

### Product Description

- Laser displacement sensor ,FULL Metal JACKET,durable, better protective performance,small size ,small spot, high precision,LED display and teachnical key setting, 940nm infrared laser,2.5 m and 4 m TOF ranging. Suitable for dispensing machine,Applications in pharmaceuticalpacking,automobile AGV and other industries.



### Product features:

- Support switch output,NPN/PNP can be set.
- Support RS485 output.
- Four white digital tubes,clear and bright
- Support multiple detection modes,multi-scene applications.



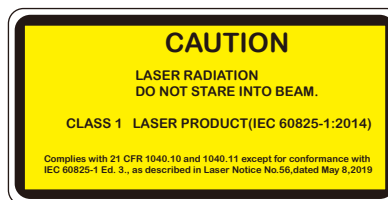
Type	Measurement range	Indicating spot diameter	Detecting spot size	Repeatability	Contron output	Resolution
OSM41-K2500CB6/485*M	50...2500mm	4mm@2.5m	9cm*5.5cm@2.5m	5mm	NPN/PNP	3mm
OSM41-K2500CB6/485-*Q12.1						
OSM41-K4000CB6/485*M	50...4000mm	4mm@2.5m 5mm@4m	9cm*5.5cm@2.5m 13cm*8.5cm@4m	5mm	NPN/PNP	3mm
OSM41-K4000CB6/485-*Q12.1						

Note 1: This product is a laser product, which can be used after 10 minutes of preheating after power-on.  
 Note 2: For breakout products, \*M represents the cable length; if not specified, the default is 2 meters.  
 For pigtail products, \* represents the cable length in meters. If there is no Wei connector product

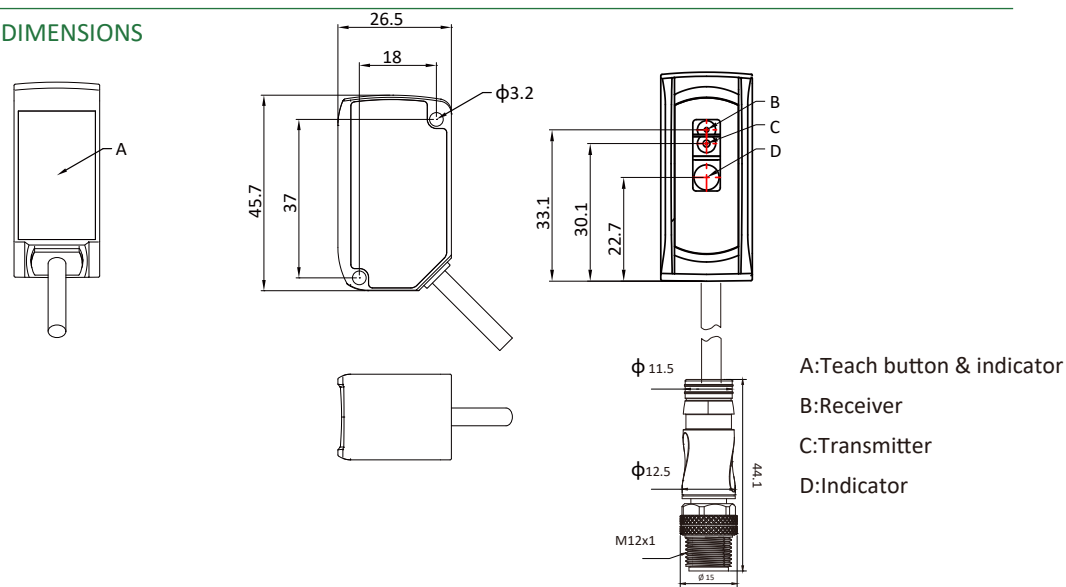
### TECHNICAL SPECIFICATION

<b>OPERATING VOLTAGE</b>	10...30 V DC , Class 2	<b>WORKING TEMPERATURE</b>	-10°C ... +50°C
<b>POWER SUPPLY</b>	<1W	<b>AMBIENT TEMPERATURE</b>	-20°C ... +60°C
<b>INDICATING LIGHT</b>	Red semiconductor laser level 2	<b>DETECTION LIGHT SOURCE</b>	940nm infrared laser (class 1)
<b>CONTROL OUTPUT</b>	NPN/PNP can be set	<b>MEASUREMENT ACCURACY</b>	30mm
<b>COMMUNICATION METHOD</b>	Modbus-485	<b>RESPONSE FREQUENCY</b>	30Hz

<b>VOLTAGE WITHSTAND</b>	650V/AC/50/60Hz 60S	<b>PROTECTION DEGREE</b>	IP67
<b>INSULATION IMPEDANCE</b>	50MQ(500VDC)	<b>HOUSING MATERIAL</b>	Die-cast zinc
<b>CONNECTIONS</b>	Cable/Pigtail Cable	<b>WINDOWS MATERIAL</b>	Glass
		<b>LASER LABEL</b>	pasting on packing bag
		<b>MAINTAIN</b>	disassemble; please return to ELCO
		<b>MAXIMUM HUMIDITY</b>	Max.85%Rh
		<b>ALTITUDE</b>	Up to 2000m
		<b>POLLUTION DEGREE</b>	3



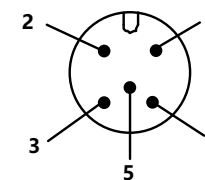
### DIMENSIONS



### INTERFACE DEFINITION AND WIRING DIAGRAM

	Function	Cabel product core color
1	Positive power supply	Brown
2	485B	Gray
3	Power negative	Blue
4	NPN/PNP	Black
5	485A	Pink

Connector wiring diagram



## 产品说明:

- 激光位移传感器, 全金属外壳, 坚固耐用, 防护性能更好, 体积小, 光斑小, 精度高, LED显示和按键设置, 940nm红外激光, 2.5米、4米TOF型测距。适用点胶机、制药、包装、汽车、AGV等行业应用。

## 产品特点:

- 支持开关量输出, NPN/PNP可设定
- 支持RS485输出
- 四位白色数码管, 明亮清晰
- 支持多种检测模式, 多场景应用



型号	检测距离	指示光斑直径	检测光斑尺寸	重复精度	控制输出	分辨率
OSM41-K2500CB6/485*M	50...2500mm	4mm@2.5m	9cm*5.5cm@2.5m	5mm	NPN/PNP	3mm
OSM41-K2500CB6/485-* Q12.1						
OSM41-K2500CB6/485*M	50...4000mm	4mm@2.5m 5mm@4m	9cm*5.5cm@2.5m 13cm*8.5cm@4m	5mm	NPN/PNP	3mm
OSM41-K2500CB6/485-* Q12.1						

注1: 本产品为激光类产品, 上电预热十分钟后使用。

注2: 出线产品\*M代表线长, 如无为默认2M长度。pigtail产品\*代表线长, 单位为米, 若无为接插件产品。

## 技术参数

工作电压	10...30VDC	工作温度	-10°C...+50°C
功率	<1W	环境温度	-20°C...+60°C
指示光源	红色半导体激光2级	检测光源	940nm infrared laser (class1)
控制输出	NPN/PNP可选	测量精度	30mm
通讯方式	Modbus-485	响应频率	30Hz
耐电压	650V/AC/50/60HZ 60S	防护等级	IP67
绝缘阻抗	≥50MΩ (500VDC)	外壳	压铸铝

## 连接形式

线缆式/pigtail线缆

## 窗口

玻璃

## 激光标签

包装袋粘贴

## 维护信息

异常返厂宜科处理

## 最高湿度

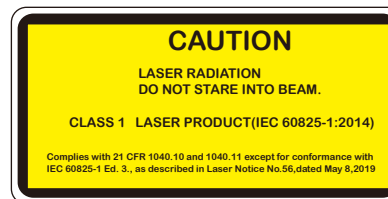
最高85%相对湿度

## 海拔

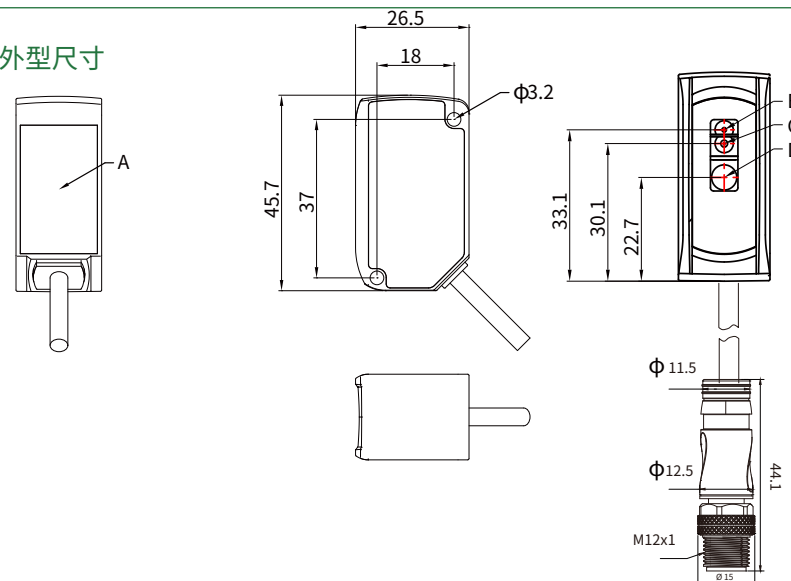
高达2000米

## 污染程度

三级



## 外型尺寸

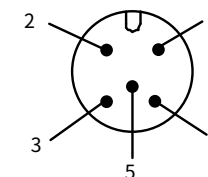


A: 按键膜端&指示灯  
B: 接收器  
C: 发射器  
D: 指示器

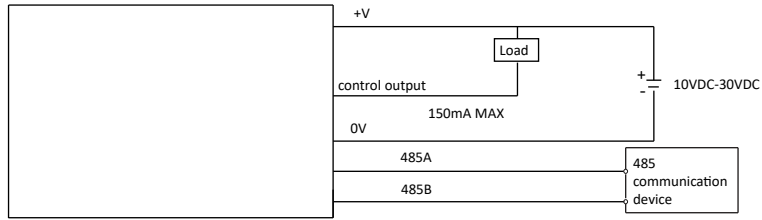
## 接口定义和接线图

	功能	出线式线芯颜色
1	电源正	棕
2	485B	灰
3	电源负	蓝
4	NPN/PNP	黑
5	485A	粉

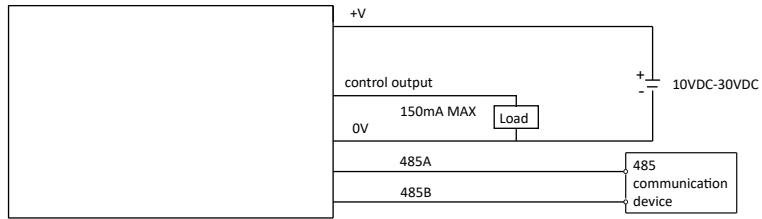
## Pigtail式接线图



Wiring diagram (NPN)



Wiring diagram (PNP)



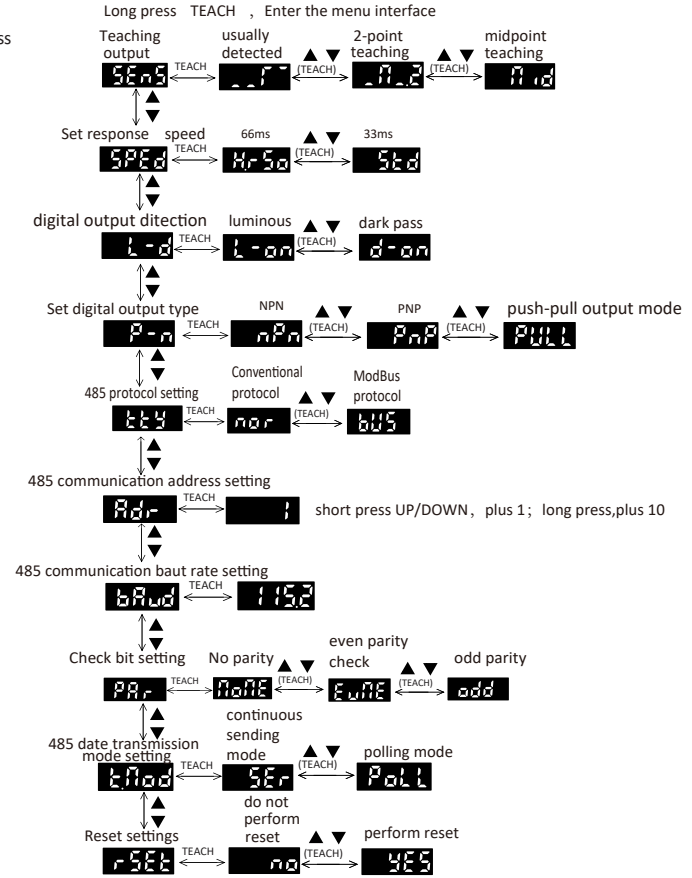
TEACHING MODE DESCRIPTION

Teach	
<p>Detection mode setting description: It is necessary to set the "Detection Mode Setting" in the menu to the corresponding function mode in advance.</p>	
<p>1. Normal detection mode In the menu, select the " _   _ " mode, automatically enter the detection interface; Select the target object(*) within the effective detection distance and press the TEACH key, and prompt "GOOD" to complete the setting. The location of the target object is the judgement distance.</p>	
<p>2.2-point teaching window comparison mode In the menu, select the " _ N_ 2 " mode, automatically enter the measurement interface. Select the target object 1(*) within the effective detection distance and press the TEACH key, and prompt "LP1" to complete p-1 setting. Select the target object 2 (*) within the effective detection distance and press TEACH key, prompt "GOOD" to complete the p-2 setting. Use the distance between the location of target object 1 and target object 2 as the window to determine the window mode.</p>	
<p>3. midpoint teaching mode In the menu, select the "Nid" mode, automatically enter the measurement interface. Select the target object 1(*) within the effective detection distance and press the TEACH key, and prompt "LP1" to complete p-1 setting. Select the target object 2(*) within the effective detection distance and press TEACH key, prompt "GOOD" to complete the p-2 setting. Take the middle distance between p-1 and p-2 as the judgement distance.</p>	

INSTRUCTION

1. Menu operation process

STEP



2. Ranging display

Measurement interface: Show actual measurement distance, resolution is 1mm, when the distance is out of detected distance, it displays "----".

3. Menu and key operation

3.1 Enter the menu: Long press TEACH above 3s when it is in the measurement interface, enter the menu interface; Exit menu: Long press TEACH above 3s when it is in the menu interface, or no key operation for 20s, return to measurement interface.

3.2 Menu operation

Enter the menu interface, display the main menu, switch the menu options by pressing the up/down key. On the main menu interface, enter the submenu options by short pressing TEACH key. Under the submenu, short press up/down to select the parameter. Short press the TEACH key to confirm and return to the previous main menu.

1) Teaching output

The main menu shows "SEns", press TEACH to enter the submenu; Submenu items: " \_ | \_ " usually detected mode (default); " \_ N\_ 2 " 2-point teaching window comparison mode; "Nid" midpoint teaching mode. The above teaching modes are detailed in 6. Teaching mode description.

2) Set response speed: The main menu shows "SPEd", press TEACH to enter the submenu;

Submenu items: "H.rSo" high precision 66ms; "Std" standard 33ms (default);

3) Set digital output detection

The main menu shows "L-d", press TEACH to enter the submenu; Submenu items: "L-on" luminous (default); "d-on" dark pass;

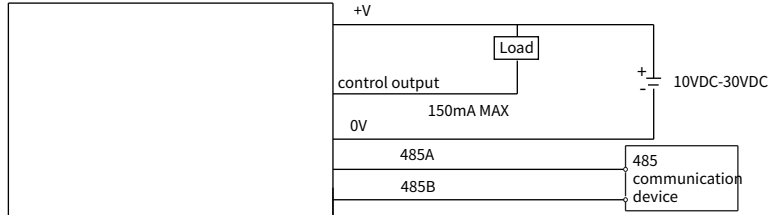
4) Set digital output type

The main menu shows "P-n", press TEACH to enter the submenu; Submenu items: "nPn" NPN output mode (default); "PnP" PNP output mode. "PULL" push-pull output mode.

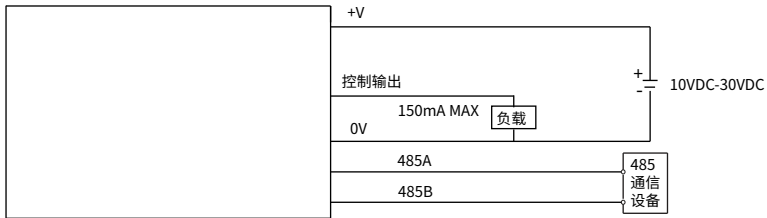
5) 485 protocol setting

The menu shows "tty" and press TEACH to enter the submenu. Sub-menu item: "nor" general mode (default); "bus" Mod Bus protocol. Under the submenu, press UP/DOWN to make a selection, and press the TEACH key to confirm and return to the superior menu. Note: The default is "nor" normal mode;

接线图 (NPN)



接线图 (PNP)

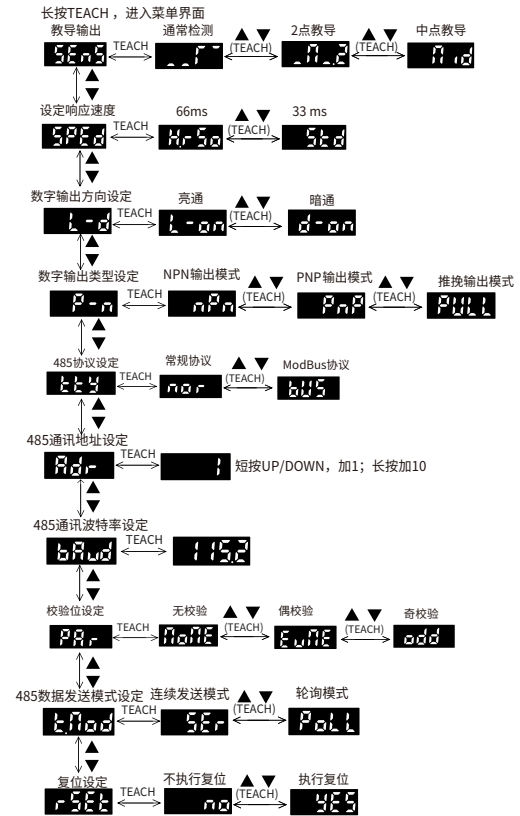


教导模式说明

教导	
<p>检测模式设定说明: 需事先在Menu中将“检测模式设定”设为对应功能模式。</p>	
<p>1.通常检测模式 在菜单中,选定“”模式,自动进入测量界面;在有效测量距离内,选定目标物体(*),按TEACH键,提示“GOOD”,完成设置;目标物体所在位置即为判定距离。</p>	
<p>2.2点教导模式 在菜单中,选定“N_2”模式,自动进入测量界面;在有效测量距离内,选定目标物体1(*),按TEACH键,提示“LP1”,完成p-1设定;在有效测量距离内,选定目标物体2(*),按TEACH键,提示“GOOD”,完成p-2设定;以目标物体1和目标物体2所在位置之间的距离为窗口,进行窗口模式判定;</p>	
<p>3.中点教导模式 在菜单中,选定“Nid”模式,自动进入测量界面;在有效测量距离内,选定目标物体1(*),按TEACH键,提示“LP1”,完成p-1设定;在有效测量距离内,选定目标物体2(*),按TEACH键,提示“GOOD”,完成p-2设定;以p-1和p-2的中间距离为判定距离;</p>	

操作指南

1.菜单操作流程



2.测距显示

测量界面: 显示实际测量距离,分辨率为1mm,未检测到距离信息时显示“----”。

3.菜单及按键操作

3.1进入菜单: 测量界面下长按TEACH键3秒以上,进入菜单界面;  
退出菜单: 菜单界面下长按TEACH键3秒以上,或20秒无按键操作,返回测量界面。

3.2菜单操作

进入菜单界面,显示主菜单,通过短按 ▲/▼ 键切换菜单选项;短按TEACH进入相应子菜单选项,短按 ▲/▼ 进行参数选择,在对应选项下短按TEACH键确认并返回上级主菜单;

1) 教导输出

菜单显示“SEnS”,按TEACH进入子菜单,子菜单项: 通常检测模式(默认);“N\_2”2点教导窗口模式;“Nid”中点教导模式”。

以上教导模式详见教导模式说明;

2) 设定响应速度:菜单显示“SPed”,按TEACH进入子菜单,子菜单项:“HrSo”高精度66ms;“Std”标准33ms(默认);

3) 数字输出方向设定:菜单显示“L-d”,按TEACH进入子菜单,子菜单项:“L-on”亮通(默认);“d-on”暗通;

4) 数字输出类型设定

菜单显示“P-n”,按TEACH进入子菜单,子菜单项:“nPn”NPN输出模式(默认);“PNP”PNP输出模式;“PULL”推挽输出模式;

5) 485协议设定

菜单显示“tty”,按TEACH进入子菜单。

子菜单项:“Nor”常规模式(默认);“bus”ModBus协议。

在子菜单下,按UP/DOWN进行选择,按TEACH键确认并返回上级菜单。

注:默认为“Nor”常规模式。

6)485 communication address setting

The main menu shows "Adr", press TEACH to enter the submenu; Submenu items: " 1", short press UP/DOWN, plus 1; long press for 3s, plus 10. Press TEACH, return to the previous menu. Setting range: 1~254. Initial address is 1, 255 is broadcast address.

7)485 communication baud rate setting

The main menu shows "bAud", press TEACH to enter the submenu; Submenu items: "115.2", press UP/DOWN adjustment parameters, the baud rate setting contains the following options, 9600、19200、38400、115200bit/s, unit is Kbit/s.

8)Check bit setting

The menu shows "PAR" and press TEACH to enter the submenu Sub-menu item: "NoNE" without verification mode (default): "EuEN" parity check: odd check Under the submenu, press UP/DOWN to make a selection, and press the TEACH key to confirm and return to the superior menu. Note: The default is "NoNE" without verification mode;

9)485 date transmission mode setting

The main menu shows "t.Nod", press TEACH to enter the submenu; Submenu items: "SER" continuous sending mode (default); "PoLL" polling mode. Press UP/DOWN to choose, press TEACH to confirm and enter the submenu.

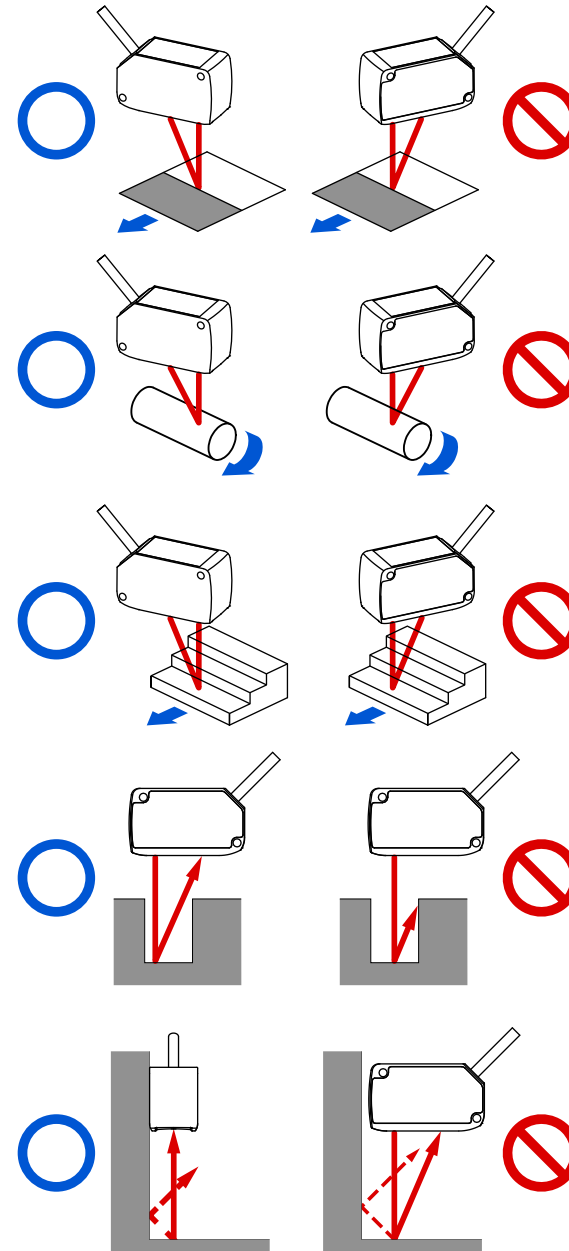
10)Reset settings

The main menu shows "rSEt", press TEACH to enter the submenu; Submenu items: " no" do not perform reset; " yES" perform reset, restore default settings.

DIGITAL TUBE DISPLAY INTERPRETATION

SEN9	sens	teaching output
_m	_m	usually detected
_m_2	_m_2	2-point teaching
_mid	_mid	midpoint teaching
SPEd	sped	set response speed
h.r50	h.r50	high precision 66ms
std	std	standard 33ms
l-d	l-d	set switch output detection
l-on	l-on	luminous
d-on	d-on	dark pass
p-n	p-n	set switch output
nPN	nPN	NPN
pnp	pnp	PNP
PULL	pull	push-pull output mode
Adr	adr	485 communication address setting
bAud	baud	485 communication baut rate setting
tNod	tnod	485 date transmission mode setting
ser	ser	continuous sending mode,always sending distance information
poll	poll	polling mode,information will only be returned when a command is sent to it
rest	rest	reset settings
no	no	do not perform reset
yES	yes	perform reset
PAR	par	Check bit setting
NoNE	mome	No parity
Evme	evme	even parity check
odd	odd	Odd check
tty	tty	485 protocol settings
bus	bus	modbus protocol
nor	nor	Regular protocol

INSTALLATON DIAGRAM



1. In the case of color or material difference  
When the material or color of moving object is extremely different, install it in the direction shown on the left to keep the measurement error to a minimum.

2. Detect rotating objects  
When detecting a rotating object, install it in the direction shown on the left, which can suppress the influence of the object's vertical vibration and position shift.

3. When there is a step  
If there is a step in the moving detection object, install it according to the method shown on the left, so as to suppress the influence of the step edge during measurement.

4. Measure in narrow places and recessed parts  
In the case of measuring in a narrow place or hole, please be careful not to block the light path from the light emitting part to the light receiving part when installing.

5. When installed on the wall  
Please install according to the method shown on the left to avoid the multiple reflected light from the wall entering the light receiving part.

## 6)485通讯地址设定

菜单显示“Adr”，按TEACH进入子菜单。子菜单初始显示“1”，按UP/DOWN调整参数，步进1。长按UP/DOWN键3s以上，步进10。按TEACH键确认并返回上级菜单。设置范围1~254。初始地址为1，255为广播地址。

## 7)485通讯波特率设定

菜单显示“bAud”，按TEACH进入子菜单。

子菜单初始显示“115.2”，按UP/DOWN调整参数，波特率设置包含以下选项，9600、19200、38400、115200bit/s，菜单显示单位为Kbit/s。

## 8)校验位设定

菜单显示“PAR”，按TEACH进入子菜单。

子菜单项：“NoNE”无校验模式（默认）；“EuEN”偶校验；“odd”奇校验。

在子菜单下，按UP/DOWN进行选择，按TEACH键确认并返回上级菜单。

注：默认为“NoNE”无校验模式。

## 9)485数据发送模式设定

菜单显示“t.Nod”，按TEACH进入子菜单。子菜单项：“SEr”连续发送模式（默认）；“PoLL”轮询模式。

在子菜单下，按UP/DOWN进行选择，按TEACH键确认并返回上级菜单。

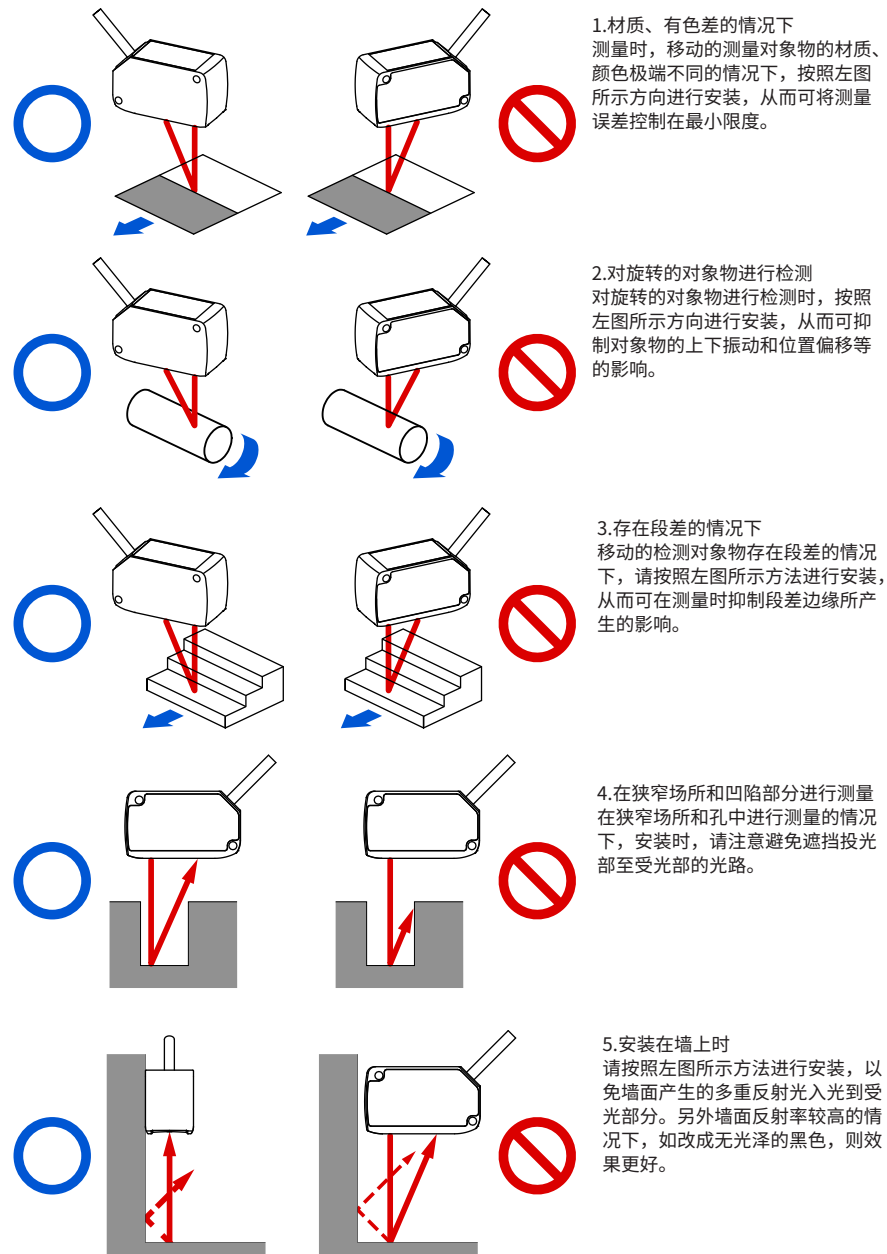
## 10) 复位设定

菜单显示“rSEt”，按TEACH进入子菜单，子菜单项：“no”不执行复位；“yES”执行复位；

## 数码管显示释义

SEr	sens	教导输出
_m	_m	通常检测
_m_2	_m_2	2点教导
_mid	_mid	中点教导
SPEd	sped	设定响应速度
h.rso	h.rso	高精度速度66ms
std	std	标准速度33ms
l-d	l-d	设定开关量输出方向
l-on	l-on	亮通
d-on	d-on	暗通
p-n	p-n	设定开关量输出类型
nPN	nPN	NPN输出模式
pNP	pNP	PNP输出模式
PULL	pull	推挽输出模式
Adr	adr	485通讯地址设定
bAud	baud	485通讯波特率设定
t.Nod	tnod	485数据发送模式设定
SEr	ser	连续发送模式，一直对外发送距离信息
PoLL	poll	轮询模式，对其发送指令时，才返回相应信息
rSEt	rest	复位设定
no	no	不执行复位
yES	yes	执行复位
PAR	par	校验位设定
NoNE	mome	无校验
EuEN	evme	偶校验
odd	odd	奇校验
tty	tty	485协议设定
bus	bus	ModBus协议
nor	nor	常规协议

## 安装示意图



SAFETY PRECAUTIONS

<b>⚠ DANGEROUS</b>	<p>This product is for the purpose of object detection only. Do not use this product for the purpose of protecting human body or human body parts. This product should not be used as an explosion-proof product. Do not use this product in dangerous places or in the environment of potentially explosive gases.</p> <p>Failure to use the control or adjustment device or perform the steps in accordance with this regulation may result in harmful radiation exposure.</p> <p>Ce produit est à des fins de détection d'objets seulement. N'utilisez pas ce produit dans le but de protéger le corps humain ou des parties du corps humain. Ce produit ne doit pas être utilisé comme produit antidéflagrant. Ne pas utiliser ce produit dans des endroits dangereux ou dans l'environnement de gaz potentiellement explosifs.</p> <p>La non-utilisation du dispositif de commande ou de réglage ou l'exécution des étapes conformément au présent règlement peut entraîner une exposition aux rayonnements nocifs.</p>
<b>⚠ WARN</b>	<p>This product is a sensor with DC power supply. Please do not apply AC power supply. If AC voltage applied, the product may explode or catch fire.</p> <p>Ce produit est un capteur avec alimentation cc. Veuillez ne pas appliquer d'alimentation en courant alternatif. En cas de tension, le produit peut exploser ou prendre feu.</p>
<b>NOTICE</b>	<p>Do not use the same wiring with the power cord and high-voltage line, otherwise the main module may fail or be damaged due to noise. When using a commercially available switching regulator, be sure to ground the housing ground terminal and the ground terminal.</p> <p>Please do not use this product outdoors.</p> <p>N'utilisez pas le même câblage avec le cordon d'alimentation et la ligne à haute tension, sinon le module principal peut tomber en panne ou être endommagé en raison du bruit. Lorsque vous utilisez un régulateur de commutation disponible dans le commerce, assurez-vous de mettre à la terre le terminal d'habitation et le terminal de terre. Veuillez ne pas utiliser ce produit à l'extérieur.</p>

OSM41-RS485 COMMUNICATION PROTOCOL

1. Conventional protocol

Default: baud rate: 115200bps, 8 data bits, 1 start bit, 1 stop bit, no parity.  
 OSM41-K2500CB6/485 Measurement range: 0...3000mm, when the distance is exceeded, default 0XFFFF;  
 OSM41-K4000CB6/485 Measurement range: 0...4500mm, when the distance is exceeded, default 0XFFFF;  
 Default output method: active upload, upload speed: 60Hz.

1.1 Full frame data format description

start character (1byte)	address bit (1byte)	byte length (1byte)	command code (1byte)	data bit(nbyte)	sum check(2byte) cs1 cs2	terminator (1byte)
0x68	adr	from the command code to the checked byte	see command list	see command details (little endian format)	sum check from data to address (little endian format)	0x16

Supplementary description of data format:

- 1.start character: 0x68, which is the start byte of a frame of data;
- 2.The address bit adr can be set through the menu or command, and the settable range is 1~254(0xfe); The default address is 1, and the broadcast address is 0xff;
- 3.Byte length refers to the number of bytes from the command code to the check code(including check code);
- 4.Command code: different command codes correspond to different function commands, see the table below for details;
- 5.Data bit: the returned data can be 1 byte or multiple bytes, and the data format is little endian.  
 little endian format: low byte first, high byte after;  
 for example: for data 0x1234, first pass the low byte 0x34, and then pass the high byte 0x12;
- 6.The check is a sum check, the sum from the address bit to the data bit, the data format is little endian format. For example, the distance reading command: 68 ff 03 00 02 01 16, ff is address code, 03 is byte length, including 1 command code and 2 check bytes.  
 0xff+0x03+0x00=0x0102, the low byte is in the front and the high byte is in the back, cs1=0x02, cs2=0x01, 00 is the instruction code.
- 7.Terminator: 0x16, which is the end mark of a frame of data;
- 8.Sending data and returning commands meet the above command frame format;  
 Example of sending instruction: distance reading instruction: 68 ff 03 00 02 01 16  
 Analysis: 68 is the start character, ff is the broadcast address; 03 is the byte length, including 1 instruction code and 2 check bytes; 00 is the command code; 02 01 is the check byte; 16 is the end code.  
 Example of receiving instruction: distance return instruction: 68 01 05 00 0D 13 26 00 16  
 Analysis: 68 is the start character, 01 is the default address code; 05 is the byte length, including 1 instruction code, 2 data bytes, and 2 check bytes; 0D 13 is the data bytes.  
 Little endian format is converted to hexadecimal as 0x130D, and the corresponding decimal is 3347mm.  
 26 00 is the sum check byte, the little endian format is converted to hexadecimal as  
 0x0026=01+05+00+0D+13, 16 is the end code.

2. Read command list

Function description	Command code	Full instruction	return instruction	Remark
Reading distance	0x00	68 adr 03 00 cs1 cs2 16 example: address is 0xff 68 ff 03 00 02 01 16	68 adr 05 00 d1 d2 cs1 cs2 16	d1 d2: distance data; Unit is mm
set address	0x80	68 adr 04 80 d1 cs1 cs2 16 example: set address as 1: 68 ff 04 80 01 84 01 16	68 adr 04 80 state cs1 cs2 16 return: state 0: success; 1: fail	d1: equipment address set range 1-254, 0xFF is broadcast address, 0x00 reserve
set baud rate	0x81	68 adr 04 81 d1 cs1 cs2 16 example: set baud rate as 9600 68 ff 04 81 02 86 01 16 set baud rate as 19200 68 ff 04 81 03 87 01 16 set baud rate as 38400 68 ff 04 81 04 88 01 16 set baud rate as 115200 68 ff 04 81 05 89 01 16	68 adr 04 81 state cs1 cs2 16 return: state 0: success; 1: fail	d1: corresponding baud rate level 0x02: 9600bit/s 0x03: 19200bps 0x04: 38400bps 0x05: 115200bit/s(default)
Set sending mode	0x83	68 adr 04 83 00 cs1 cs2 16 example: set continuous sending mode command: 68 ff 04 83 00 86 01 16 set query mode command: 68 ff 04 83 01 87 01 16	68 adr 04 83 state cs1 cs2 16 return: state 0: success; 1: fail	The default is continuous transmission mode, in this mode, only one device can be mounted on the bus;

## 安全注意事项

<b>▲危险</b>	本产品仅用于物体检测。请勿将本产品用于保护人体或人体部位。本产品不得用作防爆产品。请勿在危险场所或可能存在爆炸性气体的环境中使用本产品。本装置控制或调节装置的未使用或未按本规定执行步骤，可能导致有害辐射暴露。未按照本规定使用控制或调节装置或未执行相应步骤，可能导致有害辐射暴露。
<b>▲警告</b>	该产品为直流电源传感器。请勿使用交流电源。如接入交流电压，产品可能会爆炸或起火。
<b>通知</b>	请不要将电源线与高压线路使用同一布线，否则主模块可能会因噪声而故障或损坏。在使用市售的开关稳压器时，请确保将外壳接地端子和地线端子接地。请勿在户外使用本产品。

## OSM41-RS485通讯协议

### 1.常规协议

默认：波特率：115200bps，8位数据位，1位起始位，1位停止位，无奇偶校验。  
OSM41-K2500CB6/485测距范围:0...3000mm,距离超出时默认为0xFFFF;  
OSM41-K4000CB6/485测距范围:0...4500mm,距离超出时默认为0xFFFF;  
默认输出方式：主动上传，上传速度60Hz。

### 1.1完整帧数据格式说明

起始符 (1byte)	地址位 (1byte)	字节长度 (1byte)	命令码(1byte)	数据位(nbyte)	和校验(2byte) cs1 cs2	结束符 (1byte)
0x68	adr	从命令码到 校验的字节数	见命令列表	见命令详解 (小端格式)	从地址到数据的 和校验(小端格式)	0x16

数据格式补充说明:

- 起始符：0x68，为一帧数据的起始字节；
- 地址位adr可通过菜单或者指令设定，可设定范围为1~254（0xfe）；默认地址为1，广播地址为0xff；3.字节长度指的是从命令码到校验码的字节数（含校验码）；
- 命令码：不同命令码对应不同功能指令，详见下表；
- 数据位：返回数据可为1个字节，也可多个字节，数据格式为小端格式  
小端格式：低字节在前，高字节在后；例如数据0x1234，传递时先传递低字节0x34，再传递高字节0x12；
- 校验为和校验，从地址位到数据位的和，数据格式位小端格式  
例如，距离读取指令：68 ff 03 00 02 01 16，ff为地址码，03为字节长度，包含1个指令码与2个校验字节，0xff+0x03+0x00=0x0102，传递时低字节在前，高字节在后，cs1=0x02，cs2=0x01，00为指令码。
- 结束符：0x16，为一帧数据的结束标志；8.发送数据和返回指令均满足以上指令帧格式；  
发送指令示例：距离读取指令：68 ff 03 00 02 01 16  
解析：68为起始符，ff为广播地址码；03为字节长度，包含1个指令码与2个校验字节；00为命令码；02 01 为校验字节；16为结束码；接收指令示例：距离读取指令：68 01 05 00 0D 13 26 00 16  
解析：68为起始符，01为默认地址码；05为字节长度，包含1个指令码，2个数据字节，2个校验字节；0D 13为数据字节，小端格式转化为十六进制为0x130D，对应的十进制为3347mm，26 00 为和校验字节，小端格式转化为十六进制为0x0026 = 01+05+00+0D+13；16为结束码；

### 2.命令列表

功能描述	命令码	全指令	返回指令	备注
读取距离	0x00	68 adr 03 00 cs1 cs2 16 以地址0xff为例： 68 ff 03 00 02 01 16	68 adr 05 00 d1 d2 cs1 cs2 16	d1 d2: 距离数据； 单位为mm
设置地址	0x80	68 adr 04 80 d1 cs1 cs2 16 例，设置地址为1： 68 ff 04 80 01 84 01 16	68 adr 04 80 state cs1 cs2 16 返回: state 0: 成功；1: 失败	d1: 设备地址 设置范围1-254， 0xFF为广播地址，0x00保留
设置波特率	0x81	68 adr 04 81 d1 cs1 cs2 16 例， 设置波特率为9600 68 ff 04 81 02 86 01 16 设置波特率为19200 68 ff 04 81 03 87 01 16 设置波特率为38400 68 ff 04 81 04 88 01 16 设置波特率为115200 68 ff 04 81 05 89 01 16	68 adr 04 81 state cs1 cs2 16 返回: state 0: 成功；1: 失败	d1: 对应波特率等级 0x02: 9600bit/s 0x03: 19200bps 0x04: 38400bps 0x05: 115200bit/s(默认)
设置发送模式	0x83	68 adr 04 83 00 cs1 cs2 16 例， 设置连续发送模式指令： 68 ff 04 83 00 86 01 16 设置查询模式指令： 68 ff 04 83 01 87 01 16	68 adr 04 83 state cs1 cs2 16 返回: state 0: 成功；1: 失败	默认为连续发送模式， 该模式下，总线上只能 挂载一台设备；

2.Modbus communication description

2.1 Basic information

Baud rate: 9600bps, 8 data bits, 1 start bit, 1 stop bit, no parity  
 Default output mode: passive (Poll)  
 Default address: 0x01

2.2 Modbus communication interactive instruction format

2.2.1 Take the default address 0x01 as an example to illustrate the instruction format.

1) The instruction format for reading registers is as follows:

address	function code	register address	Number of registers	CRC_L	CRC_H
01	03	00	00	01	xx

2) Device response packet format for reading registers:

address	function code	Date byte length	High distance value	Low distance value	CRC_L	CRC_H
01	03	02	xx	xx	xx	xx

3) Device response format of reading registers instruction error or device internal error:

address	function code	Date byte length	Error code high bit	Error code low bit	CRC_L	CRC_H
01	83	02	00	xx	xx	xx

4) The instruction format for writing the registers value is as follows:

address	function code	register address	high date bit	low date bit	CRC_L	CRC_H
01	06	xx	xx	xx	xx	xx

5) Write the correct response format to the device side for register operation:

The response packet is the same as the issued packet.

6) The response format for handling exceptions on the device side of writing register operations:

address	function code	Date byte length	Error code high bit	Error code low bit	CRC_L	CRC_H
01	86	02	00	xx	xx	xx

2、Field Description:

1) Address: Device address, default to 0x01

2) Function code:

03- Read Register;06- Write Register;83- Register read exception response;86- Register write exception response

3) Register address:

All registers are 16 bit registers, and after modifying all registers, a "save configuration" instruction must be sent and the device must be powered on again to take effect. The register description is shown in Table 1 below.

Table 1 register

Register address	Defines	Description	Permission	Value range
00 00	the distance value	The output result of the sensor, which is the distance value for this sensor, Unit: resolution	Read only	Same sensor range
00 06	major version number	00+ major version number	Read only	Actual version number
00 07	Minor version number	Minor version number+revision number	Read only	Actual version number
00 80	Save configuration	Can write any number, the device only focus on instruction function code	Write only	0~65535
00 83	Baud rate High	Configure baud rate. The reboot takes effect after the save configuration instruction is sent. For now 2400、 4800、 9600、 19200、 38400、 49664	Read and write	0 or 1
00 84	Baud rate Low		Read and write	2400、 4800、 9600、 19200、 38400、 49664
00 85	Device ID	Configure device address, default 0x01, save and restart valid	Read and writew	1~247
00 86	Parity check	Check bit settings	Read and write	0-No parity ;1-odd parity 2-even parity check
00 87		Configure the working mode of the device	Read and write	0-continuous sending mode 1-polling mode ( default )

00 89	Restore factory settings	Any numeric value can be written, reboot is valid	Read and write	0~65535
-------	--------------------------	---	----------------	---------

4) Register count:

The number of registers pre-read from a register instruction. Values range from 1 to 8.

5) Data byte length:

Read register instruction reply, the number of bytes in the reply data segment.

6) Error code:

When reading and writing registers, issuing instruction format is wrong, or the data segment in the device response package is error code. The meaning of the error code is shown in Table 2 below

Table 2 error code description

Error code	Description
0x0001	Register address error
0x0002	Register write error

7) CRC Check:

In the protocol, a message carries a two-byte CRC check code, which is CRC16 check, the penultimate second byte of the message is the low byte of the check code, and the penultimate first byte of the message is the high byte of the check code.

Parametric model: X16 + X15 + x2 + 1; Polynomial: 0x8005; Initial value: 0xFFFF

3、 An example of interactive information

Function	Instructions	Successful return value	Description
Gets the distance value	01 03 00 00 00 01 84 0A	01 03 02 DH DL CL CH	DH and DL are the high 8 bit and low 8 bit of the measured values, while CH and CL are the low 8 bit and high 8 bit of CRC, respectively
Gets the version number	01 03 00 06 00 02 24 0A	01 03 04 00 VM VS VC CL CH	VM, VS, and VC are the major, minor, and minor version numbers of the version
Set the baud rate	01 06 00 83 BH1 BH2 CL CH 01 06 00 84 BL1 BL2 CL CH	01 06 00 83 BH1 BH2 CL CH 01 06 00 84 BL1 BL2 CL CH	BH1, BH2, BL1, BL2 are the highest, the second highest, the second lowest, and the lowest bits of baud rate, respectively. For example, the modified baud rate is 9600, BH1=00 BH2=00 CL=78 CH=22, BL1=25 BL2=80 CL=D2 CH=D3
Modify the device ID	01 06 00 85 IH IL CL CH	01 06 00 85 IH IL CL CH	IH, I L for ID high and low bytes, 1-247, 0x00 for broadcast address. Modify ID to 2, IH = 00 IL = 02 cl = 19 ch = E2
Change the parity bit	01 06 00 86 00 01 CL CH	01 06 00 86 00 01 CL CH	Set to odd check
Modify the device mode	01 06 00 87 00 M CL CH	01 06 00 87 00 M CL CH	M is device mode instruction byte M = 00 is continuous send mode M = 01 is query mode (default)
Save the configuration	01 06 00 80 00 00 88 22	01 06 00 80 00 00 88 22	Reboot takes effect after saving
Restore factory settings	01 06 00 89 00 00 58 20	01 06 00 89 00 00 58 20	The device ID address and baud rate are reset to factory status

## 2. Modbus通信说明

### 2.1 基本信息 (默认)

波特率: 9600bps, 8位数据位, 1位起始位, 1位停止位, 无奇偶校验。

默认输出方式: 被动(Poll); 默认地址: 0x01;

### 2.2 Modbus通信交互指令格式

2.2.1以默认地址0x01为例说明指令格式

1)读取寄存器的指令格式如下:

地址	功能码	寄存器地址		寄存器数量		CRC_L	CRC_H
01	03	00	00	00	01	xx	xx

2)读取寄存器的设备应答包格式:

地址	功能码	数据字节长度	距离值高位	距离值低位	CRC_L	CRC_H
01	03	02	xx	xx	xx	xx

3)读取寄存器指令错误或内部设备出错的设备应答格式:

地址	功能码	数据字节长度	错误码高位	错误码低位	CRC_L	CRC_H
01	83	02	00	xx	xx	xx

4)写入寄存器数值的指令格式如下:

地址	功能码	寄存器地址		数据高位	数据低位	CRC_L	CRC_H
01	06	xx	xx	xx	xx	xx	xx

5)写入寄存器操作设备端处理正确的应答格式: 应答数据包与下发数据包相同。

6)写入寄存器操作设备端处理异常的应答格式:

地址	功能码	数据字节长度	错误码高位	错误码低位	CRC_L	CRC_H
01	86	02	00	xx	xx	xx

2.2.2字段说明:

1)地址: 设备地址, 默认0x01

2)功能码: 03——读寄存器; 06——写寄存器; 83——读寄存器异常应答; 86——写寄存器异常应答;

3)寄存器地址:

所有寄存器都为16bit寄存器, 所有寄存器修改后必须发送“保存配置”指令且重新上电设备才生效。

寄存器说明见下表1。

表1 寄存器说明

寄存器地址	定义	说明	权限	取值范围
00 00	距离值	传感器的输出结果, 对于此传感器为距离值, 单位: 分辨率	只读	同传感器量程
00 06	主版本号	00+主版本号	只读	实际版本号
00 07	次版本号	次版本号+修正版本号	只读	实际版本号
00 80	保存配置	可以写入任意数值, 设备只关注指令功能码	只读	0~65535
00 83	波特率High	配置波特率。发送保存配置指令后重启生效。	读写	0或1
00 84	波特率Low	暂仅支持2400、4800、9600、19200、38400、115200	读写	2400、4800、9600、19200、38400、49664
00 85	设备ID	配置设备地址, 默认0x01, 保存后重启有效	读写	1~247
00 86	奇偶校验	校验位设置	读写	0-无校验; 1-奇校验; 2-偶校验
00 87	工作模式	配置设备的工作模式	读写	0-为连续发送模式 1-为查询模式 (默认)
00 89	恢复出厂设置	可以写入任意数值, 重启有效	读写	0~65535

4)寄存器数量:

读取寄存器指令中, 预读取的寄存器的数量。取值1~8。

5)数据字节长度:

读取寄存器指令应答中, 表示应答数据段的字节个数。

6)错误码:

读写寄存器时下发指令格式错误或设备内部处理异常时, 设备应答包中数据段为错误码。

错误码含义如下表2。

表2 错误码说明

错误码	说明
0x0001	寄存器地址错误
0x0002	寄存器写入值错误

7)CRC校验:

协议中一帧报文携带两个字节的CRC校验码, 为CRC16校验, 报文倒数第二字节为校验码低字节, 报文倒数第一字节为校验码高字节。

参数模型:  $x^{16} + x^{15} + x^2 + 1$ ;

多项式: 0x8005;

初始值: 0xFFFF

2.3交互信息示例

表1 寄存器说明

功能	指令	成功返回值	说明
获取距离值	01 03 00 00 00 01 84 0A	01 03 02 DH DL CL CH	DH、DL分别是传感器测量值低16位的高8bit和低8bit; CH、CL分别为CRC的低8bit和高8bit
获取软件版本号	01 03 00 06 00 02 24 0A	01 03 04 00 VM VS VC CL CH	VM、VS、VC 分别是版本的主、次、修正版本号
设置波特率	01 06 00 83 BH1 BH2 CL CH 01 06 00 84 BL1 BL2 CL CH	01 06 00 83 BH1 BH2 CL CH 01 06 00 84 BL1 BL2 CL CH	BH1、BH2、BL1、BL2分别为波特率的高、次高、次低、低字节。例如修改波特率为9600, BH1=00 BH2=00 CL=78 CH=22, BL1=25 BL2=80 CL=D2 CH=D3
修改设备ID	01 06 00 85 IH IL CL CH	01 06 00 85 IH IL CL CH	IH、IL为ID的高字节和低字节, 1-247, 0x00为广播地址, 修改ID为2, IH=00 IL=02 CL=19 CH=E2
修改奇偶校验位	01 06 00 82 00 01 E8 22	01 06 00 86 00 01 CL CH	设置成奇校验
修改设备模式	01 06 00 87 00 M CL CH	01 06 00 87 00 M CL CH	M为设备模式的指令字节 M=00为连续发送模式 M=01为查询模式 (默认)
保存配置	01 06 00 80 00 00 88 22	01 06 00 80 00 00 88 22	保存后重启生效
恢复出厂设置	01 06 00 89 00 00 58 20	01 06 00 89 00 00 58 20	保存后重启生效, 设备的ID地址和波特率重置为出厂状态