IFJ-3BW Series Oil Cleanliness Sensor Technical Specification

1. Product Overview



The IFJ series oil cleanliness sensors adopt single-laser light-obscuration particle counting technology. They feature fast measurement, strong anti-interference capability, high accuracy, and good repeatability. The sensor can accurately monitor the particle size distribution and particle count in the tested oil, as well as moisture contamination indicators. Combined with a Fourier waveform analysis model, it greatly improves measurement accuracy for very small particles and high-cleanliness oils.

The principle of the light-obscuration method is shown in the figure. A parallel light beam passes vertically through a sample flow cell with cross-sectional area A and reaches the photoelectric receiver. When no particles are present, the circuit output is a voltage E. When a particle with projected area a passes through the flow cell, it blocks part of the beam and attenuates the transmitted light, producing a negative pulse at the circuit output with amplitude E_0:

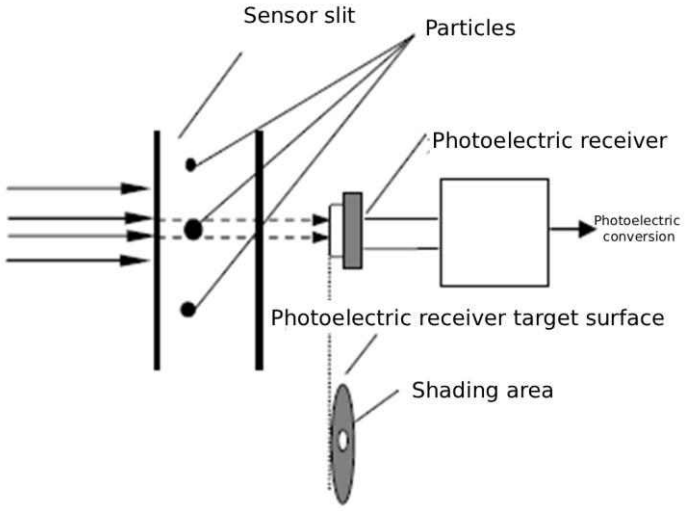


Figure: Principle of the light-obscuration method

$E_0 = (a/A) \times E$ (2.1)

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Ph : +91- 9515132797, Email : fluidanalysis@rediffmail.com

If the particle is spherical, or is described by an equivalent diameter d, and E = 10 V, then:

$E_0 = 7.854 \times d^2 / A$ (2.2)

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

The IFJ series oil cleanliness sensor is a flagship product developed by the INZOC core technology team, leveraging patented monitoring technology and years of field experience in cleanliness monitoring. It can automatically correct invalid and interference data, and significantly mitigates the impact of trace water and bubbles commonly encountered on site.

2. Key Features

• Single-laser, micro-power design; high measurement accuracy and stability;

• Built-in data correction system that automatically suppresses interference and invalid data;

• Core signal processing algorithm that eliminates the influence of trace water and bubbles on results;

• 8 particle size channels, meeting common ISO/NAS/GJB and other domestic/international evaluation standards;

• Supports ISO 4402 or ISO 11171 calibration for stable and reliable data;

• Standard serial RS485 interface for online control and data acquisition;

• Compensation model ensures long-term stable operation in harsh environments;

• Special aerospace-grade aluminum housing, rugged and durable for complex operating conditions;

3. Typical Applications

• Power industry: transformer oil, turbine oil, insulating oil, etc.;

• Metallurgy & steel: hydraulic oil, oil-film oil, turbine oil, etc.;

• Petrochemical: turbine oil, hydraulic oil, etc.;

• Construction machinery: hydraulic oil, brake fluid, etc.;

• Cement & paper: hydraulic oil, turbine oil, etc.;

• Mining: hydraulic oil, transmission fluid, engine oil, etc.;

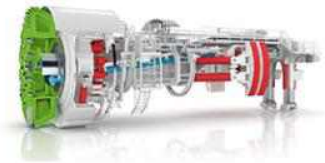
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• Wind power: hydraulic oil, insulating oil, brake fluid, etc.;

• Transportation: hydraulic oil, gearbox oil, transfer case oil, etc.;

• Aerospace: hydraulic oil, heat transfer oil, etc.;

• Other industries: hydraulic oil, steam turbine oil, turbine oil, etc.





4. Main Technical Specifications

Parameter	Specification
Monitoring items	Cleanliness code, particle size and count distribution
Monitoring items	Water activity (aw), moisture content (dissolved water, ppm)
Measurement range	1–400 μm
Sensitivity	1 μm (ISO 4402) or 4 μm(c) (GB/T 18854, ISO 11171)
Accuracy	±1 cleanliness code (typical)
Number of channels	8
Channels	NAS1638/SAE4059F: 5-15μm, 15-25μm, 25-50μm, 50-100 μm, >100μm; GOST17216: 1-2μm, 2-5μm , 5-10μm, 10-25μm, 25-50μm, 50-100μm; GJB420B: >4μm(c), >6μm(c), >14μm(c), >21μm(c), >38μm(c), >70μm(c); SAE4059F-

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	CPC: >4μm(c), >6μm(c), >14μm(c), >21μm(c), >38μm(c), >70μm(c); ISO4406: >4μm(c), >6μm(c), >14μm(c); GB/T14039: >4μm(c), >6μm(c), >14μm(c); GJB420A: >2μm, >5μm, >15μm, >25μm, >50μm
Built-in standards	GJB420B, SAE4059F-CPC, ISO4406, GB/T14039, GJB420A, GOST17216, NAS1638/SAE4059F
Calibration standard	ISO 4402 or ISO 11171
Water activity (aw)	0.03–1 aw
Moisture content	1–10,000 ppm (model calibrated)
Water activity (aw)	±0.03 aw
Moisture content accuracy	±10% or 50 ppm (no accuracy specified below 50 ppm)
Electrical parameters	Electrical parameters
Communication protocol	MODBUS RTU
Data cable	M8, 10-pin aviation connector
Supply / current	<100 mA + load current (4–20 mA output) @ 24 V
Power	≤ 5 W
Other parameters	Other parameters
Oil port	G1/8 – M12×1.25
Display	1.3-inch OLED display module (I²C communication)
Pressure rating	0–30 bar (up to 300 bar with optional pressure reducer)
Flow range	10–300 mL/min
Oil	−30 to +85 ℃

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temperature	
Storage temperature	−40 to +85 ℃
Ingress protection	IP65
Housing material	Special aluminum alloy
Sealing material	Fluororubber (FKM)
Weight	≤ 500 g
Communication interface	Standard model: RS485. Optional/custom: RS232 or 4–20 mA analog output.

5. Sensor Dimensions

5.1 Outline Dimensions

The sensor outline and mounting hole dimensions are shown below.

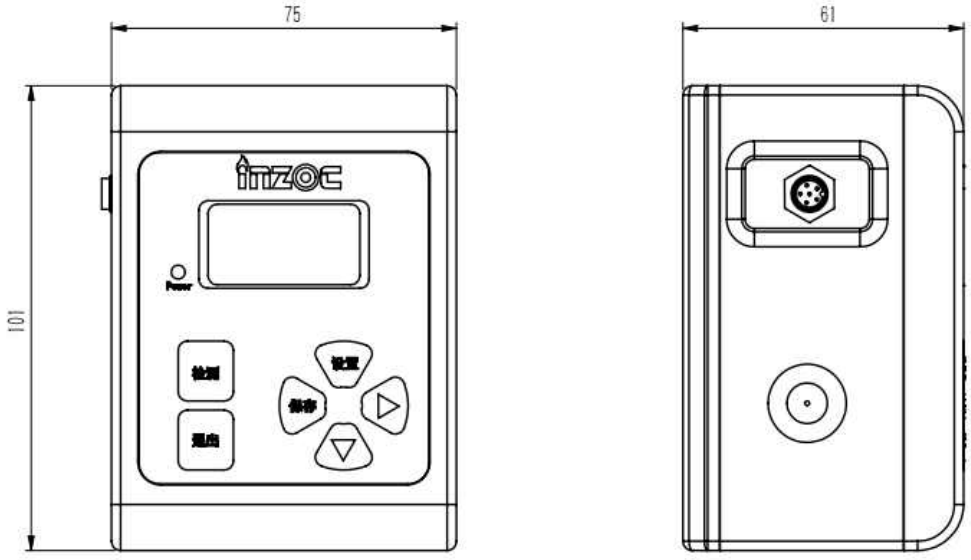


Figure: Sensor outline dimensions

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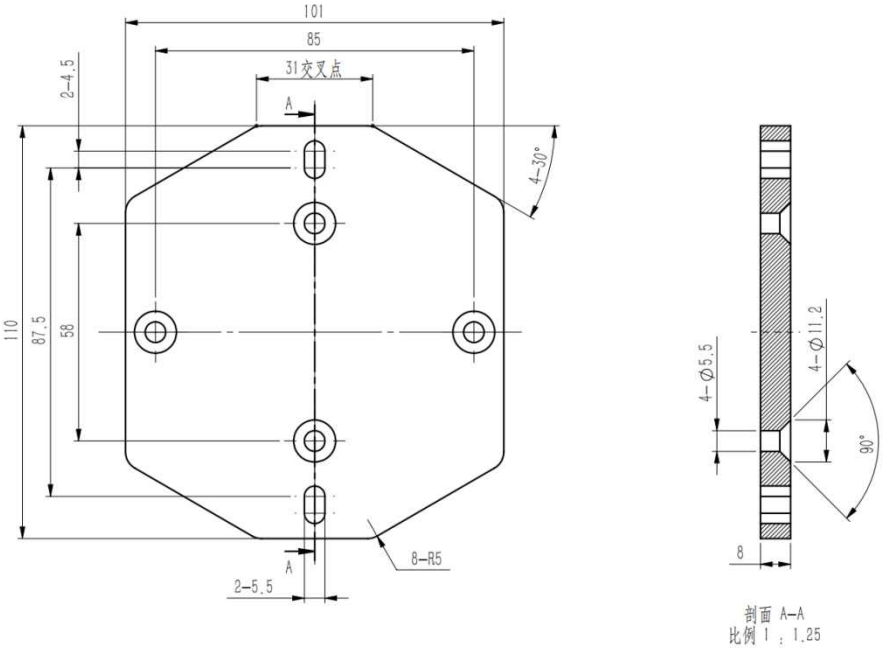


Figure: Mounting plate dimensions

5.2 Installation

The sensor should be connected to the hydraulic pipeline via a bypass tee fitting. The system pressure must ensure the flow required for sensor measurement, and a flow control device must be installed at the sensor outlet.

For ease of observation, install the sensor at a location that is convenient to view, and keep the piping as short as possible. As the line length increases, large particles are more likely to settle and deposit.

5.2.1 Online Low-Pressure Installation

When the pipeline pressure is below 2 MPa, sampling can be taken directly. The low-pressure online sampling connection is shown below.

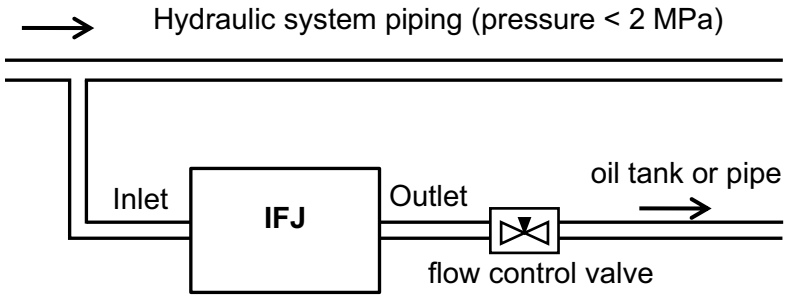


Figure: Low-pressure online sampling connection

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5.2.2 Online High-Pressure Installation

When the pipeline pressure is above 2 MPa, direct sampling is not allowed. A pressure reducing valve must be installed at the inlet to reduce the system pressure to below 2 MPa. The high-pressure online sampling connection is shown below.

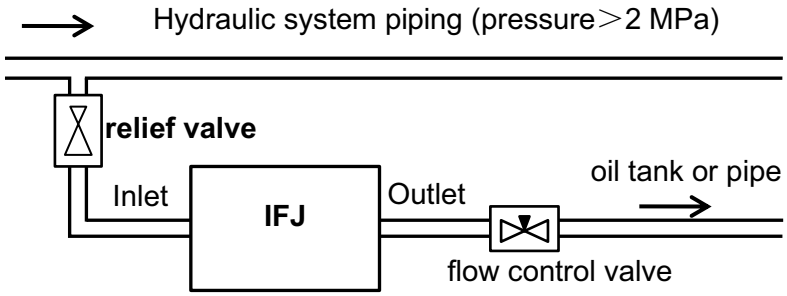


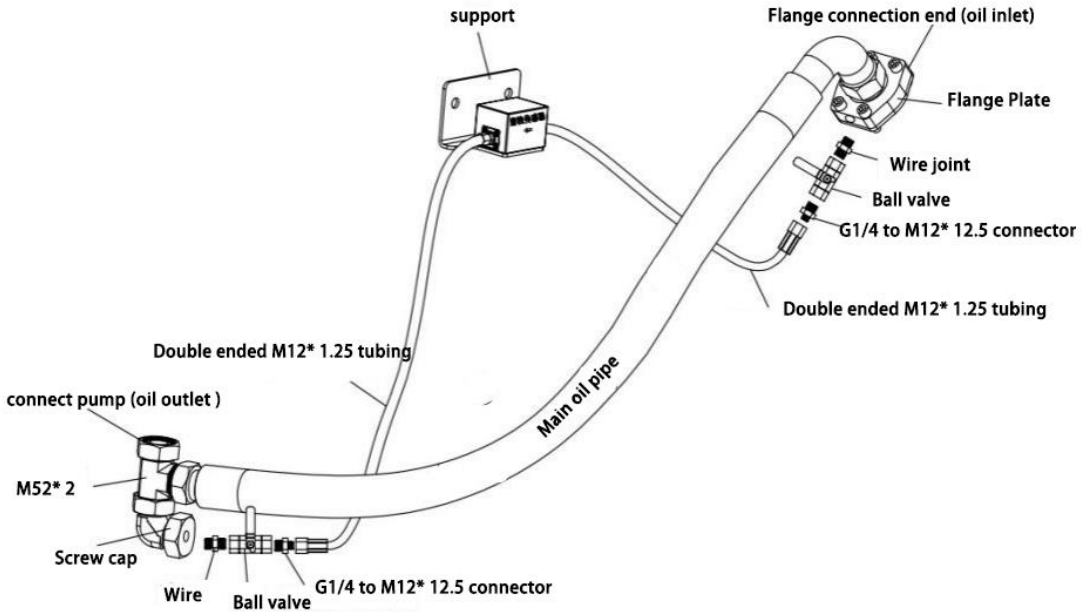
Figure: High-pressure online sampling connection

Notes:

If the outlet is connected to a pressurized system line, ensure that the outlet pressure is lower than the inlet pressure.

5.3 Installation Environment

Install the sensor at a measurement point in the hydraulic circuit where pressure is relatively stable. Severe fluctuations during measurement may cause inaccurate readings. To ensure accuracy, the flow rate in the pipeline should be maintained at 50 – 300 mL/min.



Use bypass sampling to divert oil into the sensor flow channel for monitoring.

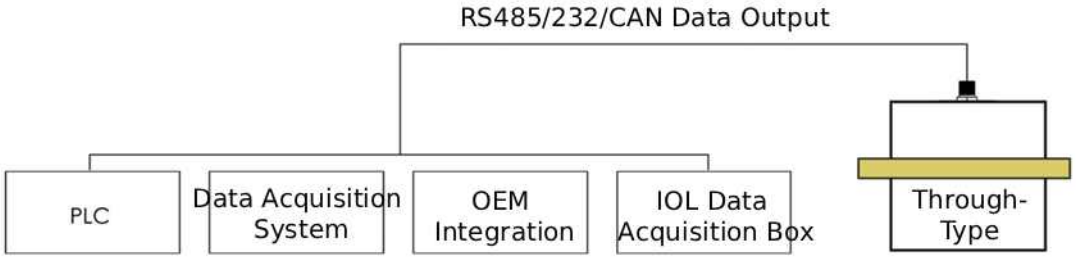
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Other Installation Methods

1) Other: You may design the installation according to your needs, as long as the sensor probe is fully immersed in flowing oil.
2) System integration: Customize an integration method suitable for your system to enable sensor monitoring.

Data Display



1) Data can be analyzed or displayed using the manufacturer's data processing module.
2) Alternatively, read the sensor communication protocol and integrate it into a PLC or other display/control system for visualization.

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