

INLINE REFRACTOMETER FOR MACHINE TOOLS

MODEL: CZ-J



R&D/Production/Sales

SINCE 1999

Thank you for purchasing the online refractometer. This user manual is designed to help you understand the instrument's functions and features. Before using the instrument, please read this manual carefully to ensure safe and proper operation. Follow the instructions to perform necessary inspections and parameter adjustments. Please keep this manual for future reference.

Safety Precautions

1. When measuring substances that are harmful to humans, take appropriate personal protective measures (PPE).
2. If the instrument becomes overheated, emits smoke, or gives off unusual odors, turn off the power immediately.
3. Do not disassemble or modify this instrument.
4. Do not apply water or samples to any part of the instrument other than the prism surface.
5. Do not measure corrosive media.
6. When the instrument will not be used for an extended period, switch off the power.

Please read this instruction manual carefully and fully understand the functions and operation of each part of the instrument before use.

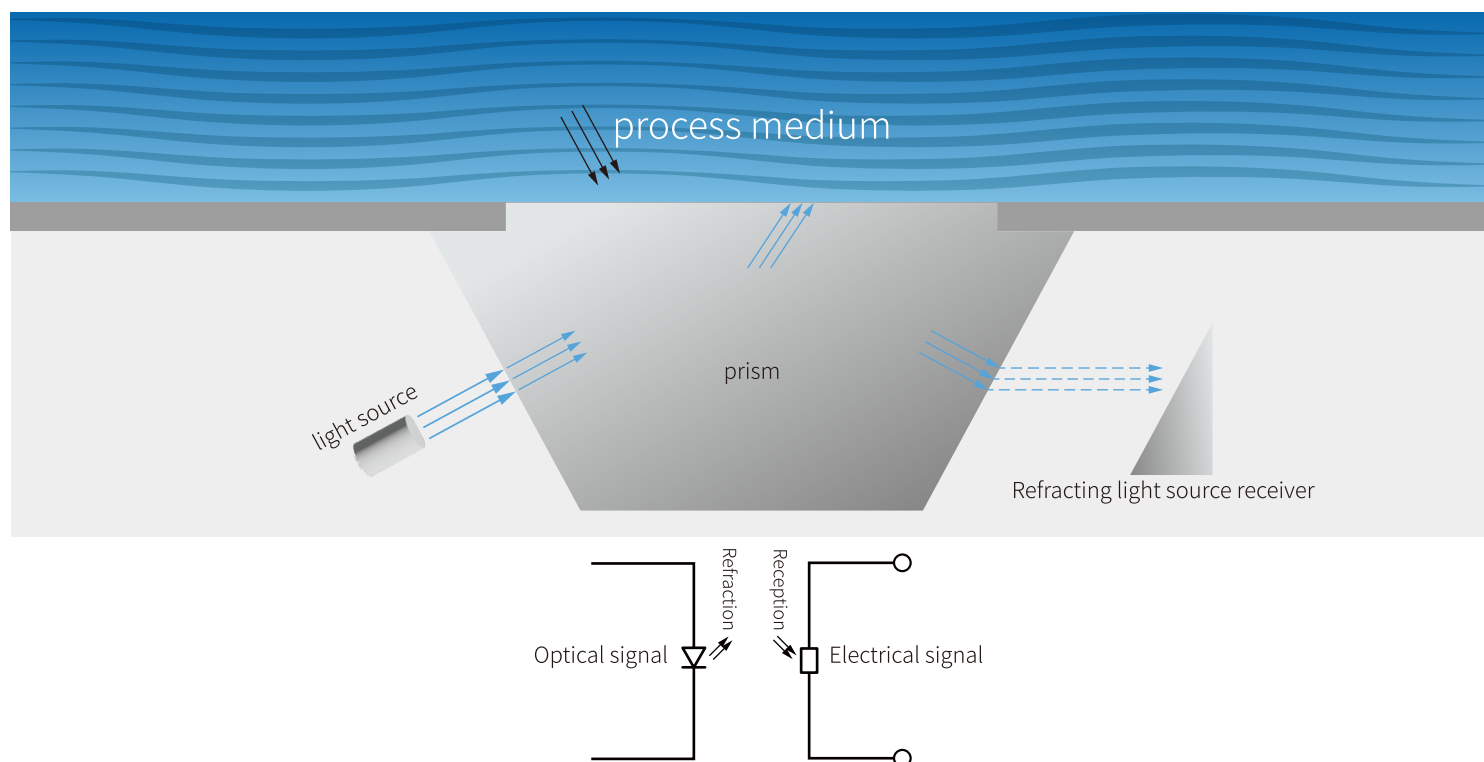
Perform the necessary inspections and parameter adjustments according to this manual before operating the instrument.

Notes for Use

- Use the instrument at altitudes below 2000 meters.
- Use the instrument indoors.
- Operating temperature range: 10 °C to 60 °C.
- Do not expose the instrument to sudden changes in ambient temperature.
- Do not use the instrument in areas with heavy dust or strong vibrations.
- Do not place the instrument in humid environments.
- Do not place heavy objects on the instrument.
- Do not install the instrument in direct sunlight, near heat sources, or in environments that are dusty or exposed to corrosive gases.

1.Description

The online refractometer consists of a light source, a sapphire prism, a photodetector, and a signal modulation circuit. The light source emits a fixed-wavelength light signal that passes through the sapphire prism and interacts with the measured medium. A portion of the light is reflected and received by the photodetector. Based on the position of the reflected light received, the photodetector calculates the refractive index of the medium, which is then converted into the corresponding concentration through data algorithms. The sensor uses internal temperature compensation to minimize the effects of temperature drift.

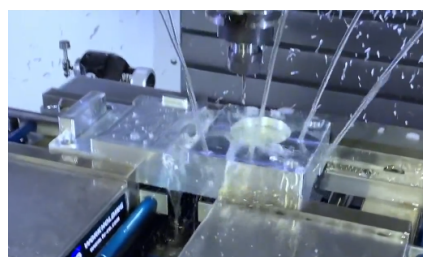


2. Typical Applications

2.1. Applicable Medium



machine tool emulsions



cutting fluids

2.2. Applicable scenarios

CNC machining centers: Monitor coolant concentration to ensure proper cooling and lubrication, reducing tool wear.

High-precision automatic grinding machines, milling machines, etc.: Optimize the coolant ratio for materials such as aluminum alloys and cast iron to improve surface finish.

Central cooling systems: Centrally manage the fluid concentration of multiple machines, reducing maintenance costs.

3.Features

3.1. Advantages

- Real-time online monitoring:

Directly integrated into the machine tool's coolant circulation pipeline, eliminating the need for manual sampling and avoiding downtime for testing.

Provides continuous feedback data, enabling timely adjustment of fluid ratios (such as adding concentrate or water).

- High accuracy and stability:

Resolution up to $\pm 0.01\%$ Brix, suitable for complex environments involving machine vibration and oil contamination.

Corrosion-resistant materials (such as stainless steel and sapphire lenses) extend service life.

- Automated control:

Works with PLC/SCADA systems to achieve automatic fluid replenishment or alarm functions.

- Cutting fluid concentration management:

Prevents concentrations from being too low (causing rust) or too high (leading to excessive foam and increased costs).

- Grinding oil/emulsion condition monitoring:

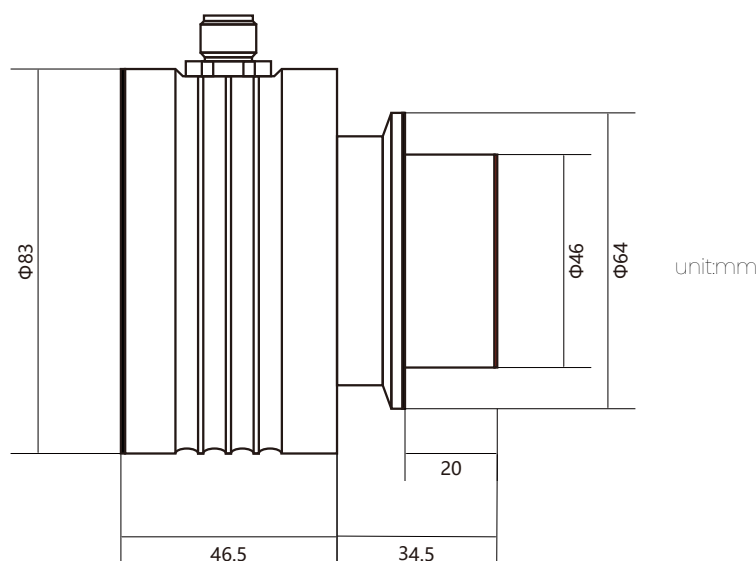
Detects contamination or oil-water separation issues.

- Compatible with ZHYQ's dedicated pneumatic automatic cleaning device, enabling 24-hour continuous measurement without manual intervention.

3.2. Features

- High accuracy, fast response, stable and reliable performance
- Compact size for easier installation
- 4–20 mA or RS485 output
- Equipped with a dedicated cleaning system

4.Product Appearance

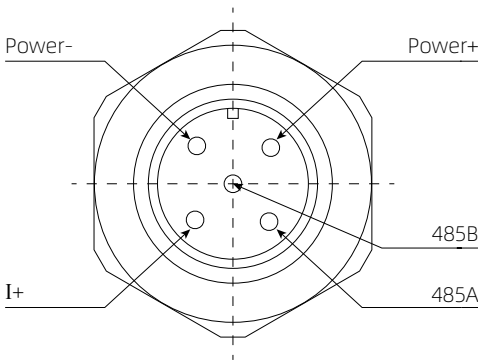


5. Technical Specifications

5.1. Specifications and Parameters

Product Model	CZ-J051	CZ-J151	CZ-J201
Measured Parameter	Temp. (T) 、 Brix (%)		
Measurement Range	Brix: 0.0~5.0 %	Brix: 0.0~10.0 %	Brix: 0.0~20.0 %
Resolution	Brix:0.01% / T:0.1℃		
Accuracy	Brix:±0.5% / T:±1℃		
Temperature Compensation	10~40℃		
Power Supply	12~24V DC		
Signal Output	DC 4~20mA or RS485		
Ambient Temperature	10~50℃		
Protection	IP65		
Process Pressure	Max 1Mpa		
High/Low Limit Setting	Button-operated		
Wetted Material	Standard 316L; optional: 2205, Hastelloy C-276		
Medium Type	Cutting oil, emulsion		
Installation Type	Tri-clamp 64		
Cleaning Options	Manual cleaning device, pneumatic cleaning device, ultrasonic cleaning device		
Pipeline Adapter Options	Tri-clamp tee, flange tee, threaded tee (for installation type with tri-clamp connection)		
Communication Protocol	Standard Modbus, customizable protocols available		

5.2. Wiring

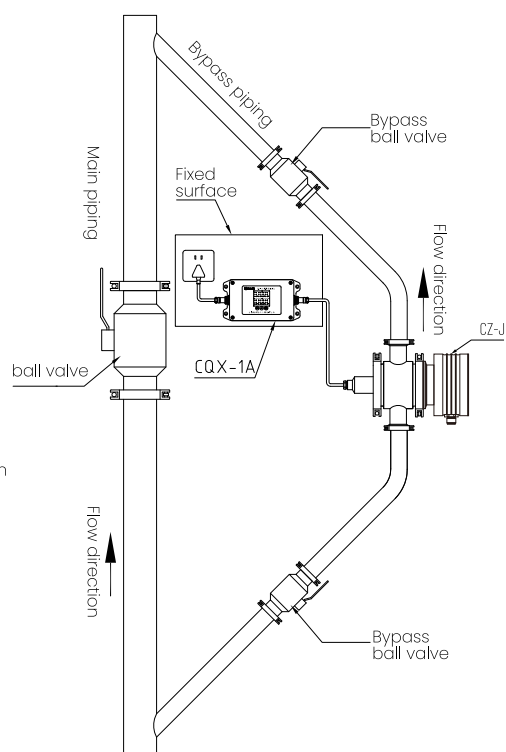
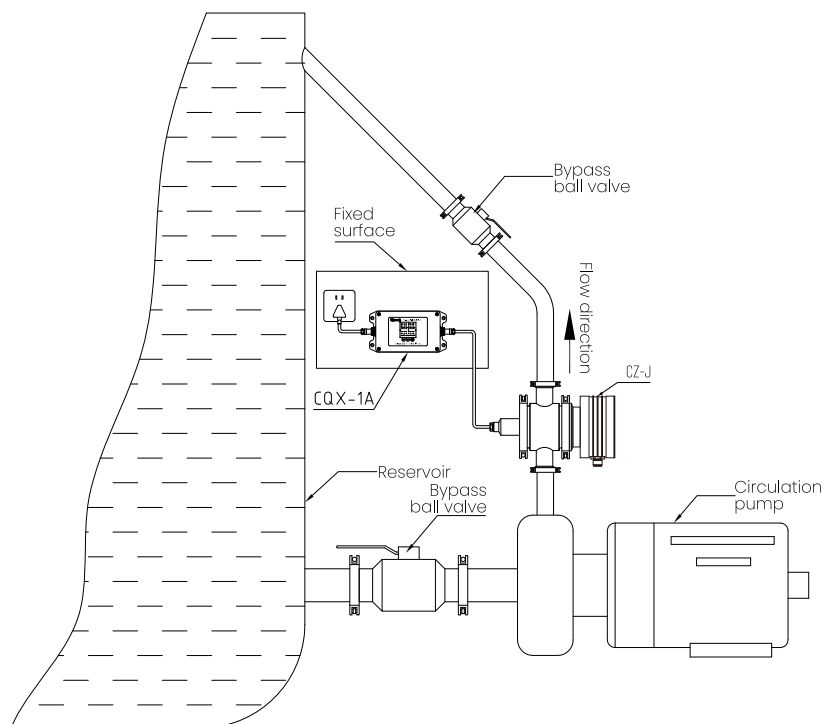
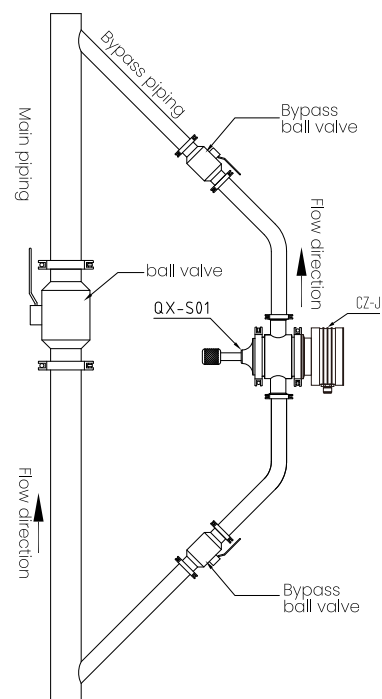
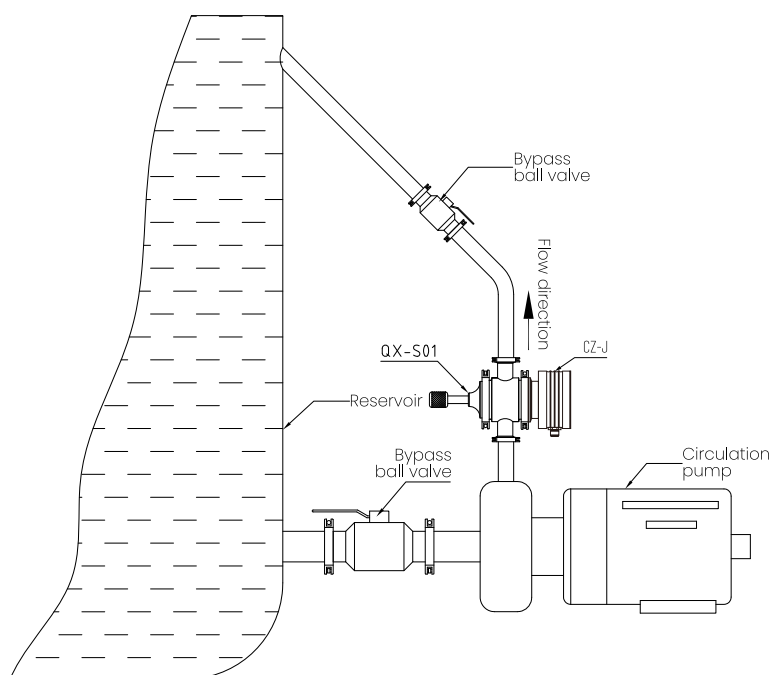


6. Product Installation Method and Precautions

6.1. Installation Procedure

- 6.1.1. Before installation, check whether all required accessories and parts are complete.
- 6.1.2. Install the two sealing rings onto the cleaning device tee. Use 1.5" tri-clamp fittings to connect both ends of the tee to the pipeline. Tighten the clamp screws and verify that the installation is secure.
- 6.1.3. Install the O-ring onto the probe end of the online refractometer. Use a 2" tri-clamp fitting to mount the refractometer onto the pipeline. Tighten the clamp screws and verify that the installation is secure.
- 6.1.4. Install the O-ring onto the cleaning device, then use a 2" tri-clamp fitting to mount the cleaning device onto the pipeline. Tighten the clamp screws and verify that the installation is secure.

6.2.Example of Product Pipeline Installation



Installation Type A	Installation Type B
The bypass installation structure using a recirculation pump is the optimal setup, as it provides a known, constant product flow and a consistent velocity across the prism of the online refractometer. This installation requires two bypass isolation valves. When using this method, it is recommended to install a damper in the pipeline between the recirculation pump and the instrument to prevent the instrument from being	A bypass installation configuration without a recirculation pump is acceptable, as the process can support the pressure drop generated by a throttle valve or control valve, ensuring that the fluid flows through the bypass line of the online refractometer. This installation also requires two stop valves to isolate the refractometer from the pipeline for maintenance without interrupting production.
Installation Type C	Installation Type D
Direct installation of the online refractometer on the main pipeline is generally not recommended. Although the initial cost may be lower, maintenance becomes more difficult later. If maintenance or prism cleaning is required, the production process must be temporarily stopped during these operations. This installation method typically requires two valves to isolate the online refractometer from the production line during maintenance.	The tank wall installation method requires that the solution in contact with the prism flows continuously to prevent impurities or debris from accumulating on the prism surface. To install the online refractometer directly on the tank wall, use a supporting flange tee adapter for proper mounting.

6.3.Installation Precautions

- 6.3.1 The default installation type of this product is tri-clamp (quick-connect) style.
- 6.3.2 During installation, take special care not to scratch the prism or probe.
- 6.3.3 Avoid subjecting the instrument to strong impacts during installation.
- 6.3.4 Ensure that all sealing rings and O-rings are properly installed.
- 6.3.5 Verify that the cables are correctly connected to their respective ports.
- 6.3.6 Install the product away from the pump outlet to prevent flow turbulence from affecting measurements.
- 6.3.7 Avoid installing near sharp pipeline bends, as this can cause measurement errors.
- 6.3.8 Do not expose the instrument to conditions where it is submerged in or constantly dripped on by liquid.
- 6.3.9 Power on the instrument only after proper installation is complete.

7.Maintenance and Troubleshooting

7.1.Daily Maintenance

If the instrument becomes dirty, wipe it with a soft cloth. Do not use gasoline, paint thinner, or other solvents to clean the instrument.

7.2.Periodic / Scheduled Maintenance

- 7.2.1 Wipe the prism of the online refractometer clean, then test with pure water. If the output is not equal to 4 mA, perform a zeroing operation by shorting the zeroing wires or sending a zeroing command (for RS485 output). To short the zeroing wires, connect them for at least 3 seconds, then re-test. After zeroing, insulate the two zeroing wires.
- 7.2.2 Online refractometers measuring high-temperature or corrosive media, or operating under vibration, should be calibrated every six months.
- 7.2.3 After five years of operation, perform an insulation resistance test. The insulation resistance should be above 500 MΩ.

7.3.General Troubleshooting

- 7.3.1 If the online refractometer has no signal output, first check for broken or shorted cables and replace them if necessary.

7.3.2 If measurements are abnormal, first check that the power supply is functioning. If power is normal, inspect the measurement window for contamination or blockage and ensure proper contact between the window and the measured solution. If the instrument itself is faulty, return it to the factory for repair.

7.3.3 If the refractometer output differs from the PLC reading, measure the instrument output current directly. If the instrument current is correct, the PLC system may need additional anti-interference measures.

7.3.4 If the concentration value deviates significantly, it may be due to accidental zeroing of the previous concentration. Remove the instrument, apply pure water to the probe, and perform the zeroing operation by shorting the zeroing wires for at least 3 seconds or sending a zeroing command (for RS485 output). Then retest to confirm.

Focus on sensor & control Since 1999
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