TWIN LASER PARTICLE COUNTERS

• Online and inline options available.
• Complete range of test options.
• Automatic on-line continuous test facility.
• Variable time & test programmes.
• Remote operating capability.

• Phosphate ester compatible product available.
• Optional bottle sampling package.
• Windows® based software package included.
The experience of designers and users of hydraulic and lubrication systems is that 75% of system failures are as a direct result of contamination. Knowing the cleanliness level of the fluid is the basis for contamination control.

**Exclusive MP Filtri technology.**

The combination of the two lasers with the unique optics and photodiode package enables the LPA2 & PML2 to give ultra accuracy combined with excellent repeatability.

**Laser 1**

A single point high accuracy laser measures particles of contamination at $4\mu m$ and $6\mu m$ giving ultra accuracy with excellent repeatability.

**Laser 2**

Standard accuracy laser specifically designed for system contaminants between $6\mu m$ and $68\mu m$.

The LPA2 gives accurate results of the amounts and sizes of contaminants - instant results. LPA2 is calibrated with ISO Medium Test Dust (MTD) based on ISO 11171:1999 calibration standard.

The new MTD has a certified distribution standard verified by NIST (National Institute of Standard and Technology), USA. The LPA2 is designed to meet the new ISO 4406 cleanliness classification code which is a 3-part code, $4\mu m$, $6\mu m$ and $14\mu m$.

The LPA2 also provides results in the NAS 1638 code.
A unique high accuracy, fully portable product. For users of hydraulic, lubrication and transmission systems.

The LPA2 is a highly accurate, portable laser particle analyser that counts and sizes particles of solid contaminants in fluid power systems - on-line to 400 bar, typical test times from 1 minute.
Features

• **The LPA2 is a single case, lightweight product.**
  The LPA2 is a robust and rugged, fully portable user friendly instrument, particularly useful in field applications where “ease of use” is fundamental.

• **External alarm socket.**
  A plug in adaptor (supplied) which allows an external alarm/indicator to be attached.

• **Language options as standard.**
  The LPA2 offers 4 language options as standard (English, Italian, French & German).

• **Monitor + keyboard**
  The LPA2 features a large LCD screen with a full size QWERTY keyboard, displaying both ISO 4406, NAS 1638 and SAE 4059 code results.

• **On-line Testing to 400 bar pressure.**

• **Phosphate ester compatible products available.**

• **Thermal printer + RS 232.**
  The LPA2 provides a complete printout of results, reporting either in ISO, NAS and SAE codes. These results can be downloaded by RS 232 computer connection.

• **Power (100 + test).**
  The LPA2 incorporates a large capacity rechargeable battery, which can be recharged with 12/24 volt power supply. The LPA2 will perform in excess of 100 tests before recharging is required.

• **Data storage 600 test.**

• **Minimess connections.**
  The LPA2 uses standard minimess connections (M16 x 2) to the hydraulic system.

• **Electrically operated flush valve.**
  The LPA2 features an inbuilt flush valve to ensure that each test is a representative sample of the fluid, and that no cross-contamination between tests occurs. With the LPA2 in the continuous mode the flushing cycle is programmed to commence prior to the test, providing an in-line system test condition.
• Technology. The LPA2 uses a revolutionary design
The patented fluid handling concept enables it to be use on hydraulic systems up to 400 bar working pressure, however the product has a single action constant low pressure pumping unit to ensure that steady state flow is achieved for every test.
The LPA2 & PML2 is calibrated with ISO MTD based on ISO 11171.
The correlation between particle sizes of ACFTD (old standard) to ISO MTD (new standard) is as follows:

<table>
<thead>
<tr>
<th>ACFTD (old standard)</th>
<th>ISO MTD (new standard)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>25</td>
<td>21</td>
</tr>
<tr>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>50*</td>
<td>38</td>
</tr>
<tr>
<td>75*</td>
<td>50</td>
</tr>
<tr>
<td>100*</td>
<td>68</td>
</tr>
</tbody>
</table>

* Yet to be confirmed by NIST.

• The LPA2 incorporates various test options.
• **ON-LINE (to 400 bar)**
  1 - **Short test**
  Test result in 1.5 min., total test time 2.5 min.
  2 - **Normal**
  Test result in 2.5 min., total test time 4.5 min.
  3 - **Dynamic**
  3 test with result average, total test time 9.5 min.
  4 - **Continuous**
  User definable test times and target cleanliness, results can be set in accordance with requirements. Shortest continuous test time 5 min.
  5 - An electrical plug socket is provided for external alarm signal applications.

• **BOTTLE SAMPLING**
  3 test and results average, test results 4½ min.

• Hard copy results.

1 **Online-normal**
Single test result.
ISO 4406 code.

2 **Online-dynamic**
Three test & result average.
NAS 1638 code.

3 **Online-dynamic**
Three Test & Result Average.
ISO 4406 code.
Features

• Remote operation.
  By RS 485 interface, please contact MP Filtri for full details.

• Accreditation.
  The LPA2 is CE marked and supplied with an EMS acceptance certificate.

• Maximum protection against environmental hazards...
  The LPA2 case has a special extrusion to take an environmentally sealed mounting panel providing protection against dust and moisture thus allowing safe operation in the field.

• Carry Bag accessory.
  A strong lightweight carry bag is available which allows the LPA2 with accessories to be carried easily on-site.

• Optional screen filter.
  Recommended for heavily contaminated systems.

• Bottle Sample Kit Contents:
  • Case
  • Bottle sampler unit
  • Power Supply
  • Vacuum Cap
  • Sampling Hose 400mm
  • Pressure Hose 1500mm
  • Samples Bottles x 3
  • Disposable Tubes x 50
  • Hand Pump and Hose x 10 metre
  • Waste Bottle and Hose x 2 metre
  • Printer paper x 2 Rolls
  • Test point Adaptor

• Standard Sampling Kit Contents:
  • Case
  • Pressure Hose 1500 mm
  • Power Adaptor
  • Waste Bottle and Hose x 2 metre
  • Printer paper x 2 Rolls
  • Test point Adaptor
Bottle sampling 110 ml and 250 ml options

110 ml standard bottle sampler unit incorporates de-aeration facility. Suitable for mineral oil applications only.

250 ml laboratory bottle sampler unit incorporates de-aeration facility. Suitable for both mineral oil and phosphate ester applications.

A highly aerated fluid may lead to inaccurate result when analysed, therefore a de-aeration facility has been incorporated into the bottle sampling units. By evacuating the sampling chamber aeration within the fluid is removed and the fluid is conditioned prior to sampling. Any entrained or free air in the oil media at time of bottle sampling may be shown as part of the particle count. This would lead to inaccuracies of the cleanliness results. As air can be seen as a contaminant. An example of the difference between an aerated sample and a non aerated sample can be seen in this picture.

It is essential that only sample bottles which have been cleaned to ISO 3722 standard are used. Modern hydraulic systems featuring highly effective filters have fluid cleanliness levels that approach that of the sample bottle itself. The use of uncleaned bottle can greatly increase the particle counts. (Please note sterilisation kills bacteria but does not remove particles). Perhaps of even greater concern is the variability in their levels of cleanliness. A sudden increase in contamination could be caused by the sample bottle. This apparent increase could instigate unnecessary corrective action.

Information taken from BFPA/P5 paragraph 7.6.2 Sample bottles.

MP Filtri UK can supply laboratory standard sample bottles, Part No.: P. 02. These have been cleaned in accordance with DIN/ISO 5884.

The degree of cleanliness has been verified to ISO 3722 with a NAS 1638 cleanliness certification of between Class 00 and Class 0.
PML2 Series 30

• **In-line particle counter Series 30.**
  The permanent in-line twin laser particle counter is designed for all hydraulic applications, where continuous monitoring is essential. The PML2 incorporates the LPA2 technology and is designed to work continuously and automatically in most hydraulic industries and applications:

• **PML2 Features**
  - Cast aluminium powdered coated case
  - Continuous self diagnostics
  - Standard RS 232
  - Eight channel analysis
  - ISO 4406, NAS 1638, SAE 4059
  - Test time flexibility
  - Operation by laptop or specified customers protocol
  - Permanently installed
• **Software.**

Full system trend analysis is available within the accompanying Windows® based software package.

- CD and interface supplied with LPA & PML for downloading of data to PC.
- Data can be exported to other windows based programmes.
- Long term service records and trend analysis can be monitored.
- Quick and simple filter-keys for easy-to-read selected data.
- Comprehensive contamination analysis report generator.
- Comparison graphs for selected cleanliness codes reference and actual readings taken.
- Other protocols available on request.
### How to order

<table>
<thead>
<tr>
<th>Product</th>
<th>LPA2</th>
<th>M</th>
<th>S</th>
<th>X</th>
<th>30</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral oil</td>
<td>LPA2</td>
<td>M</td>
<td>S</td>
<td>X</td>
<td>30</td>
<td>UK</td>
</tr>
<tr>
<td>Phosphate ester</td>
<td>LPA2</td>
<td>M</td>
<td>S</td>
<td>X</td>
<td>30</td>
<td>UK</td>
</tr>
</tbody>
</table>

**Example:** LPA2-M-S-X-30-UK (LPA2 Standard)

LPA2 is supplied with a full software package.

### Optional Products

<table>
<thead>
<tr>
<th>Product</th>
<th>Optional Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottle Sampling / De aeration Unit 110ml</td>
<td>BS-LPA-M-110-*</td>
</tr>
<tr>
<td>Bottle Sampling / De aeration Unit 250ml (Mineral Oil)</td>
<td>BS-LPA-M-250-*</td>
</tr>
<tr>
<td>Bottle Sampling / De aeration Unit 250ml (Skydrol)</td>
<td>BS-LPA-S-250-*</td>
</tr>
<tr>
<td>RS485 remote operating interface</td>
<td>SK0050</td>
</tr>
<tr>
<td>Software Package</td>
<td>LPA-W-20</td>
</tr>
<tr>
<td>Carry Bag</td>
<td>CB0001</td>
</tr>
<tr>
<td>In line Coarse Screen filter</td>
<td>SK.0040</td>
</tr>
</tbody>
</table>

* State either **UK**, **EU** or **US** power supply.

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**The LPA2 Analyser**

Includes accessories package - hoses, waste bottle, printer paper and ribbon, M 16x2 to BSP adaptor.
### Specification PML2

<table>
<thead>
<tr>
<th><strong>Technology</strong></th>
<th>Automatic optical particle analyser</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Laser package</strong></td>
<td>Twin laser and twin optical diode detectors</td>
</tr>
<tr>
<td><strong>Sensitivity</strong></td>
<td>&gt;4, 6, 14, 21, 25, 38, 50, 68, µm(c), micron range to revised ISO 4406 Standard</td>
</tr>
<tr>
<td><strong>Accuracy/repeatability</strong></td>
<td>Better than 3% typical</td>
</tr>
<tr>
<td><strong>Calibration</strong></td>
<td>Each unit is individually calibrated with ISO Medium Test Dust (MTD) as based on ISO 11171:1999.</td>
</tr>
<tr>
<td><strong>Analysis range</strong></td>
<td>ISO 8 to ISO 24, ISO 4406 Code. (NAS 1638 Code - 2 to 12) (SAE AS 4059- Code 2-12)</td>
</tr>
<tr>
<td><strong>PML2 sample volume</strong></td>
<td>15 ml.</td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td>Max. system working pressure - 400 bar. Min. working pressure - 2 bar.</td>
</tr>
<tr>
<td><strong>Viscosity range</strong></td>
<td>to 400 centistokes</td>
</tr>
<tr>
<td><strong>Operating temperature</strong></td>
<td>+ 5 to + 80°C</td>
</tr>
<tr>
<td><strong>Fluid compatibility</strong></td>
<td>Mineral oil &amp; petroleum based fluids, and Skydrol® (consult MP FILTRI for other fluids)</td>
</tr>
<tr>
<td><strong>Typical test time</strong></td>
<td>2 mins.</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>12/24 volt DC power supply.</td>
</tr>
<tr>
<td><strong>Data storage</strong></td>
<td>600 tests</td>
</tr>
<tr>
<td><strong>Computer interface</strong></td>
<td>RS 232 communication port (Standard)</td>
</tr>
<tr>
<td><strong>Hose connections</strong></td>
<td>Microbore pressure hose 1.5 m long with minimess fittings (5 m &amp; 10 m lengths available). Quick coupling waste hoses.</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>Height 120 mm - Length 275 mm - Weight 4.8 kilos</td>
</tr>
<tr>
<td><strong>Optional Product</strong></td>
<td>In line coarse screen filter minimess fitting. 500 micron st.steel cleanable mesh 400 bar filter pressure.</td>
</tr>
</tbody>
</table>

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**How to order**

```
M | Mineral oil
S | Phosphate ester
D | Standard no display
X | Customer specified display
IC | RS 232
2C | RS 485
3C | Customer specified

UK | Power Supply
EU | Power Supply
US | Power Supply
```

Example: **PML2-M-D-1C-30-UK** (PML2 Standard)  
PML2 is supplied with a full software package

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The PML2 Analyser  
Includes accessories package - hoses.

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**Patent app. no. 9921154.2** - As a policy of continual improvement, MP FILTRI reserve the right to alter the specification without prior notice.
Applications and testimonials

• The LPA2 Applications in Industry.
  Service – Accurate monitoring of systems reduces costs attributed
to manpower and material shortcomings.
  Quality Control – Certifies products to a recognised cleanliness standard.
  Condition Monitoring – Allows accurate monitoring of high cost processes
& installations ensuring system reliability.
  Maintenance Operations – Used in predictive & preventative maintenance
routines to monitor and investigate equipment performance.
  Military Applications – Accurate system monitoring and performance ensures
confidence in a hostile environment.
  Production Development – The ability to define a specified cleanliness
code for manufactured products to customers of hydraulic systems.

• Typical Applications
  - Steel Mills
  - Paper Mills
  - Injection moulding
  - Automotive
  - Wind Power
  - Test Benches
  - Lubrication
  - Roll Off cleanliness
  - Power packs

• The Lufthansa Technik AG hydraulic
test centre located in Hamburg,
uses the LPA2 for analysis of hydraulic
fluids of its Skydrol test benches.

• Prior to completion, each Extec
machine is flushed. The LPA2 is used
to ensure that the hydraulic systems
meet with the required standards.

• The LPA2 has been selected
as the preferred contamination
monitor for all Vermeer divisions.
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