LPC 500 Liquid Particle Counter: Standalone Particle Counting/Sizing Configuration

Introduction

The LPC 500™ liquid particle counter, Teledyne CETAC Oils 7400 autosampler and
the SPM 700 syringe module comprise a complete system for particle analysis
of lubricating oils. A suitable working area, computer table or bench, and
waste containers are still needed and must be provided by the analyst.

The complete particle counting system consists of the LPC 500 optical sensor,
LPC 500 multi-channel pulse analyzer, Oils 7400 autosampler, SPM 700
syringe pump module, and the computer used to view the LPC 500 software
interface to control the instrument – the dimensions of which are provided in
Table 1 (Page 4).
Suitable Working Area

An instrument’s environment is an important consideration. The instrument will operate with a laboratory temperature between 15 °C and 35 °C (59 °F - 95 °F).

The relative humidity should be between 20% and 80%, noncondensing.

In order to minimize contamination problems, a relatively dust-free environment is necessary. Maximum dust levels should not exceed 36 million particles (0.5 mm or larger) per cubic meter of air. Failure to operate the instrument in a relatively dust-free environment will necessitate more frequent maintenance and could eventually damage the instrument. As a reference, a normal, clean office environment would be 18 to 36 million particles per cubic meter.

Another important consideration is to locate the instrument in an area free of corrosive fumes and excessive vibration.

The LPC 500 particle counter system is bench-mounted and may need to be moved for service and preventative maintenance. Allow at least 5 cm behind the autosampler for cable egress, ventilation, and access to the power switch. Always position the equipment so that it is easy to disconnect the power cord.

Location

The bench for this instrument fits the LPC 500 particle counter along with the host computer so that an extra computer cart is not needed for the system (Part No. N0782060). The dimensions are listed in Figure 1.

Electrical Services

*NOTE: Grounding the instrument is necessary.*

The liquid particle counter system is equipped with four power cords. The syringe pump module, autosampler, particle counter, and host computer each have a power cord. For all of these cords, the power supply must be connected to an AC power source that will not apply more than 240 VAC between the supply conductors and ground. A protective ground connection by way of the grounding connector in the power cord is required for safe operation.

Rinse and Dilution Solution Requirements

The sample matrix and analytical method will determine the rinse and dilution agent should be used.

For liquid particle counting of lubricants, Ultra Low Particulate (ULP) V-Solv™ is used as the rinse solution and dilution agent. The rinse agent source should be placed within two meters of the autosampler. The autosampler rinse and dilution solutions must be relatively clean of particulates to allow the particle counter optical sensor to be properly rinsed between sample runs and to reduce the chance of incorrect particle count results.

ULP V-Solv™ is available from PerkinElmer (Part No. N9308755 for 5 gallons). All solutions should remain capped when not in use to prevent particle contamination.

Drain Vessels

A drain vessel (Part No. 09200486) and end cap (Part No. N0690271) are necessary accessories for the LPC 500 particle counter.

The vessel is made of plastic and is used to gather the effluent from the rinse station on the autosampler and the syringe pump.

The drain vessel should be placed on the floor in front of the particle counter and within two meters of the autosampler. The waste receptacle inlet should be 30 to 60 centimeters lower than the autosampler rinse station outlet. It should be configured so that the rinse station drain tubing drops directly into the waste receptacle without coiling and without being submerged below the liquid level of the waste receptacle.

The drain vessel should not be stored in an enclosed storage area. The drain system should be checked regularly and replaced when necessary. Should it become necessary to replace the drain vessel, it should be made from a material not likely to be impacted by the types of samples being analyzed. Glass or other brittle materials are not recommended due to the higher possibility of breakage.

And separate drain vessels must be used for acid-containing aqueous and organic samples.
Summary: Facilities Required

Tables 1 and 2 provide the dimensions and power requirements, respectively, for the liquid particle counter and its major accessories. The ANS-IEEE C62.41* recommends the noise level to be <10 volts normal mode (signal to ground) and <1/2 volt common mode** (neutral to ground) for the AC power input. This can be verified by an oscilloscope or power meter.

* American National Standards Institute (ANSI) is a private, non-profit organization that administers and coordinates the U.S. voluntary standards.

* Institute of Electrical and Electronics Engineers (IEEE) is a professional association with its corporate office in New York City.

** Excessive common mode (neutral to ground) noise can be caused by a poor building ground. The NEC (National Electrical Code) requires that the building ground resistance does not exceed 25 ohms. This can be verified with an earth ground test.
### Table 1. Dimensions of LPC 500 particle counter components and peripherals

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Width</th>
<th>Height</th>
<th>Depth</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPC 500 Optical Sensor</td>
<td>16.0 cm (6.5 in.)</td>
<td>5.0 cm (2.0 in.)</td>
<td>6.0 cm (2.5 in.)</td>
<td>0.7 kg (1.6 lb)</td>
</tr>
<tr>
<td>LPC 500 Multi-Channel Pulse Analyzer</td>
<td>37.0 cm (14.5 in.)</td>
<td>19.0 cm (7.5 in.)</td>
<td>47.0 cm (18.5 in.)</td>
<td>8.5 kg (18.8 lb)</td>
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<tr>
<td>Oils 7400 Autosampler</td>
<td>57.0 cm (22.0 in.)</td>
<td>49.0 cm (19.3 in.)</td>
<td>54.0 cm (21.0 in.)</td>
<td>23.0 kg (50.0 lb)</td>
</tr>
<tr>
<td>SPM 700 Syringe Pump Module</td>
<td>7.5 cm (3.0 in.)</td>
<td>30.0 cm (11.8 in.)</td>
<td>17.0 cm (6.7 in.)</td>
<td>3.0 kg (6.6 lb)</td>
</tr>
<tr>
<td>Computer Keyboard</td>
<td>48.3 cm (19.0 in.)</td>
<td>4.3 cm (1.7 in.)</td>
<td>21.6 cm (8.5 in.)</td>
<td>2.0 kg (4.0 lb)</td>
</tr>
<tr>
<td>Computer CPU (minitower)</td>
<td>18.0 cm (7.1 in.)</td>
<td>42.6 cm (16.8 in.)</td>
<td>44.7 cm (17.6 in.)</td>
<td>10.0 kg (22.0 lb)</td>
</tr>
<tr>
<td>Computer Monitor 24&quot; Flat Panel</td>
<td>56.0 cm (22.0 in.)</td>
<td>43.6 cm (17.2 in.)</td>
<td>17.2 cm (6.8 in.)</td>
<td>6.8 kg (15.0 lb)</td>
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### Table 2. Power specifications for LPC 500 particle counter components and peripherals

<table>
<thead>
<tr>
<th>Power</th>
<th>Volts</th>
<th>Hz</th>
<th>Ampere</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPC 500 Optical Sensor</td>
<td>+/-15 V, +5 V</td>
<td></td>
<td>Power provided by the LPC 500 Multi-Channel Pulse Analyzer</td>
</tr>
<tr>
<td>LPC 500 Multi-Channel Pulse Analyzer</td>
<td>115-230 VAC</td>
<td>50-60 Hz</td>
<td>750 VA</td>
</tr>
<tr>
<td>Oils 7400 Autosampler</td>
<td>100-240 VAC</td>
<td>47-63 Hz</td>
<td>1.07 amp</td>
</tr>
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<td>SPM 700 Syringe Pump Module</td>
<td>100-240 VAC</td>
<td>47-63 Hz</td>
<td>1.07 amp</td>
</tr>
<tr>
<td>Computer</td>
<td>115 V</td>
<td>60 Hz</td>
<td>-</td>
</tr>
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