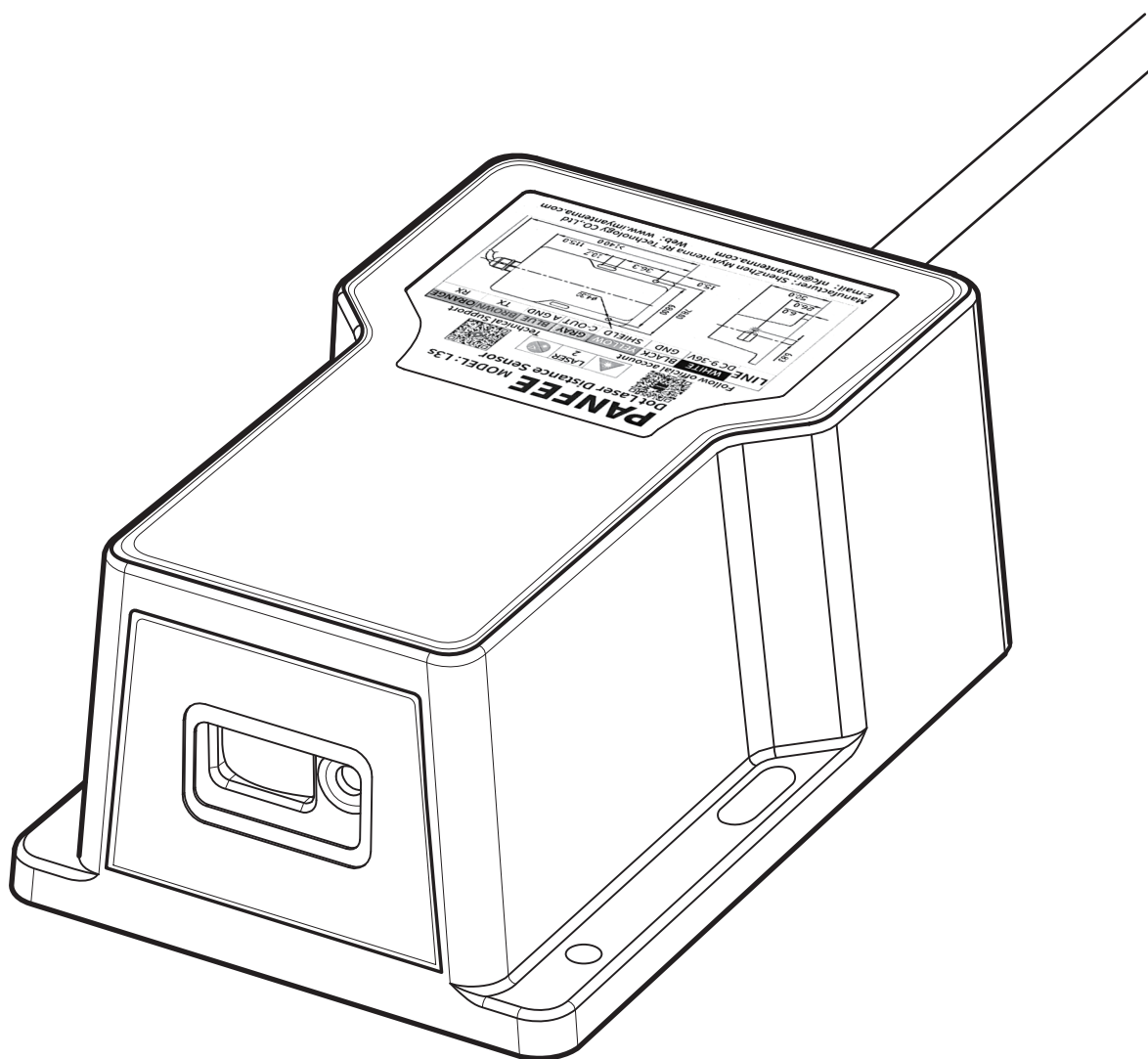


L3 Series

Laser Distance Sensor

User's Manual



Introduction

- Thank you for purchasing our products. Be sure you have read this manual and understood its contents before proceeding.
- This manual is only for client reference.
- Copyright © ShenZhen MyAntenna RF Technology Co., Ltd. All rights reserved. No part of this document may be reproduced or transmitted in any form or by any means without prior written consent of ShenZhen MyAntenna RF Technology Co., Ltd.

Change History

Date	Version	Change Description
01/09/2017	1.0	First draft
23/05/2019	1.1	Addition of the <Quick Start> chapter
29/11/2023	1.2	Updating manual layouts



Safety Policy



WARNING

- This product is intended to detect objects and does not have the control function to ensure safety such as accident prevention.
- Please read all safety instructions carefully before using this instrument.
- Do not use the product as a sensing device to protect the human body.
- Do not directly view or point the laser at an eye. This can create a hazard. Low-power visible lasers do not normally present a hazard but may present some potential for hazard if viewed directly for extended periods.
- Do not use this device in flammable or explosive environments.
- Do not use this device near strong electromagnetic interference.
- Do not disassemble or modify the device or the sensor module.

Cautions on Handling Laser Light

Laser Classification (Class 2)

The L3, L3s, L3s-Filled produce visible Class 2 laser beams. (Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007)

Laser Hazardous Class

Classification according to IEC 60825-1-2014

Class	Model	Description of hazardous evaluation
Class 1	—	Safe under reasonably foreseeable conditions of operation
Class 1M	—	Safe under reasonably foreseeable conditions of operation, except for diverging or large area beams when collecting optics used. Hazardous when collecting optics used.
Class 2	L3 L3s L3s-Filled	Visible beam, low power. Blink response of eye affords protection.
Class 2M	—	Visible beam, low power. Blink response of eye affords protection. Hazardous when collecting optics used.
Class 3R	—	Direct intrabeam viewing is hazardous, but risk is lower than for 3B.
Class 3B	—	Direct intrabeam viewing is always hazardous.
Class 4	—	High power. Capable of producing hazardous diffuse reflections. Capable of producing skin burns and fire hazardous.

Warning Label



To ensure stable performance, please observe these precautions:

- Purchase Notes for Glue-Filled Series: Once damaged, the glue-filled sensors cannot be repaired. Please strictly follow the instructions for power supply and wiring, and avoid any incorrect connections.
- Due to the exposed components of L3, please follow proper procedures to prevent damage from electrostatic discharge/transient voltage and current/power short circuits/squeezing or impact.
- Please don't touch the circuit board directly, especially sensitive optical components. Please make sure to wear anti-static gloves or wristbands.
- To ensure secure connections, preferably soldering cables, avoiding using pins, and prevent unstable connect that may cause frequent power on and power off. Instant power interruptions and restarts will impact control chips and optical components and cause damage.
- For transparent liquids and oils, it is necessary to add a reflective buoy to the liquid surface for measurement;
- The black substances, such as crude oil, coal and other black coagulated and solid materials, require a smooth surface with laser vertical orthophoto, and the indoor environment can be stably measured up to 12 meters.
- Strongly reflective surfaces, such as mirrors, painted surfaces, shiny metals like stainless steel/aluminum, or other smooth surfaces, are less than ideal for direct measurement. Direct measurement on such surfaces can easily lead to abnormal measurement data or errors, requiring the addition of diffuse reflection auxiliary materials. Use white paper for short-distance measurements and add 3 meters of diffuse reflection material for long-distance measurements.
First, connect the device to a computer to check the amount of return light. Distance readings can be normally obtained between 60# and 3000#. If it is less than 60#, adjust the reflection angle (the strongest when vertical) or paste white paper to enhance the reflection signal; if it is greater than 3000#, adjust the reflection angle. (inclined at a certain angle) or changed to a matte surface to weaken the signal strength.
- Avoid spraying the L3 laser source and lens with insulating paint or other chemicals, otherwise the coating on the laser source or lens will be damaged by chemicals and the laser cannot be emitted or received.
- To avoid mutual interference, the minimum distance between laser beams should be at least 15 cm (not less than 10cm) when using multiple modules.
- When networking multiple modules, avoid using 120-ohm terminal resistors within 100 meters, as this will weaken the signal and affect communication.
- If need glue filling, please consult our technical engineer before operating, otherwise the light propagation path will be blocked and measurement will be impossible.
- Please read this manual thoroughly and follow the steps to operate, otherwise repeated communication will affect your efficiency.

Electromagnetic Compatibility (EMC)

"Electromagnetic Compatibility" refers to the ability to operate stably in the presence of electromagnetic radiation and static charge environments without causing electromagnetic interference to other devices. Although the L3 series already meets strict regulations and standards in this regard, it cannot completely rule out the possibility of potential interference to other devices.

Trash Disposal

This product should not be discarded as household waste. Please dispose of this product in accordance with the regulations implemented in the country/region of use.

Order Information			
Model	Cable Connector Type	Ordering Code	Description
L3-40	Bottom 4 Pins 3.5mm Pitch	M03-0100030000	PCBA, 0.05-40m, Working temperature: -10 — 50°C
L3s-40	Detachable 2m Cable	M03-0400030000	IP56, Waterproof and dustproof housing, 0.05-40m, Working temperature: -10 — 50°C
L3s-80	Detachable 2m Cable	M03-0400190000	IP56, Waterproof and dustproof housing, 0.05-80m, Working temperature: -10 — 50°C
L3s-40 Filled	Detachable 2m Cable	M03-0400170000	IP67, Shockproof, waterproof and dustproof housing, 0.05-40m, Working temperature: -10 — 50°C
L3s-80 Filled	Detachable 2m Cable	M03-0400370000	IP67, Shockproof, waterproof and dustproof housing, 0.05-80m, Working temperature: -10 — 50°C

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1.0 Product Overview

The L3 series are single-point laser distance sensors based on the principle of phase-shift laser ranging, a type of time-of-flight measurement method commonly used for medium to short-range distances. It offers millimeter-level accuracy, making it one of the most precise methods for measuring distances in medium and short-range applications. When a continuously modulated beam of light is directed at the target object, the light beam reflects back, and the distance is calculated by analyzing the phase changes in the received light.

The L3 series laser ranging products feature millimeter-level resolution, a wide range of applications, broad temperature adaptability, high precision, and suitability for various scenarios, including industrial control, PC applications, and microcontroller competitions.

Product Features

- **Long Range:** The L3 series offer a maximum range of up to 80 meters, making it suitable for various long-distance ranging needs.
- **Accurate Measurement:** It exhibits excellent temperature drift characteristics, automatically compensating for errors caused by temperature changes.
- **High Data Rate:** The system supports data acquisition rates of 10Hz, providing high-speed data collection.
- **High Precision:** It boasts high precision with an error margin of only $\pm 1\text{mm}$.
- **Quick Response:** The power-on time is 0.5 seconds, available to send back the ranging value in 0.1 to 1 second.
- **High Signal-to-Noise Ratio:** The system has a high signal-to-noise ratio, which means that measurement results are hardly affected by factors such as the target's color, surface roughness, and material.
- **Compact Design:** The system is compactly designed, making it convenient for use and integration into various applications.
- **Easy to Assemble:** Supports two types of pin interface configurations, either a 8-pin 2.54mm dual-row pin/hole or a 4-pin 3.5mm single-row pin/hole, facilitating easy integration into a mainboard.

2.0 Wiring Diagram and Dimensions

2.1 L3 Wiring Diagram

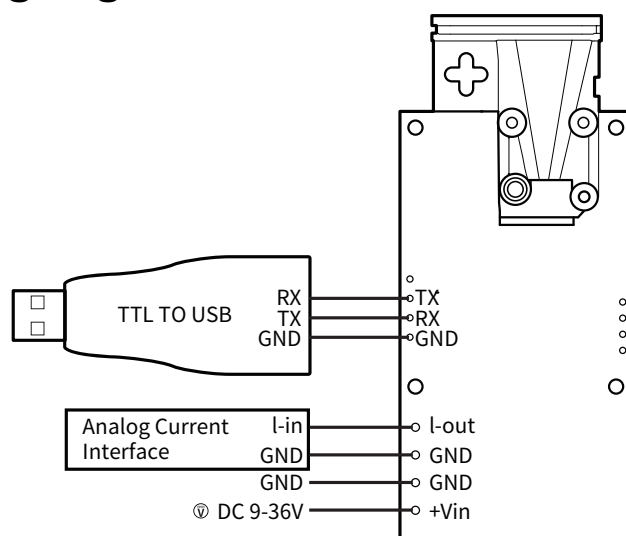


Figure 1. L3 wiring diagram

© L3 Wiring Instructions

1. Following Figure 1, connect the sensor's RX, TX, and GND to the TTL-to-USB converter's RX, TX, and GND respectively.
2. The I-out and GND of the analog output sensor are respectively connected to the 4-20mA analog current input ports I+, I-.
3. Connect the sensor's Vin+ and GND to the positive and negative terminals of a 9-36V DC power supply respectively.
4. Do not connect the sensor's GND to the converter's GND to avoid potential differences, which may result in data errors or damage to the interface chip.

2.2 L3s/L3s-Filled Wiring Diagram

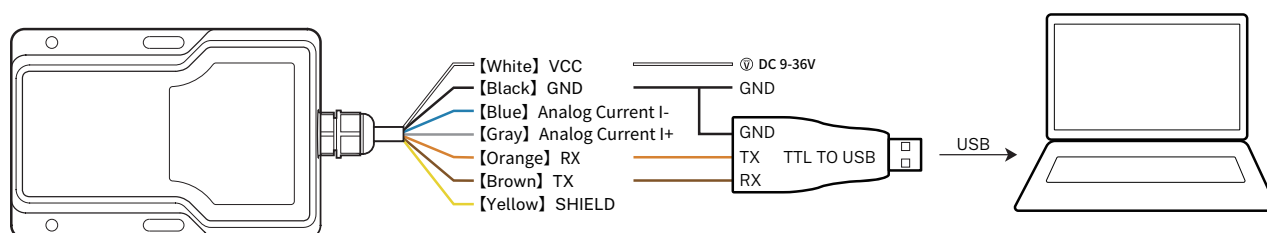


Figure 2. L3s/L3s-Filled wiring diagram (brown wire is not connected)

© L3s/L3s Filled Wiring Instructions

1. Following Figure 2, connect the white wire to the positive terminal of a DC 9-36V power supply, and the black wire to the negative terminal of the power supply or serial ground (GND).
2. The gray wire and blue wire of the sensor are connected to the device's 4-20mA analog current input ports I+ and I- respectively.
3. Connect the brown wire to the RX of the TTL-to-USB converter, and the orange wire to the TX of the TTL-to-USB converter.
4. Connect the yellow wire to the shield ground.

- © The USB to 485/TTL converters of our company feature magnetic upper covers. Upon opening, there is a small screwdriver inside for conveniently and securely fastening after wiring.

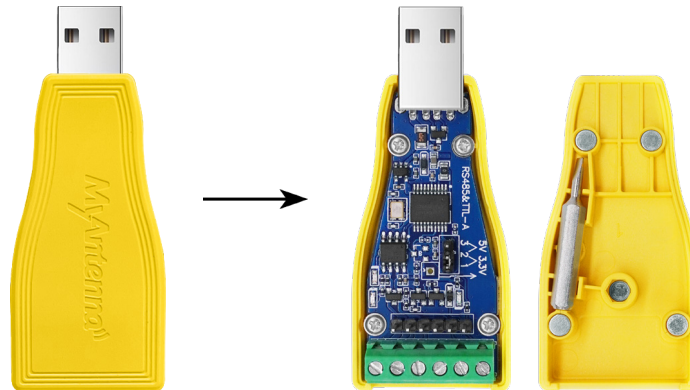


Figure 3. The USB to 485/TTL converter

2.3 L3/L3s/L3s-Filled Dimensions

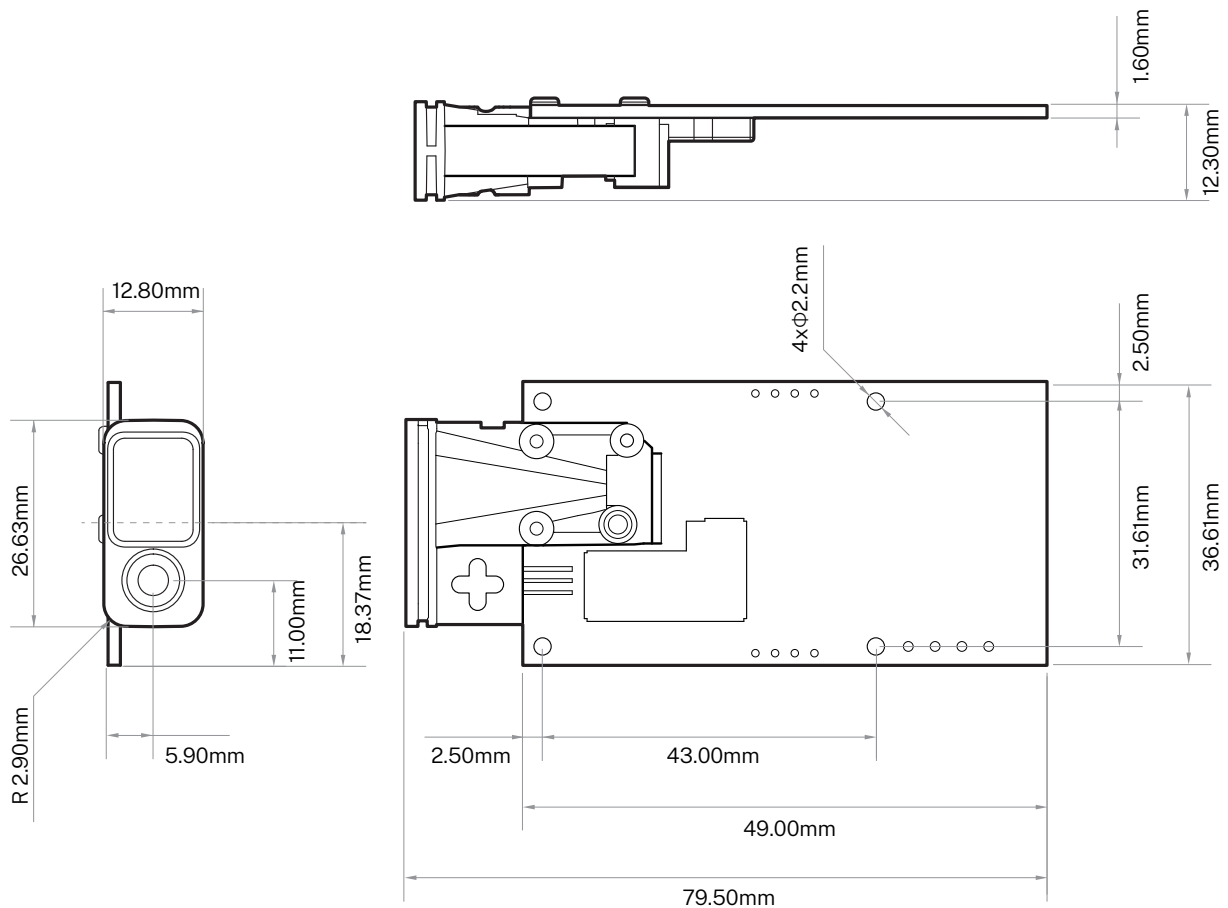


Figure 5. L3 dimensions

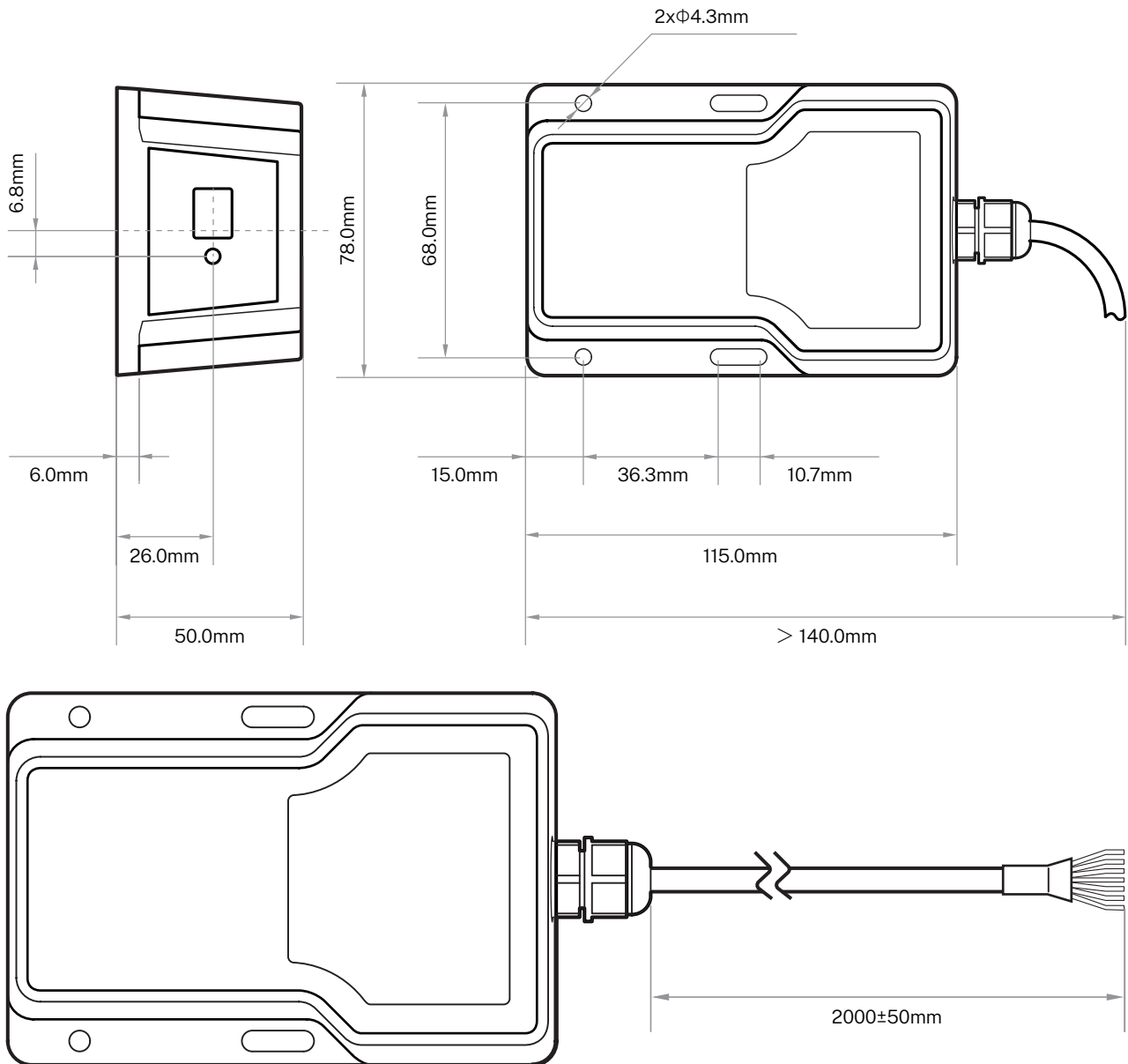
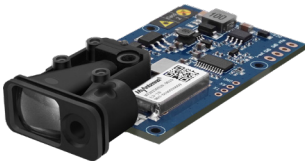




Figure 6. L3s&L3s-Filled dimensions

3.0 Parameters

Product model	L3	L3s	L3s-filled
Product image			
Power supply	DC 9-36V		

Power consumption	20Hz, 0.8W, standby <0.2W		
System startup time	600ms		
Optical device parameters	Wavelength : 650nm Optical power : <1mW (Class 2 laser) Spot type : point laser Spot size : ≤ 6mm at 10mm (See 7.0 Measurement Distance and Spots Sizes for details) Working life : Approximately 20,000 hours (50,000-60000 hours for customized wide temperature version)		
Communication interface	4-20mA Analog Current		
Baud rate	9600/19200/38400/115200 Baud, default 115200		
Serial port format	Baud rate : 115200 Data bits : 8 Stop bits : 1 Verification : none Flow Control : none		
Communication protocol	ASCII		
Sampling rate	1, 2, 5, 10Hz (Usually 1Hz)		
Measurement range	0.05M-40M/0.05M-80M (Available for selection)		
Zero reference point	Default housing frontend (Adjustable)		
Resolution	0.1mm		
Absolute accuracy	±(1mm+ D*5‰), D is the actual measurement distance		
Repeatability	±1mm		
Working temperature	-10 — +50°C (Customizable -20 — +65°C, please contact us for details)		
Storage temperature	-20 — +60°C (Customizable -40 — +85°C , please contact us for details)		
Operating humidity	< RH85%		
Waterproof rating	—	IP56	IP67
Cable	—	2m Aviation cable	2m Aviation cable
Net weight	20.7 g	275.4 g	488.2 g
Gross weight	21.2 g	402.6 g	613.7 g
Size	79.05*36.61*14.3mm	140*78*50mm	

- With strong reflectors, longer distances can be measured. The range value can be set through the downstream command, and the maximum setting is 40/80 meters.
- In harsh environments, such as outdoor sunlight, the performance will be affected. It can be used with a target reflector to improve performance.
- In fast mode, the recovered light signal is weak, the error will become larger, and there are certain requirements for the measurement target and distance, and not suitable for outdoor daytime applications.

4.0 Serial Port Identification

After connecting according to the instructions, plug the serial TTL/232 to USB adapter into the computer, open the computer device manager, and check whether the driver has been successfully installed on the port. If not, you need to find the supplier of the adapter to obtain it. Driver or download it from their official website and make sure the installation is successful, as shown below:

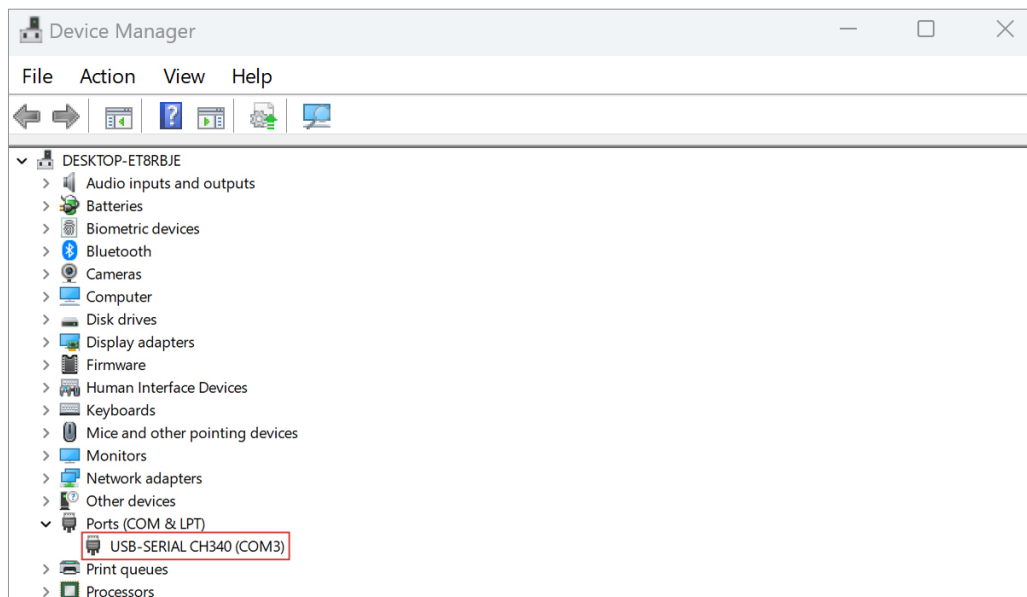


Figure 7. Serial port driver location diagram

5.0 Power-on Test Steps

© After the serial port recognition is successful, aim the sensor at a target distance of more than 3cm. Do not aim at black objects or glass. Proceed as follows:

1. Power on the sensor and check whether the laser light is on. The sensor lights up the red laser by default when it is powered on. If the laser light is successfully lit, open the SSCOM serial port assistant software provided by our company, select the corresponding COM number, and select the baud rate as the factory default value, which is 38400 for L3, and other parameters do not need to be configured.
2. Click to open the serial port, if the wiring is correct, distance data will be continuously displayed. When other parameters need to be set, enter the command "iHALT" (lowercase "i", uppercase "HALT") in the command window to stop the measurement. At this point, the data reporting will cease, as shown in Figure 8:

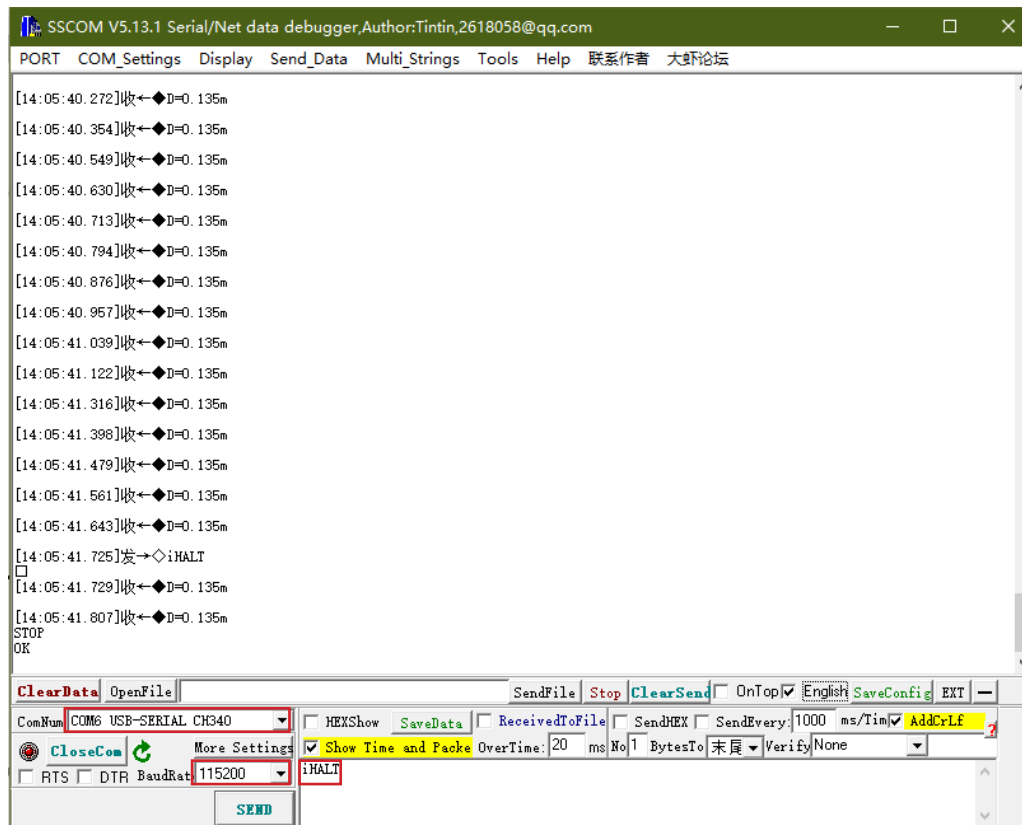


Figure 8. Serial port assistant software window diagram

4.0 Parameter Adjustment Commands

The range module L3 with analog 4-20mA output can set parameters through the serial port UART-LVTTL together with the serial port assistant software. The serial port UART baud rate is 115200.

 **Note:**

Before operation, you must first issue an instruction of iHALT to stop the working of the laser ranging module. The instructions are as follows:

4.1 Stop Measurement

Stop measurement

Host:iHALT.

4.2 Distance Offset

Set distance offset

Host:iSET:1,X

In which X is the offset value, the unit is (mm), the range is -1000 — 1000

For example

Set the offset to -10mm. iSET:1,-10

Read distance offset

Host:iGET:1

4.3 Rate Measurement

Set rate measurement

Host:iSET:7,X

In which X=1/2/5/10; default 1 is 1HZ

Read rate measurement

Host:iGET:7

4.4 Measurement Mode

Set measurement mode

Host: iSET:8,X Host:iSET:8,X

In which X=0/1; 0-represents periodic measurement (default), 1-represents continuous measurement

Read measurement mode

Host:iGET:8

4.5 Analog quantities corresponding to distance range

Set range

Host;iSET:9,X,Y

Among them, X is starting distance; Y is cutoff distance.

The default is 100 — 10100(0.1m to 10.1m).

The maximum setting is 40m.

For example

Set the analog 4-20mA distance range to 0.05m to 20m.

iSET:9,50,20000

Read the range Host;iGET:9

5.0 Operation Notes

The UART interface on the motherboard is a 2.54mm pinhole [TX/RX/GND], which can be operated by connecting to the serial port assistant through the serial port (the power supply is still 9-36V, and a voltage of 12V or above is recommended);L3s is with a shell. If you want to connect it to a computer to adjust parameters, you need to disassemble the shell and perform wiring operations;

 **Note:**

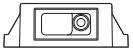
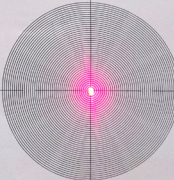
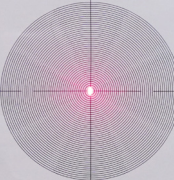
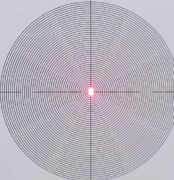
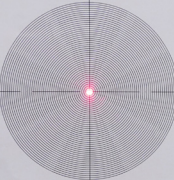
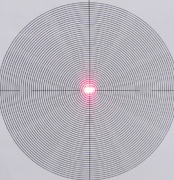
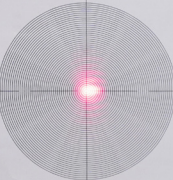
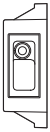
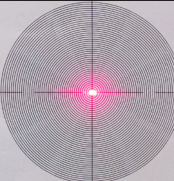
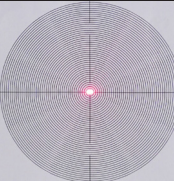
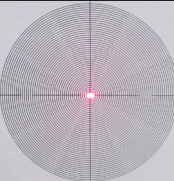
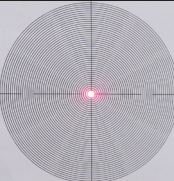
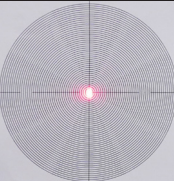
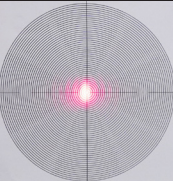
Before operation, you must first issue an instruction of iHALT to stop the working of the laser ranging module;

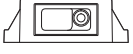
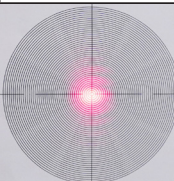
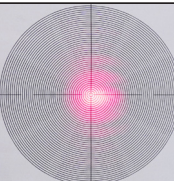
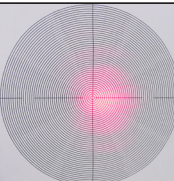
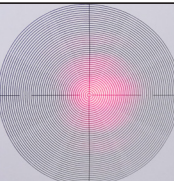
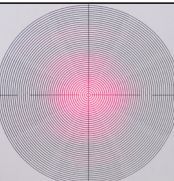
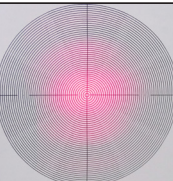
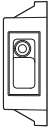
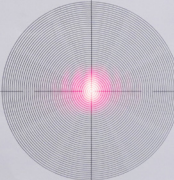
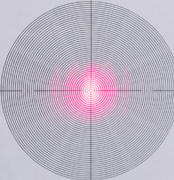
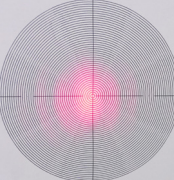
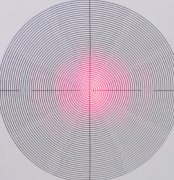
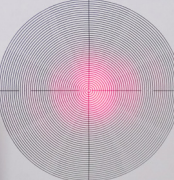
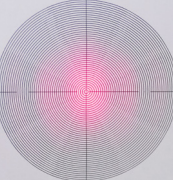
6.0 Distance Conversion

	Symbols	Units
Sample to range module output value	A	mA
4mA represents starting distance	SD	mm
20mA represents cut-off distance	ED	mm
Calculate distance	RD	mm

© The conversion formula is as follows : $RD = (A - 4.000) * (ED - SD) / 16.000 + SD$

7.0 Measurement Distance and Spots Sizes

Range	0.05M	0.5M	1M	5M	10M	20M
 Module flat test						
Spot size	3*4mm	3*4mm	3*4mm	3.5*4mm	6*3.5mm	10*6mm
 Module side test						
Spot size	4*3mm	4*3mm	4*3mm	4*3.5mm	3.5*6mm	6*10mm

Range	30M	40M	50M	60M	70M	80M
 Module flat test						
Spot size	9*12mm	14*10mm	22*12mm	24*14mm	22*16mm	24*18mm
 Module side test						
Spot size	12*9mm	10*14mm	12*22mm	14*24mm	16*22mm	18*24mm

8.0 Maintenance and After-sales Service

8.1 Maintenance

1. The instrument should be stored in a dry place and protected from dust.
2. Make sure the instrument power supply is reliably connected before starting up. Please do not switch the power on and off continuously to avoid damaging components or accelerating the aging of electronic components and reducing their lifespan.
3. Never immerse the laser rangefinder in water.
4. Keep the instrument lens clean and wipe away dust with cotton cloth soaked in alcohol.
5. Never use corrosive or oily substances to clean the instrument lens.
6. Check the instrument regularly, especially after the instrument is used abnormally, or before and after the instrument performs important measurements.

8.2 After-sales Service

1. **"7-day return service"**: Suppose the product has non-human quality problems within 7 days from the date of sale, the manufacturer's inspection report is attached, and the packaging accessories are intact, customers can choose to return, exchange, or repair the product.
2. **"15-day exchange service"**: Free exchange and repair services are supported with non-human quality problems within 15 days from the date of purchase of the instrument and the manufacturer's test report is attached. When exchanging, please ensure that the packaging accessories are intact.
3. **"30-day free maintenance"**: If the product has non-human quality problems within 30 days from the date of sale, the customer can choose to repair it. If the product still cannot be used normally after two consecutive repairs, the customer can choose to replace it with a new product of the same model.
4. **"One-year warranty service"**: If quality problems occur with the product within one year from the date of purchase, the customer can send the machine to our designated maintenance center or our headquarters for inspection and repair. If parts need to be replaced during maintenance, the corresponding parts cost will be charged appropriately by our company. If there is no need to update parts, customers can enjoy free maintenance services.

8.3 After-sales Instructions

1. **Factory warranty**: All instruments are guaranteed by the factory or the service centers authorized by the factory. The company does not assume any responsibility for any issues not caused by our factory or designated service centers.
2. The included freebies are not covered by the warranty: Giveaways/freebies come with the purchase are not covered by replacement or warranty.
3. If customers return or replace an item, it should be returned in the same condition in which it was received, and it should include all items that were in the original package. Returns or replacements will not be accepted if the packaging is damaged, or missing any parts, or is damaged during return shipping because it wasn't packaged correctly, or the machine is used, scratched, or worn.

Warranty Policy

1. Warranty Period

Under normal use, a year warranty will be offered from the purchase date for malfunctions not caused by human factors.

2. Below circumstances are not applied for warranty and will be repaired for a fee.

- Damage caused by improper use, maintenance and storage by the buyer.
- Dismantled and repaired by oneself or at a repair center other than our factory.
- No warranty card or purchase invoice.
- The machine number on the warranty card is inconsistent with the repair product or has been altered;
- Product damage caused by force majeure.
- Parts that need to be replaced due to normal wear and tear.
- Loss or damage caused by abnormal factors such as temperature/humidity in the environment in which the instrument is used.
- Damage caused by improper operation.

3. When the instrument needs maintenance, please send it to the local dealer with the original purchase invoice/receipt.

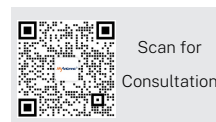
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