



SG Series Laser Displacement Sensor

——Quick User Guide

Please read the User Guide before use.

This guide aims to provide instructions for users to quickly use the SG Series Laser Displacement Sensors.

For detailed user guide, please download the user manual from the official website of SSZN, website: <http://www.cnsszn.com>.

Please read the user guide comprehensively to have a complete understanding of the SG Series Laser Displacement Sensors.

- Do not tear off the label or it will void the warranty.
- Do not disassemble the sensor head, otherwise it may lead to damage of the sensor head, and the error of the factory calibration data. In that case, it has to be returned to the factory for repair.
- Please read this guide carefully, as incorrect operation may result in camera damage.

1 Installation Environment

- Keep away from strong electromagnetic interference environment and high-power electrical appliances.
- Avoid sharing the power supply with high-power electrical appliances.
- Avoid laying the sensor head cable parallel to the power supply line with high current or frequent voltage switching.

2 Preparation

Before installation, please prepare the following items:

- Ethernet cable (above Category 6 or support 10GBASE-T);
- Multimeter;
- Wire stripper;
- Crimping plier;
- Nipper pliers;
- M4 screw with washer × 3;
- A set of slot type screwdrivers;
- A set of Phillips screwdrivers;
- A set of internal hexagonal wrench;
- A set of wrenches.



3 Description of sensor head components

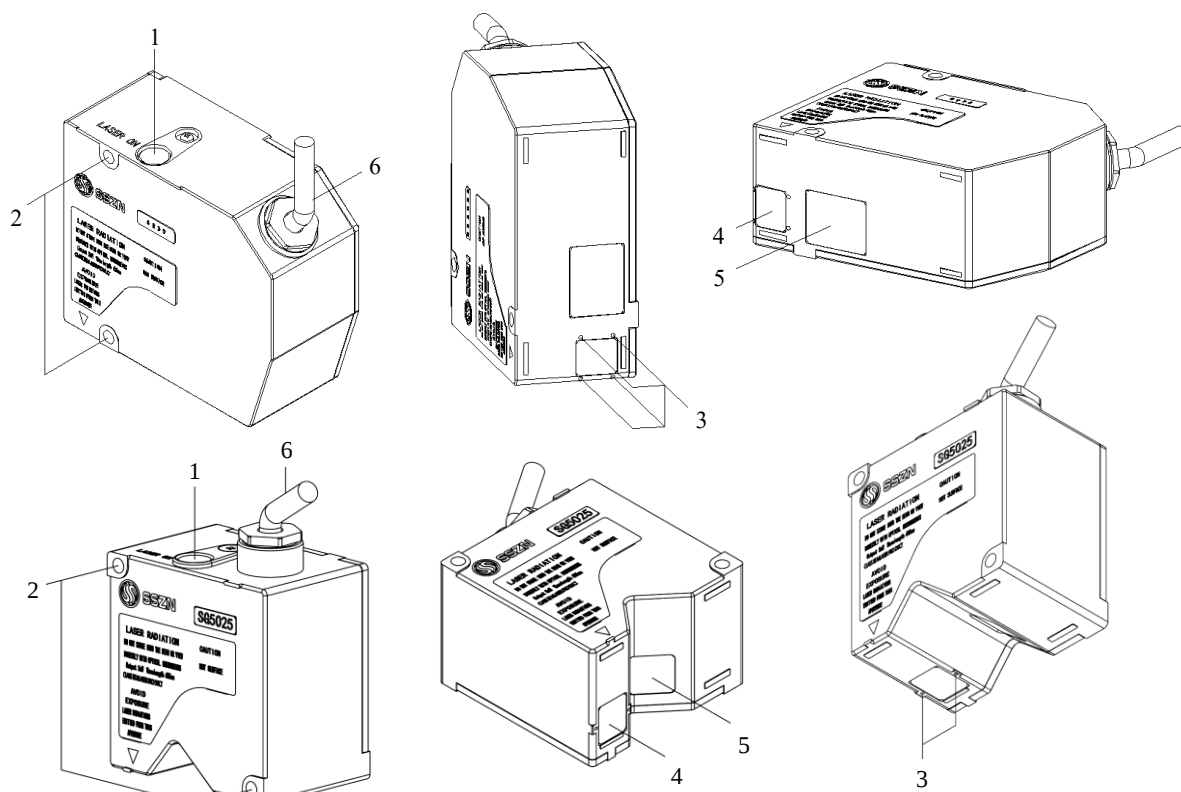


Figure 3-1 Schematic diagram of sensor head components

Table 3-1 Description of sensor head components

No.	Name	Function description	
1	Laser emission LED	Solid green light	The object is near the center of the measurement range ($\pm 5\%$ range)
		Solid yellow light	The object is within the measurement range
		Blinking yellow light	The object is outside the measurement range
		Yellow or green light is on	The laser device is working
		The light is off	No power or power supply anomaly
		Red light is on	Sensor head failure alarm
2	Mounting hole	Install the sensor head with the supplied hex eye bolt. Please refer to " 5 Precautions for sensor head installation ".	
3	Neutral density attenuator optical filter accessory hole	It is used to fix the additional neutral density attenuator optical filter. Decide whether to add it or not according to the actual application.	
4	Sensor head laser emission window	Laser used for emission measurement. Protected by a glass cover.	
5	Sensor head photosensitive window	Laser used for receiving measurement. Protected by a glass cover.	
6	Cable with high flexibility	Connect the sensor head cable. Please refer to " 6.4 Connect the controller and sensor head ".	

4 Description of controller components

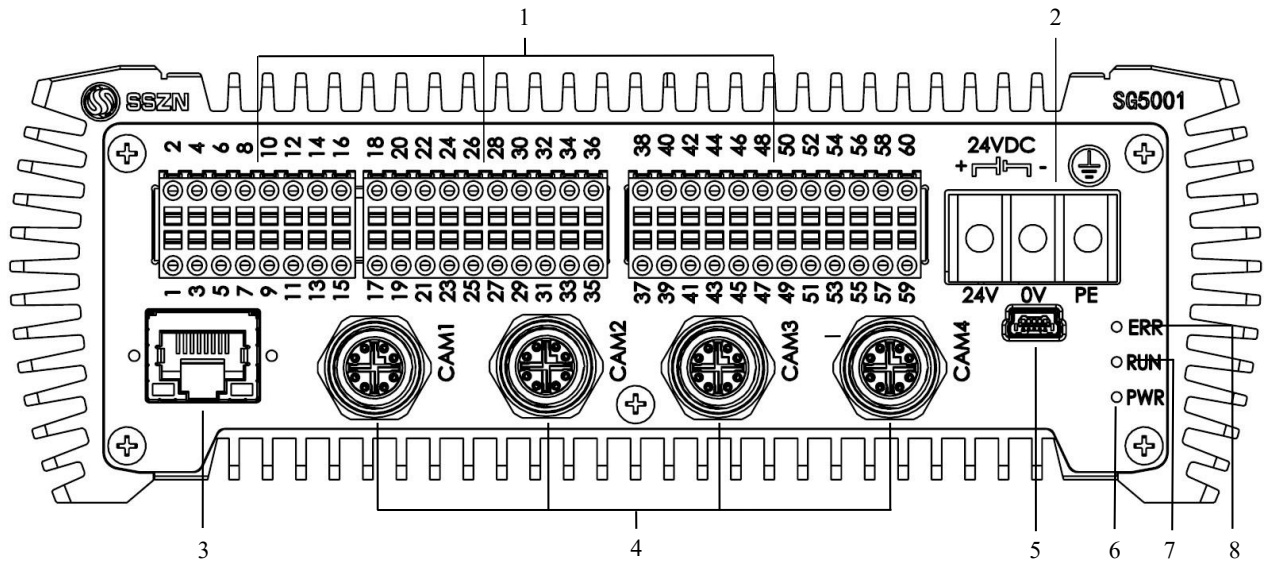


Figure 4-1 Schematic diagram of controller components

Table 4-1 Description of controller components

No.	Name	Function description		
1	IO, encoder input, RS232 interface terminal	It is used for controlling the input and output of signal, and IO isolated power supply. It is used to input the pulse signal of the encoder. It is used for RS232 serial port connection. Please refer to "6.2 Names and functions of I/O terminals".		
2	24V power terminal	It is used for controller power supply (DC24V). Left: +24V, middle: 0V, right: earth (PE and case).		
3	Ethernet interface RJ45 connector	Connect to PC or switch via Ethernet cable.		
4	Sensor head cable interface connector	It is used to connect the sensor head. Include sensor head 1/2/3/4 connectors. Please refer to "6.4 Connect the controller and sensor head"		
5	Reserve	Do not use, otherwise it may cause damage of the device.		
6	Power indicator	Blue	On	Power supply is normal
			Off	Power-off, or abnormal power supply
7	Controller running status indicator	Green	Flashing	Normal operation
			Off	Anomaly
8	Controller error status indicator	Red	On	Error status
			Off	Normal

5 Precautions for sensor head installation

Target distance measurement

Please choose to use the sensor head closest to the reference distance, thereby ensuring the most stable inspection.

Target shape

The sensor head is recommended to be installed in the direction indicated by the circle in the figure below.

The laser light reflected on walls, etc. will become stray light, so please confirm whether it will affect the measurement before use.

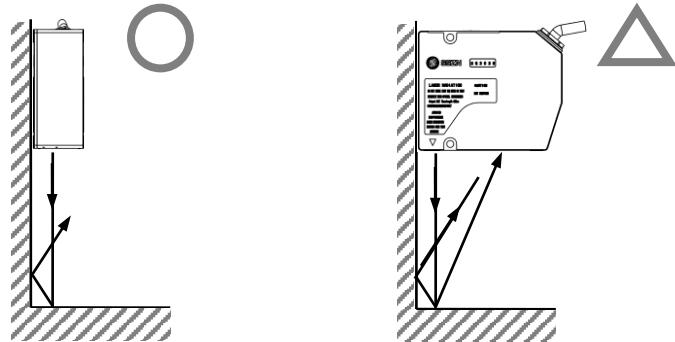


Figure 5-1 Schematic diagram of the correct installation for measuring close to the wall surface

Please avoid blocking the laser beam irradiating the target object and the light path reflected from the target object to the photosensitive window.

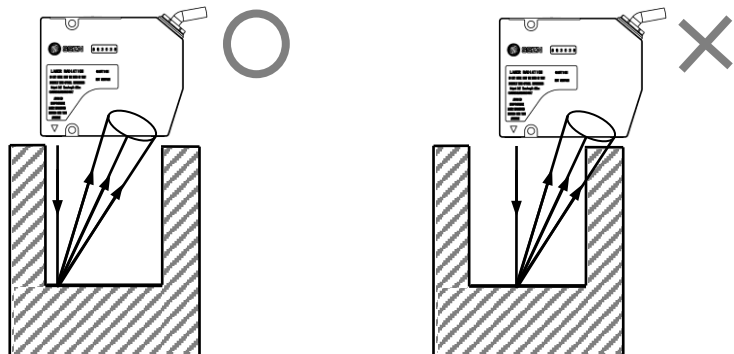
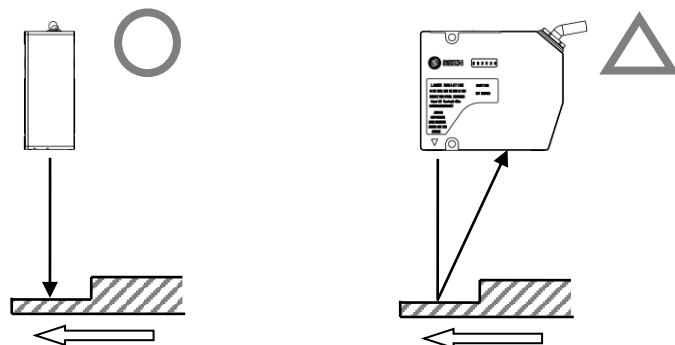


Figure 5-2 Schematic diagram of correct installation for displacement measurement in the hole

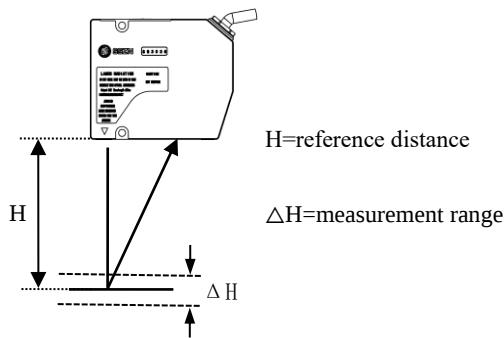
For height difference measurement, please confirm whether the object under test will block the light path during travel.



5-3 Schematic diagram of correct installation for height difference measurement

Installation method

Diffuse reflection installation method



Mirror reflection installation method

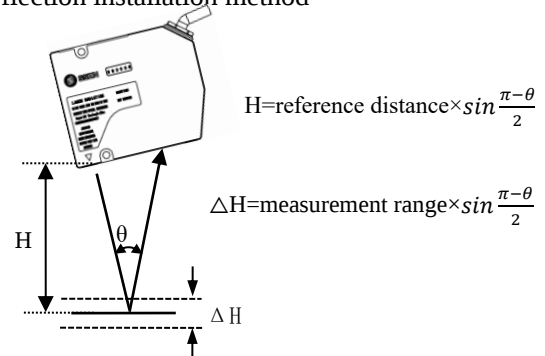


Figure 5-4 Schematic diagram of diffuse reflection and mirror reflection

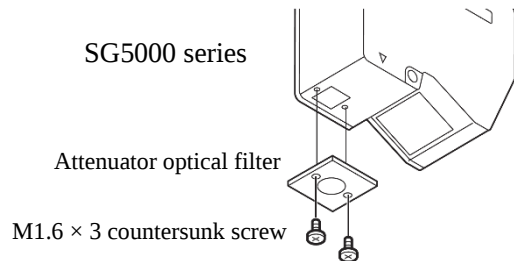
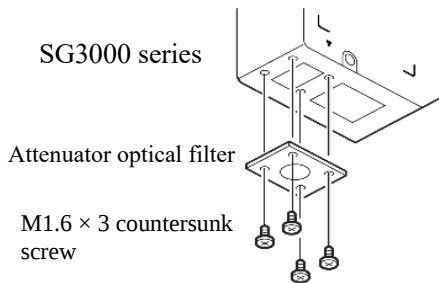


Figure 5-5 Schematic diagram of optical filter installation

Adjust the distance between the sensor head and the target object, and fix it with screws.
Please refer to "[9 Dimensional diagram](#)" for installation dimensions.
The tightening torque for the installation screws should be within the following range.
M4 screw: 1.2 to 1.8N·m

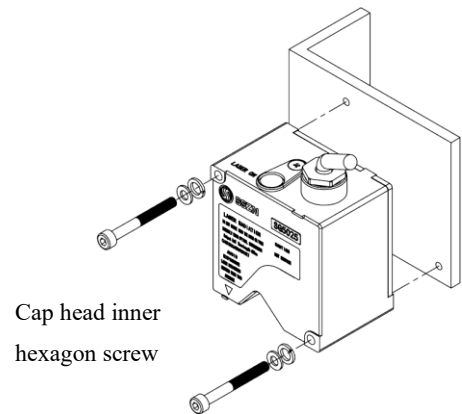
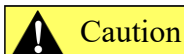


Figure 5-6 Schematic diagram of sensor head installation



- If the sensor head is mounted on a flat plate with poor heat dissipation, such as resin, the surface temperature of the sensor head will rise, which may cause burns.
- To facilitate the heat dissipation of the sensor head, please install the sensor head on a metal plate.

When using 2 or more sensor heads, pay attention to the mutual interference area to prevent mutual interference. Please refer to *SG Series Laser Displacement Sensor Software User Manual*.

6 Hardware connection

6.1 System wiring diagram

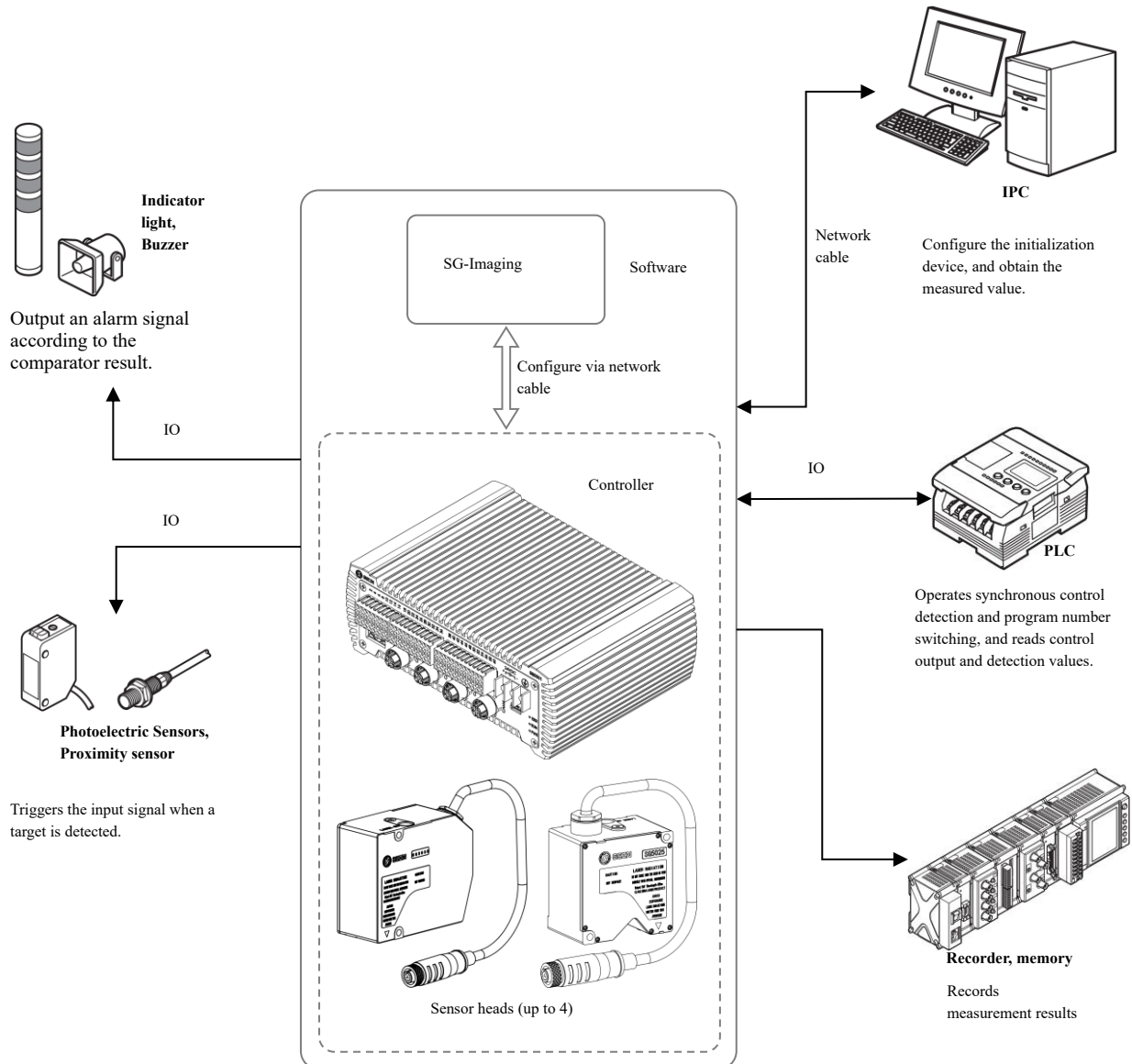
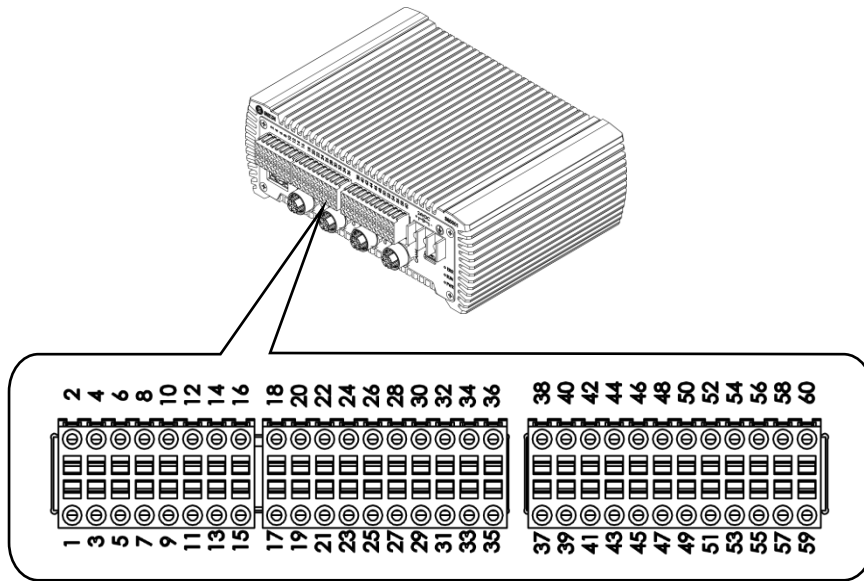


Figure 6-1 System composition diagram

▶ Important

- **Be sure to connect and remove cables after turning off the power to the controller. Connecting and removing with the power turned on will result in a malfunction.**
- **Please confirm the orientation of the connector before connecting. If the connection is not correct, the pins of the connector may be bent, resulting in a malfunction.**

6.2 Names and functions of I/O terminals



1. Common terminal

Terminal No.	Signal name	Description
1	COM_IN	COM for input
19		
2	COM_OUT	COM for output
20		
48		

2. Input terminal

Terminal No.	Signal name	Description
1	COM_IN	COM for input
3	TIMING_SYNC	Timing (Sync.) input
4	ZERO_SYNC	Auto-zero (Sync.) input
5	RESET_SYNC	Reset (Sync.) input
6	TIMING	Timing input (binary selection)
7	ZERO	Auto-zero input (binary selection)
8	RESET	Reset input (binary selection)
9	LASER_CTRL1	Laser control input 1
10	LASER_CTRL2	Laser control input 2
11	B_IN1	Binary selection input
12	B_IN2	
13	DEC_IN	Binary selection confirmation input
14	Reserve	No
15	P1	Program number switching input
16	P2	
17	P3	
18	Reserve	No
19	COM_IN	COM for input

3. Output terminal

Terminal No.	Signal name	Description
52	OUT1_HI	OUT1 comparator HI output
51	OUT1_GO	OUT1 comparator GO output
50	OUT1_LO	OUT1 comparator LO output
49	OUT1_STROBE	OUT1 strobe output
48	COM_OUT	COM for output
47	Reserve	No
46	OUT2_HI	OUT2 comparator HI output
45	OUT2_GO	OUT2 comparator GO output
44	OUT2_LO	OUT2 comparator LO output
43	OUT2_STROBE	OUT2 strobe output
[42:37]	Reserve	No
36	OUT3_HI	OUT3 comparator HI output
35	OUT3_GO	OUT3 comparator GO output
34	OUT3_LO	OUT3 comparator LO output
33	OUT3_STROBE	OUT3 strobe output
32	OUT4_HI	OUT4 comparator HI output
31	OUT4_GO	OUT4 comparator GO output
30	OUT4_LO	OUT4 comparator LO output
29	OUT4_STROBE	OUT4 strobe output
[28:21]	Reserve	No
20	COM_OUT	COM for output

4. Analog output

Terminal No.	Signal name	Description
21	ANALOG_OUT1	Analog voltage output of OUT1 (0~10V)
22	AGND	Analog reference ground
23	ANALOG_OUT2	Analog voltage output of OUT2 (0~10V)
24	AGND	Analog reference ground
25	ANALOG_OUT3	Analog voltage output of OUT3 (0~10V)
26	AGND	Analog reference ground
27	ANALOG_OUT4	Analog voltage output of OUT4 (0~10V)
28	AGND	Analog reference ground

5. Encoder interface

Terminal No.	Signal name	Description
37	ENC_A+	Encoder Phase A input positive pole, optical isolation, RS-422 standard differential input (built-in AM26LS32 equivalent).
38	ENC_A-	Differential encoder Phase A input negative pole, optical isolation, RS-422 standard differential input (built-in AM26LS32 equivalent).
39	ENC_B+	Encoder Phase B input positive pole, optical isolation, RS-422 standard differential input (built-in AM26LS32 equivalent).
40	ENC_B-	Differential encoder Phase B input negative pole, optical isolation,

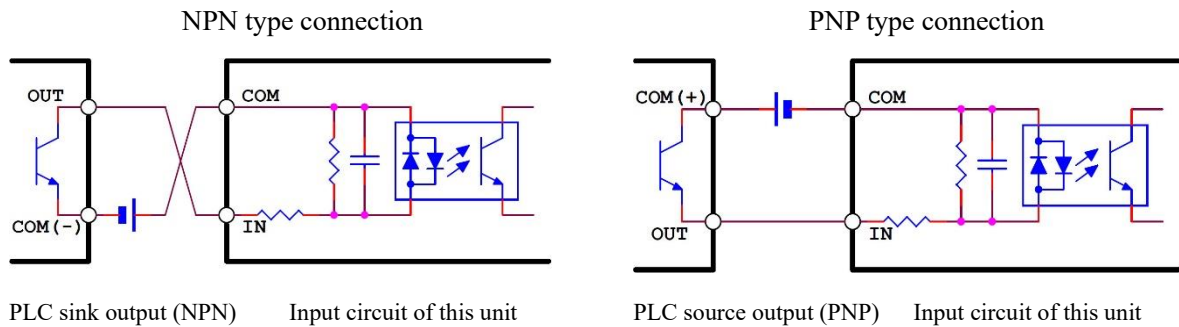
		RS-422 standard differential input (built-in AM26LS32 equivalent).
41	ENC_Z+	Encoder Phase Z input positive pole, optical isolation, RS-422 standard differential input (built-in AM26LS32 equivalent).
42	ENC_Z-	Differential encoder Phase Z input negative pole, optical isolation, RS-422 standard differential input (built-in AM26LS32 equivalent).

6. RS-232 terminal

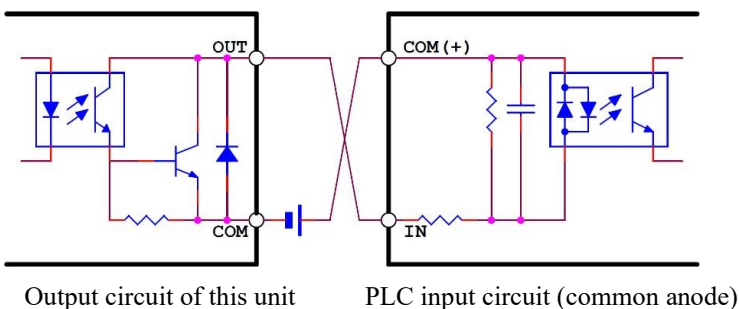
Terminal No.	Signal name	Description
55	RS232_TX	Send signals to external devices
56	RS232_RX	Receive signals from external devices
57	RS232_GND	Earth wire
[58:60]	Reserve	No

6.3 I/O terminal connection method

- Input terminal wiring diagram:

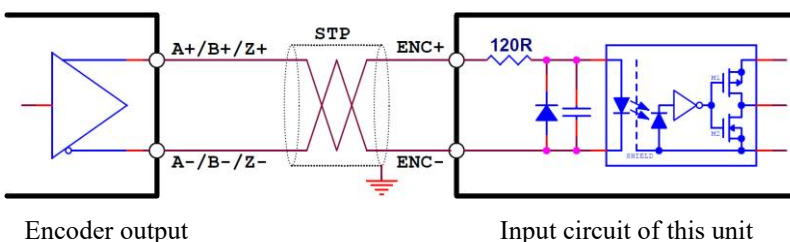


- Output terminal wiring diagram:

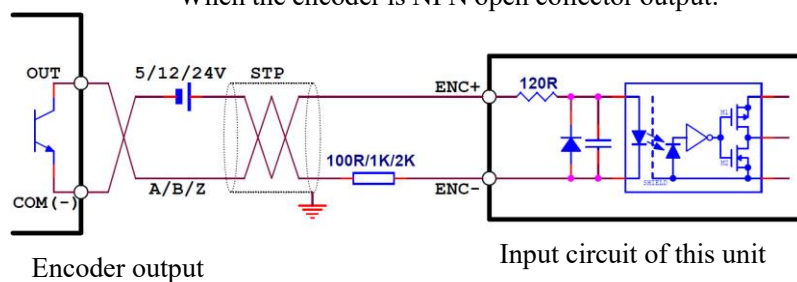


- Encoder terminal wiring diagram:

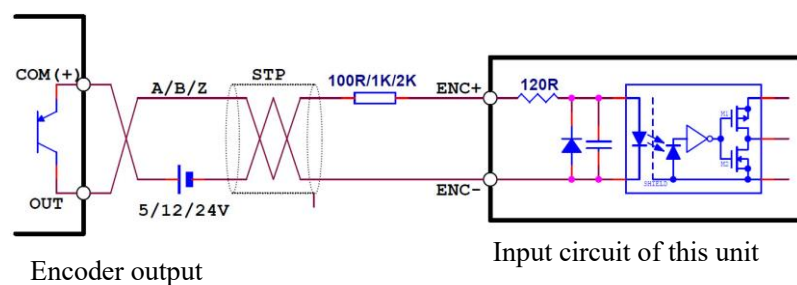
When the encoder is a differential linear drive output:



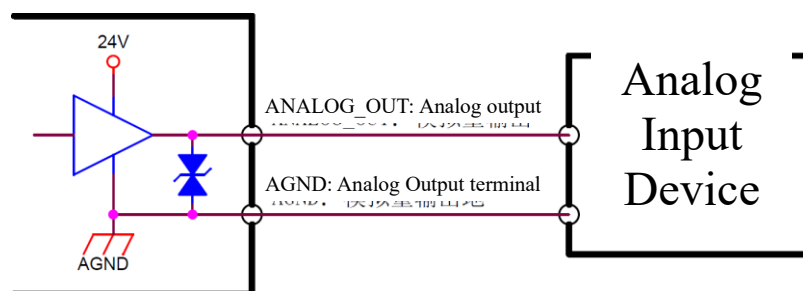
When the encoder is NPN open collector output:



When the encoder is NPN open collector output:



- Analog output terminal wiring diagram:



The analog output circuit of this unit

6.4 Connect the controller and sensor head

The steps for connecting the controller and sensor head are described as follows:

Precautions	- Do not supply power to the controller before connecting the sensor head cable. If the data communication sensor head cable is connected while the power is on, the sensor head or controller will be damaged. - Please ensure that the minimum bending radius of the sensor head cable is more than 30mm. - When using drag chains, if it is not specified, please choose products above R100.
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Step 1 Connect the sensor head cable to the data communication interface connector of the controller.

If only 1 sensor head is used, it should be connected to the CAM 1 connector. After tightening the aviation plug by hand, use a wrench and other tools to further tighten it by a quarter turn to confirm that it is firmly fixed.

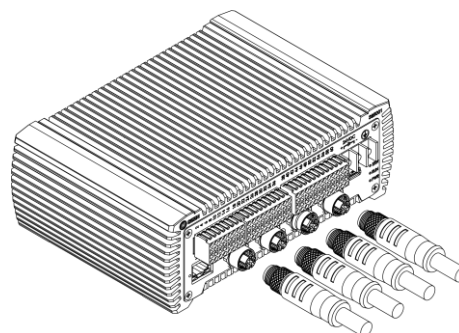


Figure 6-2 Schematic diagram for connecting the sensor head cable to the controller

Step 2 Connect the sensor head and sensor head cable.

Align the orientation of the connectors, and slowly rotate to insert them to the bottom. The tightening torque of the screws is 1 to 1.5 N·m.

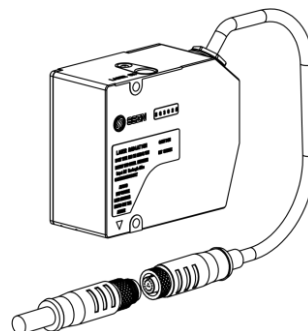
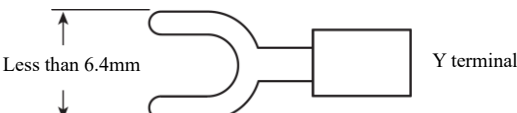


Figure 6-3 Schematic diagram of connecting the sensor head cable to the sensor head

Precautions	- Check the orientation of the connector, and connect it correctly. If the connection is not correct, the pins may be bent, resulting in a malfunction. - Insert the connector without tilting it, and tighten it. If it is not tightened, the connector will loosen due to vibration, etc., which may cause poor contact. - As the standard procedure for tightening, first tighten it by hand, and then further tighten it by about 45°~60° with tools, such as wrench.
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6.5 Connect the controller and power supply

The steps for connecting the controller and power supply are described as follows:

Precautions	• Please use the electric wires from AWG14 to AWG20. • When the terminal is a crimp one, use a product with the following size that fits M3 screws.  • The tightening torque of the screw is from 0.5 to 0.75N·m, please tighten it. • The power of DC24V power supply is required to be greater than or equal to 36W.
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Step 1 Connect the DC24V power supply to the 24V power terminal of the controller.

6.6 How to use the terminal

The method to use the terminal is described as follows.

▶ Important	• Please use the wires from AWG16 ~ AWG28. • The stripping length of the front end of the wire is about 8mm. • Do not treat the front end of the electric wire with soldering (pre-solder and solder). • The electric wires should solidly be inserted to the bottom of the terminal.
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Step 1 Use a slot type screwdriver to press Part a of the terminal, and insert the electric wire into Part b.

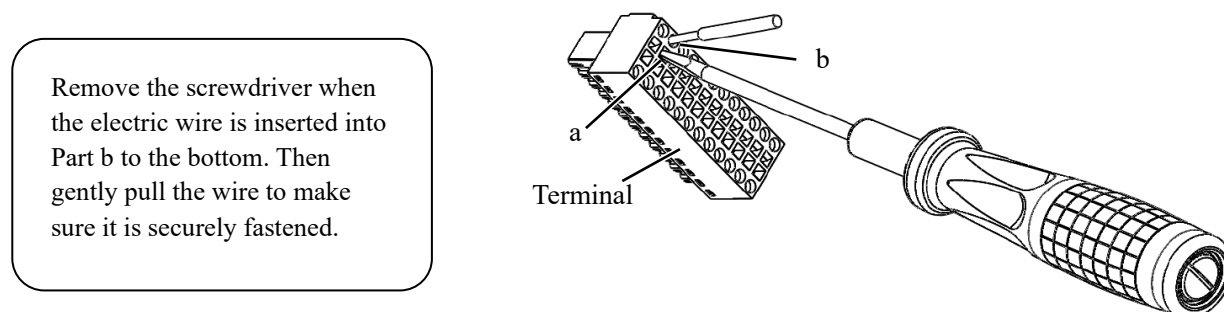


Figure 6-1 Schematic diagram of terminal wiring

Step 2 After inserting it to the bottom, remove the screwdriver, and then gently pull the wire to confirm that it is securely fastened.

7 Software connection

7.1 Install SG-Imaging

1. Obtain the installation package of SG-Imaging software;
2. Enter the Windows system, double-click the installation package of the SG-Imaging software;
3. Set up the installation step by step according to the installation wizard (e.g. Image 7-1),



Image 7-1

4. After the installation, the installation wizard will display as Image 7-2, click [Finish] to exit. So far, the installation of SG-Imaging software is completed.



Image 7-2

7.2 Connect controller

1. Connect the computer and the controller with a network cable.
2. Enter the Windows system, and set a fixed IP address (such as Image 7-3) for the network card used to connect to the controller.



Image 7-3

3. Open the SG-Imaging software, and select "PC Communication Settings" in the pop-up prompt window (e.g. Image 7-4) of connection failure, and click [OK].



Image 7-4

4. The "PC Communication Settings" window (e.g. Image 7-5) pops up.

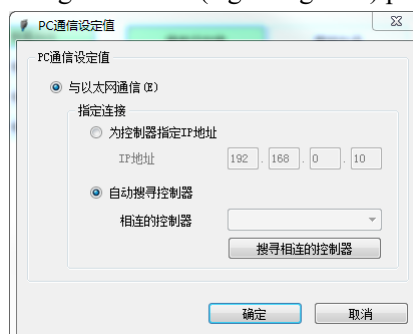


Image 7-5

5. Any of the following two ways can be selected to connect to the controller:
 - a) Select "Specify an IP address for the controller", and enter the IP address of the controller in the IP address input box below (the factory default IP address of the controller is 192.168.0.10);

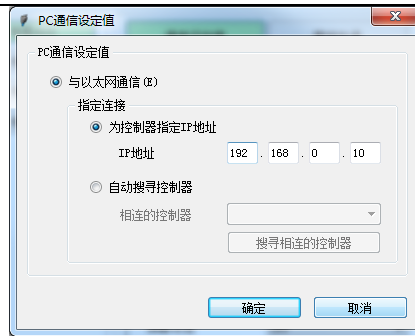


Image 7-6

- b) Select "Automatically search for controllers", and click [Search for connected controllers]. The IP address of the controller found will be displayed in the drop-down box above (e.g. Image 7-7). Select the corresponding IP address in the drop-down box (the factory default IP address of the controller is 192.168.0.10);

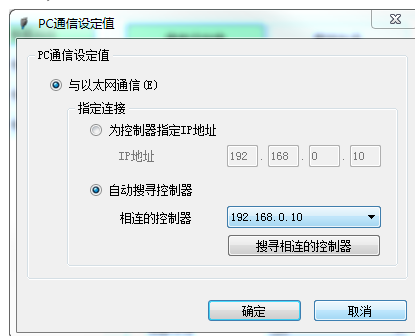


Image 7-7

6. After setting the IP address of the controller, click [OK]. After the connection is successful, a prompt (e.g. Image 7-8) "Do you want to read the set value of the controller" will pop up, and click [Yes] to read the set value.



Image 7-8

7. At the completion of reading the set value, return to the home screen, and perform software operations. The connection status of the current controller and the IP address of the controller (e.g. Image 7-9) will be displayed in the lower left corner of the home screen.

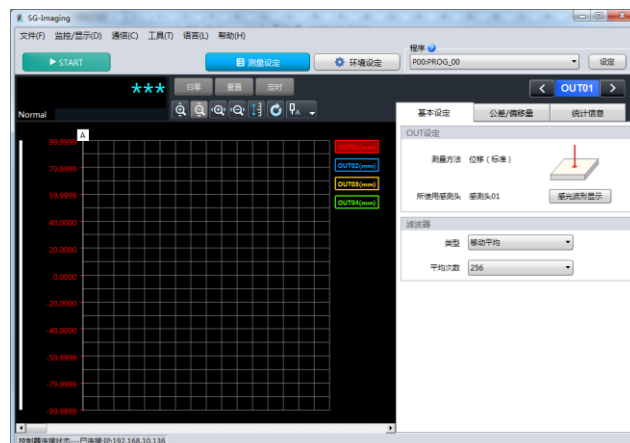


Image 7-9

8 Specifications

8.1 Controller parameters

Table 8-1 Controller parameters

Parameters		Controller
Model		SG5001
Sensor head interface		4
I/O interface		16 input interfaces, 16 output interfaces
Encoder input		Support differential encoders
Analog output port		4 (current type/voltage type multiplexing ports)
Analog output	Electric current	Output 4~20mA, allowable load resistance below 300Ω
	Voltage	Output 0~10V, output impedance 100Ω
I/O		1 RS232 interface, 1 100Base-TX/1000Base-T Ethernet interface
Operating temperature		0~50℃
Storage temperature		-20-70℃
Operating humidity		35%-85% no condensation
ESD protection		Contact discharge 4kV, air discharge 8kV, in line with IEC 61000-4-2
EFT protection		Power port 2kV/5 or 100kHz, signal port 1kV/5 or 100kHz, in line with IEC 61000-4-4
Vibrations		10-100Hz total amplitude of 1.5mm, each direction, namely X, Y, Z for 3 hours, in line with IEC 68-2-6 Fc
Dimensions (mm)		182x139x64
Weight (g)		1583

8.2 SG3000 series parameters

Table 8-2 SG3000 series parameters

Parameters		SG3000 Series Laser Displacement Sensor		
Model	Note 1	SG3030 / SG3035	SG3080 / SG3085	SG3150 / SG3155
Reference distance		30mm	80mm	150mm
Measuring distance		25mm~35mm	65mm~97mm	115mm~197mm
Repeatability	Note 2	0.05μm	0.2μm	0.5μm
Linearity		±0.05% of full scale (F.S. = 10mm)	±0.05% of full scale (F.S. = 32mm)	±0.05% of full scale (F.S. = 82mm)
Temperature characteristics		±0.01%/°C of full scale (F.S. = 10mm)	±0.01%/°C of full scale (F.S. = 32mm)	±0.01%/°C of full scale (F.S. = 82mm)
Sampling frequency		88/50/20/10/5/2/1KHz (7 levels are optional)		
Light source	Emitter	Red semiconductor laser		
	Wavelength	655nm		
	Laser class	Class 2 (IEC60825-1:2014), Class IIIa (FDA CDRH Part 1040.10)		
	Output power	5mW		
	Spot size Note 3 (μm)	Φ60 (SG3030)/ 60×400 (SG3035)	Φ110 (SG3080)/ 110×720 (SG3085)	Φ190 (SG3150)/ 190×1300 (SG3155)
Ambient brightness		Incandescent or fluorescent lamp: 10,000 lux Max.		
Operating temperature		0~50°C		
Storage temperature		-20~70°C		
Operating humidity		35%-85% no condensation		
ESD protection		Contact discharge 4kV, air discharge 8kV, in line with IEC 61000-4-2		
EFT protection		Power port 2kV/5 or 100kHz, signal port 1kV/5 or 100kHz, in line with IEC 61000-4-4		
Bumps		15Gs/6ms per axis, in line with IEC 68-2-27 Ea		
Vibrations		10 ~ 100Hz total amplitude of 1.5mm, each direction, namely X, Y, Z for 2 hours, in line with IEC 68-2-6 Fc		
Enclosure protection level		IP67, in line with IEC 60529		
Case material		Aluminum alloy		
Dimensions (mm)		90x76x39	85x77x47	85x76x47
Weight (g)		324	376	370
Data cable model		SCB-GCAM-HA1-3m / SCB-GCAM-HAY-5m		

Note 1: SG3xx0 laser spot is narrow spot type, which is recommended to be used for fine object measurement, while SG3xx5 laser spot is wide spot type, which is recommended to be used for rough object measurement.

Note 2: At the reference distance, take the average of 4096 measurements.

Note 2: Standard dimensions at the reference distance.

8.3 SG5000 series parameters

Table 8-3 SG5000 series parameters

Parameters		SG5000 Series Laser Displacement Sensor			
Model ^{Note 1}		SG5020 / SG5025	SG5050 / SG5055	SG5080 / SG5085	SG5150 / SG5155
Reference distance		20mm	50mm	80mm	150mm
Measuring distance		17mm~23mm	42mm~59mm	64mm~99mm	115mm~197mm
Repeatability ^{Note 2}		0.02μm	0.025μm	0.1μm	0.25μm
Linearity		±0.02% of full scale (F.S. = 6mm)	±0.02% of full scale (F.S. = 17mm)	±0.02% of full scale (F.S. = 35mm)	±0.02% of full scale (F.S. = 82mm)
Temperature characteristics		±0.01%/°C of full scale (F.S. = 6mm)	±0.01%/°C of full scale (F.S. = 17mm)	±0.01%/°C of full scale (F.S. = 35mm)	±0.01%/°C of full scale (F.S. = 82mm)
Sampling frequency		590/400/200/88/50/20/10/5/2/1KHz (10 levels are optional)			
Light source	Emitter	Red semiconductor laser			
	Wavelength	655nm			
	Laser class	Class 2 (IEC60825-1:2014), Class IIIa (FDA CDRH Part 1040.10)			
	Output power	5mW			
	Spot size ^{Note 3} (μm)	Φ45 (SG5020)/ 45×400 (SG5025)	Φ75 (SG5050)/ 75×480 (SG5055)	Φ110 (SG5080)/ 110×720 (SG5085)	Φ190 (SG5150)/ 190×1300 (SG5155)
Ambient brightness		Incandescent or fluorescent lamp: 10,000 lux Max.			
Operating temperature		0~50°C			
Storage temperature		-20~70°C			
Operating humidity		35%-85% no condensation			
ESD protection		Contact discharge 4kV, air discharge 8kV, in line with IEC 61000-4-2			
EFT protection		Power port 2kV/5 or 100kHz, signal port 1kV/5 or 100kHz, in line with IEC 61000-4-4			
Bumps		15Gs/6ms per axis, in line with IEC 68-2-27 Ea			
Vibrations		10 ~ 100Hz total amplitude of 1.5mm, each direction, namely X, Y, Z for 2 hours, in line with IEC 68-2-6 Fc			
Enclosure protection level		IP67, in line with IEC 60529			
Case material		Aluminum alloy			
Dimensions (mm)		61x62x41	69x71x47	75x70x47	85x76x47
Weight (g)		324	323	339	370
Data cable model		SCB-GCAM-HA1-3m / SCB-GCAM-HAY-5m			

Note 1: SG5xx0 laser spot is narrow spot type, which is recommended to be used for fine object measurement, while SG5xx5 laser spot is wide spot type, which is recommended to be used for rough object measurement.

Note 2: At the reference distance, take the average of 16384 measurements.

Note 2: Standard dimensions at the reference distance.

9 Dimensional diagram

9.1 SG3030/5 sensor head dimensional diagram

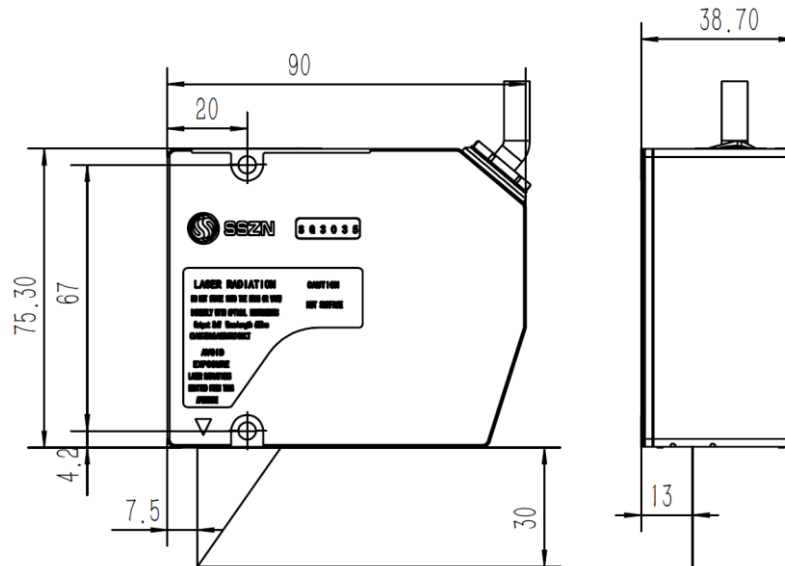


Figure 9-1 SG3030/5 Sensor Head dimensional diagram Unit (mm)

9.2 SG3080/5 sensor head dimensional diagram

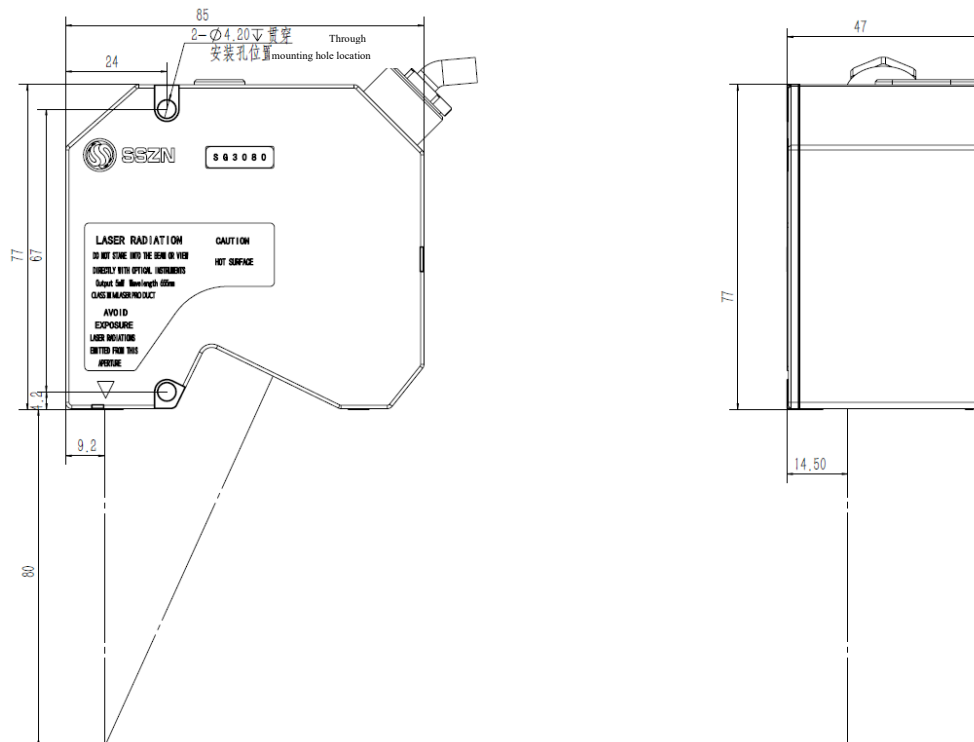


Figure 9-2 SG3080/5 Sensor Head dimensional diagram Unit (mm)

9.3 SG3150/5 sensor head dimensional diagram

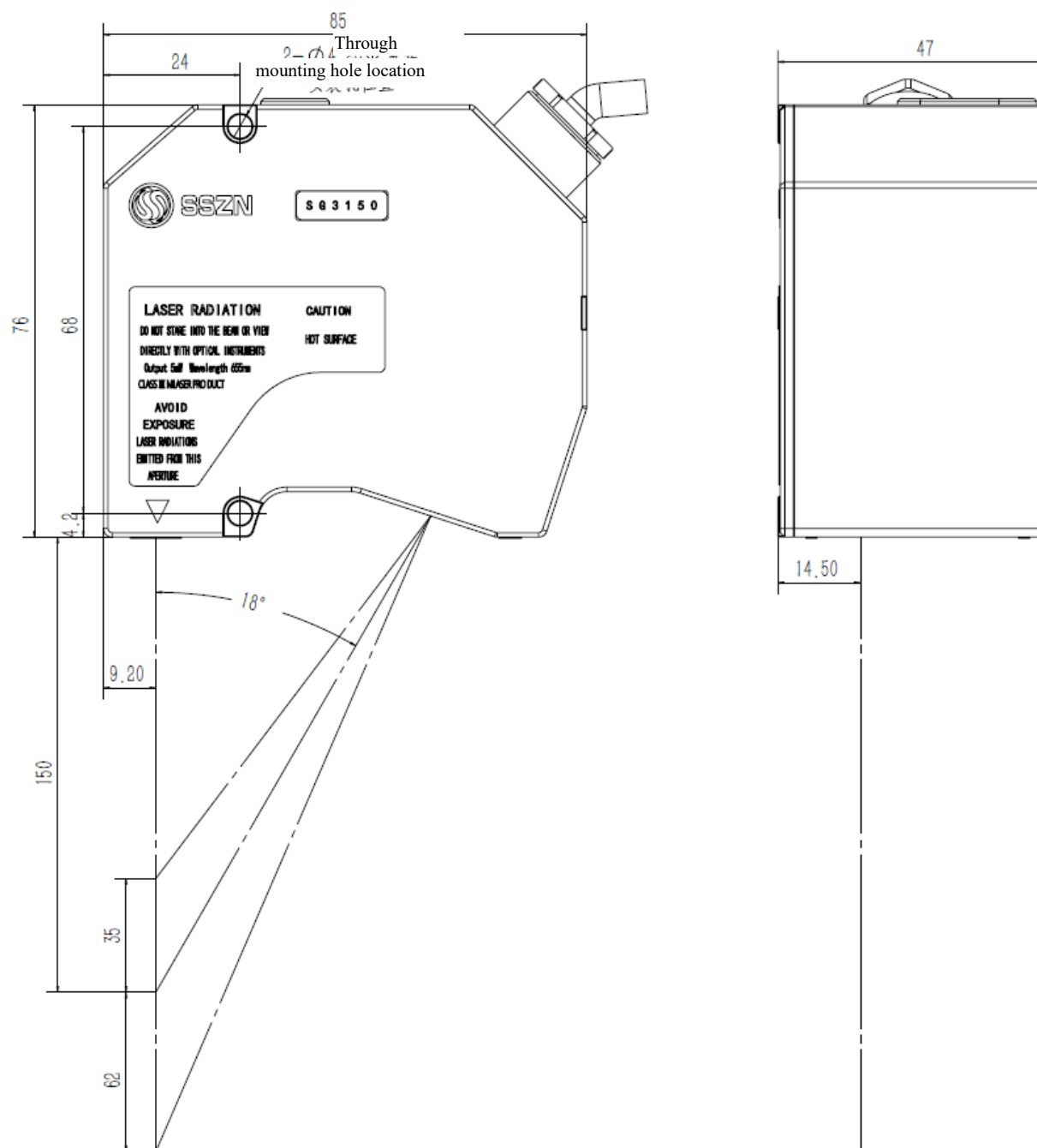


Figure 9-3 SG3150/5 Sensor Head dimensional diagram Unit (mm)

9.4 SG5020/5 sensor head dimensional diagram

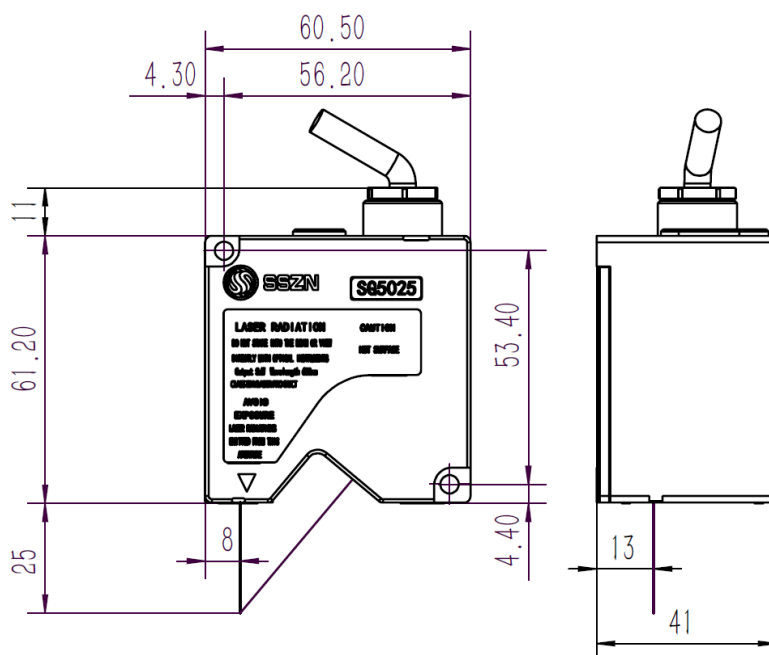


Figure 9-4 SG5020/5 Sensor Head dimensional diagram Unit (mm)

9.5 SG5050/5 sensor head dimensional diagram

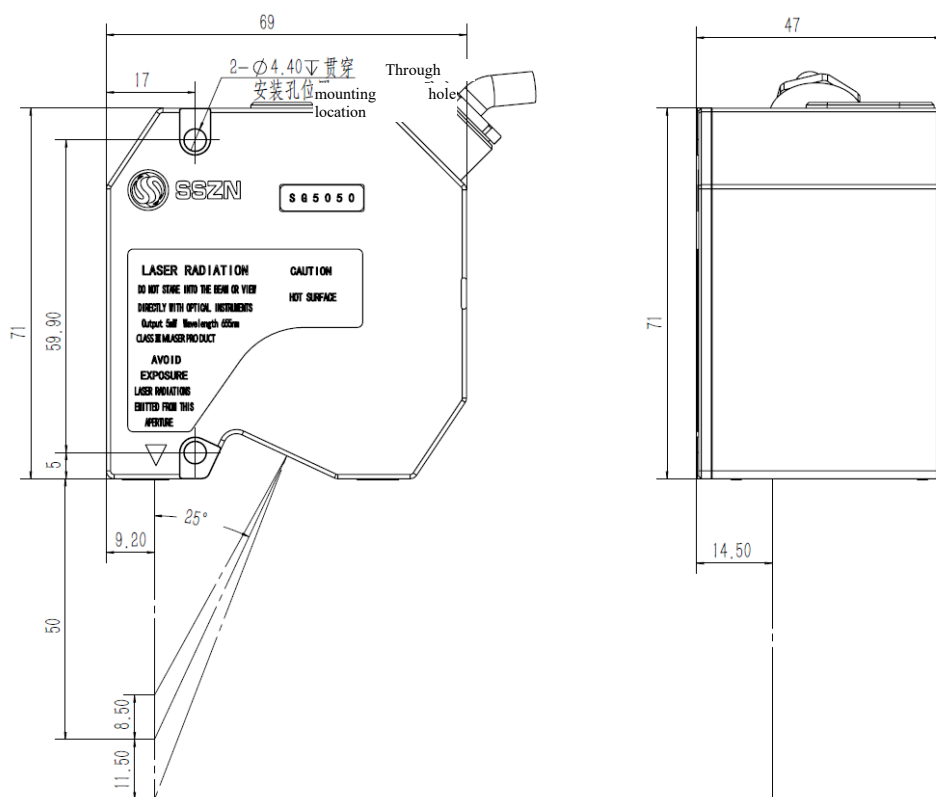


Figure 9-5 SG5050/5 Sensor Head dimensional diagram Unit (mm)

9.6 SG5080/5 sensor head dimensional diagram

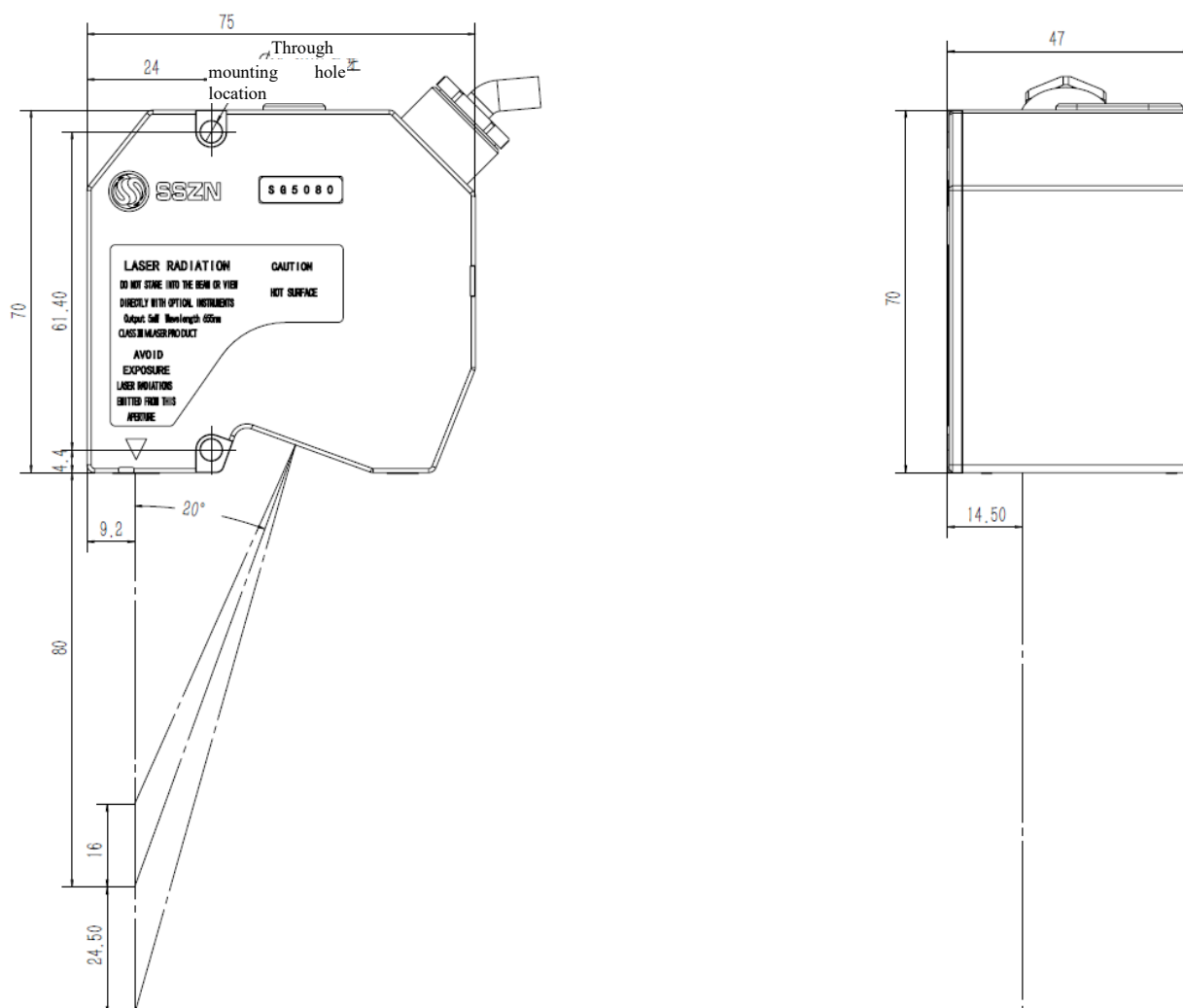


Figure 9-6 SG5080/5 Sensor Head dimensional diagram Unit (mm)

9.7 SG5080/5 sensor head dimensional diagram

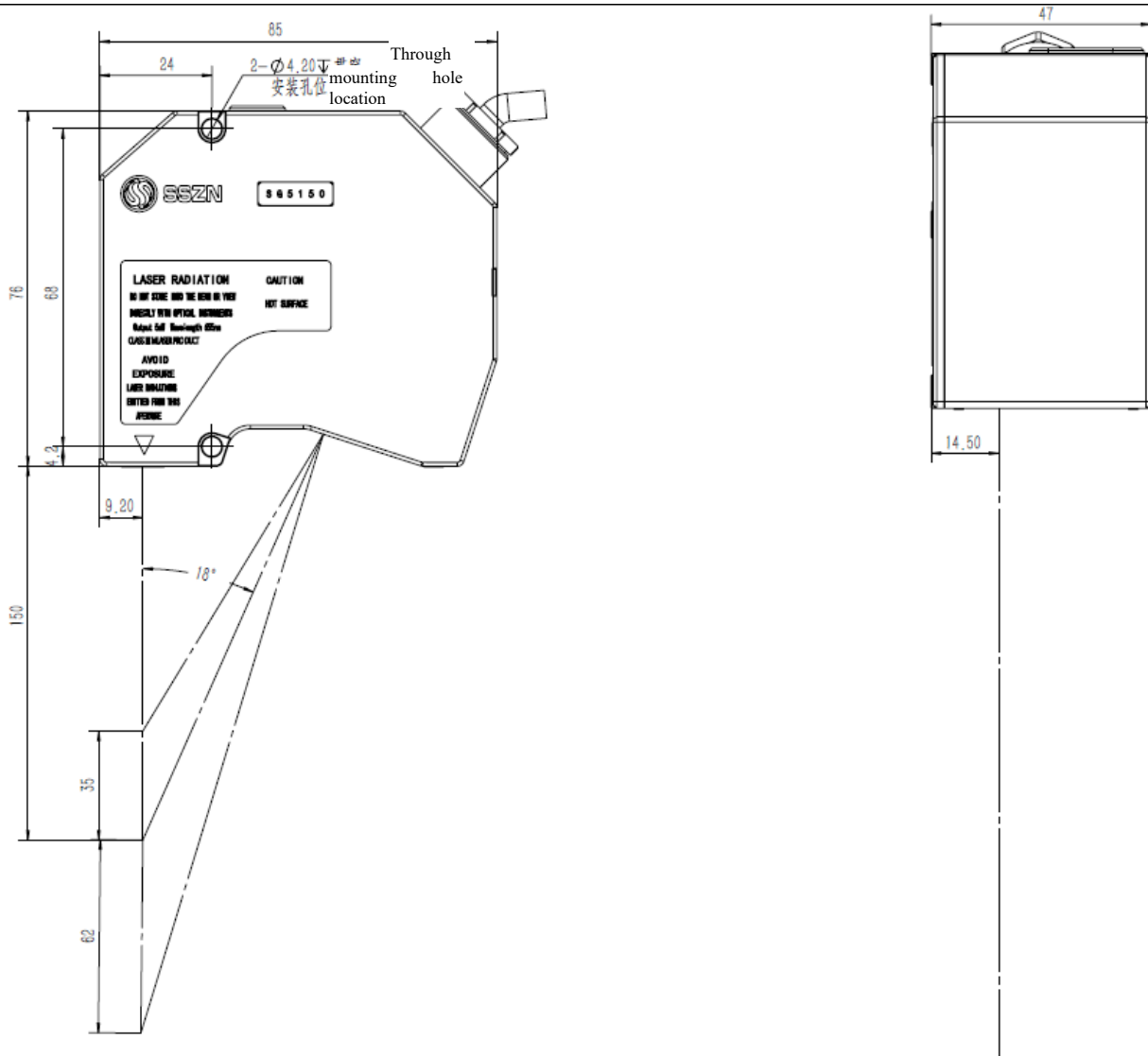


Figure 9-7 SG5150/5 Sensor Head dimensional diagram Unit (mm)

9.8 SG5001 Controller dimensional diagram

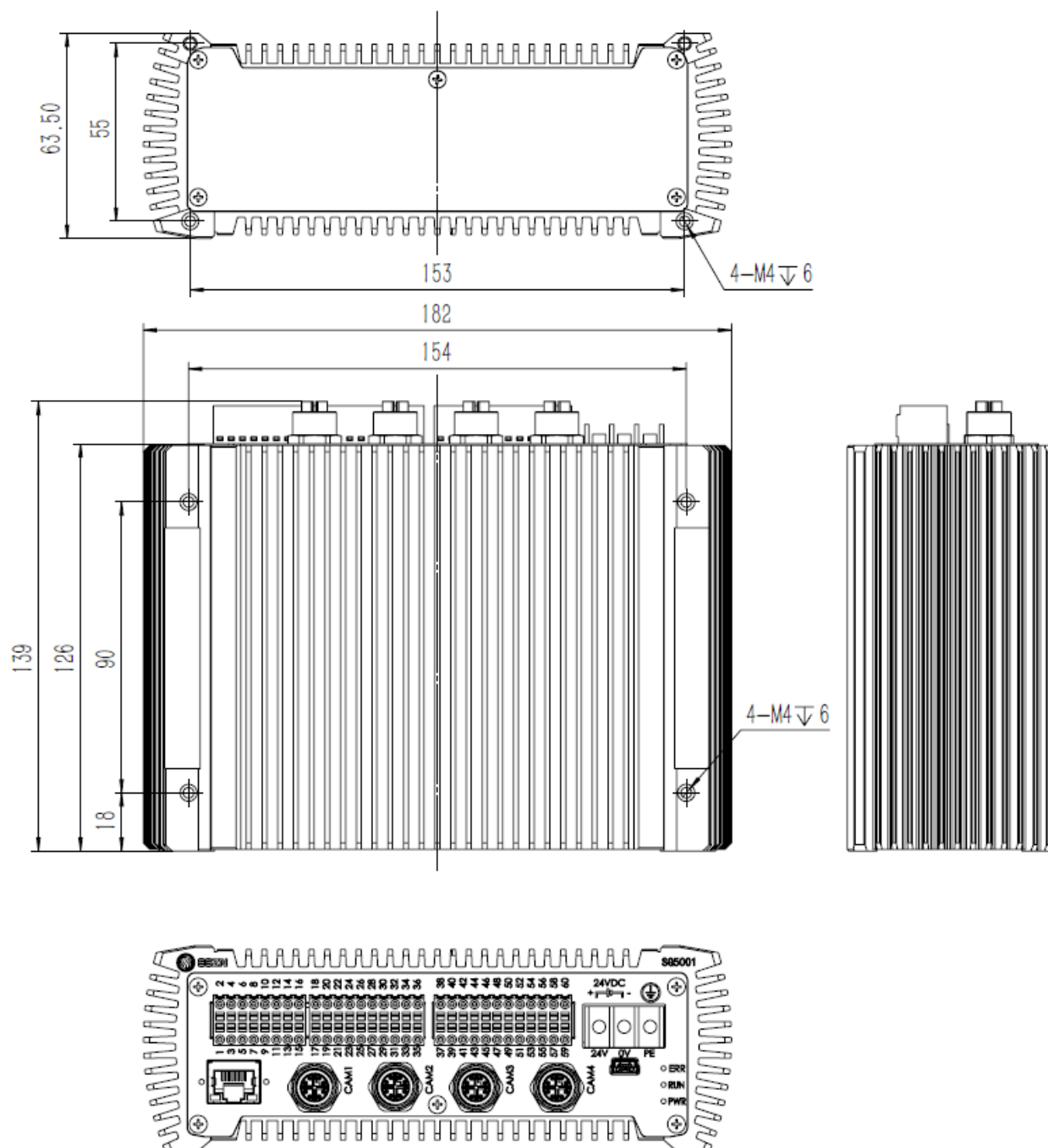


Figure 9-8 SG5001 Controller dimensional diagram Unit (mm)