G1	AZ2	Phosphate Ester and aggressive fluids, LCD output, Relays, M16x2 test point connections

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



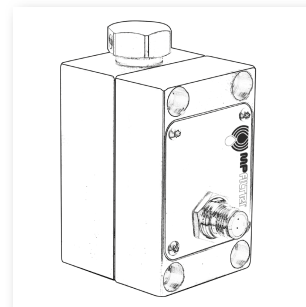
## Description

### Automatic Particle Counters

#### 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 M6x1.0x60 mm long fixing bolts
  - 2 x 6.50 ID x 1.5 CSD FKM o-ring seals
- 1 x Hard copy of calibration certificate



Right facing view



Front / Left facing view

## Technical data

### Technology

LED Based Light Extinction Automatic Optical Contamination Monitor

### Particle Sizing

>4, 6, 14  $\mu\text{m}_{(c)}$

### Analysis range

ISO 4406 Code 0 to 20

### Accuracy

$\pm 1/2$  ISO code for 4, 6, 14  $\mu\text{m}_{(c)}$  across the analysis range

### 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

200 ml/minute controlled by the built in flow control valve

### Viscosity range

Up to 1000 cSt

### Fluid temperature

Minimum: 0 °C

Maximum: +80 °C

### Ambient Temperature

Minimum: 0 °C

Maximum: +60 °C

### Pressure

Minimum: 25 bar / 362 psi

Maximum: 350 bar / 5075 psi

### Test time

Adjustable 10 - 3600 seconds

### Communication options

4-20 mA time multiplex as standard

### Environmental Protection

IP 65/67 versatile

### Weight / Dimensions

1.4 Kg, Height 70 mm, Depth 50 mm, Width 93 mm

### Supply Voltage

24VDC  $\pm 20\%$

### Power consumption

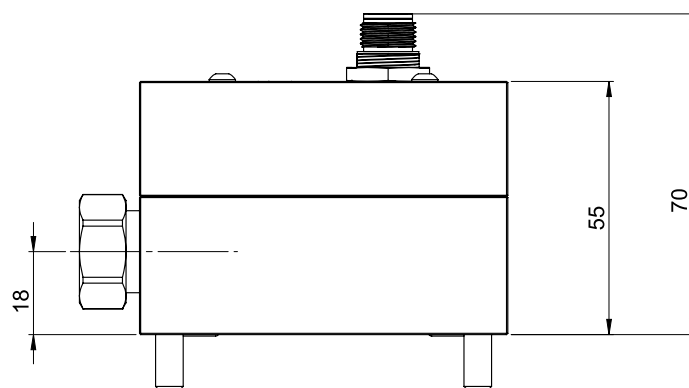
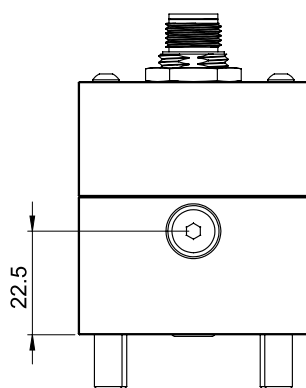
<2.2 W

### Cable

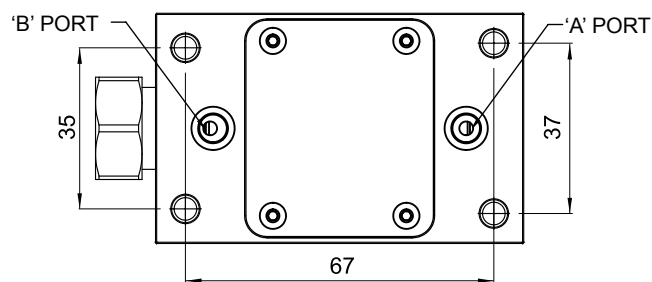
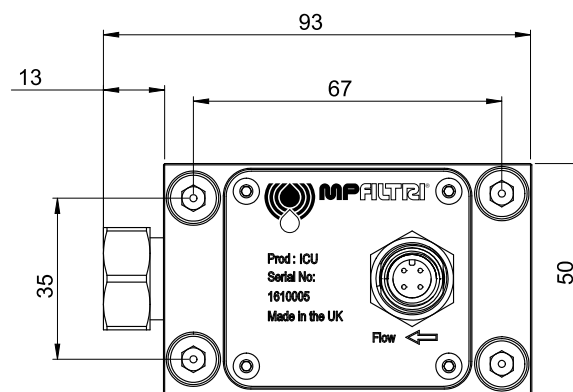
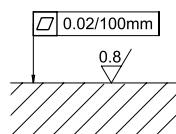
Electrical cable has to be ordered separately (optional accessory), MP Filtri item no. 13.061000 - ICU Cable M12 4 pin 1.5m long

ICU is supplied with a full software package and digital product information

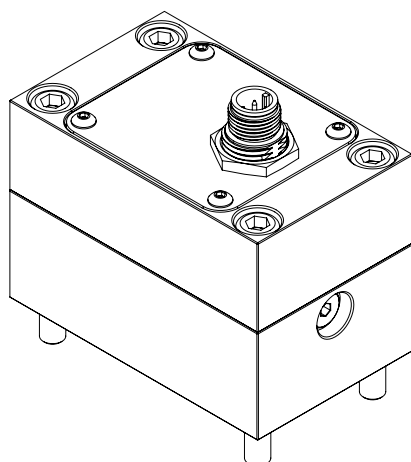
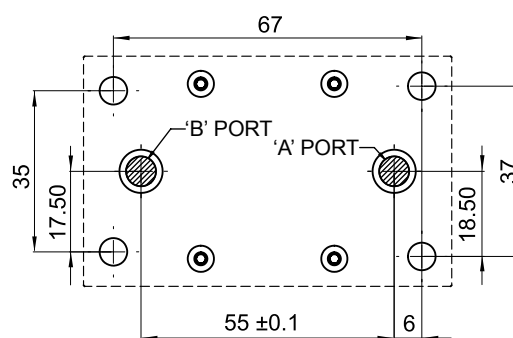
## Dimensions



REQUIRED SURFACE  
FINISH OF MATING PIECE



MOUNTING INTERFACE



**AUTOMATIC PARTICLE COUNTER ICU**

Configurations :

ICU	0	M	0	0	G5	P01	Without moisture sensor, Mineral oil, Without keypad/display, 4 to 20mA timed multiplex, Manifold mounted, Standard option
ICU	0	M	0	0	G5	Pxx	Customized version



# ACMU

Auxiliary Contamination Monitoring Unit





## Description

### Automatic Particle Counters

#### 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



Closed Cabinet version  
Front/Right facing view



Open Cabinet version  
Front facing view



Plate version  
Front facing view

#### 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 91

#### 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

[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

### 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 186 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

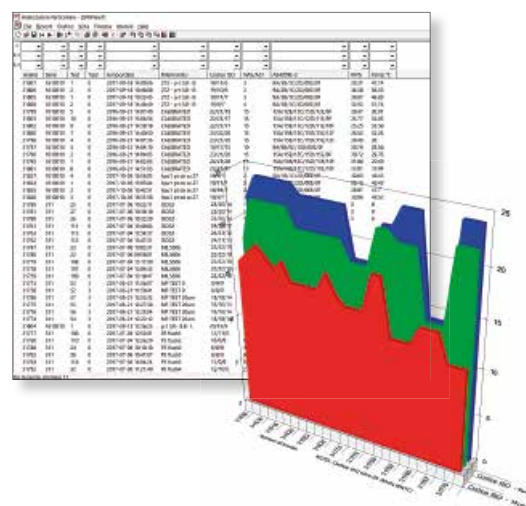
**ACMU is supplied with a full software package and digital product information**

# ACMU GENERAL INFORMATION

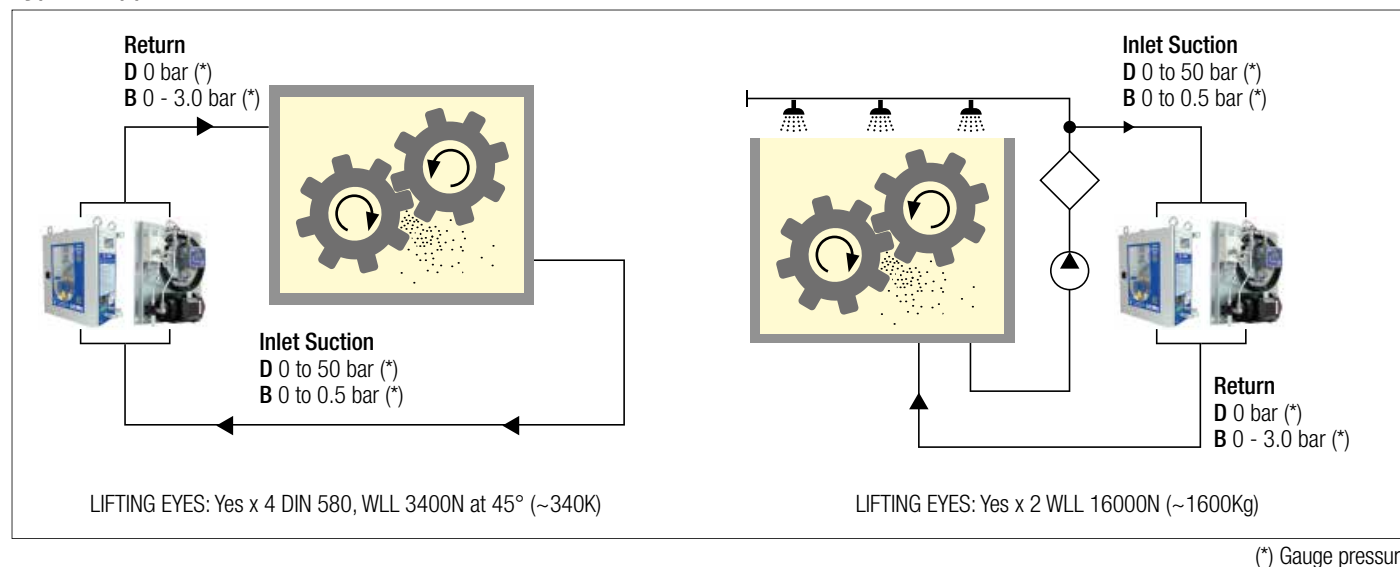
## LPA View Software

The LPA View software is used with the LPA3, LPA2, CML2 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



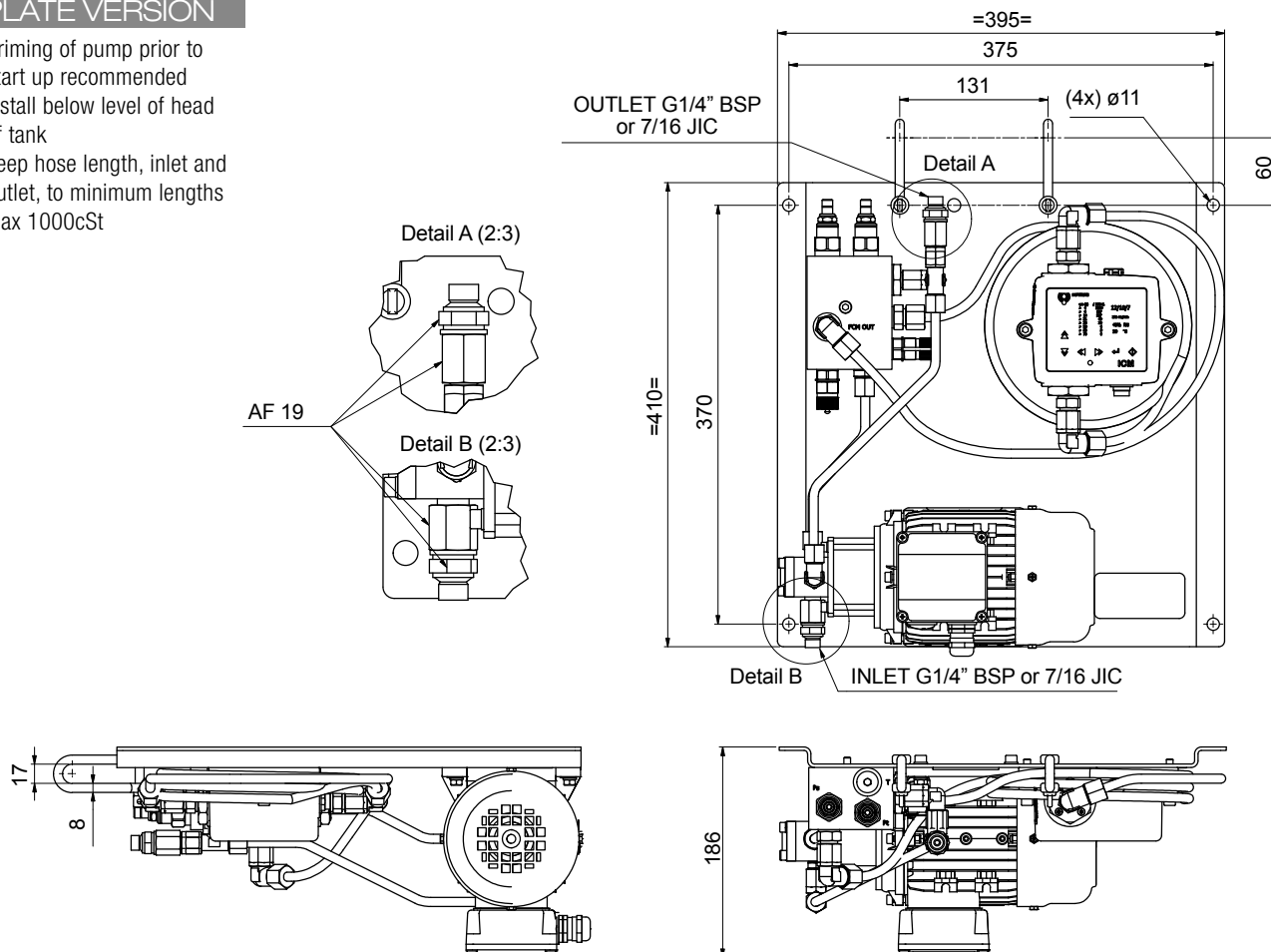
## Designation & Ordering code

### AUTOMATIC PARTICLE COUNTER ACMU

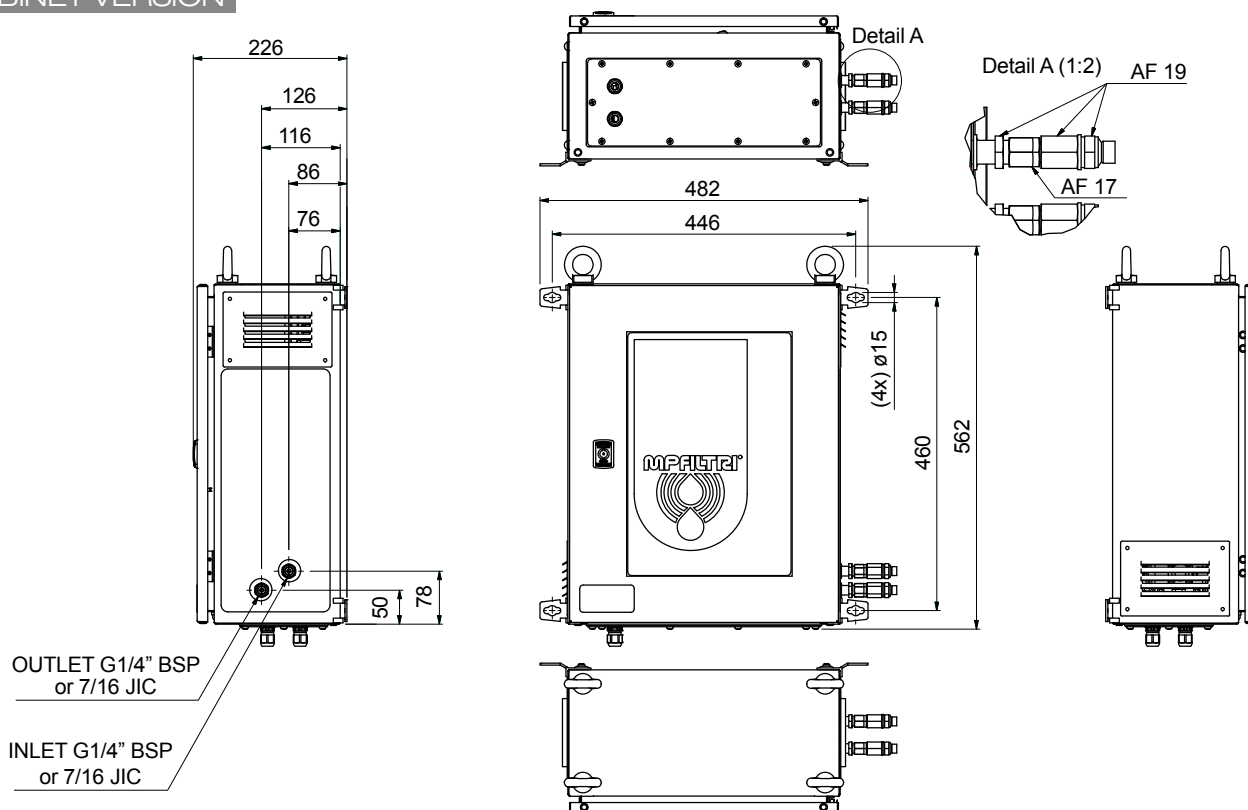
Series	Configuration example:	ACMU	W	D	C	S	230V
<b>ACMU</b>							
<b>Moisture Sensor (RH%)</b>							
<b>O</b>	Without moisture and temperature sensor						
<b>W</b>	With moisture and temperature sensor						
<b>Pressure Sensor</b>							
<b>D</b>	Up to 50 bar inlet (gauge pressure), atmosphere outlet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

### PLATE VERSION

- 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



### CABINET VERSION





# BS110 & BS500

Bottle Samplers - For use with MP Filtri's portable APC



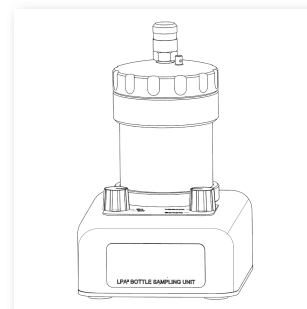
## Description

### Automatic Particle Counters

#### 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 91



Left facing view



Front facing view



Open case  
Front facing view



## 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

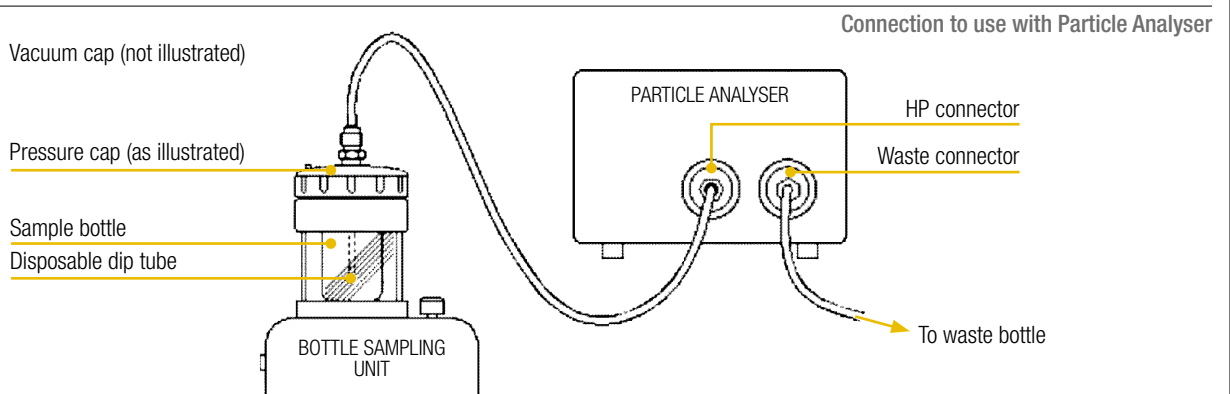
24W

### Warranty

12 months

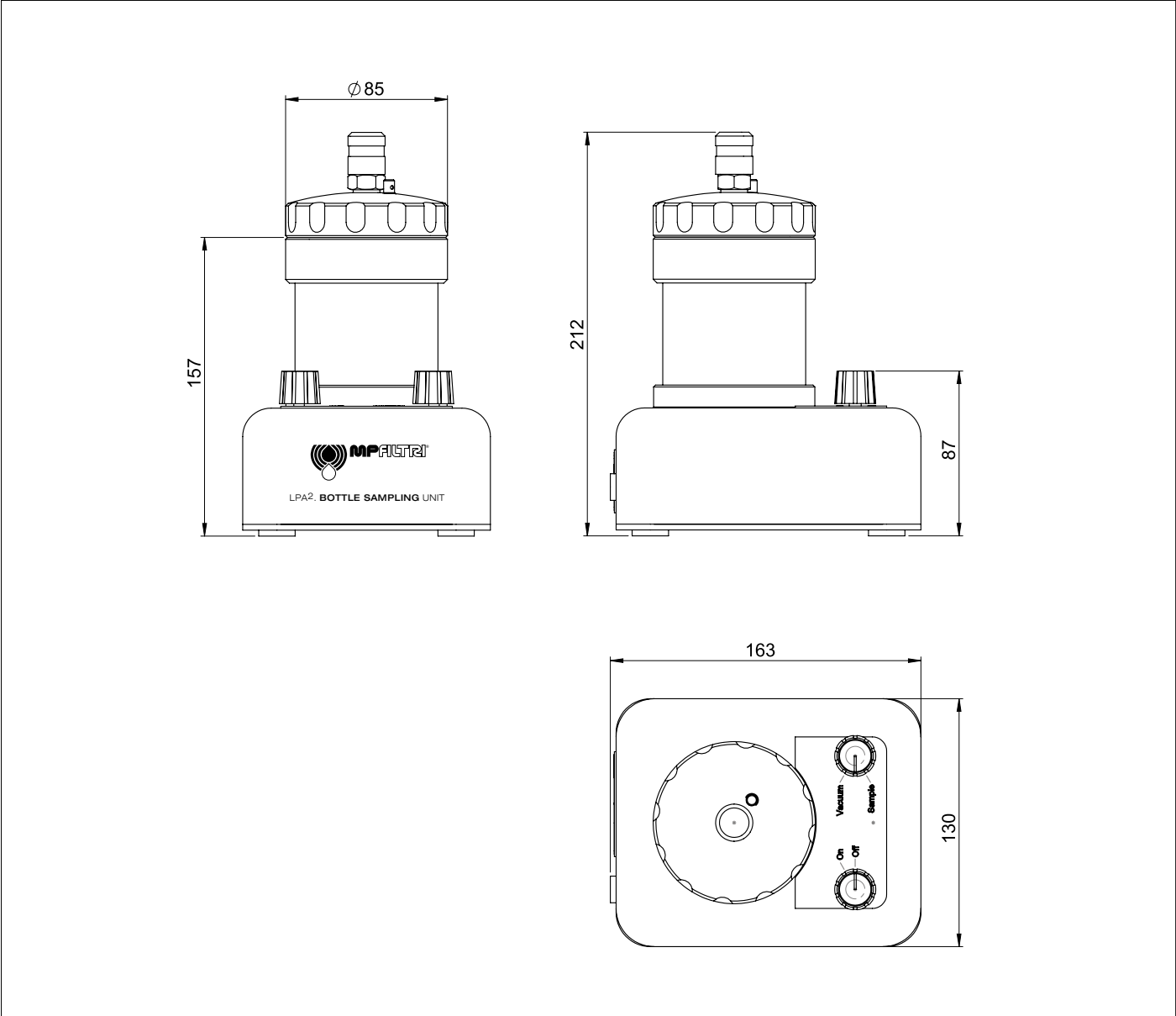
### Installation

Indoor Use / Laboratory Use



# BS110 Bottle Samplers

## Dimensions



## Designation & Ordering code

BOTTLE SAMPLER BS110				
Series	Configuration example: BS110			
BS110 110 ml fluid volume	M	0	0	
Fluid compatibility				
M Mineral oil and synthetic fluids				
Pressure rating				
0 2.0 bar				
Pressure cylinder option				
0 Acrylic cylinder assembly				



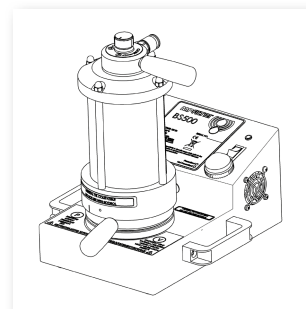
## Description

### Automatic Particle Counters

#### Bottle Samplers

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 91



Front / Left facing view



Front / Right facing view



Back / Right facing view



Back / Left facing view

## Technical data

### Max. Chamber Pressure

2.5 bar / 36.3 psi (standard), 4.5 bar / 65.3 psi (high pressure)

### 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, 5 amp

### Wetted Parts (Internal)

Aluminium 6082 T6, 303 Stainless Steel, 316 Stainless Steel.  
Seal & Cylinder material optional

### 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

Yes

### Weight / Dimensions

9 kg, Height 333 mm, Depth 341 mm, Width 264 mm

### Pressure Gauge

Yes (only on 4.5 bar / 65.3 psi version)

### Pressure Ranges

4.5 bar / 65.3 psi or 2.5 bar / 36.3 psi options

### IP Rating

IP50

### Fluid Compatibility / Corrosion Resistance

Industrial, aerospace & off-shore control 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

Not greater than 400cSt (on 2.5 bar version)

### Min. Viscosity

1 cSt

### Max outlet pressure

Version dependant: 2.5 bar / 36.3 psi for O version  
4.5 bar / 65.3 psi for H version

### Min. Continuous Ambient Temperature

10°C / 50°F

### Max. Continuous Ambient Temperature

55°C / 131°F

### Power Consumption

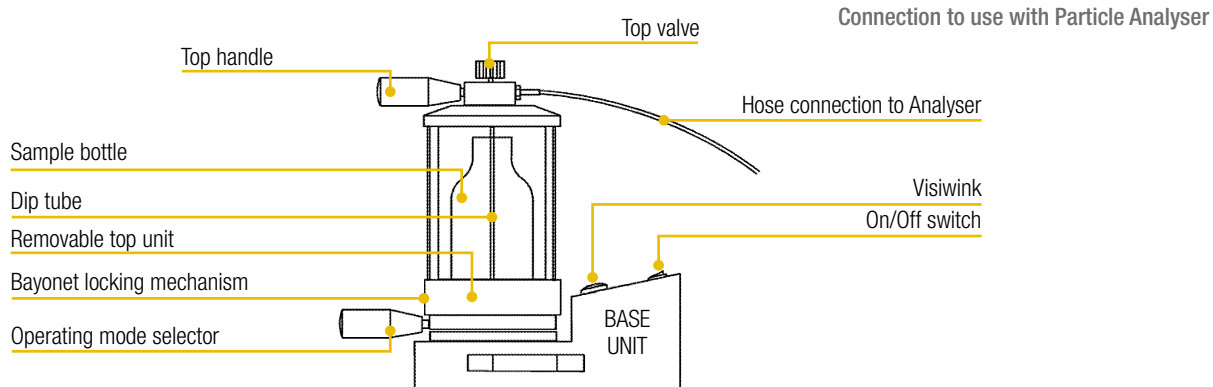
60W

### Warranty

12 months

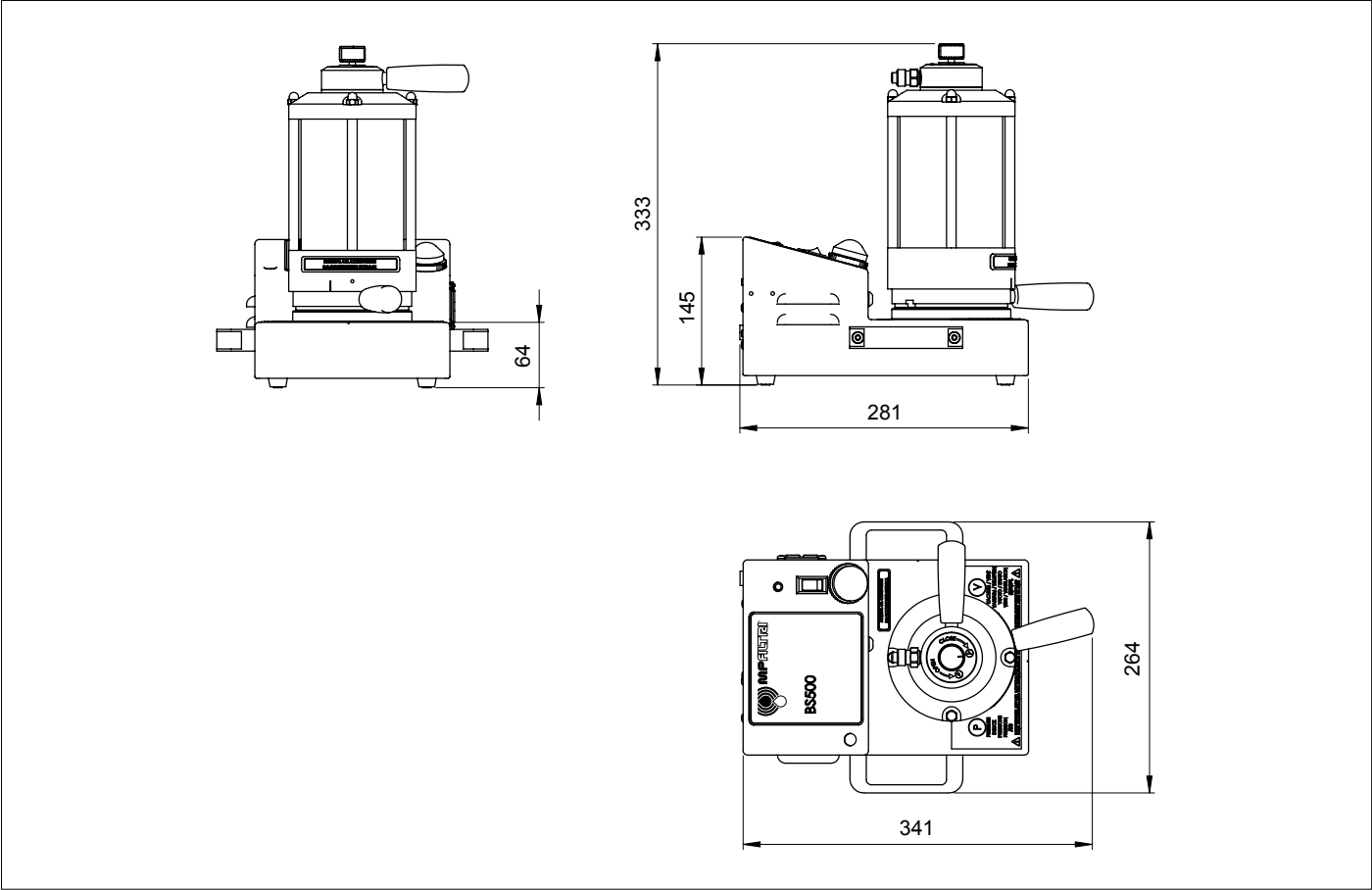
### Installation

Indoor Use / Laboratory Use



# BS500 Bottle Samplers

## Dimensions



## Designation & Ordering code

BOTTLE SAMPLER BS500					
Series		Configuration example: BS500			
BS500 500 ml fluid volume		V	0	0	UK
Fluid compatibility					
V	Mineral oil and synthetic fluids, Subsea and water based fluids				
E	Phosphate ester and aggressive fluids				
S	Phosphate ester and aggressive fluids, Mineral oil and synthetic fluids, Subsea and water based fluids				
Pressure rating					
0	2.0 bar, standard option				
H	4.0 bar, high pressure option (*)				
Pressure cylinder option					
0	Acrylic cylinder assembly				
S	Glass cylinder assembly (**)				
Power adapter options					
UK	UK power adapter				
EU	European power adapter				
US	USA power adapter				
AU/CN	Australasia power adapter				

(\*) = H version only available in BS500 V version  
(\*\*) = Glass version only available in BS500 E & S version





# HOW SAMPLING

## Bottles



**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



**100 µm**  
Dust particle  
(dead skin)



**40 µm**  
Pollen



**24 µm**  
White blood cell



**10 µm**  
Dust mite faeces



**8 µm**  
Red blood cell



**3 µm**  
E-coli bacteria

# HOW SAMPLING

## Sample pumps

### Hand pump



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.

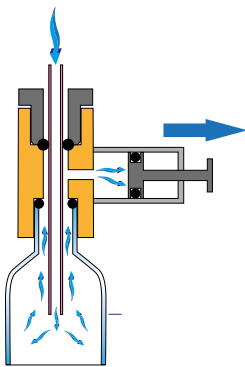
Ultra clean bottles cleanliness verified to ISO 3722.

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

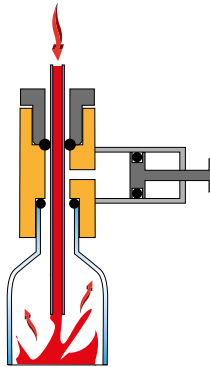
The pump and its associated parts are also available as a spares. See spares list page 88-89

Descriptions	Part Code	Dimensions (mm)
100 ml - Ultra Clean Bottle (Certified)	P.02	Ø 50x92
100 ml - Standard Bottle Brown Glass	BS0016	Ø 50x91
100 ml - Clear Plastic Bottle	7.111	Ø 51x92
100 ml - Standard Bottle Tray (72 bottles)	BS0072	N/A
210 ml - Ultra Clean Bottle (Certified)	P.03	Ø 65x130
210 ml - Standard Bottle	8.054	Ø 65x122
500 ml - Standard Bottle	8.328	Ø 82x152

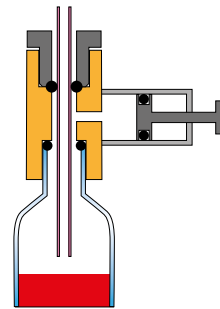
### How it works



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



## Description

### Automatic Particle Counters

#### High-resolution microscopic visual analysis of contamination in fluids

### > Features & Benefits

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.

#### KEY FEATURES

- 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 87

See Accessories at page 91

#### PRINCIPAL COMPONENTS TECHNICAL DATA

##### Microscope:

- Digital microscope that connects direct to PC/laptop
- Fully rotatable monocular head for easy shared use, perfect for laboratories and one-on-one instruction
- Available magnification settings of 40X, 100X and 400X
- A dual-illumination system allows examination of both transparent and solid specimens while cool LED lights protect eyesight
- Sleek design with metal carrying handle and base combine with cordless capability to make this microscope practical for field experiments
- The digital microscope allows operators to examine and easily determine the nature and sizes of solid particles inside the fluid.

#### PARTICLES QUANTITATIVE ANALYSIS

After determination of the nature (and sizes) of particles inside the fluid, it is useful to quantify the contamination inside system.

Determination of quantitative contamination is done by taking fluid sample from the system (preferably in working conditions) and following the sample fluid analysis with an automated particle counter or with a portable particle counter that is linked directly to the system.

They give immediate results according to standard ISO 4406 or NAS 1638. Both particle counters, portable or not, have values and counter indications. Please note the portable particle counters need a minimum pressure to work correctly. They produce immediate results.

(\*) 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

### PIK - PATCH IMAGING KIT

Product	Configuration example:	PIK	P01
<b>PIK</b> Patch Imaging Kit			
Pump and Electric supply options			
<b>P01</b> Hand pump only			
<b>P02</b> Electric Vacuum Pump - UK supply			
<b>P03</b> Electric Vacuum Pump - EU supply			
<b>P04</b> Electric Vacuum Pump - US supply			
<b>P05</b> Electric Vacuum Pump - AUS/CN supply			





# FLUID COMPATIBILITY CHARTS

## HYDROCARBON AND SYNTHETIC

Fluid type	Fluid spec.	ICM				LPA				CML				BS110		BS500		
		M	(W)	N	S	M	(W)	N	S	M	(W)	N	S	M	V	E	S	
SYNTHETIC OR MINERAL BASED LIQUIDS	AEROSHELL FLUID 31 (OX-19)																	
	AEROSHELL FLUID 51																	
	AEROSHELL FLUID 602																	
	CASTROL CONSTAB PS 10W-40																	
	DIESEL CALIBRATION OIL 4113																	
	FINA POLYGLYCOL FLUID																	
	GEAROIL ISO VG 320																	
	ISO 32																	
	ISO 46																	
	ISO 68																	
	MIL-H-5606																	
	MIL-H-83282																	
	MIL-H-87257																	
	MOBILGEAR SHC XMP 320																	
	NATO H-515 (OM-15)																	
	NATO H-520 (OM-18)																	
	NATO H-537																	
	RENOLIN PG 68																	
	RENOLIN PG 100																	
	RENOLIN PG 150																	
	RENOLIN PG 220																	
	RENOLIN PG 320																	
	RENOLIN PG 460																	
	RENOLIN PG 680																	
	RENOLIN PG 1000																	
	RENOLIN UNISYN OL 32																	
	RENOLIN UNISYN OL 46																	
	RENOLIN UNISYN OL 68																	
	RENOLIN UNISYN OL 100																	
	RENOLIN UNISYN OL 150																	
	STATOIL HYDRAULIC 131																	
	AERO HF585B																	
	MOBIL DTE 25																	

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.

■ Compatible  
■ Not compatible  
■ Contact MP Filtri

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.

# FLUID COMPATIBILITY CHARTS

## OFFSHORE

Fluid type	Fluid spec.	ICM				LPA				CML				BS110		BS500		
OFFSHORE & SELECTED WATER BASED FLUIDS		M	(W)	N	S	M	(W)	N	S	M	(W)	N	S	M	V	E	S	
	HW443																	
	HW443R																	
	HW453																	
	HW540																	
	HW540																	
	PELAGIC 50																	
	PELAGIC 100																	
	TRANSAQUA HT																	
	TRANSAQUA HT2																	
	FRESH WATER																	
	DE-IONISED WATER																	
	SEAWATER																	
	HOUGHTO-SAFE 273 CTF																	
	HOUGHTO-SAFE BC24046																	
	WATER GLYCOL HFC 46																	
	LF2100 (99%WATER, 1% MIX)																	
SV3																		

## AGGRESSIVE FLUIDS

Fluid type	Fluid spec.	ICM				LPA				CML				BS110	BS500		
PHOSPHATE ESTHER & AGGRESSIVE LIQUID APPLICATIONS		M	(W)	N	S	M	(W)	N	S	M	(W)	N	S	M	V	E	S
	HYJET IV																
	HYJET V																
	SKYDROL 500B																
	SKYDROL 500B4																
	SKYDROL LD4																

■ 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.

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

# FLUID COMPATIBILITY CHARTS

## FUELS

Fluid type	Fluid spec.	ICM				LPA				CML				BS110	BS500		
FUELS		M	(W)	N	S	M	(W)	N	S	M	(W)	N	S	M	V	E	S
	JET A-1																
	JET A																
	JET B																
	JP1																
	JP5																
	JP6																
	JP7																
	JP8																
	JPTS																
	FT JET FUEL																
	GTL JET FUEL BLEND																
	DIESELS																

## BIO FLUIDS

Fluid type	Fluid spec.	ICM				LPA				CML				BS110	BS500		
BIODEGRADEABLE FLUIDS & VEGETABLE OILS		M	(W)	N	S	M	(W)	N	S	M	(W)	N	S	M	V	E	S
	BIO-ETHANOL																
	BIO-DIESEL																
	PLANTOHYD N SERIES																
	PANOLIN HLP SYNTH 22																
	SUNFLOWER OIL																
	RAPESEED OIL																
	CORN OIL																
	GROUND NUT OIL																
	CAT BIO HYDO HEES																

■ 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 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

Description	Ordering Code	LPA2	LPA3	CML2	ICM 4.0	ICM 2.0	AZ2	ACMU	PIK	BS110	BS500
Calibration Verification Fluid	PCCF		●	●						●	●
Thermal printer paper for LPA3	63.083000		●								
12V, 2A Power Adapter - UK	6.209	●		●						●	
Power Adapter for LPA3	61.034000		●								
<i>M16x2 microbore pressure hose Plated steel (mineral/synthetic fluid):</i>											
600 mm	95.Y30Y30X261060		●	●	●	●				●	●
1500 mm	95.Y30Y30X261150		●	●	●	●					
<i>M16x2 microbore pressure hose Stainless steel, for use with offshore fluids (N version of CMP units):</i>											
600 mm	95.Y30Y30X161060		●	●						●	●
1500 mm	95.Y30Y30X161150		●	●	●	●					
<i>Waste Hose:</i>											
Series 30 Waste Hose	SK0014S30		●	●							
2m - Stainless Steel, for use with offshore fluids (N version of CMP units)	SK0014S30N		●	●							
2m - Perfluorelastomer seals, for use with Phosphate Esters (S version of CMP units)	SK0014S30S	●	●	●							
Pouch for pressure hose/waste hose	7.106000		●	●					●		
<i>M16x2 microbore pressure hose extension kit:</i>											
5000 mm	SK0500		●	●	●	●					
10000 mm	SK0100		●	●	●	●					
Coarse Screen Filter	SK0040		●	●	●	●					
<i>Waste Bottle:</i>											
1 Litre - Round	SK0012		●	●							
1 Litre - Square (for use with CB0001)	SK0013			●							
Serial cable to USB converter	SK0026	●		●							
PC Download cable	6.123	●		●							
USB A-B cable	13.055001		●								
USB Data stick	11.081								●		
USB stick with all user guides and LPA-View Software	13.055001		●	●	●	●				●	●
Airbus adaptor with test point	SKAA02	●									
Thermal paper roll	6.160	●									
In line coarse filter assembly for aerospace phosphate esters	SK0041	●									
Aviation Edition travel case without foam	TC0005	●									
Replacement foam insert for TC0005	6.300	●									

# SPARE PARTS LIST

Description	Ordering Code	LPA2	LPA3	CML2	ICM 4.0	ICM 2.0	AZ2	ACMU	PIK	BS110	BS500
Disposable Dip tubes - pack of 50	BS0018									●	
Hand Pump	BS0020								●	●	
Hand Pump Hose- 1000 mm	BS0022									●	
Bottle Sampler hand pump and hose kit	BS0024									●	
Black support case (without contents)	BS0040									●	
Heavy Duty Travel Case for Bottle Sampler	TC00055B										●
100 ml Standard Brown Glass Bottle	BS0016									●	
Tray of 72 x 100 ml Standard Brown Glass Bottles	BS0072									●	
100 ml Clear Plastic Bottle	7.111									●	
Box of 20 x 100 ml Clear Plastic Bottles	7.112									●	
200 ml Standard Clear Glass Bottle	8.054										●
Box of 20 x 200 ml Standard Clear Glass Bottles	8.054-20										●
500 ml Standard Clear Glass Bottle	8.328										●
<i>Ultra-clean Clear Glass bottles Cleaned in accordance with DIN/ISO 5584 and verified to ISO3722:</i>											
100 ml	P.02								●	●	
Pack of 25 x 100 ml	P.0225									●	
200 ml	P.03										●
Pack of 20 x 200	P.0320										●
Power Adapter for 500 ml Bottle Sampler	8.029										●
UK Lead for 8.029	8.031		●								●
EU Lead for 8.029	8.032		●								●
US Lead for 8.029	8.030		●								●
CN/AUS Lead for 8.029	8.072		●								●
Heavy-duty orange pelicase	443.061E20								●		
Pellicase foam insert	443.062020								●		
Self-adhesive patch test covers	444.029001								●		
Patch test membranes -1.2 micron filter	444.010000								●		
Spray bottle	444.018J10								●		
Stainless steel tweezers	444.011120								●		
Waste bottle	444.032J00								●		
Reuseable Nalgene filter assembly	444.024000								●		
0.01mm Calibration slides	444.025000								●		
Microscope power adaptor	444.033000								●		
Hose - 8 x 6mm Nalgene vacuum cable	444.026000								●		
Hose - 6 x 4mm Hand pump sampling cable	7.107								●		
Microscope camera - 1.3MP	444.016010								●		
Serial plate for patch imaging kit	484.314000								●		
A5 document wallet	444.027001								●		
Patch test report card	444.028001								●		
Electric vacuum pump	444.009000								●		



# Accessories

RDU 2.0



ICM-USBi  
ICM-ETHi



ICM-FC1



SK0040



FLUID SAMPLING BOTTLES



PRESSURE & WASTE HOSES



444.009000



## Description

### 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

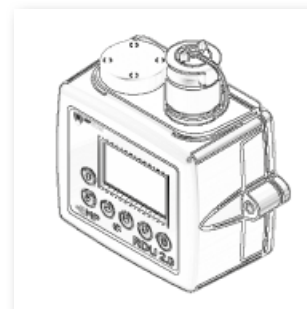
- 1 x ICMRDU2.0
- 1 x 10m Twisted Pair Cable Assembly
- 1 x Digital copy of user guides/software/drivers

### 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



Left facing view



Right facing view

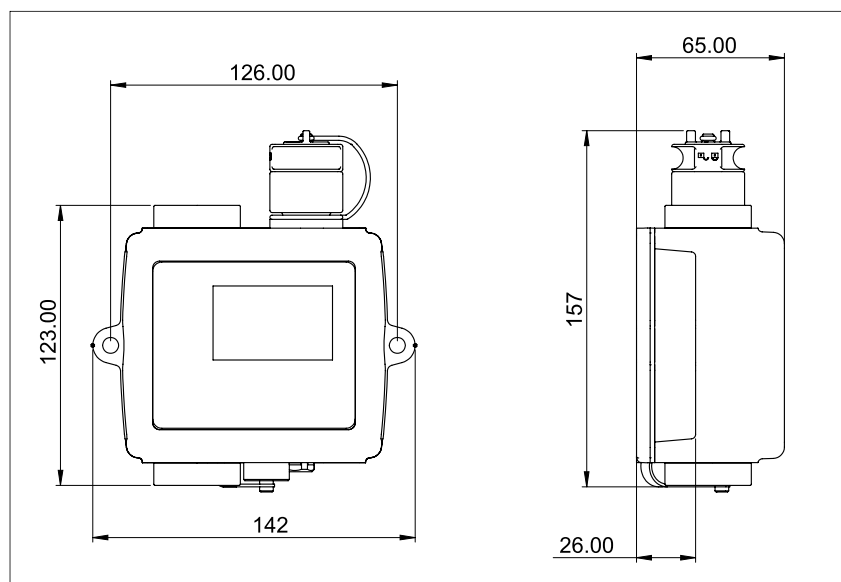


Top view with USB port



Bottom view

## Dimensions



## Designation & Ordering code

### RDU 2.0

Configuration:




Description

**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.

**Used with PIK**



Designation & Ordering code

Configuration:

444.009000

444.009000

ICM-FC1

Description

**Flow Control Valve**

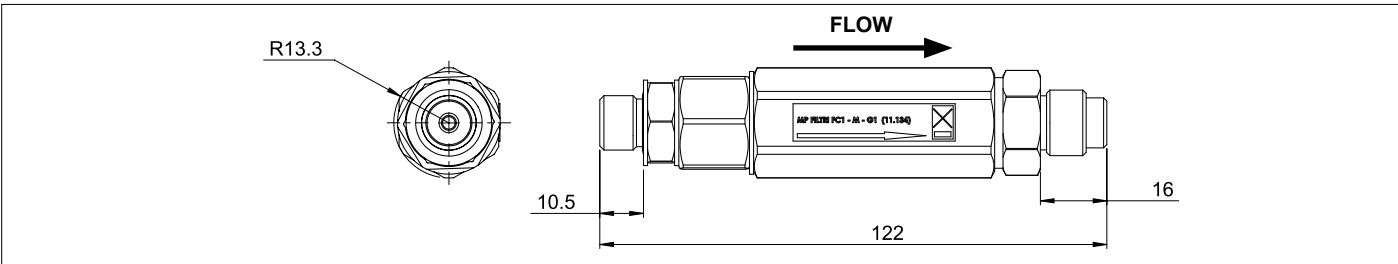
The FC1 is a pressure compensated flow control valve which can operate across a range of fluid types and is compatible with the ICM where flow rate exceeds operating parameters. Max pressure rating 400 bar at normal hydraulic system temperatures.

> **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

**ICM-FC1**

Series	Configuration example:		
<b>ICM-FC1</b>	<b>ICM-FC1</b>	<b>M</b>	<b>G1</b>
Fluid compatibility			
<b>M</b> Mineral oil			
<b>N</b> Offshore fluids			
<b>S</b> Phosphate ester			
Connections			
<b>G1</b> ICM complete with M16x2 pressure test point connections fitted			
<b>G3</b> 1/4" BSP - Female port			
<b>G4</b> 7/16" UNF - Female port			

## Description

### 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.



ICM-USBi



ICM-ETHi

### > 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.

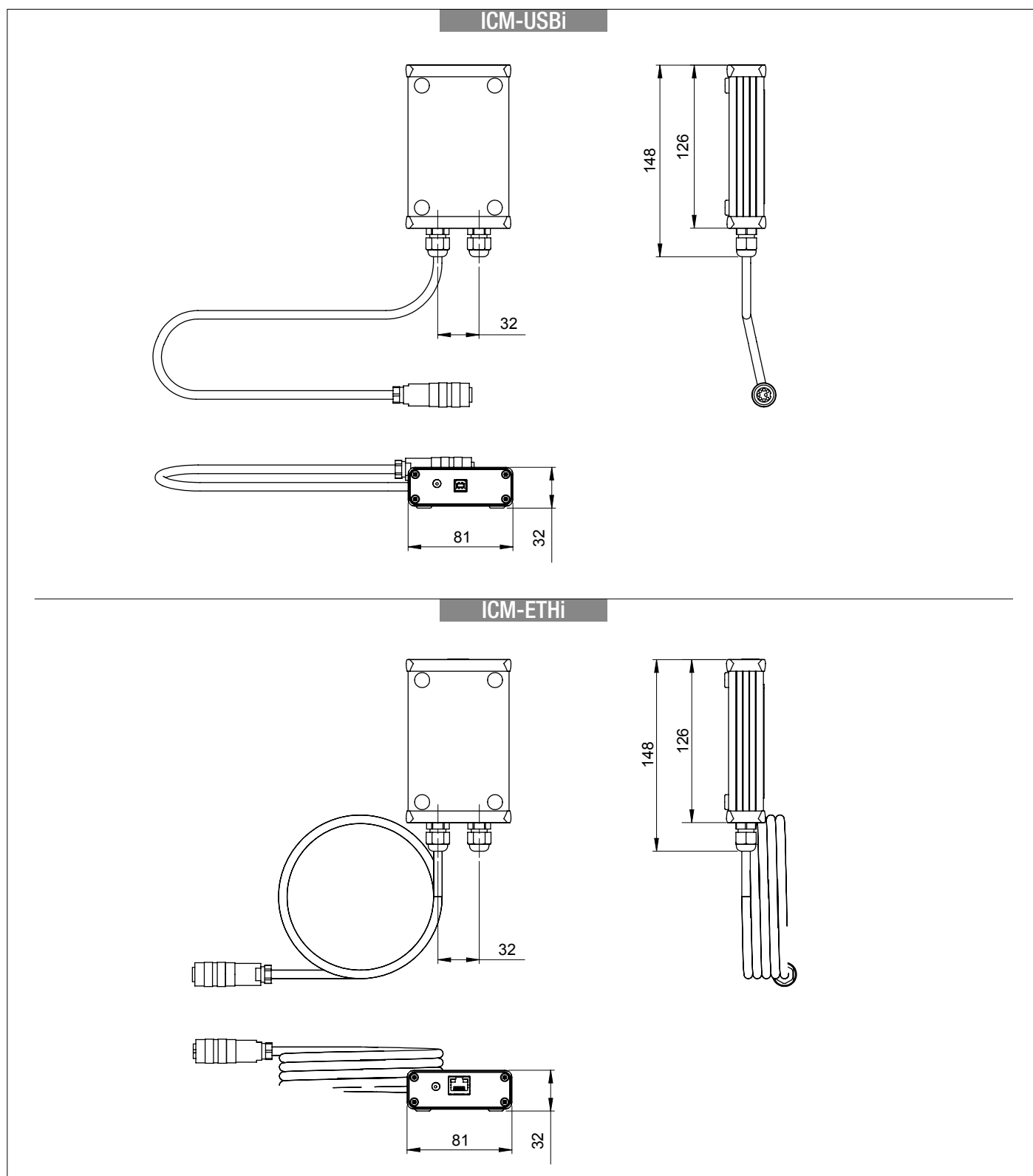
ICM-USBi



ICM-ETHi



## Dimensions



## Designation &amp; Ordering code

## ICM-USBi &amp; ICM-ETHi

Configuration:

ICM	USBi
ICM	ETHi

## Description

**Screen Filter**

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).

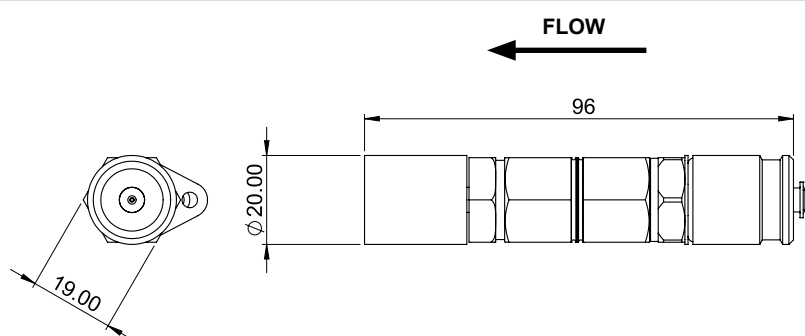
**> Features & Benefits**

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

Used with LPA3, LPA2, CML2 and ICM2.0



## Dimensions



## Designation &amp; Ordering code

**SK0040**Configuration: **SK0040**

## Description

## &gt; Features &amp; 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 &amp; Ordering code

BS110 - BS500

For Ordering Codes see page 88-89

## PRESSURE &amp; WASTE HOSES

## Description

## &gt; Features &amp; 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.

- LPA3
- LPA2
- CML2
- BS110 - BS500
- ICM 2.0

**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

- LPA3
- LPA2
- CML2



## Designation &amp; Ordering code

HOSES

For Ordering Codes see page 88-89

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**PASSION TO PERFORM**



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