SDC laser ranging sensor

Product manual

V1.0

Attention: Installation

catalogue

Compilation date	Editor	Edit content
2025.1.10	Liu Yafeng	Initial editing

1、 Product Overview

The SDC series laser ranging sensor is based on advanced laser phase method ranging principle, and achieves non-contact, fast and accurate measurement of natural target distance through precise laser emission and reception mechanism. As an innovative product independently developed by our company, this sensor integrates multiple core technologies and has excellent measurement performance: its measurement accuracy reaches millimeter level, response time is only milliseconds, and the maximum measurement distance can reach hundreds of meters. At the same time, the product is equipped with multiple standard industrial interfaces (including SSI, RS485, CAN, Ethernet)

It can flexibly adapt to various industrial automation systems and is widely used in intelligent manufacturing, precision measurement, automation control and other fields, providing reliable measurement solutions for Industry 4.0 application scenarios.

characteristic:

- Distance of 200m;
- Accuracy up to ± 1mm, resolution of 0.1mm;
- Fast response speed, supporting up to 100Hz, measuring targets<5m/s;
- Industrial grade;
- Rich output interfaces: RS485/4-20mA/switch/Canbus/SSD/Ethernet/Profinet;
- OLED display, button control.

Application scenarios:

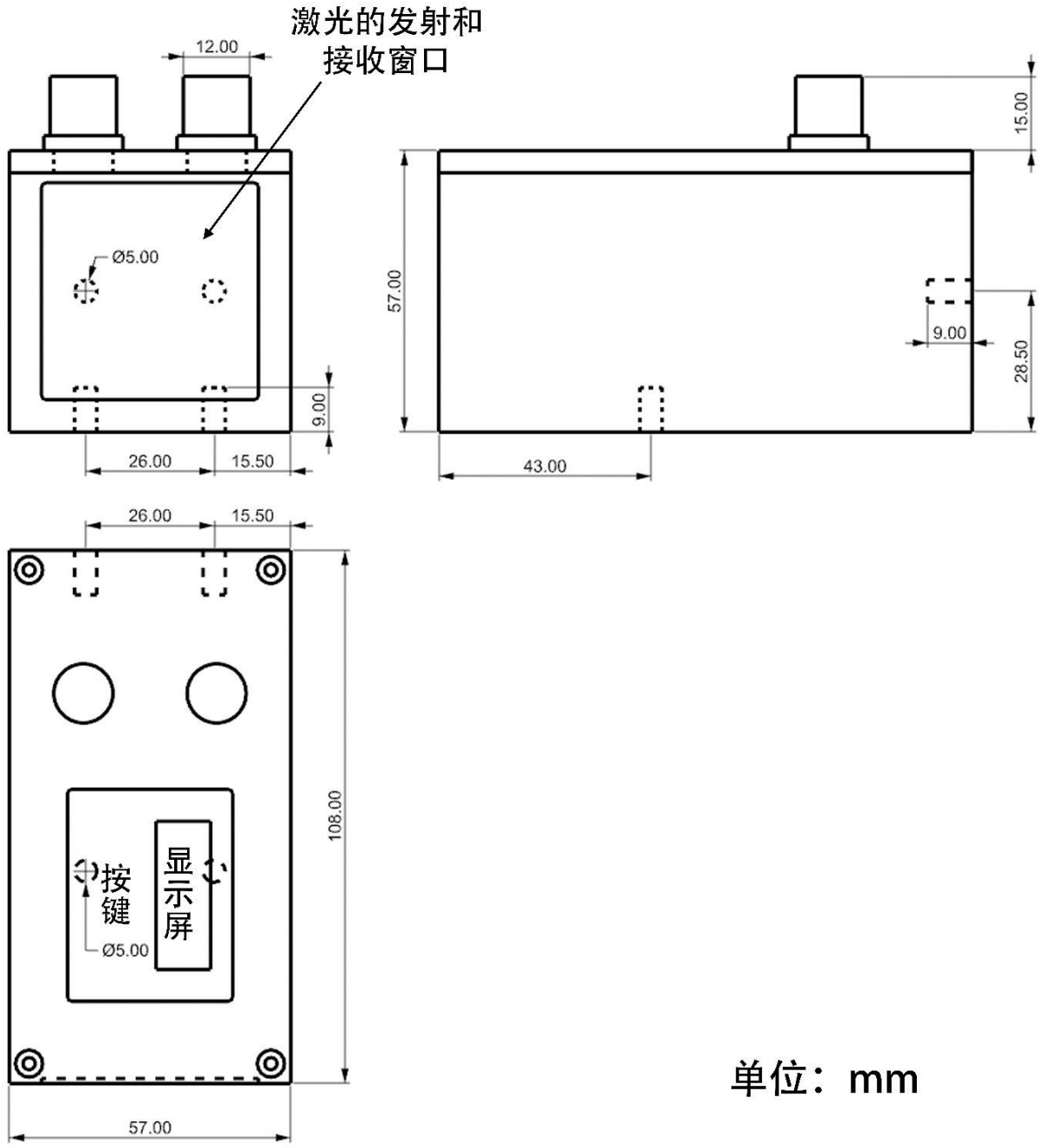
- Intelligent warehousing, stacker positioning;
- Factory workshop, track car positioning, and driving positioning;
- Geological monitoring, deformation monitoring of pipelines, tunnels, mining tunnels, and bridges;
- Elevator positioning monitoring;
- Material level monitoring.

Widely applicable to high-precision tracking and measurement of targets at short and medium distances.

2、 Specification parameters

project	parameter					interpretation
measuring range	30m	60m	100m	150m	200m	Special reflective panels are required for outdoor use
resolution	0.1mm					Minimum display unit
repeatability	0.5mm					Measure the distance range of the same target
accuracy	1mm					Deviation from standard value
Measurement rate	1…30…100Hz					The number of measurements taken by sensors per unit time
Measure the target object	Natural surface or specialized reflector plate					Movement speed ＜ 5m/s
Environmental light impact	Resistant to outdoor sunlight 1000kLux					Under strong outdoor light, it is necessary to use a dedicated reflective board
light source	Wavelength 650-660nm					Red visible laser
Laser safety level	Class 1					
display	OLED					Real time display of distance values, capable of displaying parameters
Supply Voltage	DC7~26V					make an appointment 80mA@12V
power consumption	<1.5W (typical value)					
Housing material	aluminium					
Dust proof lens material	PC					
Specification and size	57*57*108mm					
degrees of protection provided by enclosure	IP67					Outdoor protective cover is required
weight	445g					
operation temperature	-20~60℃					
Laser lifespan	Over 100000 hours					
install	Equipped with mounting bracket and reflective board					
Typical spot size	At 10m: 5x3mm; At 25m: 10x6mm; 50m away: 15x10mm; At 100m: 30x20mm					
data interface	RS485 /Canbus/SSI/Ethernet/Profinet					
analog quantity	4-20mA					Adjustable to 0-5V
Switching quantity	1 Road					

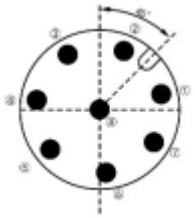
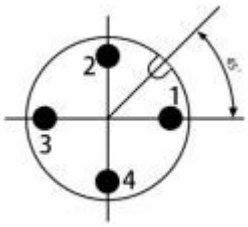
3、 Mechanical dimensions



notes:

1. Can be equipped with an installation bracket, which supports adjusting the installation angle up, down, left, and right.
2. There are 2 M5 screw holes at the back and bottom respectively, supporting installation at the back and bottom;

4、 Wiring Definition

M12 * 8pin male connector			M12 * 4pin male head			
						
Needles Position	colour	SSI/RS422 Definition	Needles Position	colour	definition	
					Analog and Canbus	Ethernet
1	white	RS485 B	1	brown	Analog +	TX+
2	brown	Vcc+7~26V	2	white	Canbus CANL	RX+
3	green	RX-/CLK-	3	blue	Analog-	TX-
4	yellow	RX+/CLK+	4	black	Canbus CANH	RX-
5	grey	TX-/DATA-				
6	pink	TX+/DATA+				
7	blue	GND				
8	red	RS485 A				

5、 Ordering Notice

Order Model Table					
communication interface	Range 30m	Range of 60m	Range of 100m	Range 150m	Range 200m
Analog quantity Canbus	SDC-30A	SDC-60A	SDC-100A	SDC-150A	SDC-200A
Ethernet	SDC-30E	SDC-60E	SDC-100E	SDC-150E	SDC-200E

1. RS485, SSI, and RS422 output interfaces are standard; Analog, Canbus, and Ethernet are available for selection
2. Analog supports 4-20mA current loop and 0-5V, 0-10V voltage signals, which can be selected through RS485 settings;

Shipping List				
sensor	wiring	reflector panel	mounting bracket	accessory
				
	M12*8p， 1 piece, 1m M12 * 4p, 1 piece, 1m			

6、 Operation and Safety

6.1 equipment installation

When installing SDC series laser ranging sensors, please follow the following steps:

Firstly, ensure that you have carefully read and understood all safety warnings and operating instructions in the product manual. Choose a suitable installation location to ensure that the sensor can be stably fixed and there are no obstacles within its measurement range to avoid affecting measurement accuracy.

Use the provided installation bracket and adjust the installation angle of the bracket according to actual needs to ensure that the sensor beam can accurately illuminate the target object. Fix the bracket in the selected position and securely install the sensor onto the bracket using M5 screws.

In terms of wiring, according to the product's wiring diagram, correctly connect the sensor's data line, power line, etc. to the corresponding interface. Pay attention to checking the firmness and correctness of the wiring to avoid equipment failure or measurement errors caused by wiring errors.

After installation, conduct preliminary debugging and calibration of the equipment. According to the guidance in the product manual, set the measurement parameters of the sensor, such as measurement range, measurement rate, etc. Through OLED display and button control, it is easy to view and modify device settings.

Finally, conduct actual measurement tests to verify the measurement accuracy and stability of the sensor. If necessary, make further adjustments and optimizations based on the test results.

During installation and use, please pay attention to following the safety regulations and operating instructions of the product to ensure personal safety and the normal operation of the equipment. If you have any questions or need assistance, please contact our technical support team in a timely manner.

6.2 precautions

1. Shortened measurement range:

Target surface: Dim, green/blue surface needs to shorten the distance measurement; It is recommended to use specialized reflective panels.

Environmental lighting: Strong light (such as direct sunlight) can reduce the measurement range, and it is recommended to use it in low light environments.

Air conditions: Fog, rain, snow, dust, etc. can significantly shorten the measurement range, and it is necessary to maintain a clean environment.

Distance measuring instrument lens: Dust and other debris adhering to the surface can affect the measurement range and should be kept clean.

2. Decreased accuracy:

Rough/Transparent Surface: Avoid measuring rough walls, transparent materials (such as glass, water), or highly reflective surfaces. Sloping/circular surface: Ensure that the target surface is sufficiently large and flat.

Multipath reflection: Avoid the presence of other reflectors in the measurement path, which may result in

erroneous data.

6.3 Security Warning

Before using this product, please carefully read and follow the following safety instructions to avoid personal injury, equipment damage, or measurement errors.

6.3.1. LASER

- Do not look directly at the laser beam

  ➢ This device uses Class 1 laser (compliant with IEC 60825-1 standard), but it is still necessary to avoid direct or optical instruments (such as

Look directly at the laser emission port with a magnifying glass or telescope.

Unexpected laser irradiation on the eyes may cause temporary visual interference. If such a situation occurs, please stop using it immediately and seek medical attention.

- Laser protection measures

➢ Ensure that there is no human or animal activity in the laser emission path, especially when installing at heights, warning signs should be set up.

➢ Regularly check if the laser window is clean to avoid beam scattering caused by stains or scratches.

6.3.2. Electrical safety

- Power specifications

➢ Only use power supply within the range of DC 7~26V, overpressure may cause equipment burnout or fire risk.

➢ Before wiring, ensure that the equipment is powered off and follow the wiring diagram in the instruction manual to avoid short circuits or reverse connections.

- Anti static and grounding

When operating in a dry environment, wear an anti-static wristband to prevent static electricity from penetrating sensitive components.

➢ The device casing must be reliably grounded to avoid the risk of electrical leakage.

6.3.3. environmental safety

- Work environment restrictions

➢ It is prohibited to use this equipment in flammable and explosive environments (such as oil and gas warehouses, dust workshops).

➢ Operating temperature range: -20 ℃~60 ℃. Exceeding this range may result in measurement errors or component damage.

- Dustproof and Waterproof

➢ The device has a protection level of IP67, but should avoid prolonged exposure to rain, snow, high humidity, or dust environments.

➢ Regularly clean dust-proof lenses (made of PC material) and prohibit the use of corrosive cleaning agents.

6.3.4. Installation and operation safety

- Mechanical Installation

➢ Use the installation bracket provided by the original factory to ensure that the equipment is firmly fixed and avoid vibration or falling.

When adjusting the laser angle, avoid the beam from shining on reflective objects (such as mirrors and metal plates) to prevent secondary reflection damage.

- Target object restriction

➢ It is prohibited to measure transparent materials (such as glass, water surface) or strongly reflective surfaces, which may result in measurement failure or error.

If the target object moves at a speed greater than 5m/s, a dedicated high-speed

mode or reflector must be used.

6.3.5. Maintenance and troubleshooting

- Equipment maintenance

  ➢ Before maintenance, be sure to disconnect the power supply. It is prohibited to disassemble the casing or replace internal components with power on.

  If the device casing is deformed, the lens is broken, or there is abnormal heating, stop using it immediately and contact after-sales.

- Emergency response to malfunction

  If the device reports an error (such as error code 252/253 abnormal temperature), immediately shut down and check the environmental ventilation conditions.

Non professionals are prohibited from modifying the structure or circuit of the equipment, otherwise it will result in the expiration of the warranty.

6.3.6. Responsibility Statement

- Users must ensure that the operation complies with the instructions. The manufacturer shall not be held responsible for accidents caused by unauthorized operations (such as direct viewing of the laser or overvoltage power supply).
- Only original accessories or certified compatible devices are allowed to be used, otherwise it may pose a safety hazard.

7 RS485/RS422 communication protocol

7.1 Communication physical parameters

- Baud rate: 115200, other baud rates (9600, etc.) can be marked and recorded by setting the baud rate.
- Data bit: 8; Stop position: 1; Checkpoint: None;

7.2 protocol format

Adopting MODBUS-RTU method and CRC16 bit verification.

Note: Adding H after the number indicates the hexadecimal data format, for example, 03H represents hexadecimal 03.

(1) Function code 03H -- Query the main

device message format from the device

register content

From device address	function code	Starting register address	Number of registers	crc check
1 byte	(03H) 1 byte	2 bytes	N bytes	2 bytes

From device message format

From device address	function code	Number of bytes in the data area	data area	crc check
1 byte	(03H) 1 byte	1 byte	N * 2 bytes	2 bytes

(2) Function code 06H -- Set the message format of

the master device from the content of a single

register of the slave device

From device address	function code	Register address	Write Data	crc check
1 byte	(06H) 1 byte	2 bytes	2 bytes	2 bytes

From device message format

From device address	function code	Register address	Write Data	crc check
1 byte	(06H) 1 byte	2 bytes	2 bytes	2 bytes

explain:

- The entire packet of data must be sent continuously, and two packets must be sent with a pause time of 3.5 characters between them, otherwise both will be parsed incorrectly.
- If a PLC device is used as the main device, the number of read registers sent is 2 bytes per register, so the number of registers sent is half the byte length.
- The effective range of slave device addresses is 0-247 (decimal), where device address 0 is a broadcast address that can be received by all slaves, and 1-247 is the addressing range of slaves.
- The valid range of the function code is 1-255 (decimal), and the function codes used in this protocol are 03 (read) and 06 (write).
- If the address and data contain 16 or 32-bit data, the high byte will be sent first and the low byte will be sent last.
- The CRC check data consists of two bytes, with the lower 8 bits at the beginning and the upper 8 bits at the end. The verification data is calculated from the device address, function code, and data using the CRC

calculation formula in 1.2.1. The receiving device recalculates the CRC of the received message and compares it with the values in the received CRC field. If the two values are different, there is an error.

7.3 Implementation of CRC Check in C Language

```
//Calculate CRC check value
    unsigned short CRC16(unsigned char *arrbuff, int len) {
```

```
unsigned short crc = 0xFFFF;
for (int j = 0; j < len; j++) {
      crc ^= arrbuff[j];
      for (int i = 0; i < 8; i++)
            { if (crc & 1) {
                  crc = (crc >> 1) ^ 0xA001;
            } else {
                  crc >>= 1;
            }
      }
}
return crc;
}
```

7.4 RS485 Modbus RTU Register Description

7.4.1 Basic Function Register

Register address	Register content	Number of registers	Register Status	describe
0000H	error status code	2	read only	=0 No faults >0 has a fault, please refer to 7.4.3 for specific error codes
0001H	running state	2	Reading and writing	0=Idle; 1=Laser indication: 2=Measuring in progress
0002H	Measure distance value	4	read only	Register 0002H: 4-byte data, with the high-order bit at the beginning, in units of 0.1mm. Example 0x00003D9B → 15771 → 1577.1mm.
0003H	Device Address	2	Reading and writing	Effective range 1-247
0004H	Serial communication parameters	4	Reading and writing	The top 8 digits are the verification parameters: 00 without verification; 01 Odd verification; 02 Verification The lower 24 bits represent the baud rate: Effective range 2400-112200
0005H	Distance offset	2	Reading and writing	Signed integer, unit 0.1mm
0006H	Software version number	2	read only	Current software version number
0007H	Measurement frequency setting	2	Reading and writing	=0 single occurrence= one 5Hz； = two 10Hz； =3 20Hz； = four30Hz
0008H	Equipment temperature	2	read only	Unit 0.1 ℃
0009H	serial number	4	read only	Unique Serial Number

7.4.2 Extended Function Register

register address	Register content	Register word Section length	register state	describe
000AH	DAC output mode	2	Reading and writing	Analog output function =0 closed= 1 0-5V； = 2 0-10V =3 4-20mA； = 4 0-20mA； = 5 0-24mA
000BH	DAC output minimum range	4	Reading and writing	Effective data range 0-900000

000CH	DAC output maximum range	4	Reading and writing	Effective data range 0-900000
000DH	Switch output 1 high-level distance value	4	Reading and writing	Effective data range 0-900000
000EH	Switching output 1 low-level distance value	4	Reading and writing	Effective data range 0-900000
000FH	Switching output 2 high-level distance value	4	Reading and writing	Effective data range 0-900000
0010H	Switching output 2 low level distance value	4	Reading and writing	Effective data range 0-900000
0011H	Switch input function	2	Reading and writing	=0 Close =1. Suspended or high-level start measurement, low-level stop measurement =2. Suspension or high level stop measurement, low level start measurement
0014H	CAN communication frame mode	2	Reading and writing	=0 standard frames= 1 Extended frame
0015H	CAN communication baud rate	2	Reading and writing	Unit KHz, valid data is: 20,50,80100125250500600800 1000
0016H	CAN communication sending ID	4	Reading and writing	Standard frame mode, ID valid range is 0-7FF, H extended frame mode ID valid range is 0-1FFFFFFFH
0017H	CAN communication receiving ID	4	Reading and writing	Standard frame mode, ID valid range is 0-7FF, H extended frame mode ID valid range is 0-1FFFFFFFH
0018H	Save parameters	2	write	Store the set parameters in memory and save them in case of power failure
0019H	Obtain multiple measurement result parameters	12	read	Obtain the measured distance, signal strength, and internal temperature values. All three parameters are 4-byte length integers.
0028H	Read the maximum range	4	read	Obtain the farthest measurement distance of the device

0029H	Read the minimum range	4	read	Obtain the latest measured distance of the device

7.4.3 Error codes and solutions

error code	meaning	Solution
220	Internal communication malfunction	
252	High temperature (60 ℃)	Reduce temperature
253	Low temperature (-10 ℃)	elevated temperature
254	The target ranging value exceeds the range of measurement	Place the target closer together
255	Weak or out of range target reflection signal	Target uses dedicated luminous panels or lighter colors
256	The target reflection signal is too strong	Replace the target with a darker color or change the target
257	Excessive ambient light	Used in scenes with lower ambient light

4.5 Register usage details and examples

The device is a distance measuring sensor, and the host is the control receiver. Taking device address=19H (decimal 25) as an example, the data sent by the device is received by the host.

4.5.1 Read error status

direction	data	meaning
Host ->Device	19 03 00 00 00 01 87 D2	Read error status
Equipment ->Host	19 03 02 00 00 98 46	No errors
	19 03 02 00 FF D8 06	Error code 255

4.5.2 Read measurement status

direction	data	meaning
Host ->Device	19 03 00 01 00 01 D6 12	Read measurement status
Equipment ->Host	19 03 02 00 00 98 46	Laser off, stop measuring
	19 03 02 00 01 59 86	Laser on, indication mode
	19 03 02 00 02 19 87	Measuring in progress

4.5.3 Set measurement status

direction	data	meaning
Host ->Device	19 06 00 01 00 02 5A 13 19 06 00 01 00 01 1A 12 19 06 00 01 00 00 DB D2	Start measurement Turn on the laser and stop measuring
Equipment ->Host	19 06 00 01 00 02 5A 13	Measurement has been initiated
	19 06 00 01 00 01 1A 12	Laser turned on
	19 06 00 01 00 00 DB D2	Measurement has been stopped

4.5.4 Read the measured distance value

direction	data	meaning
Host ->Device	19 03 00 02 00 02 66 13	Read measurement distance
Equipment ->Host	19 03 04 00 00 3D 9B 33 09	Unit: 0.1mm Measurement result 00003D9BH, converted to decimal 1.5771m
	19 03 04 00 00 00 00 62 32	The measurement result is 0, and the distance is invalid

4.5.5 Read device address

direction	data	meaning
Host ->Device	19 03 00 03 00 01 77 D2 perhaps 00 03 00 03 00 01 75 DB	Read the device address. If you don't know the device address, you can use the broadcast address 0
Equipment ->Host	19 03 02 00 19 59 8C	The address is 0019H

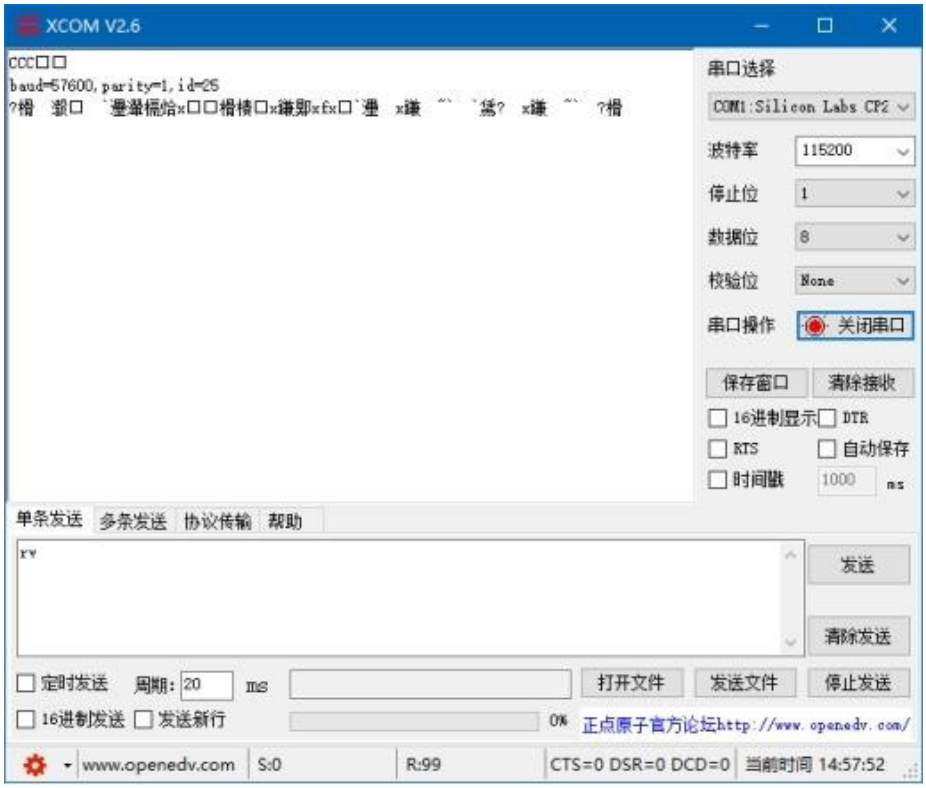
4.5.6 Read serial communication parameters

direction	data	meaning
Host ->Device	19 03 00 04 00 01 C6 13	Read serial communication parameters
Equipment ->Host	19 03 04 00 01 C2 00 62 92	00H: No verification 01C200H: Baud rate 115200

4.5.7 Set communication parameters

direction	data	meaning
Host ->Device	19 06 00 04 01 00 E1 00 5F 01	01H: Odd verification 00E100H: Baud rate 57600
Equipment ->Host	19 06 00 04 01 00 E1 00 5F 01	01H: Odd verification 00E100H: Baud rate 57600

Instructions for use: When modifying the baud rate, it is necessary to know the current baud rate, otherwise the instruction will not be correctly recognized by the device. If you don't know the specific baud rate, you can set the serial port receiving debugging tool to the default parameter 115200 without verification. The first power on will output the currently set serial communication parameters and device ID through the serial port, as shown in the following figure:



4.5.8 Read the overall offset

direction	data	meaning
Host ->Device	19 03 00 05 00 01 97 D3	Read the overall offset of the device
Equipment ->Host	19 03 02 FF 03 99 B7	The offset unit is 0.1mm, and the returned data FF03H is -253 in decimal,

4.5.9 Set overall offset

direction	data	meaning
Host ->Device	19 06 00 05 FE FC DA 32	The overall offset unit is 0.1mm, set the overall offset as FFFC, decimal as -260, and the effective range is [-20000~20000]
Equipment ->Host	19 06 00 05 FE FC DA 32	The overall offset unit is 0.1mm. Set the overall offset as FFFC and decimal as -260

Note: The offset is a signed integer, and a negative number indicates that the measured value is greater than the true value and needs to be subtracted. For example, -260 means output value=measured value -260.

4.5.10 Read software version number

direction	data	meaning
Host ->Device	19 03 00 06 00 01 67 D3	Read software version number
Equipment ->Host	19 03 02 00 66 18 6C	Version number 0066H, decimal representation is 102

4.4.11 Reading measurement frequency

direction	data	meaning
Host ->Device	19 03 00 07 00 01 36 13	Read measurement frequency
Equipment ->Host	19 03 02 00 00 98 46 19 03 02 00 01 59 86 19 03 02 00 02 19 87 19 03 02 00 03 D8 47 19 03 02 00 04 99 85	Single 5Hz 10Hz 20Hz 30Hz

4.5.12 Set measurement frequency

direction	data	meaning
Host ->Device	19 06 00 07 00 02 BA 12	Set the frequency parameter to 0002H, which represents 10Hz
Equipment ->Host	19 06 00 07 00 02 BA 12	The frequency parameter is 0002H, which represents 10Hz

4.5.13 Read device temperature

direction	data	meaning
Host ->Device	19 03 00 08 00 01 06 10	Read device temperature
Equipment ->Host	19 03 02 00 CA 18 11	The unit of internal temperature of the device is 0.1 ℃, and the value is 00CAH, which represents 20.2 ℃

4.5.14 Read the device serial number

direction	data	meaning
Host ->Device	19 03 00 09 00 02 17 D1	Read serial number, 2 register lengths
Equipment ->Host	19 03 04 00 00 04 51 A1 0E	Serial number 00000 451H, decimal 1105

4.5.15 Read DAC output mode

direction	data	meaning
Host ->Device	19 03 00 0A 00 01 A7 D0	Read DAC output mode
Equipment ->Host	19 03 02 00 03 D8 47	The mode parameter is 0003H, 4-20mA output, which is the factory default value

The meaning of analog output mode parameters is as follows. Only the following parameters can be selected, and other parameters are invalid

=0 Close	=1 0-5V	=2 0-10V	=3 4-20mA	=4 0-20mA	=5 0-24mA

4.5.16 Set DAC output mode

direction	data	meaning
Host ->Device	19 06 00 0A 00 03 EA 11	Set the DAC output mode to 0003H, which is 4-20mA output
Equipment ->Host	19 06 00 0A 00 03 EA 11	The frequency parameter is 0002H, which represents 10Hz

4.5.17 Read the minimum range of DAC output

direction	data	meaning
Host ->Device	19 03 00 0B 00 02 B6 11	Read the minimum value of analog output from DAC
Equipment ->Host	19 03 04 00 00 01 F4 62 25	The mode parameter is DAC, and the minimum output analog value is 00000 1F4H, which is 500

Note: The minimum range is 0-900000.

4.5.18 Set the minimum range for DAC output

direction	data	meaning
Host ->Device	19 06 00 0B 00 00 01 F4 42 BB	Set the minimum value of DAC output analog to 00000 1F4H, which is 500
Equipment ->Host	19 06 00 0B 00 00 01 F4 42 BB	

4.5.19 Read the maximum range of DAC output

direction	data	meaning
Host ->Device	19 03 00 0C 00 02 07 D0	Read the maximum value of analog output from DAC
Equipment ->Host	19 03 04 00 09 EB 10 FD 0C	The mode parameter is DAC, and the minimum output analog value is 0009EB10H, which is 650000

Note: The maximum range is 500-90000.

4.5.20 Set the maximum range of DAC output

direction	data	meaning

Host ->Device	19 06 00 0C 00 09 EB 10 68 52	Set the maximum value of DAC output analog quantity For 0009EB10H, which is 650000
Equipment ->Host	19 06 00 0C 00 09 EB 10 68 52	

Explanation: The DAC output of this device has a precision of 16 bits, and the resolution of the DAC output is:

(Dmax-Dmin)/65535DAC。

The output data has a minimum range as the lower limit and a maximum range as the upper limit, with a linear relationship within the range. For example, in the 4-20mA output mode, if the measured distance is d, the DAC output data is:

$$Iout = \frac{d - Dmin}{max - Dmin} \times 16 + 4$$

4.5.21 Read the high-level distance value of switch output 1

direction	data	meaning
Host ->Device	19 03 00 0D 00 02 56 10	Read the high-level distance value of switch output 1
Equipment ->Host	19 03 04 00 00 03 E8 62 8C	The parameter is 00000 3E8H, which is 1000

4.5.22 Set the high-level distance value for switch output 1

direction	data	meaning
Host ->Device	19 06 00 0D 00 00 03 E8 CA 12	Set the high-level distance of switch output 1 Deviation value 00000 3E8H, which is 1000
Equipment ->Host	19 06 00 0D 00 00 03 E8 CA 12	

4.5.23 Read the low-level distance value of switch output 1

direction	data	meaning
Host ->Device	19 03 00 0E 00 02 A6 10	Read the low-level distance value of switch output 1
Equipment ->Host	19 03 04 00 00 01 F4 62 25	The parameter is 00000 7D0H, which is 2000

4.5.24 Set the low-level distance value for switch output 1

direction	data	meaning
Host ->Device	19 06 00 0E 00 00 07 D0 8D 00	Set switch output 1 low level distance Deviation value 00000 7D0H, which is 2000
Equipment ->Host	19 06 00 0E 00 00 07 D0 8D 00	

4.5.25 Read the high-level distance value of switch output 2

direction	data	meaning
Host ->Device	19 03 00 0F 00 02 F7 D0	Read the high-level distance value of switch output 2
Equipment ->Host	19 03 04 00 00 07 D0 61 9E	The parameter is 00000 7D0H, which is 2000

4.5.26 Set the distance value of high-level output for switch quantity 2

direction	data	meaning

Host ->Device	19 06 00 0F 00 00 07 D0 B0 C0	Set the distance value of high-level output for switch quantity 2 00000 3E8H, which is 1000
Equipment ->Host	19 06 00 0F 00 00 07 D0 B0 C0	

4.5.27 Read the distance value of the switch output 2 low level

direction	data	meaning
Host ->Device	19 03 00 10 00 02 C6 16	Read the distance value of the switch output 2 low level
Equipment ->Host	19 03 04 00 00 03 E8 62 8C	The parameter is 00000 3E8H, which is 1000

Note: The minimum range is 0-900000.

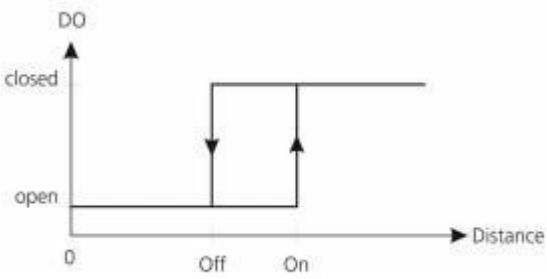
4.5.28 Set the distance value of switch output 2 low level

direction	data	meaning
Host ->Device	19 06 00 10 00 00 03 E8 26 10	Set the distance value of low level for switch output 2 to 00000 3E8H, which is 1000
Equipment ->Host	19 06 00 10 00 00 03 E8 26 10	

Explanation of switch parameters:

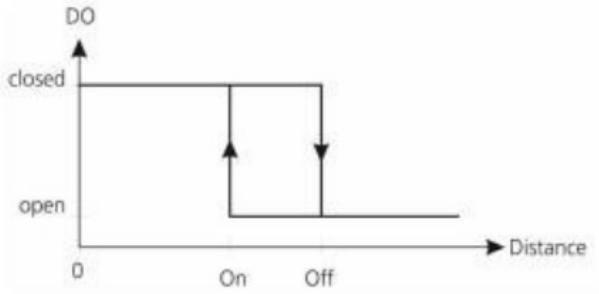
Two separate parameter settings can be made for the device's 2-channel switch output, with two possible configurations: (1: ON>OFF, 2: ON<OFF). The device automatically determines which mode it belongs to based on the set switch numerical parameters.

1） Hysteresis parameter: ON level>OFF level



随着距离的增加，当距离超过 ON 时打开数字输出高电平。随着距离的减小，当距离下降时，开关关闭输出低水平。

2） Hysteresis parameter: ON level<OFF level



随着距离的增加，当距离超过 OFF 时打开数字输出低电平。随着距离的减小，当距离下降时，输出高电平。

4.5.29 Read CAN communication frame mode

direction	data	meaning
Host ->Device	19 03 00 14 00 01 C7 D6	Read CAN communication frame mode
Equipment ->Host	19 03 02 00 00 98 46 19 03 02 00 01 59 86	Parameter 0000H: Normal frame Parameter 0001H Normal Frame

4.5.30 Set CAN communication frame mode

direction	data	meaning
Host ->Device	19 06 00 14 00 01 0B D6	Set CAN communication frame mode to extended frame
Equipment ->Host	19 06 00 14 00 01 0B D6	Parameter 0001H Normal Frame

4.5.31 Read CAN communication baud rate

direction	data	meaning
Host ->Device	19 03 00 15 00 01 96 16	Read the baud rate of CAN communication frames
Equipment ->Host	19 03 02 00 7D 58 67	Parameter 007DH, unit K, decimal meaning 125K

4.5.32 Set CAN communication baud rate

direction	data	meaning
Host ->Device	19 06 00 15 00 FA 1B 95	Set the baud rate of CAN communication frames to 00FAH in K, which is 250K

Equipment ->Host	19 06 00 15 00 FA 1B 95	

The CAN communication baud rate is limited to the following types: 20,50,80100125250500600800 1000, in K.

4.5.33 Read CAN communication sending ID

direction	data	meaning
Host ->Device	19 03 00 16 00 02 26 17	Read CAN communication receiving ID
Equipment ->Host	19 03 04 00 00 02 86 E2 F0	Parameter 00000 286H, decimal 646

The valid range of the sending ID is related to the frame mode.

Normal frame, with a value range of 0-7FF Extended frame, with a value range of 0-1FFF FFFF

4.5.34 Set CAN communication sending ID

direction	data	meaning
Host ->Device	19 06 00 16 00 00 02 86 2E 6C	Set the communication sending ID to 00000 286H, decimal For646
Equipment ->Host	19 06 00 16 00 00 02 86 2E 6C	

The valid range of the sending ID is related to the frame mode.

Normal frame, with a value range of 0-7FF; Extended frame, with a value range of 0-1FFF FFFF

4.5.35 Read CAN communication receiving ID

direction	data	meaning
Host ->Device	19 03 00 17 00 02 77 D7	Read CAN communication receiving ID
Equipment ->Host	19 03 04 00 00 03 06 E2 C0	Parameter 00000 306H, decimal 774

The valid range of the sending ID is related to the frame mode.

Normal frame, with a value range of 0-7FF; Extended frame: Value range: 0-1FFF FFFF

4.5.36 Set CAN communication receiving ID

direction	data	meaning
Host ->Device	19 06 00 17 00 00 03 06 13 9C	Set the communication sending ID to 00000 306H and decimal to 774
Equipment ->Host	19 06 00 17 00 00 03 06 13 9C	

The valid range of the sending ID is related to the frame mode.

Normal frame: Value range: 0-7FF Extended frame: Value range: 0-1FFF FFFF

4.5.37 Save parameter data

direction	data	meaning
Host ->Device	19 06 00 18 00 01 CB D5	Save parameters to internal memory, save in case of power failure
Equipment ->Host	19 06 00 18 00 01 CB D5	Successfully saved

Only after using this command, the set parameters will be saved after power failure, otherwise they need to be reconfigured when powered on again.

4.5.38 Read multiple measurement result data

direction	data	meaning
Host ->Device	19 03 00 19 00 06 17 D7	Read distance, signal strength, and temperature
Equipment ->Host	19 03 0C 00 00 3C FA 00 00 AB 1A 00 00 01 04 71 54	00 00 3C FA is a distance value of 15610 00 00 AB 1A has a strength value of 43802

		00 00 01 04 is the temperature value of 260

This command is used to simultaneously obtain multiple measurement parameters, with distance values in 0.1mm, intensity values in uV, and temperature values in 0.1 ℃

8 CANBUS communication protocol

8.1 CAN communication parameter description

- The CAN communication parameters need to be set through the RS485 bus. The specific setting method can refer to the RS485 communication protocol document.
- The maximum supported baud rate is 1M, and it is recommended to use 125K, 250K, and 500K.

The baud rate can be set through parameters, and the supported baud rates include 20K, 50K, 80K, 100K, 125K, 250K, 500K, 600K, 800K, and 1000K.

- Supports two formats: CAN2.0B standard frame and extended frame, which can be set through parameter settings.
- The sending ID and receiving ID can also be set through parameter settings.
- The difference between standard data frames and extended data frames is only in the range of ID representation, and the rest is completely the same. Default is standard frame, baud rate 125K, send ID 646, receive ID 774.

8.2 CAN2.0B standard data frame format

The standard frame information bit is 11 bytes long, including both information and data parts, with the first three bytes being the information part. ID(Identifier)： The identifier of the data frame is 11 bits long, and the ID of each node on the bus is unique and not duplicated. RTR(Remote Transmission Request Bit): The remote transmission request bit is used to distinguish between data frames and remote control frames. When it is an explicit level, it represents the data frame, and when it is an implicit level, it represents the remote control frame.

DLC(Data Length Code)： The data length code consists of four data bits, indicating how many bytes are in the message, with a data range of 0 to 8.

The format of the CAN protocol packet sent by the sensor is as follows:

ID (send)	RTR	DLC	Data							
			D0	D1	D2	D3	D4	D5	D6	D7
0x000-0x7FF	0	8	xx	00	yy	yy	MM (LSB)	MM	MM	MM (MSB)

XX=Status byte (02 measurement completed 01 measurement started, 00 laser turned off) yyyy=Error byte (error flag)

MM=distance value, unit 0.1mm, using small end mode (binary data)

Example: For example, at a distance of 1458.8mm, the format sent using CAN is as follows:

ID=0x000-0x7FF RTR=0 DLC=8 DATA=02 00 00 00 FC 38 00 00 (hexadecimal mode)

Data packets received by sensors:

ID (Received)	RTR	DLC	Data							
			D0	D1	D2	D3	D4	D5	D6	D7
0x000-0x7FF	0	1	XX	YY	00	00	00	00	00	00

XX = 01: Turn on the laser to start measurement (default to on state after power on)

XX = 00: Turn off the laser and stop measuring; YY = 00: Single measurement; YY = 01: Measurement frequency 5Hz

YY = 02: Measurement frequency 10Hz; YY = 03: Measurement frequency 20Hz; YY = 04: Measurement frequency 30Hz; 00 reserved for backup

8.3 CAN2.0B Extended Data Frame Format

The standard frame information bit is 13 bytes long, including both information and data parts, with the first five bytes being the information part. ID(Identifier)： The identifier of the data frame is 29 bits long, and the ID of each node on the bus is unique and not duplicated. RTR(Remote Transmission Request Bit): The remote transmission request bit is used to distinguish between data frames and remote control frames. When it is an explicit level, it represents the data frame, and when it is an implicit level, it represents the remote control frame.

DLC(Data Length Code)： The data length code consists of four data bits, indicating how many bytes are in the message, with a data range of 0 to 8.

The format of the CAN protocol packet sent by the sensor is as follows:

ID (send)	RTR	DLC	Data							
			D0	D1	D2	D3	D4	D5	D6	D7
0x0000000-0x1FFFFFFF	0	8	xx	00	00	00	MM (LSB)	MM	MM	MM (MSB)

XX=Status byte (02 measurement completed 01 measurement started, 00 laser turned off) yyyy=Error byte (error flag)

MM=distance value, unit 0.1mm, using small end mode (binary data)

Example: For example, at a distance of 1458.8mm, the format sent using CAN is as follows:

ID=0x000-0x7FF RTR=0 DLC=8 DATA=02 00 00 00 FC 38 00 00 (hexadecimal mode)

Data packets received by sensors:

ID (Received)	RTR	DLC	Data							
			D0	D1	D2	D3	D4	D5	D6	D7
0x0000000-0x1FFFFFFF	0	1	XX	YY	00	00	00	00	00	00

XX = 01: Switch on laser (state after Power-On), Turn on the laser and start measuring XX=00: Switch off laser, stop measuring

YY = 00: SINGLE

YY = 01: Measurement frequency 5Hz YY=02: Measurement frequency 10Hz YY=03: Measurement frequency 20Hz YY=04: Measurement frequency 30Hz 00 reserved for backup

9 SSI Communication Protocol

SSI uses RS422 physical connection at the bottom layer, and its performance parameters are equivalent to RS422 as follows:

Data transmission rate from 20kbps to 500kbps

ESD protection level ± 15kV

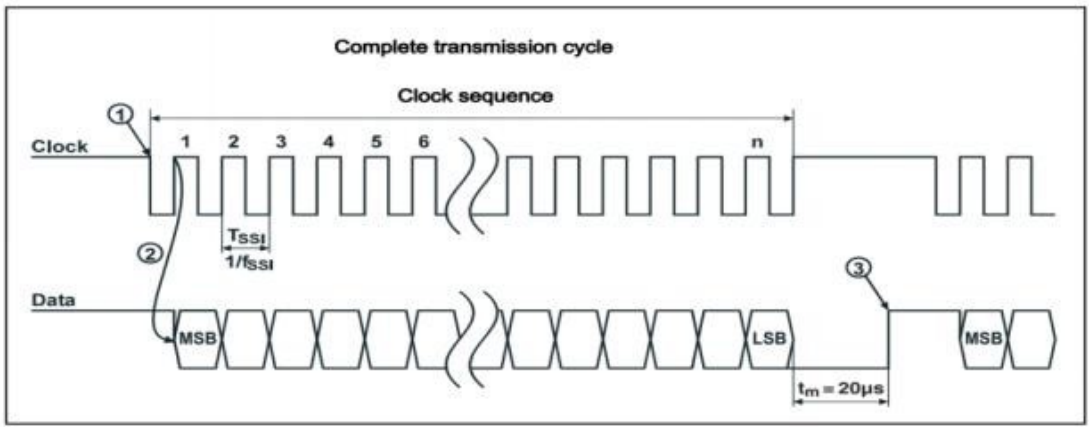
SSI is a differential communication interface with point-to-point connection.

SSI wiring diagram

SSI default communication parameters

SSI activation status	Default activation
Measurement numerical encoding format	Binary code, can be modified to gray code through commands
MODE	24 bit distance value+1 bit error status (=1 fault trigger), error status bit=LSB When the error status bit is 1, the higher 24 bit value bit error code
range resolution	0.1mm
Measurement data update rate	Consistent with the measurement frequency, the fastest is 33ms

The SSI timing diagram is as follows:



10 Ethernet Command Set Description

Every command sent to SDC devices is based on ASCII and ends with carriage return and line break (CRLF), and SDC's response commands also end with carriage return and line break. SDC can set a unique address code ID, which uses N as a placeholder in the command. In actual use, the actual ID is used to fill in the position of N. The value range of N is 0-99, occupying 2 bytes. For example, if the address is 1, then N is "01". The command set syntax uses a '+' sign as the parameter separator, and multiple parameters can be separated by spaces. When the command allows negative numbers, it can also be '-'.

	Set Command	Get Command
Command	sNeg+aaaaaaaa<CRLF>	sNeg<CRLF>
Recturn Successful	gNeg?< CRLF>	gNeg+aaaaaaaa<CRLF>
Return error	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>
Parameters	N=Device ID; zzz=Error code aaaaaaa=Comnand parameters/configuration value	

5.4.1 Operation command

（1） Stop, clear command (snc): Stop the current process, reset the LED status and switch output status

	command
command	sNc<CRLF>
ACK	gNc? < CRLF>
Wrong response	gN@Ezzz <CRLF>
Parameter Description	N=Device ID; Zzz=Error code

（2） Distance measurement command (sNg): triggers simple distance measurement Each new command will cancel the ongoing command

	command
command	sNg<CRLF>
ACK	gNg+aaaaaaaa <CRLF>
Wrong response	gN@Ezzz <CRLF>
Parameter Description	N=Device ID; Aaaaaaa=distance data with an accuracy of 0.1mm; Zzz=Error code

（3） Single ranging module fixed speed measurement tracking command (sNH)

Trigger continuous distance measurement, with measurement speed determined by set parameters and target reflectivity, up to 30Hz. This command is prohibited from being used when multiple SDC devices are networked on the bus. This command actively sends out measurement result data at the end of the measurement. This measurement mode will continue until a stop command (snc) is received, and the LED status and digital output pins will automatically update based on the newly measured distance value.

If there are no parameters, it is considered a read command, and if there are parameters, it is a set command.

	Set measurement frequency command	Read Command
command	sNh+xxxx<CRLF>	sNh<CRLF>
ACK	gNh+aaaaaaaa <CRLF>	gNh+xxxx <CRLF>

Wrong response	gN@Ezzz <CRLF>	
Parameter Description	N=Device ID Xxxx=measurement interval, in milliseconds. The valid data below 1000 are 200, 100, 50, and 33, respectively. The remaining parameters are invalid. When the measurement time is greater than 1000, a single measurement is triggered at a scheduled time. Aaaaaaa=distance data with an accuracy of 0.1mm; Zzz=Error code	

（4） Single ranging module constant speed measurement tracking command - with signal strength data and temperature (sHe)

Trigger continuous distance measurement, with measurement speed determined by set parameters and target reflectivity, up to a maximum of

30Hz, this command is prohibited from being used when networking multiple SDC devices on the bus. This command actively sends out measurement result data at the end of the measurement. This measurement mode will continue until a stop command (snc) is received, and the LED status and digital output pins will automatically update based on the newly measured distance value.

If there are no parameters, it is considered a read command, and if there are parameters, it is a set command.

	Set measurement frequency command	Read Command
command	sNhe+xxxx<CRLF>	sNh<CRLF>
ACK	gNhe+aaaaaaaa+bbbbbbbb +cccccccc<CRLF>	gNhe+xxxx <CRLF>
Wrong response	gN@Ezzz <CRLF>	
Parameter Description	N=Device ID Xxxx=measurement interval, in milliseconds. The valid data below 1000 are 200, 100, 50, and 33, respectively. The remaining parameters are invalid. When the measurement time is greater than 1000, a single measurement is triggered at a scheduled time. Aaaaaaa=Distance data with an accuracy of 0.1mm Bbbbbbb=signal strength data; Ccccccc=internal temperature of 0.1 ℃; Zzz=Error code	

（5） Activate the trace measurement command with internal cache mode (snf)

Trigger continuous distance measurement, this command supports internal caching function, and the measurement speed is determined by the set parameters and target reflectivity, with a maximum of 30Hz,. At the end of the measurement, the result data is stored in the internal cache, and the last measurement result can be read from the module using the sNq command. This measurement mode will continue until a stop command (snc) is received, and the LED status and digital output pins will automatically update based on the newly measured distance value.

	dispatch orders	Read Command
command	sNf+xx<CRLF>	sNf<CRLF>
ACK	gNf? < CRLF>	gNf+aaaaaaaa <CRLF>
Wrong response	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>

Parameter Description	N=Device ID Xxxx=measurement interval, in milliseconds. The valid data below 1000 are 200, 100, 50, and 33, respectively. The remaining parameters are invalid. When the measurement time is greater than 1000, a single measurement is triggered at a scheduled time. Aaaaaaa=distance data with an accuracy of 0.1mm; Zzz=Error code

（6） Read - Trace measurement command with internal cache mode (sNq)

When starting the continuous measurement mode with cache using the snf command, the latest measurement data can be read from the module using the sNq command, which is only valid when the continuous measurement mode with cach

	command

command	sNq<CRLF>
ACK	gNq+aaaaaaaa+b<CRLF>
Wrong response	gN@Ezzz <CRLF>
Parameter Description	N=Device ID; Zzz=Error code aaaaaaa=Distance data 0.1mm Accuracy b=0 No new data since last command until now B=1 There is a new data from the last command until now, which has been overwritten B=2 There are multiple new data from the last command until now, which have been overwritten

（7） Read - Tracking measurement command with internal cache mode - with signal strength and temperature (sNqe)

When starting the continuous measurement mode with cache using the sNf command, the latest measurement data, signal strength, and temperature can be read from the module using the sNqe command, which is only valid when the continuous measurement mode with cache is enabled.

	command
command	sNq<CRLF>
ACK	gNq+aaaaaaaa +bbbbbbbb +cccccccc +d<CRLF>
Wrong response	gN@Ezzz <CRLF>
Parameter Description	N=Device ID Aaaaaaa=Distance data 0.1mm accuracy bbbbbbb=Signal strength data ccccccc=Internal temperature 0.1 ℃ D=0. There has been no new data since the last command D=1. There is a new data from the last command until now, which has been overwritten D=2 There are multiple new data from the last command until now, which have been overwritten Zzz=Error code

（8） Signal strength measurement command (sNm)

The signal strength measurement command can perform single or continuous measurements. This data is only a rough estimate and may vary when using different devices or in different environments.

	command
command	sNm<CRLF>
ACK	gNm+aaaaaaaa<CRLF>
Wrong response	gN@Ezzz <CRLF>
Parameter Description	N=Device ID; Aaaaaaa=signal strength; Zzz=Error code

（9） The temperature measurement command (sNT) of the movement triggers the internal temperature measurement command of the device

	command

command	sNt<CRLF>
ACK	gNt+bbbbbbbb<CRLF>
Wrong response	gN@Ezzz <CRLF>
Parameter Description	N=Device ID; Bbbbbbb=device temperature value (unit: 0.1 ℃); Zzz=Error code

（10） Read/Clear Error Stack Command (sRe)

Trigger the internal temperature measurement command of the device

	Read Command	CLEAR COMMAND
command	sNre<CRLF>	sNce<CRLF>
ACK	gNre+bbb+bbb+bbb..<CRLF>	gNre?< CRLF>
Wrong response	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>
Parameter Description	N=Device ID+ bbb+bbb+bbb The current error code is 0 with no errors Zzz=Error code	

（11） Open laser command (sNo)

	command
command	sNo<CRLF>
ACK	gN?<CRLF>
Wrong response	gN@Ezzz <CRLF>
Parameter Description	N=Device ID; Zzz=Error code

5.4.2 configuration command

（1） Set communication parameters (sBrr)

Set communication parameters for RS485 communication. The default setting parameter at the factory is 115200, without verification.

	command
command	sNbr+aaaaaa+b<CRLF>
ACK	gNbr?< CRLF>
Wrong response	gN@Ezzz <CRLF>
Parameter Description	N=Device ID; Zzz=Error code Aaaaaa=communication baud rate, from 4800 to 115200 b: 0-None, 1-Odd (odd parity), 2-even (even parity)

（2） Set device ID (sNid)

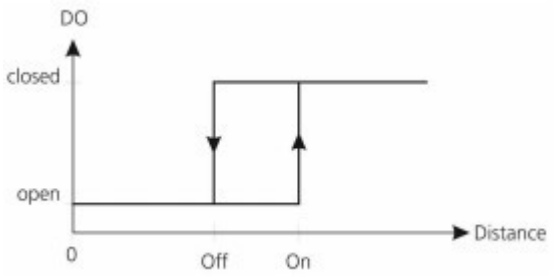
	command
command	sNid+aa<CRLF>
ACK	gNid?< CRLF>
Wrong response	gN@Ezzz <CRLF>
Parameter Description	N=Device ID; Zzz=Error code Aa=new ID number, range 1-247, factory default ID is 1, where 0 is the broadcast ID.

（3） Set switch output hysteresis parameters (sNo1, sNO2)

It is possible to set separate parameters for the 2-channel switch output of the device, and there are two possible scenarios for configuring hysteresis (1: ON>OFF, 2: ON<OFF). The device automatically determines which mode it belongs to based on the set switch numerical parameters.

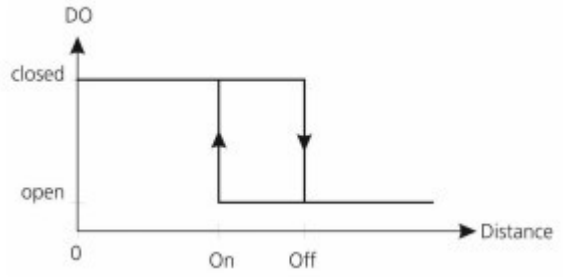
As the distance increases, when the distance exceeds ON Turn on the digital output high level. As the distance decreases, the switch closes and outputs a low level when the distance decreases.

1） Hysteresis parameter: ON level>OFF level



2） Hysteresis parameter: ON level<OFF level

As the distance increases, when OFF Turn on the digital output low level. As the distance decreases, output a high



	set command	Read Command
command	sNoa+bbbbbbbb+cccccccc<CRLF>	sNoa<CRLF>
ACK	gNoa?< CRLF>	gNoa+bbbbbbbb+cccccccc<CRLF>
Wrong response	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>
Parameter Description	N=Device ID A=Switch output port number, 1 or 2 Bbbbbbbb=Switching to high-level output level distance (unit: 0.1mm) ; Cccccccc=Switching to low-level output distance value (unit: 0.1mm) zzz=Error code	

（4） Set switch input function (sNDI1)

Change the command to set the function of one switch input pin. The level status of the input pin can be controlled using the command sNRI

Read.

	set command	Read Command
command	sNDI1+aa<CRLF>	sNDI1<CRLF>
ACK	gNDI1?< CRLF>	gNDI1+aa<CRLF>
Wrong response	gN@Ezzz <CRLF>	
Parameter Description	N=Device ID Aa=input port function; 0->Turn off the input pin function; 1->Low level stop measurement, high level start measurement 2->Low level start measurement, high level stop measurement	

	Zzz=Error code

（5） Read switch input function (sNRI)

This command can set the function of one switch input pin. The level status of the input pin can be read using the command sNRI.

	command
command	sNRI<CRLF>
ACK	gNRI+a<CRLF>
Wrong response	gN@Ezzz <CRLF>
Parameter Description	N=Device ID; Zzz=Error code a： 0->Input level is low, 1 input level is high

（6） Restore factory settings (sNd)

	command
command	sNd<CRLF>
ACK	gNd?< CRLF>
Wrong response	gN@Ezzz <CRLF>
Parameter Description	N=Device ID; Zzz=Error code

（7） Set user distance offset (sNuof)

This command can restore all parameters to factory default settings, and communication parameters will also be restored to factory default.

	set command	Read Command
command	sNuof+aaaaaaaa<CRLF>	sNuof<CRLF>
ACK	gNof?< CRLF>	gNuof+aaaaaaaa<CRLF>
Wrong response	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>
Parameter Description	N=Device ID Aaaaaaaa=offset, negative allowed, unit: 0.1mm; Zzz=Error code	

（8） Set analog output function (sNao)

	set command	Read Command
command	sNao+aa <CRLF>	sNDao<CRLF>
ACK	gNao<CRLF>	gNao+aa <CRLF>
Wrong response	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>
Parameter Description	N=Device ID Aa=Analog output parameter: 0 Analog output turned off; 1. Output range 0-5V; 2 output range 0-10V; 3 output range 4-20mA; 4 output range 0-20mA; 5 output range 0-24mA Zzz=Error code	

（9） Set the minimum analog range value (sNam)

	set command	Read Command
command	sNam+aaaaaaaa <CRLF>	sNDam<CRLF>
ACK	gNam<CRLF>	gNam+aaaaaaaa <CRLF>

Wrong response	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>
Parameter Description	N=Device ID; Zzz=Error code Aaaaaaaa The minimum distance value of the analog output range, and the minimum value of the analog output for distances less than this value	

（10） Set the maximum analog range value (sNatu)

	set command	Read Command
command	sNau+aaaaaaaa <CRLF>	sNDau<CRLF>
ACK	gNau<CRLF>	gNau+aaaaaaaa <CRLF>
Wrong response	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>
Parameter Description	N=Device ID; Zzz=Error code Aaaaaaaa The minimum distance value of the analog output range, and the minimum value of the analog output for distances less than this value	

（11） Save parameters (SNS)

This command can save all parameters to internal memory and save them in case of power failure.

	command
command	sNd<CRLF>
ACK	gNd?< CRLF>
Wrong response	gN@Ezzz <CRLF>
Parameter Description	N=Device ID; Zzz=Error code

（12） Set output format (sNuo)

	set command	Read Command
command	sNuo+aaaaaaaa <CRLF>	sNuo<CRLF>
ACK	gNuo<CRLF>	gNuo+aaaaaaaa <CRLF>
Wrong response	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>
Parameter Description	N=Device ID Aaaaaaaa=0 Normal mode aaaaaa=1xy, where x is the number of decimal places, up to a maximum of 4, y is the total length of the displayed content (y>x), filled with spaces in front, such as 117, displayed at a distance of 32.5642m as 32564.2aaaaa=4xy, where x is the number of decimal places, up to a maximum of 4, y is the total length of the displayed content, starting with the letter d, ending with a unit letter, and a fixed length number in the middle, filled with 0 if it is not enough, for example: Set 418, display as d032564.2mm at a distance of 32.5642m; Set 428, display d03256.42cm at a distance of 32.5642m; Set 438, display as d0325.642dm for distance 32.5642m, set 448, display as d032.5642maaaaaaa=300 for distance 32.5642m, output data format as g1h+00018835+00060389+386 distance strength Temperature aaaaaaaa=301, output data format is g1h+00018946+00056884+380+000077 distance strength Temperature speed Zzz=Error code	

（13） Set measurement frequency (sNsfq)

	set command	Read Command
command	sNsfq+a <CRLF>	sNsfq<CRLF>
ACK	gNsfq<CRLF>	gNsfq+a <CRLF>
Wrong response	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>

Parameter Description	N device ID; A=Measurement frequency,=0 Single time 1=5Hz 2=10Hz 3=20Hz 4=30Hz zzz=Error code

（14） Set the startup and power on working mode (sNspo)

	set command	Read Command
command	sNspo+a <CRLF>	sNspo<CRLF>
ACK	gNspo<CRLF>	gNspo+aaaaaaaa <CRLF>
Wrong response	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>
Parameter Description	N device ID A=Power on working mode, 1=Proactively send the distance measurement results using the command format gNh+aaaaaaa<CRLF>. 2=The distance measurement result is not actively sent, and the sNq command needs to be used to read and obtain distance data 3=Proactively send distance measurement results using the command format gNhe+aaaaaaa+bbbbbbb +Cccccccc<CRLF>. 4=The distance measurement result will not be sent, and the command sNqe is required to obtain the data Zzz=Error code	

（15） Set filter parameters (sNsft)

	set command	Read Command
command	sNsft+aa <CRLF>	sNsft<CRLF>
ACK	gNsft<CRLF>	gNsft+aaaaaaaa <CRLF>
Wrong response	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>
Parameter Description	N device ID; A=depth parameter of the filter, the maximum value should be less than 32; A<=1 filter is prohibited. a> =1 filter enabled, the larger the value, the smaller the fluctuation of the output distance value, but the disadvantage is that the response speed slows down. Suitable for slow measurement scenarios. Zzz=Error code	

（16） Set the maximum analog range value (sNatu)

	set command	Read Command
command	sNau+aaaaaaaa <CRLF>	sNDau<CRLF>
ACK	gNau<CRLF>	gNau+aaaaaaaa <CRLF>
Wrong response	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>
Parameter Description	N=Device ID Aaaaaaaa The minimum distance value of the analog output range, and the minimum value of the analog output for distances smaller than this value; Zzz=Error code	

（17） Set analog zero bias compensation (sNaz)

	set command	Read Command
command	sNaz+aaaaaaaa <CRLF>	sNDaz<CRLF>
ACK	gNaz<CRLF>	gNaz+aaaaaaaa <CRLF>
Wrong response	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>
Parameter Description	N=Device ID Aaaaaaaa=zero bias value of analog output, in uA; Zzz=Error code	

（18） Set analog linearity calibration value (sNak)

This command is used to compensate for the linearity of the measured analog output, with the unit of uA/100mm. The calculation method is to set the minimum analog range to 0 and the maximum analog range to 1000000 (0.1mm), measure a distance of about 50m, and set the measured distance value to d (m). The theoretical analog output is Ib (mA), and the actual measured analog value is Ic (mA). The formula for calculating the value of k is as follows:

$$k = \frac{(Ib-Ic)*1000*100}{d}$$

	set command	Read Command
command	sNak+aaaaaaaa <CRLF>	sNDak<CRLF>
ACK	gNak<CRLF>	gNak+aaaaaaaa <CRLF>
Wrong response	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>
Parameter Description	N device ID Aaaaaaaa=linear compensation value of analog output, meaning the maximum error value of analog output at a distance of 100m, measured in uA; Zzz=Error code	

（19） Set analog output distance value (sNas)

This command is used to manually set the distance value for measuring analog output, only for testing analog output, with numerical units

0.1mm, after setting, the analog unit sets the analog output value based on this value to verify the accuracy of the analog output.

	set command	Read Command
command	sNas+aaaaaaaa <CRLF>	sNDas<CRLF>
ACK	gNas<CRLF>	gNas+aaaaaaaa <CRLF>
Wrong response	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>
Parameter Description	N device ID Aaaaaaaa=analog output value, unit: 0.1mm; Zzz=Error code	

（20） Set the local IP address (sNip) of the sensor

This command is used to modify and configure the local IP address of the sensor. After modification, the gateway and destination IP will also be automatically adjusted. The gateway and destination IP can also be modified separately using dedicated instructions. After changing the command settings, it is necessary to manually send s1s to save the parameters, otherwise restarting will result in loss.

	set command	Read Command
command	sNip xxx.yyy.zzz.kkk:mmmm <CRLF>	sNip<CRLF>
ACK	gNip xxx.yyy.zzz.kkk:mmmm <CRLF>	gNip xxx.yyy.zzz.kkk:mmmm <CRLF>
Wrong response	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>
Parameter Description	N device ID Xxx. yyy. zzz. kkk is the IP address, filled in with numbers, separated from the previous command by spaces Mmmm is the port number, filled in numerical format, separated from the IP address by ":" For example, when sending s1ip 192.168.2.25:2270, the local IP address can be changed to 192.168.2.25 and the port number can be changed to 2270. After the modification, the gateway and destination IP will be automatically adjusted to the same network segment Adjusted to 192.168.2.1, destination IP automatically adjusted to 192.168.2.10	

（21） Set sensor local IP address gateway (sNgate)

This command is used to modify the configuration of the sensor's local IP address gateway, which defaults to 192.168.1.1. After changing the command settings, it is necessary to manually send s1s to save the parameters, otherwise restarting will result in loss.

	set command	Read Command
command	sNgate xxx.yyy.zzz.kkk <CRLF>	sNgate<CRLF>
ACK	gNgate xxx.yyy.zzz.kkk <CRLF>	gNgate xxx.yyy.zzz.kkk <CRLF>

Wrong response	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>
Parameter Description	N device ID Xxx. yyy. zzz. kkk is the IP address, filled in with numbers, separated from the previous command by spaces For example, when sending s1ip 192.168.1.1, the local IP gateway address can be changed to 192.168.1.1	

（22） Set the destination IP address of the sensor (sNDIP)

This command is used to modify and configure the destination IP address of the sensor, which should be in the same network segment as the local IP. After changing the command settings, it is necessary to manually send s1s to save the parameters, otherwise restarting will result in loss.

	set command	Read Command
command	sNdip xxx.yyy.zzz.kkk <CRLF>	sNdip<CRLF>
ACK	gNdip xxx.yyy.zzz.kkk <CRLF>	gNdip xxx.yyy.zzz.kkk <CRLF>
Wrong response	gN@Ezzz <CRLF>	gN@Ezzz <CRLF>
Parameter Description	N device ID Xxx. yyy. zzz. kkk is the IP address, filled in with numbers, separated from the previous command by spaces For example, when sending s1dip 192.168.2.11, the destination IP address can be changed to 192.168.2.11	

5.4.3 Device Information Command

（1） Obtain software version (sNsv)

	command
command	sNsv<CRLF>
ACK	gNsv+aaaabbbb?< CRLF>
Wrong response	gN@Ezzz <CRLF>
Parameter Description	N=Device ID Aaaa=internal measurement module software version; Bbbb=interface board software version; Zzz=Error code

（2） Obtain serial number (sNsn)

	command
command	sNsn<CRLF>
ACK	gNsn+aaaaaaaa?< CRLF>
Wrong response	gN@Ezzz <CRLF>
Parameter Description	N=Device ID; Aaaaaaaa=internal serial number; Zzz=Error code

（3） Get production date (sNPd)

This command can read the SDC sensor serial number

	command
command	sNpd<CRLF>
ACK	gNpd+aaaaaaaa?< CRLF>

Wrong response	gN@Ezzz <CRLF>
Parameter Description	N=Device ID; Aaaaaaaa=production date; Zzz=Error code

（4） Obtain device type code (sNdg)

This command can read the SDC sensor type code

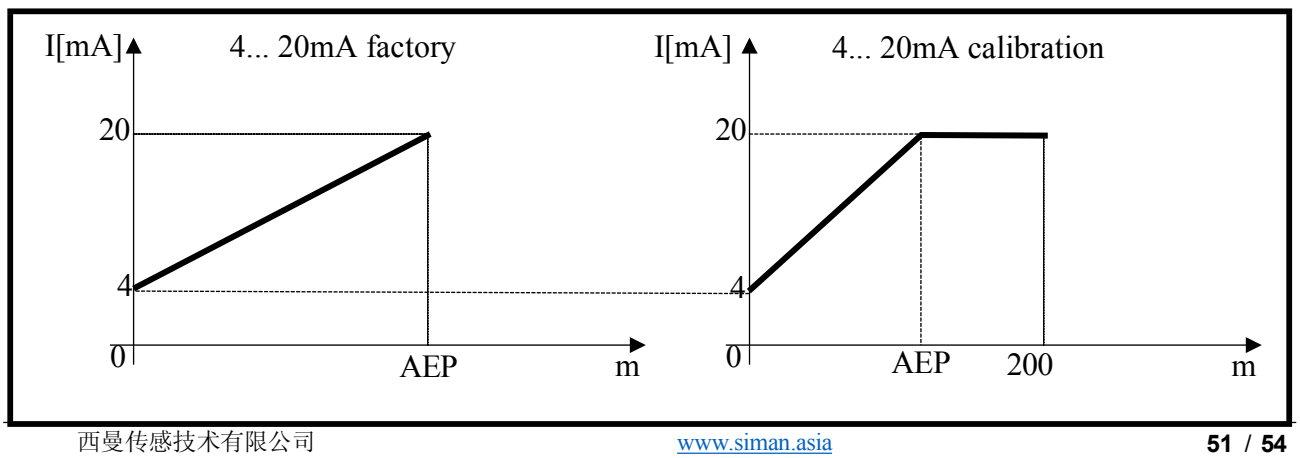
	command

command	sNdg<CRLF>
ACK	gNdg+aa?< CRLF>
Wrong response	gN@Ezzz <CRLF>
Parameter Description	N=Device ID; Aa=SDC device type code 0x54; Zzz=Error code

5.4.4 error code

No.	format	meaning	solution
0		No err	
200		Sensor startup error	Restart the sensor
203	@E203	Command error or parameter error	Check if the command, parameters, or communication parameters are correct (baud rate, stop bit, checksum, terminator)
210	@210	The sensor is not in continuous measurement mode	Activate continuous measurement function
212	@212	Continuous measurement is in progress, unable to process command	Stop continuous measurement first
230	@230	Measurement distance exceeded due to incorrect settings	Check for offset parameter settings
234	@234	Measurement distance exceeds the measurement range	Check user settings and surface reflectivity of reflectors
252	@252	The temperature is too high	Reduce the operating temperature
253	@253	Temperature too low	Raise the operating temperature
255	@255	Weak signal or measurement distance outside the range	Check the user's measured target reflectivity. If the reflectivity is too low, it is recommended to use a reflector plate
256	@256	Received signal too strong	Check the target reflectivity and use a lower reflective surface as the target
257	@257	Excessive ambient light	Reduce the impact of ambient light usage
260	@260	The measurement signal is too unstable	Stable measurement of target object reflection surface
other			Please contact the manufacturer's after-sales service

11 4-20mA analog quantity



- The distance value is directly proportional to the analog quantity;
- AEP： The upper limit of the analog range set; When the range is 30m, the default AEP is 30; When the range is 60m, the default AEP is 60;
- When the range is 100m, the default AEP is 100; When the range is 200m, the default AEP is 200;

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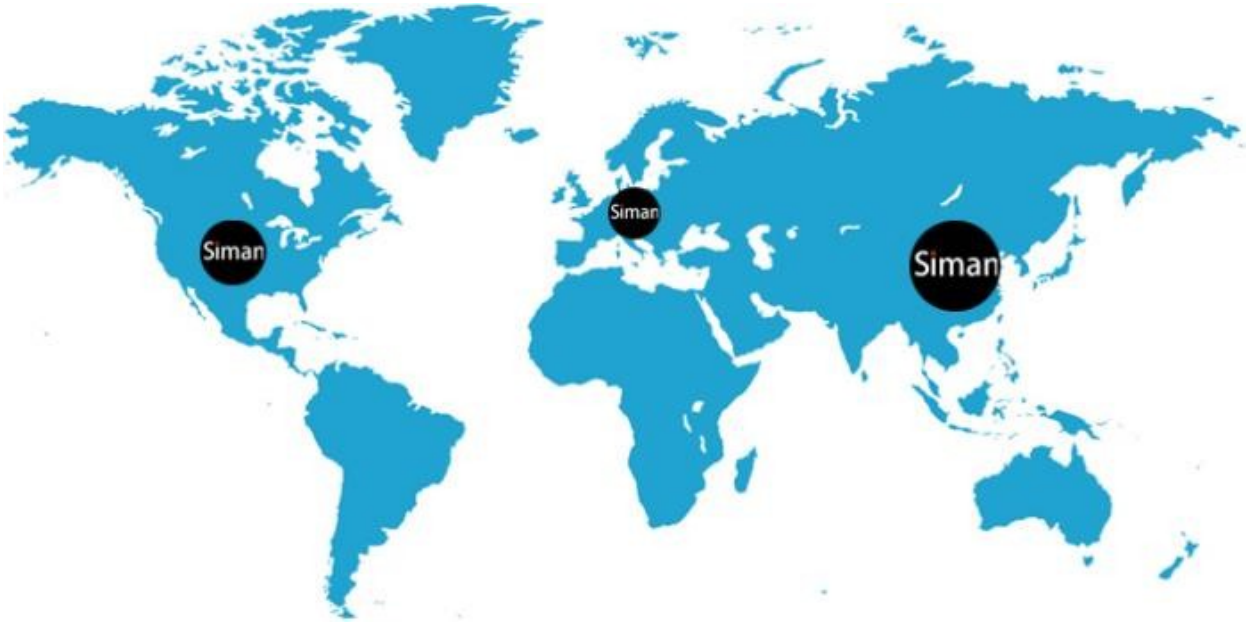
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