Product Manual

Ceiling-mounted TOF Laser Distance Sensor

Model · TOF20

Product version · V1.0



1. Product Overview

This product is a high-precision laser distance sensor based on the DTOF (Direct Time of Flight) principle. It is compact in size and low in power consumption, comes standard with an RS485 Modbus RTU interface, supports high-speed dynamic measurement, and can be optionally configured with a Home Assistant (HA) version for IoT integration.

2. Features

- 20M range and high precision: Measurement range 0.05~20m (90% reflectivity), close-range accuracy ±5cm, long-range 1%.
- 200Hz high-frequency measurement: Meets the needs of high-speed dynamic measurement, very suitable for robot obstacle avoidance and drone altitude hold.
- Strong ambient light resistance: Ambient light resistance up to 8m@60K Lux, stable operation both indoors and outdoors, unaffected by strong light interference.
- Standard and easy integration: Standard Modbus RTU protocol, supports 03 read and 06 write function codes, can be directly connected to PLC, HMI, and industrial control instruments.
- Optional HA version: Connects to Home Assistant via Wi-Fi/MQTT, enabling real-time monitoring of distance data and automated linkage.

3. Application Scenarios

- Mobile robots: Collision avoidance and distance detection for service robots and robot vacuums.
- Drones: Drone altitude measurement and altitude hold hovering.
- Industrial automation: AGV cart automatic navigation and obstacle avoidance, safety light curtain distance detection.
- Smart buildings: Micro-displacement and deformation monitoring at monitoring points for ancient buildings or dangerous buildings.

4. Structural Interface

- Appearance: White hexagonal petal-textured housing, with a dual-lens (transmit and receive) window in the center.
- Interface method: Multi-core cable led out from the side (including power supply line and RS485 communication line).

5. Technical Parameters

- Product Model: TOF20
- Product Name: Laser Distance Sensor
- Supply Voltage: DC12-24
- Dimensions: 91 x 91 x 23 mm
- Weight: 150g
- Measurement Range: 0.05~20m (90% reflectivity)
- Repeatability: ±30mm
- Accuracy: ±5cm (<5m), 1% (≥5m)
- Measurement frequency: 200Hz
- Measurement laser light source: 905nm, Class 1
- Field of view FOV: 3°
- Ambient light immunity: 8 meters @60K Lux
- Control output: RS485 Modbus RTU
- Operating temperature: -20~60℃
- Optional versions: Modbus standard version / loramesh / HA version (Wi-Fi + MQTT)

6. Installation and Wiring

- Power supply: Connect to 12~24V DC power supply.
- RS485 communication: Connect the device's A and B lines to the A and B ports of the host computer or converter respectively.
- Safety warning: Please perform wiring operations with the power off.

7. Configuration and Usage

- Modbus version: The default address of the device is 01, and the default baud rate is 9600. After wiring is completed, standard RTU commands can be sent via a Modbus debugging tool or PLC to read distance data.
- HA version (optional):

1. Network configuration: After powering on, an AP hotspot (“HA-xxxx”) is automatically created, with the password 12345678. After connecting a phone/computer to this hotspot, access 192.168.4.1 in a browser to configure the device to connect to the local 2.4G Wi-Fi.

2. HA auto-discovery: Open the Home Assistant backend, wait for the ESP integration to automatically discover and add the device in “Devices & Services”, and the distance entity will be generated automatically.

3. Local web configuration: The local native web page can be viewed via port 88 of the device, supporting Chinese/English switching, as well as light/dark theme switching.

4. Scene linkage: Add a distance sensor card to the HA dashboard and create automation linkage.

5. Device reset: If the network configuration is not connected for about two consecutive minutes, it will reset automatically; or click the RESET button in the HA backend to reset.

8. Communication Protocol

This product supports the standard Modbus RTU protocol, supporting function codes 03 (read) and 06 (write). The default baud rate is 9600, and the default address is 01.

Register address table:

Function Code	Register Name	Read/Write	Register Address (10 decimal)	Register Address (16 hex)	Value	Value Meaning	Remarks
03 / 06	Address	Read/Write	0000	0x0000	0001	Address range 01-FE	FF is the broadcast address
03 / 06	485 Baud Rate	Read/Write	0001	0x0001	0006	00→115200, 01→76800, 02→57600, 03→38400, 04→19200, 05→14400, 06→9600, 07→4800, 08→2400, 09→1200	06 corresponds to 9600
03	Distance Value	Read-only	0101	0x0065	0000	Distance, unit mm	—

(Example of reading distance: send 01 03 00 65 00 01 ..., the response data converted to decimal is the value in millimeters)

9. Application Conditions and Limitations

- Environmental Limitations: Operating temperature must be between -20℃ ~ 60℃.
- Measurement Conditions: The measurement range of 0.05~20m is a nominal value under 90% reflectivity conditions; the actual range is affected by the target's color, material, and ambient light.
- Light Source Safety: Uses a 905nm Class 1 laser light source, compliant with safety standards, but prolonged direct viewing of the laser emission port should still be avoided.

10. Troubleshooting

- HA Version Anomalies: If unable to connect or if configuration errors occur, an automatic reset can be triggered by disconnecting the network for two consecutive minutes, or a reset can be performed by clicking the RESET button in the backend.

11. Safety and Maintenance

- Avoid use in environments exceeding the operating temperature or with condensation.
- Keep the central optical lens clean, avoiding obstruction by dust, oil stains, or water droplets, which may affect measurement accuracy or cause measurement failure.
- Unauthorized disassembly or modification of the equipment is strictly prohibited.

12. Others

None

13. Packing List

1. Laser distance sensor main unit x 1