

Online Particle Counter

LWL-3



ShangHai LUWATECH Industrial Co.,Ltd.

1. Typical application

LWL-5 on-line particle counter is a special oil contamination level detection device for on-site on-line measurement by adopting the counting principle of photo-resistance (shading) method specified by the International Hydraulic Standards Committee (IHSC). LWL-5 has the advantages of small volume, light weight, fast detection speed, high accuracy, good repeatability, etc., and can work under high temperature and high pressure and other harsh conditions. Suitable for engine oil, gear oil, transformer oil (i.e. insulating oil) hydraulic oil, lubricating oil, synthetic oil and other oils, can be widely used in aerospace, petrochemical, transport ports, iron and steel metallurgy, automotive manufacturing. Oil filtration equipment and other fields

Aerospace

- Matching hydraulic oil filtration and refuelling system
- Matching Cleaning System Continuous on-line monitoring of various

oil systems in the aerospace ground support sector ensures the cleanliness of the oil and the safe operation of aerospace equipment.

Construction machinery

- Earth moving machinery
- Agricultural machinery
- Forestry machinery

• Harvesting machinery The on-line inspection of the cleanliness of the hydraulic system of construction machinery before leaving the factory or during daily use can effectively ensure the working performance of the various components in the system (such as piston pumps, servo valves, controllers, gear pumps, etc.) under load conditions.

Power industry

- Wind turbines
- Gearboxes

• Lubrication systems Continuous online monitoring ensures that normal operating performance is achieved in the least amount of time.

Industrial equipment

- Production plants
- Oil production and transport
- Refineries

• Precision product lines monitor the cleanliness of the hydraulic systems (cleaning systems) of all equipment throughout the production line, from the hydraulic control systems of machine tools, to the cleaning systems of precision components, to the monitoring of contamination during the transmission of the oil, thus enabling the integrity of the oil to be effectively maintained at a good level during the oil refining process.

Test bench

- Hydraulic Valve Test Bench
- Flushing test stand

• Various oil test benches can greatly improve the efficiency of equipment by continuously testing the cleanliness of hydraulic system (lubrication system) fluids.



2. Detection Principle

The particle counters utilise the principle of the Light Extinction Method as defined in ISO 111711/SO4402 for the detection of oil contamination. The Light Extinction method, also known as the extinction method or the light barrier method, can detect particles with a minimum size of 1 μ m or 4 μ m (C). The Li-ght Extinction method has the advantages of fast detection speed, strong anti-interference, high precision and good repeatability.

The principle of the masking method is shown in the figure below, the laser light source through the lens to produce a set of parallel beams, parallel beams perpendicular to the cross-sectional area of A through the sample flow chamber, irradiation to the photoelectric receiver, when there is no particles in the liquid stream, the circuit output for the E voltage, when there is a liquid stream of a projected area of a particles through the sample flow chamber, blocking the parallel beams, so that the transmission of light attenuation, then the output of the circuit on a A negative pulse of amplitude E0 is output to the circuit:

 $E_0 = -(a/A) \times E(V)$

If the particle is spherical, or if the particle is described in terms of an equivalent diameter d and E is equal to

10V, then $E_0 = -(a/A) \times E(V)$

 $= -[\pi \times (d/2)^{2}]/A \times 10 (V)$

 $= -(\pi d^2/4A) \times 10 (V)$

 $= -7.854 \times d^{2}/A$ (V)

That is, the projected area of the particle and the pulse voltage amplitude are linearly related.



3. Key features

- Adopting the principle of photoresist (shading) method, using highprecision laser sensor, small size, high precision, stable performance.
- Suitable for on-site online testing, real-time monitoring of particle contamination in the oil system.
- Built-in data analysis system, can output the real data of each channel particle size and automatically determine the sample grade.
- The standard version is designed to withstand 100kg direct pressure and can be fitted with an optional pressure reducing valve for high pressure measurements up to 400kg.
- Volumetric flushing and time flushing modes are available for ease of use and maintenance.
- Built-in ISO4406, NAS1638, SAE4059, GJB420A, GJB420B, ΓOCT17216, GB/ T14039 particle contamination level standards.
- Built-in calibration function, can be calibrated according to GB/ T21540, ISO4402, ISO11171, GB/T18854 and other standards.
- Printing, alarming and storing functions can be realised through secondary programming of data acquisition.
- RS485 interface, support the standard modbus protocol can be connected to a computer, PLC system or other devices for data monitoring, processing.
- Sturdy external structure, suitable for complex working environment.
- The inlet and outlet ports are distributed left and right for easy installation.
- Continuous testing or any time interval can be set.
- Optional external display, equipped with Chinese and English dual system (optional)
- Optional 4G module, support mobile phone or computer remote data monitoring, historical data, curve query (optional)



- 4. Technical specifications
- Light source: Semiconductor laser
- Measuring range: 1µm~1000µm
- Measurement standards: GJB420B, SAE4059F-CPC, ISO4406, GB/T14039, GJB420A, NAS1638/SAE4059F, GOST17216.
- Flow rate range: 5mL/min~500mL/min (optimum 30mL/min)
- Sample viscosity: ≤650cSt
- Sensitivity: 1µm or 4µm(c)
- Counting volume: 1~999mL
- Counting accuracy: ± 0.4 contamination levels
- Recombination Error Limit: 40,000 particles/mL
- Online detection pressure: 0.1-10Mpa (optional pressure reducing
- device up to 40MPa)
- Data output: RS485 interface
- Power supply: DC 9-36V; ≤5W
- Ambient temperature: -20~60° C
- Weight: <500g
- Size: 77.5×70×55mm

5. Connection method for in-line detection

system pressure	Pressure less than 2Mpa	Pressure less than 6Mpa	Pressure less than 41.3Mpa
Online work stress	0.1 ~ 0.6Mpa	0.1 ~ 6Mpa	0.1 ~ 41.3Mpa
Liquid inlet specification	Φ6 double ferrule fitting: male thread M10x*1 or stainless steel quick coupling M6, stainless steel quick-screw coupling M10X1	Pressure measuring connector: male thread M16*2	Pressure measuring connector: male thread M16*2
Inlet tube specification	I. Transparent PTFE tubing 6x4mm 2. PU transparent tube 6x4mm	Pressure measuring hose: double head female thread M16*2	Pressure measuring hose: double head female thread M16+2
Inlet tube length	Factory default 2 metres	Factory default 1.5 metres	Factory default 1.5 metres
Detection point specifications	 double ferrule fitting M6 quick coupling M6 quick-screw fitting M6 	Pressure gauge connector: male thread M16*2	Pressure gauge connector: male thread M16*2
Note	Mount the particle counter on the system or position it in a safe and stable area as close as possible to the detection point of the system. Connect the detection point of the system to the inlet of the particle counter via the inlet tube and connect the outlet tube of the particle counter into the recovery vessel (note: the outlet tube should not be connected to a pressurised system connection).		

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6. Instrument Structure

Main Panel



- 1. Inlet and outlet ports: oil inlet and outlet.
- 2. Data and power interface: provide power and communication connection for the instrument.

Interface Definitions

4-pole round jack socket pin definitions:

- 1 VCC+
- $\textcircled{2} \mathsf{GND}$
- 3 RS485 pin A
- 4 RS485 pin B



7. Equipment shape and installation dimensions

Main panel



Side panel



Mounting plate



1.4×M3 countersunk head screws 2.4× Φ 3.4 through hole

Note: Unit: mm

8. Factory inspection and after-sales service

Instruments are strictly inspected before leaving the factory and issued a "factory inspection report", using the standard material for "National Defence Technology Industry Particle Size Level 1 Measuring Station" produced GBW (E) 120017 (ACFTD oil particles in the standard material) or GBW (E) 120083 (oil-based MTD particles in the standard material).

Third party test certificate: The domestic particle counter test institution is "National Defence Science and Technology Industry Granularity First Grade Measuring Station", located in Xinxiang City, Henan Province. If you need a third party certificate when you first purchase the instrument, we will be responsible for contacting and sending the instrument to the "National Defence Science and Technology Industry Granularity Measurement Station" for calibration and issuing a "Certificate of Calibration". When the particle counter needs to be calibrated again, you can contact the "National Defence Science and Technology Industry Granularity Measurement Station" by yourself.

The calibration period for particle counters and sensors is normally 6 or 12 months. The calibration should be carried out immediately after the discovery of any abnormality of the instrument, or after the maintenance and readjustment that affects the particle size measurement and counting capability of the particle counter.

Our company is willing to buy our products for the user to make the following commitments and provide the following services:

I. Installation, commissioning and acceptance: the acceptance of the instrument in the demand side of the premises, the goods arrived at the designated location, received a notice of installation within 3 working days, the supply side to provide technical training by telephone, other models (desktop portable particle counters) can be purchased to the demand side of the site for the installation, commissioning and acceptance of the work. After the installation, commissioning and acceptance, the supplier's engineers will train the personnel of the demand side on the actual use of the operation to ensure that the demand side operators can independently carry out the operation of the instrument, maintenance, simple troubleshooting, experimental data processing data processing.

II, the warranty period: from the date of acceptance, the company's products on the whole machine free of charge warranty of 12 months, responsible for lifelong maintenance.

III, the technical service: in the warranty period, where the equipment (instrument) itself caused by quality problems of equipment failure, the supplier is responsible for free maintenance or replacement parts, the cost of the supply side of their own responsibility. Normal instrument consumables are not included in the warranty. Outside the warranty period, the supplier shall guarantee the long-term provision of spare parts and high-quality maintenance services to protect the demand side production needs. The supplier is responsible for the lifelong maintenance of the equipment (instrument), when the equipment (instrument) fails, the supplier will make a reply within 24 hours after receiving the notice of maintenance; if it is necessary to send someone for maintenance, the maintenance personnel will arrive at the site of the demander within 3 working days and solve the problem. If the instrument is still unable to return to normal use within 10 working days, in order not to affect the normal use of the customer, our company will provide the user with the same type, the same type of instrument, to be replaced by the original instrument after normal. Fourth, the supplier will visit the demand side from time to time to understand the demand side of the use of the instrument, and in the application of communication to ensure that the instrument long-term normal use. During the warranty period or outside the warranty period of the equipment (instrument), the supplier can provide lifelong preferential technical support for the equipment (instrument).

The technical maintenance personnel of the supplier shall visit the user at least twice a year (the form can be on-site, by phone, etc.), and the supplier shall provide the latest information on the instrument and its application to the user in time and help the user to improve and upgrade the software related to the instrument, so as to ensure that the user can keep in the advanced level in terms of the instrument and technical information.

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