DADISICK®

Laser Ranging Sensor

User Manual

DA/B-Y10 DA/B-Y20 DA/B-Y30 DA/B-Y50 DA/B-Y100

Contents




Executive standard: GB/T 14267-2009

User Instructions

Safety Regulations

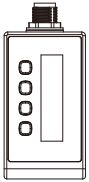
Beforeusing the instrument for the first time, please read the safety terms and operating instructions carefully.

- ⚠ Please read all operating instructions and safety regulations in this manual carefully before using the instrument. Failure to use the instrument in accordance with the operating methods in this manual may cause damage to the instrument, affect measurement accuracy, and cause personal injury to the user or third parties.
- ⚠ Do not open or repair the instrument by yourself in any way. It is strictly prohibited to illegally modify or change the performance of the instrument's laser transmitter. Please keep the instrument properly, do not place it in a place where children can reach it, and avoid use by unrelated persons.
- ⚠ It is strictly forbidden to irradiate your own or other people's eyes and other parts of the body with the instrument's laser, and it is strictly forbidden to irradiate the laser on highly reflective surfaces.
- ⚠ The electromagnetic radiation of the instrument may cause interference to other equipment and devices. Please do not use the instrument near aircraft or medical equipment, and do not use in flammable or explosive environments.
- ⚠ Do not dispose of used batteries and scrapped instruments with domestic waste. Please abide by relevant national or local laws and regulations.
- ⚠ If there are any quality problems with the instrument, or if you have any questions about using the instrument, please contact the local dealer or Sndway in time. We will provide services for you as soon as possible.

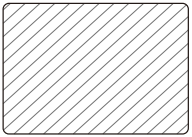
1.Packing List

When purchasing the instrument, please carefully check whether all accessories of the instrument are complete according to the following list.

Name	Unit	Qty.	Remarks
Main unit	pc	1	
M12 8pin connector cable	pc	1	About 2 meters
Color box	pc	1	
User Manual	pc	1	
Reflector	pc	1	210*148mm
Metal film resistor	pc	1	120Ω±1% 125mW plug-in “Housheng”
Installation screws	pc	1	GB M4*60/304 stainless steel hexagon socket countersunk head bolts (screws) + external hexagonal shock-proof stainless steel nut + stainless steel spring washer



Main unit



Reflector

Connector cable

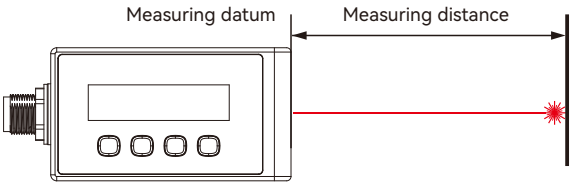
User Manual

Metal film resistor

Mounting screws

2.Features and Applications

DA/B-Y series industrial-grade laser sensors provide accurate and stable distance measurement and can be integrated into various industrial applications. The red laser beam hits the reflective surface and non-contact measurement is performed based on the return signal.



● Features

◇ Phase method distance measurement, high accuracy and fast speed.

◇ Precision optics can ensure high accuracy even outdoors and in harsh environments.

◇ Metal die-cast shell, IP67 safety protection level.

◇ Output interface: RS232/RS485, 2-way switching output, voltage/current output (type B only).

◇ With buttons and display screen, it is convenient to set the working parameters of the instrument.

● Applications

◇ Industrial measurement of position, displacement, thickness, distance, etc.

◇ Industrial automation and production intelligent management.

◇ High-altitude cable erection measurement and railway catenary measurement.

◇ Material level/liquid level detection.

◇ Monitoring of slope and dam deformation.

◇ Building safety monitoring.

3.Technical Parameters

Item	Type A					Type B(With voltage and current output)				
Model	DA-Y10	DA-Y20	DA-Y30	DA-Y50	DA-Y100	DB-Y10	DB-Y20	DB-Y30	DB-Y50	DB-Y100
Measuring distance	0.2m-10m	0.2m-20m	0.2m-30m	0.2m-50m	0.2m-100m	0.2m-10m	0.2m-20m	0.2m-30m	0.2m-50m	0.2m-100m
Voltage/current output	/					Can be set to 0~5V / 0~10V / 4~20mA / 0~20mA /0~24mA output *Note 2				
Voltage output error	/					0.2%+0.5mV				
Current output error	/					0.2%+0.005mA				
Output mode	Digital quantity+switch quantity					Digital quantity+switch quantity+analog quantity				
Communication interface	RS232/RS485 (switchable)									
Measuring frequency	1Hz-40Hz									
Laser type	Class II, 660±15nm, ≤1mW									
Measurement resolution	1mm									
Measurement error	±(2mm+d * one ten thousandth) *Note 1									
Indicator light	Red laser									
Spot size	@1m∅6mm;@10m∅8mm;@20m∅12mm;@30m∅16mm;									
Display	128x32 dot matrix screen									
Backlight off time	30 minutes (can be set to normally on)									
Operating mode	Off measurement, continuous measurement									
Transistor switch output	2 channels (cannot exceed DC36V 0.5A) *Note 3									
Power supply	DC15~30V									

Power consumption	<3.0W
Protection grade	IP67
Shell material	Die-cast zinc alloy
Working temperature	-10℃~50℃
Storage temperature and humidity	-20℃~60℃, 20%~85%RH
Overheating protection	When the body temperature is higher than 70℃, the measurement will be shut down and when the temperature is lower than 70℃, the measurement will be resumed
Body size	88.45x40x59.3mm (including connection base)

*Note 1: When [Speed Level] is 1.

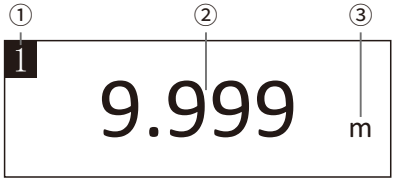
"d" represents the actual distance. In harsh environments, such as when the sun is too strong and the ambient temperature fluctuates too much, there will be a large error in the measurement results. In this case, the effect is better when used with a target reflector.

*Note 2: Current and voltage can't be output at the same time.

*Note 3: If the external DC output of the transistor switch exceeds the limited voltage or current, it may cause permanent damage to the instrument.

4.Display and Buttons

- Display



① Station number

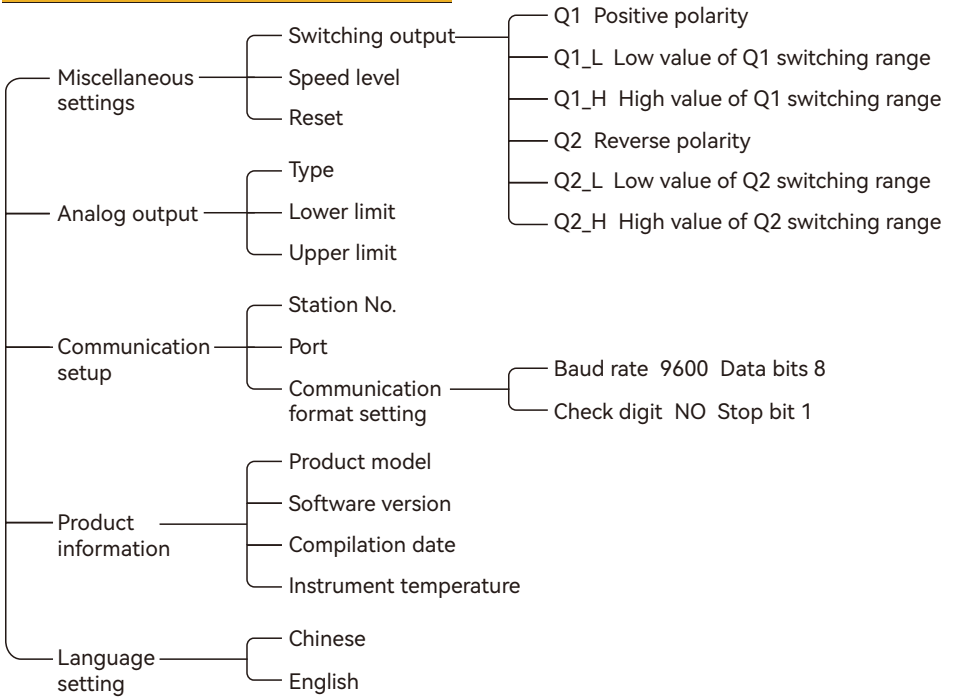
② Measuring distance

③ Unit of measurement distance

- Buttons

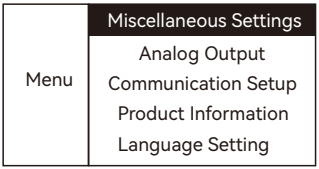
Button	Press	Hold
SET	Confirm in setting mode	Enter parameter setting mode
ESC	Return to setting mode	Backlight switch setting
▲	Adjust option content	Adjust position forward
▼	Adjust option content	Adjust position backward

5.Setting Mode



5.1 Setting Menu

The setting menu includes: Miscellaneous settings, analog output, communication setup, product information and language setting.

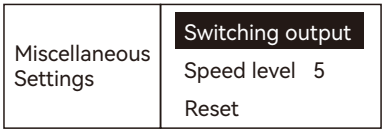


1) Press ▲ to adjust the previous option;
2) Press ▼ to adjust the next option;
3) Press SET to enter the selected menu item;
4) Press ESC to return to the previous interface;

Note: “Analog output” function is only available for type B

5.2 Miscellaneous Settings

Enter the “Miscellaneous Settings” option in the settings menu, refer to [5.1 Settings Menu].



1) Press ▲ to adjust the option upward;
2) Press ▼ to adjust the option downward;
3) Press SET to enter the selected menu item;
4) Press ESC to return to the previous interface;

5.2.1 Switching Output

Enter the “Switching Output” option in the miscellaneous settings, refer to [5.4 Miscellaneous Settings].

Switching Output	Q1	Positive polarity
	Q1_L	01000
	Q1_H	02000
	Q2	Reverse polarity
	Q2_L	01000
	Q2_H	02000

1) Press ▲ to adjust the option upward/adjust the value of the selected option;
2) Press ▼ to adjust the option downward/adjust the value of the selected option;
3) Press SET to select/uncheck the menu item;
4) Press ESC to cancel the selected menu item;
5) Hold ▲ to switch to the previous bit of the selected value;
6) Hold ▼ to switch to the next bit of the selected value;

Trigger level options: Off/positive polarity/reverse polarity

5.2.2 Speed Level

Enter the “Speed Level” option in the miscellaneous settings, refer to [5.4 Miscellaneous Settings]. Speed level: The instrument provides a total of 5 levels of speed from 1 to 5 for users, Level 1 is the slowest with an output rate of about 10Hz, Level 5 is the fastest with an output rate of about 40Hz, The ranging accuracy is inversely proportional to the speed. Users can flexibly choose according to actual conditions.

Miscellaneous Settings	Switching output Speed level 5 ▲▼ Reset

1) Press ▲ ▼ to adjust;
2) Press SET ESC to return to the previous interface;

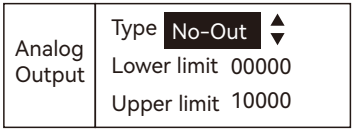
5.2.3 Reset

Enter the “Reset” option in miscellaneous settings, refer to [5.4 Miscellaneous Settings], and restore to factory settings.

1) Press SET to confirm reset;
2) Press ESC to cancel and return to the previous interface;

5.3 Analog Output

Enter the “Analog Output” option in the setting menu, type B only, refer to [5.1 Settings Menu].



Output mode options: No-Out/0~5V / 0~10V / 4~20mA / 0~20mA / 0~24mA

1) Press ▲ to adjust the option upward/adjust the value of the selected option;
2) Press ▼ to adjust the option downward/adjust the value of the selected option;
3) Press SET to select/uncheck the menu item;
4) Press ESC to cancel the selected menu item;
5) Hold ▲ to switch to the previous bit of the selected value;
6) Hold ▼ to switch to the next bit of the selected value;

5.4 Communication Setup

Select the “Communication Setup” option in the menu, refer to [5.1 Settings Menu].

Communication Setup	Station No. 01 Port RS485 Communication format setting

1) Press ▲ to adjust the previous option;
2) Press ▼ to adjust the next option;
3) Press SET to enter/select the selected menu item;
4) Press ESC to return to the previous interface/ cancel the selection;

5.4.1 Station No.

Select the “Station No.” option in the communication setup, refer to [5.4 Communication Setup].

Communication Setup	Station No. 01 ▲▼ Port RS485 Communication format setting

1) Press ▲ to adjust the station number value upward;
2) Press ▼ to adjust the station number value downward;
3) Press SET to confirm the selected menu item;
4) Press ESC to cancel the selected menu item;

5.4.2 Port

Enter the “Port” option in the communication setup, refer to [5.4 Communication Setup].

Communication Setup	Station No. 01 Port RS485 ▲▼ Communication format setting

1) Press ▲ to adjust the port upward;
2) Press ▼ to adjust the port downward;
3) Press SET to confirm the selected menu item;
4) Press ESC to cancel the selected menu item;

The port provides two options: RS485 and RS232

5.4.3 Communication Format Setting

Enter the “Communication Format Settings” option in the communication setup, refer to [5.4 Communication Setup]; there are four options: B (baud rate), D (data bit), P (parity check), and S (stop bit).

Communication Setup	B 9600 D 8 P Even S 1

1) Press ▲ to adjust the option upward/adjust the value of the selected option;
2) Press ▼ to adjust the option downward/adjust the value of the selected option;
3) Press SET to select/uncheck the menu item;
4) Press ESC to cancel the selected menu item;

B (Baud rate) option: 1200/2400/4800/9600/19200/38400/57600/115200

D (data bit) option: 8/9

P (parity) option: Even/Odd/None

S (stop bit) option: 1/1.5/2

5.5 Product Information

Enter the “Product Information” option in the Settings menu, refer to [5.1 Settings Menu];
The product model, software version, compilation date, and instrument temperature are scrolled.

Product Information	
Product Model	DA-Y20
Software Version	V.1.20
Compilation Date	2024.01.31
Instrument Temperature	38℃

1) Press ESC to return to the previous interface;

5.6 Language Setting

Enterthe"Language Settings" option in the settings menu, refer to [5.1 Settings Menu];

1) Press ▲ to adjust the option upward;
2) Press ▼ to adjust the option downward;
3) Press SET to confirm the selected menu item;
4) Press ESC to return to the previous interface;

5.7 Backlight Status Setting

The backlight has two states: ① Automatically extinguishes after 30 minutes, Press any button and the backlight will automatically turn on;
② The backlight is always on;

In the instrument measurement state, press and hold the ESC for about 3 seconds to switch between the two states;

The display backlight will automatically turn off after 30 minutes.

The display backlight is always on.

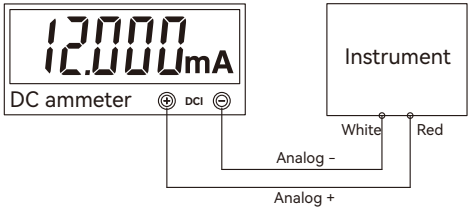
6.Main Unit Wiring and Networking Instructions

No.	Wire color	Interface definition	Description
2	Brown	DC+	Positive pole of external power supply DC 15~30V (input)
7	Blue	DC-	Power- (input)
8	Red	AO+ (type B only)	Analog output+ 4~20mA / 0~20mA / 0~24mA 0~5V / 0~10V
1	White	AO- (type B only)	Voltage/current output dedicated ground terminal
3	Green	RS232RX/RS485-B	232 or 485 communication line
4	Yellow	RS232TX/RS485-A	232 or 485 communication line
5	Gray	Q1	Switching output 1
6	Pink	Q2	Switching output 2
	Shielded wire	EARTH	Connected to the ground

6.1 Current Output (type B only)

Note: Current and voltage can't be output at the same time.

Wiring method:



Output value calculation:

$$I_{out} = \frac{(I_{max} - I_{min}) * (D - D_{min})}{D_{max} - D_{min}} + I_{min}$$

In the formula, I_{out} is the output current;

I_{max} is the maximum value of the output current range, Imin is the minimum value of the output current range;

D is the present measurement distance;

D_{min} is the minimum distance value of analog output, Set in 5.3 [Lower limit];

D_{max} is the maximum distance value of analog output, Set in 5.3 [Upper limit].

For example:

The working mode is 4~20mA output (I_{max} = 20, I_{min} = 4),

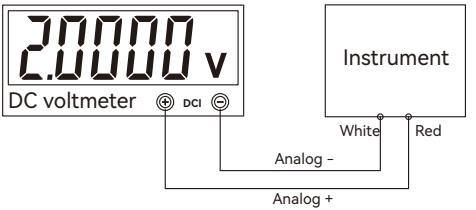
The maximum distance value [upper limit] 0x1B=5000 (mm), the minimum distance value [lower limit] 0x1A=0 (mm), the present measurement distance = 3000 (mm), the calculation method is as follows:

$$I_{out} = \frac{(20-4)*(3000-0)}{5000-0} + 4 = 13.600mA$$

6.2 Voltage Output (type B only)

Note: Current and voltage can't be output at the same time.

Wiring method:



Output value calculation:

$$U_{out} = \frac{(U_{max} - U_{min}) * (D - D_{min})}{D_{max} - D_{min}}$$

In the formula, U_{out} is the output voltage;

U_{max} is the maximum value of the output voltage range, Umin is the minimum value of the output voltage range;

D is the present measurement distance;

D_{min} is the minimum distance value of analog output, Set in 5.3 [Lower limit];

D_{max} is the maximum distance value of analog output, Set in 5.3 [Upper limit].

For example:

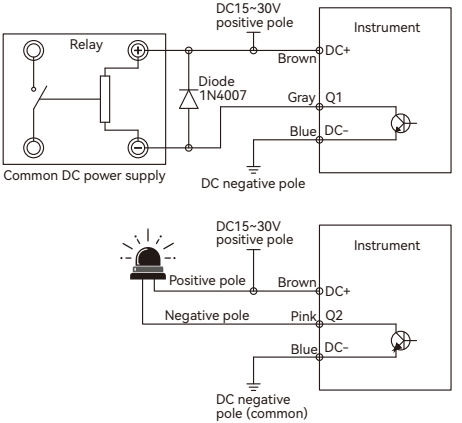
The working mode is 0~5V output, the maximum distance value [upper limit] 0x1B=5000 (mm), the minimum distance value [lower limit] 0x1A=0 (mm), the present measurement distance = 3000 (mm), the calculation method is as follows:

$$U_{out} = \frac{(5-0) * (3000-0)}{5000-0} = 3.000V$$

6.3 Transistor Switching Output

This function has an open-drain (collector) output inside the instrument, It can only input DC current and cannot directly output voltage and current, Please note that the current sink cannot exceed DC36V 0.5A.

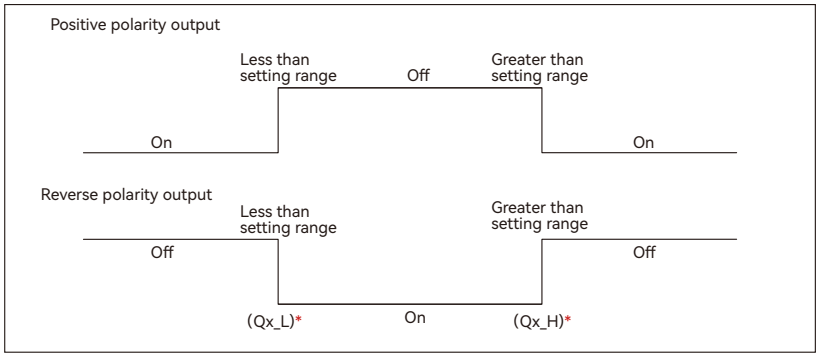
The schematic diagram of the external relay and alarm light of the instrument is as follows:



Note 1: When using a relay, please connect a freewheeling diode (1N4007) in parallel to both ends of the relay drive coil.

Note 2: The transistor switch output of the instrument is connected to external alarm speaker, LED and other devices, The wiring method is the same as the figure above, The positive terminal of the device is connected to the positive terminal of the DC power supply, and the negative terminal of the device is connected to Q1 or Q2 of the instrument.

The level output mode can be set to positive polarity or reverse polarity, Qx_L (0x1C) and Qx_H (0x1D) in register.

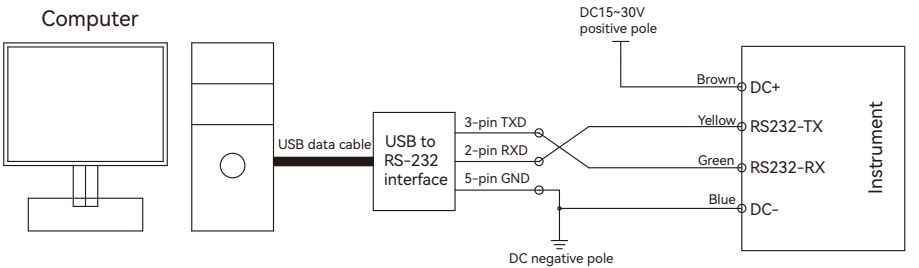


*Note: x means 1 or 2

For example:
Now set the level output mode to positive polarity, the value of Q1_L is 1000 (mm), and the value of Q1_H is 2000 (mm). When the measured distance value is less than 1000mm, Q1 outputs low level; when the measured distance value is 1000mm~2000mm, it outputs high level, when the measured distance value is greater than 2000mm, Q1 outputs low level.

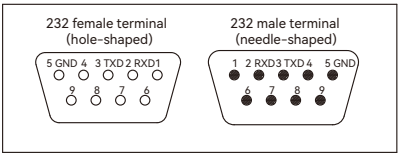
6.4 RS232 Wiring Method

This function has an open-drain (collector) output inside the instrument. It can only input DC current and cannot directly output voltage and current. Please note that the current sink cannot exceed DC36V 0.5A.



Note: RXD and TXD on the computer side and instrument side need to be cross-connected. RS232 has three connections: RX (green) TX (yellow) GND (blue).

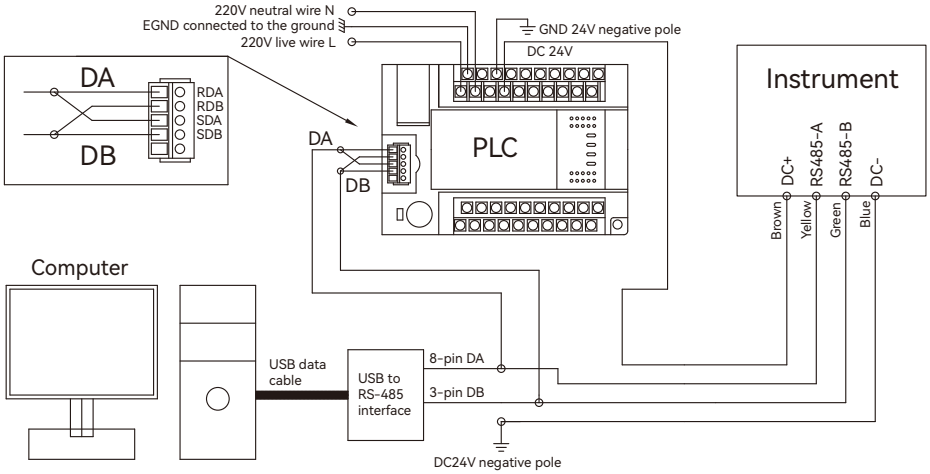
D-Sub connector RS232 pin definition



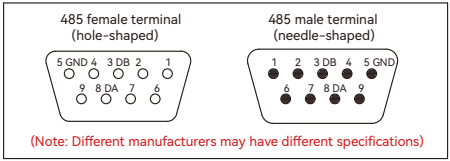
6.5 RS485 Wiring Method

For example, the following figure is the wiring diagram for joint commissioning of Mitsubishi PLC (FX3U-16M), computer and ranging sensor.

Note: The power supply for the instrument in the figure is provided by the 24V of the PLC. In the absence of PLC 24V power supply, an additional 15~30V DC power supply can be connected.



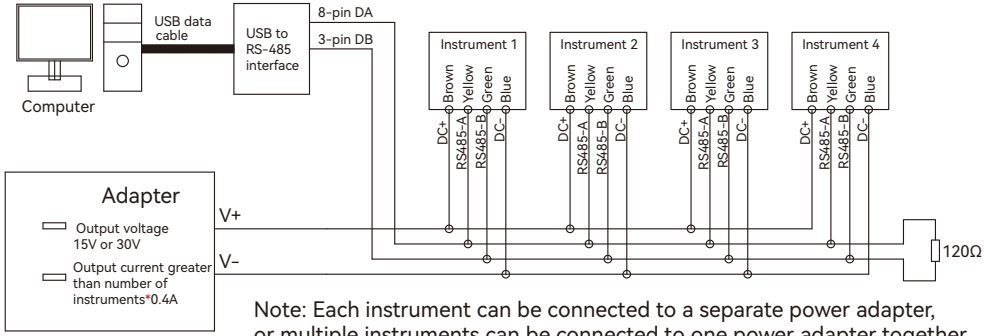
D-Sub connector RS485 pin definition



6.6 RS485 Networking Wiring Method

For example, the figure below is a connection diagram for networking a computer and multiple instruments through RS485 half-duplex communication, All instruments are connected to the bus, Due to address restrictions, the maximum number is 64.

Note: In actual application, if communication is unstable, a 120Ω 1/8W resistor needs to be connected in parallel to the RS485 terminal.



Note: Each instrument can be connected to a separate power adapter, or multiple instruments can be connected to one power adapter together.

7.Communication Protocol (MODBUS RTU)

Please go to www.dadisick.com to download the Ranging Sensor Reference Manual for detailed information.

7.1 Data Transmission Format

Default format Baud rate: 9600 Data bit: 8 Stop bit: 1 Parity bit: N

Baud rate, data bits, stop bits, parity bits and other parameters can be set in 5.2.3 [Communication Format Settings].

7.2 RS485 Interface

When the instrument is connected to 485 network, each instrument (slave) must be set with a unique address.

Because it is a slave device, when the instrument measures data, it will not actively send the data, and the host computer needs to issue instructions to obtain the data.

7.3 RS232 Interface

When the instrument measures data, the interface will actively upload the data in the following format:

01	03	04	00 01 0D 7E	2F 43
①	②	③	④	⑤

① 01 indicates that the slave address is 1, only 1~64 are used in the system, and other addresses are reserved.

② 03 is the read function code, which means reading the data register.

③ 04 means returning 4 bytes of data.

④ The distance is 0x00010d7e (hexadecimal) = 68990 (decimal), which means the measured distance is 6.8990m.

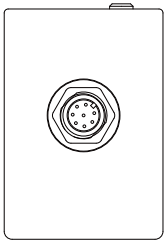
⑤ Error parity bit, which allows the host and terminal to check errors during the transmission process and occupies two bytes.

7.4 Function Register List (16-bit)

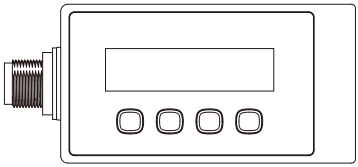
Hexadecimal address	Decimal address	Attribute	Value range	Function description
0x10	16	R/W (reserved)		
0x11	17	R/W	0~2	0: Turn off measurement 2: Continuous measurement
0x12	18	R/W	1~5	Ranging speed level: 1: slowest, 5: fastest
0x13	19	R/W (reserved)		
0x14	20	R/W	1~64	Slave station number
0x15	21	R		High byte of distance register
0x16	22	R		Low byte of distance register
0x17	23	R		Ranging status register *
0x18	24	R/W	0~7	Communication baud rate
0x19	25	R/W	0~4	Voltage output 0: 0~5V 1: 0~10V Current output 2: 4~20mA 3: 0~20mA 4: 0~24mA
0x1A	26	R/W	0~50000	Minimum value register of analog output
0x1B	27	R/W	0~50000	Maximum value register of analog output
0x1C	28	R/W	0~50000	Minimum distance of Q1 switch output
0x1D	29	R/W	0~50000	Maximum distance of Q1 switch output
0x1E	30	R/W	0~2	Q1 0: Off 1: Positive polarity 2: Reverse polarity
0x1F	31	R/W	0~50000	Minimum distance of Q2 switch output
0x20	32	R/W	0~50000	Maximum distance of Q2 switch output
0x21	33	R/W	0~2	Q2 0: Off 1: Positive polarity 2: Reverse polarity

Note: When this register is 0, the distance measurement is successful; when it is not 0, the distance measurement is wrong, and the value of the distance register (21, 22) is 9999999.

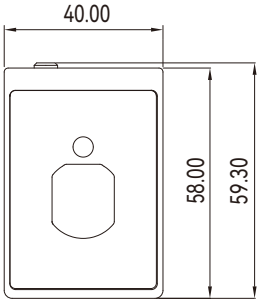
8.Installation Dimensions



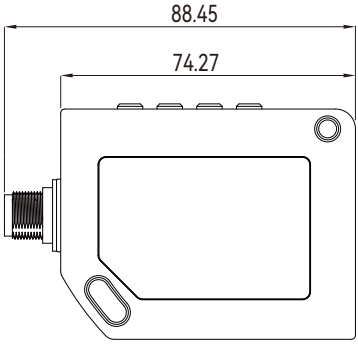
(Joint surface)



(Joint surface)



(Laser emitting surface)



(Side view of main body)

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