



CNS-MGS-160N

Line guidance sensors

Operating Instructions

*Thank you for using our products

*This manual describes the use and safety of the product

*Read this manual well and pay attention to safety during use

*Keep this manual in a suitable place for reference at any time

FoShan Hinson Robot Technology Co.LTD

Version Declaration

Specification version	Hardware version	Illustration
V1.0	V1.1	Announce
V1.2	V1.1	Correct Can Open switch byte
V1.3	V1.2	Change the outlet mode
V1.4	V1.2	Add configuration description
V1.5	V1.2	PDO default mapping changed.MODBUS 1014 and 1015 added description

Catalogue

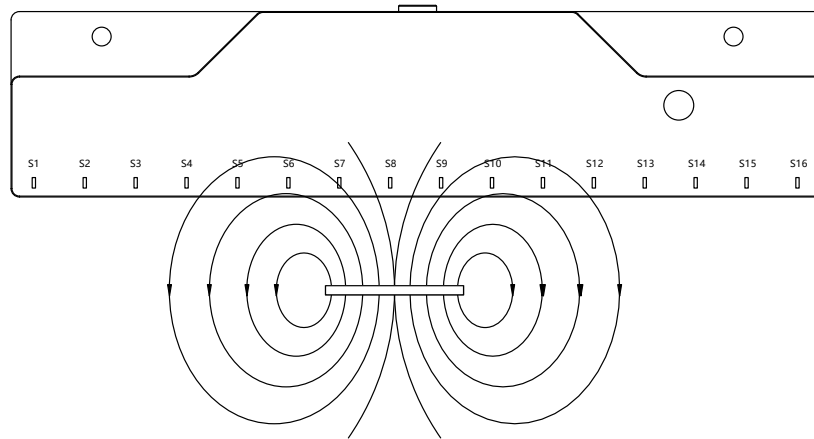
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1 FUNCTION

1.1 DETECTION PRINCIPLE

The position of the magnetic strip relative to the sensor is determined by detecting the strength of the magnetic field signal. The sensor uses 16 points to detect the signal and 16 points to output the sensor signal.



1.2 MAIN PERFORMANCE

Basic features	
Detecting height	10-50mm (with CNS-MS-30N magnetic stripe)
Detecting range	150mm
Detecting precision	1mm
Detecting points	16
Detected point spacing	10mm
Detecting signal	N pole magnetic field signal or S pole magnetic field signal
Performance	
Response time	5ms
Elementary errors	1mm
Detecting range of magnetic field strength	1.5gauss-95gauss
Number of magnetic strips	3
Location output	Support
Switching signal output	Support
Strength signal output	Support
Branch road selection function	Support
Port	
RS232 port	1
RS485 port	1 (Modbus support)
CAN BUS port	1 (CAN OPEN support)

Electrical Performance	
Working voltage	DC10 - 36V
Current consumption	<20mA typical value
Physical property	
Shell material	Aluminium alloy
Working enviroment	
Background magnetic field	<1gauss
Working enviroment	-20℃ - 50℃

2 PREPARATION

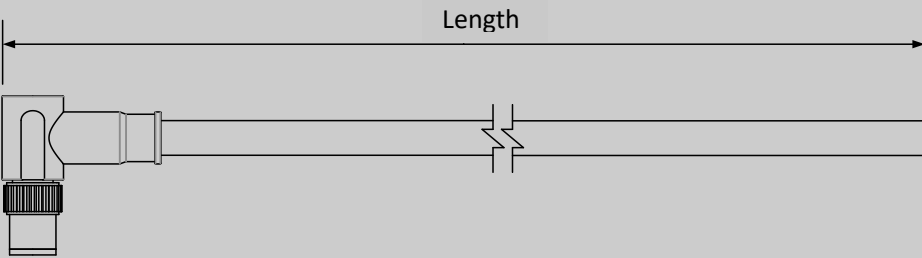
2.1 PACKING LIST

Confirm the product name and model on the external label of the product packing box are the same as those you purchased.

Confirm the product name and model number are determined by the product external label.

Confirm the following items are complete after unpacking.

Connector mode-new version after August 2020

Product	Quantity						
CNS-MGS-160N	1						
							
1 (Another purchase)							
<table border="1"> <thead> <tr> <th>Model</th><th>Specification</th></tr> </thead> <tbody> <tr> <td>H8X8L15CX</td><td>1.5m length</td></tr> <tr> <td>H8X8L30CX</td><td>3.0m length</td></tr> </tbody> </table>	Model	Specification	H8X8L15CX	1.5m length	H8X8L30CX	3.0m length	
Model	Specification						
H8X8L15CX	1.5m length						
H8X8L30CX	3.0m length						

Old version-direct out

Product	Quantity
CNS-MGS-160N	1

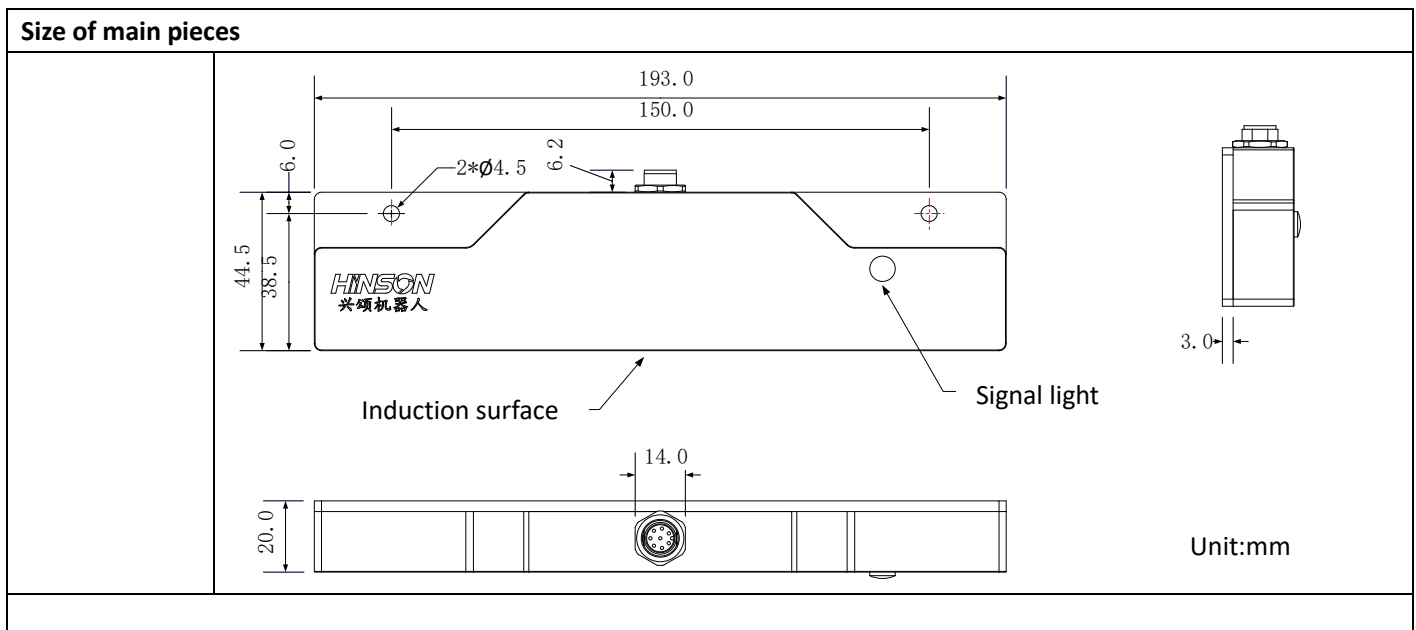
2.2 DEBUGGING TOOL

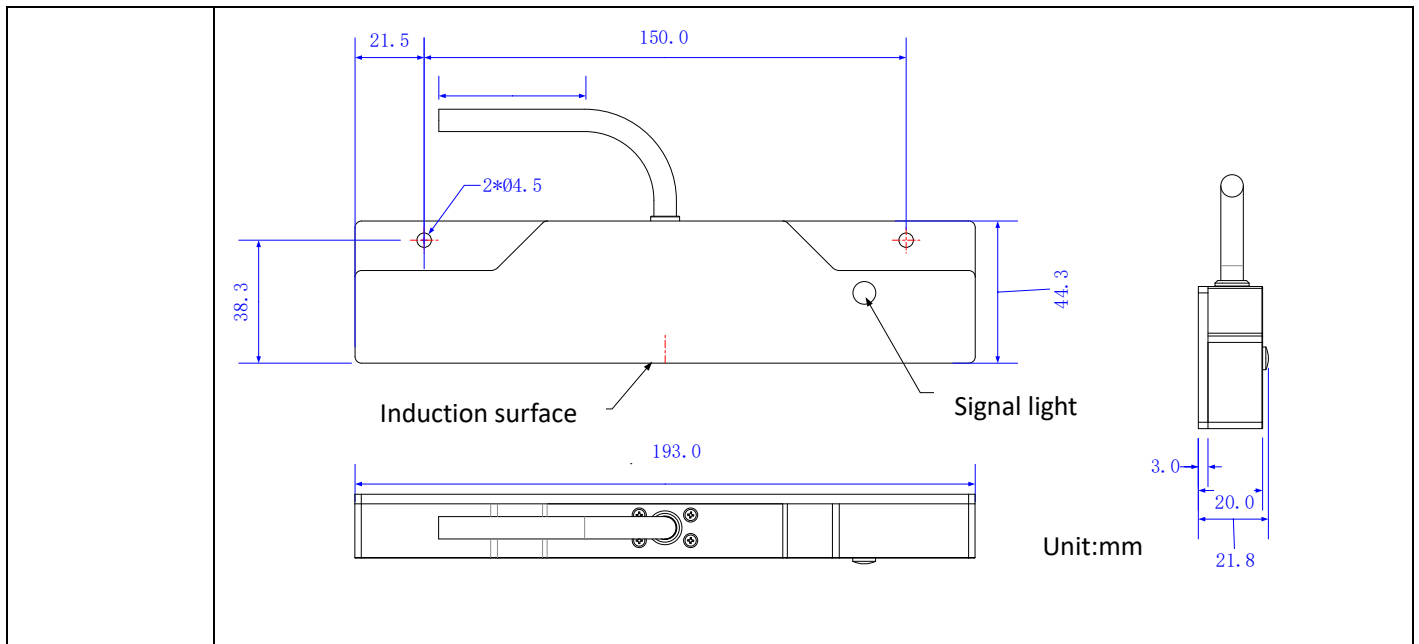
The following software and hardware are required to assist debugging:

	Software and Hardware
Parameter configuration	Hinson configure software version 1.3.6 or above
RS232 free agreement control	USB to RS232 serial line Recommended brand and model: C-Y105 Serial port debugging assistant software
CAN BUS free agreement control	USB to CAN analyzer
Navigation magnetic stripe	Width 30mm*Thickness 1.2mm,

3 PHYSICAL PARAMETER

3.1 DIMENSION



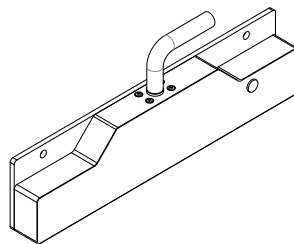


3.2 LED DISPLAY

LED flash	Statements
Green flash	Flash 0.5s after power on
Green normally o	Induction magnetic stripe signal normal
Red flash	Sensor internal failure

3.3 LINE DEFINITION

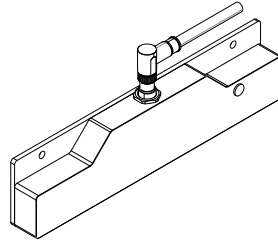
Direct outbound mode



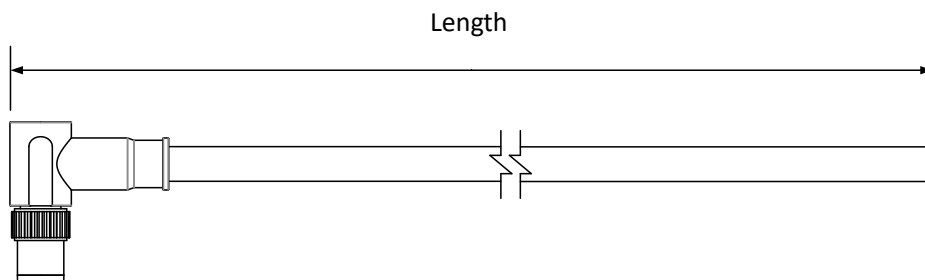
Communication port support RS232,RS485 and CAN BUS

Color	Model type	Signal	Function declaration
Red	Power supply	VIN+	Positive pole.10-32V
Blue	Power supply	VIN-	Negative pole
Black	RS232	RX	RS232-RX Port
Gray		TX	RS232-TX Port
Purple		GND	RS232-GND Port
White	RS485	A	RS485-A Port

Brown	CAN BUS	B	RS485-B Port
Green		GND	RS485-GND Port
Orange		CAN-H	CAN H
Yellow		CAN-L	CAN L



Cable



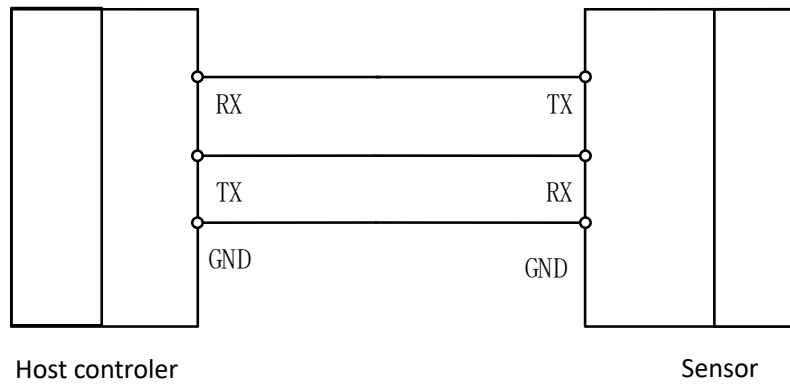
Model	Specification
H8X8L15CX	Length: 1.5m
H8X8L30CX	Length: 3m

Communication port support RS232,RS485 and CAN BUS

Color	Model type	Signal	Function declaration
Red	Power supply	VIN+	Positive pole.10-32V
Blue	Power supply	VIN-	Negative pole
Black	RS232	RX	RS232-RX port
Gray		TX	RS232-TX port
White	RS485	A	RS485-A port
Brown		B	RS485-B port
Orange	CAN BUS	CAN-H	CAN H
Yellow		CAN-L	CAN L

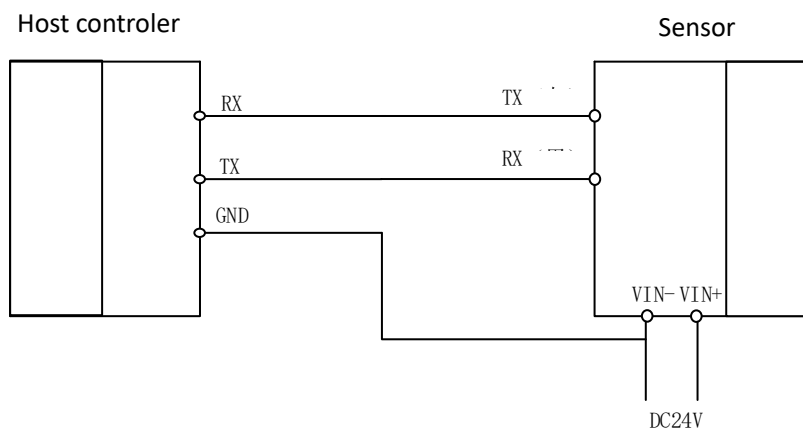
3.4 COMMUNICATION WIRING

RS232 wiring-direct outbound version



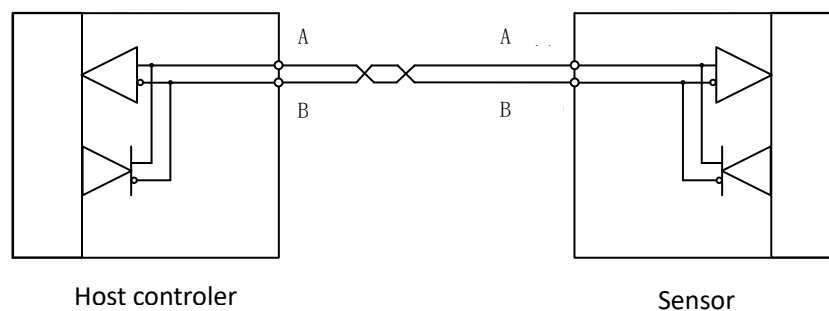
- 1) Host controller RX need to be cross-connected with TX of the sensor
- 2) GND of sensor is internally collinear with the negative electrode of the power supply

RS232-Outbound version of connector



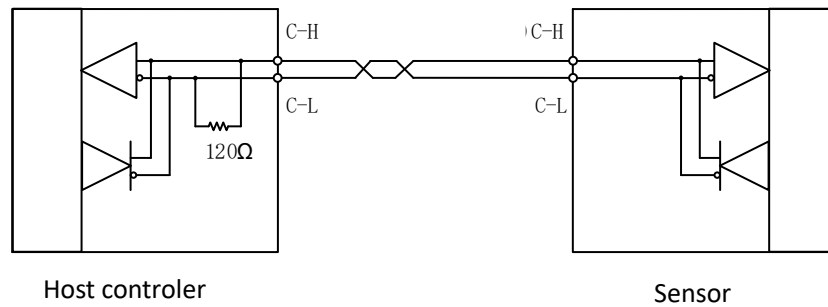
- 1) Host controller RX need to be cross-connected with TX of the sensor
- 2) GND of sensor is internally collinear with the negative electrode of the power supply
- 3) Power on first and then connect to RS232

RS485 Wiring



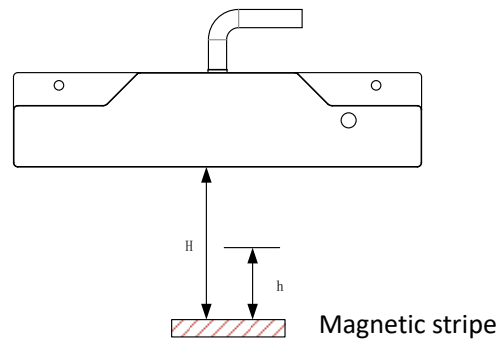
- 1) Cross connection is required when connecting with Omron and Siemens PLC

CAN BUS Wiring



- 1) The master station must be equipped with a 120 ohm terminal resistor

3.5 INSTALL



$$h = \frac{1}{2}H$$

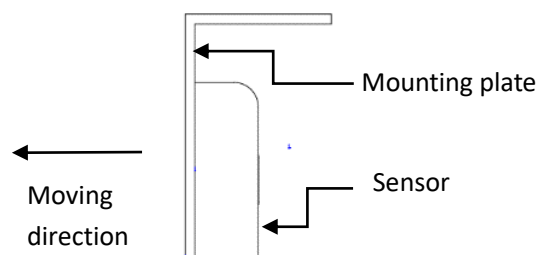
H: Maximum detection height of magnetic stripe

h: Sensor mounting height

Prompt

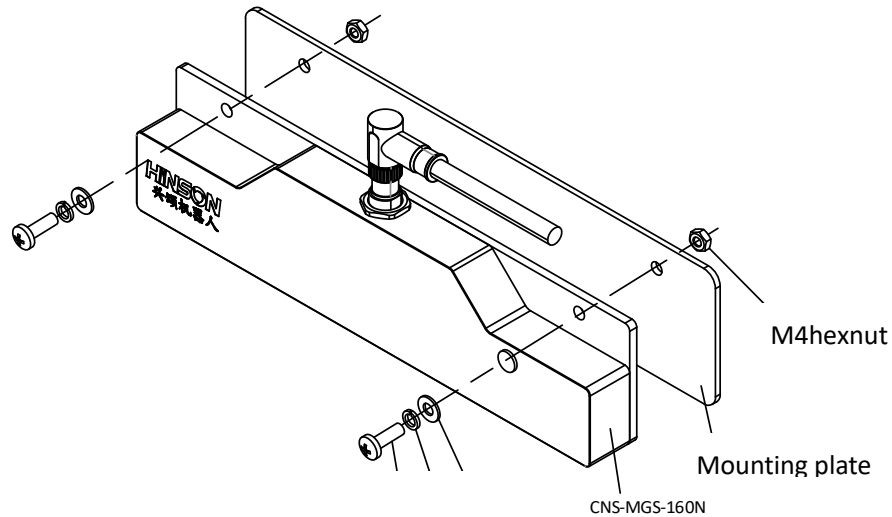
The installation height should consider the variation of the sensor installation position to ensure the sensor movement range is within the maximum detection height range.

- 1) The sensor is installed perpendicular to the ground.
- 2) The mounting height is 20-40mm when use CNS-MS-30N magnetic stripe.



Prompt

- 1) Choose aluminum or stainless steel for sensor fixing plate. Do not use magnetic metal for prevent magnetization.
- 2) The retaining plate provides protection with this Mounting.

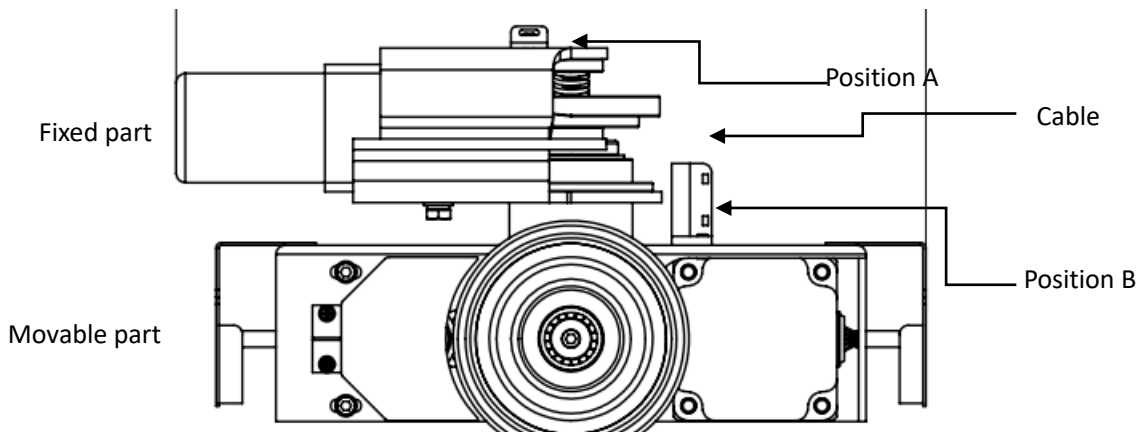


Installation environment requirement

Installation condition	The mounting plate shall be made of non-magnetic material Background magnetic field intensity should be less than 1 gauss
Operating environment	Ambient temperature: -10-50°C Ambient humidity: ≤80%RH (No frost)
Gas environment	Do not use in corrosive, flammable gas or dust environment

3.6 THE THREAD NOTE

Drive mode



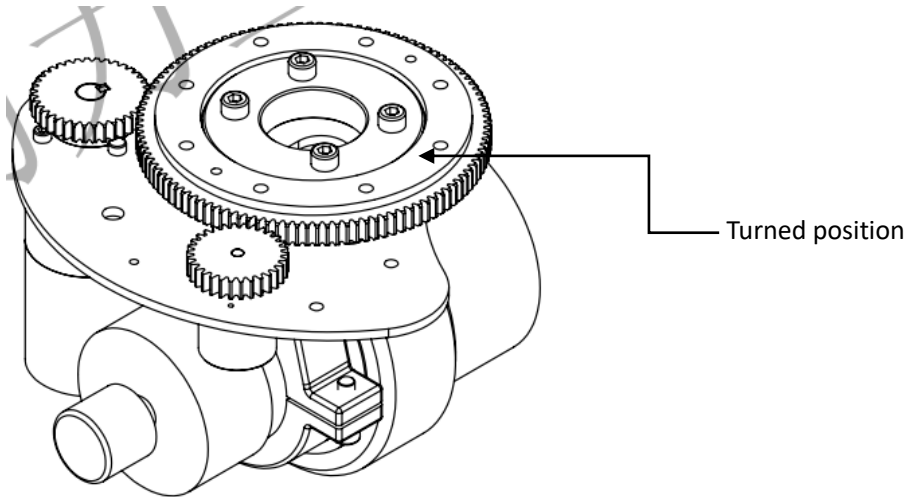
Position A

Fix the wire well and leave enough space for movement to avoid fatigue damage

Position B

Fix the wire well and leave enough space for movement to avoid fatigue damage

Way of steering gear



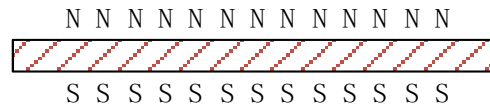
Turned position

The full half-turn line length is reserved to meet the steering wheel rotation range.and there is enough room for movement to avoid fatigue damage.

4 MAGNETIC STRIPE LAYOUT

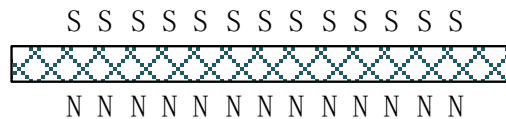
4.1 MAGNETIC STRIPE SPECIFICATIONS

Model	CNS-MS-30N
Size	1.2mm*30mm*50m
Polarity	N
Installation	Externally bonded



Magnetic field distribution

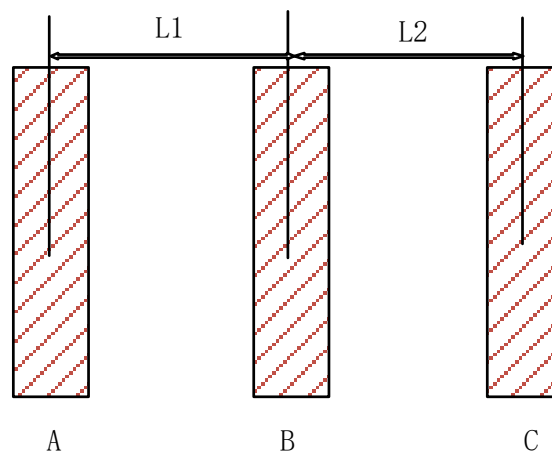
Model	CNS-MS-30S
Size	1.2mm*30mm*50m
Polarity	S
Installation	Externally bonded



Magnetic field distributio

4.2 MAGNETIC STRIPE LAYOUT

Parallel to the magnetic stripe

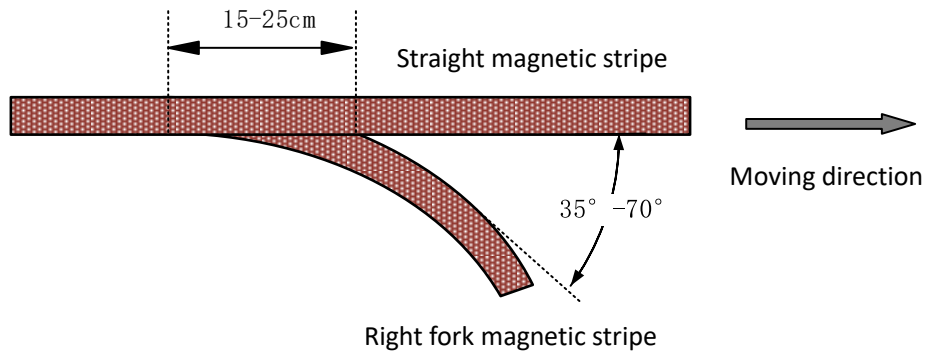


Magnetic strip spacing greater than 50mm

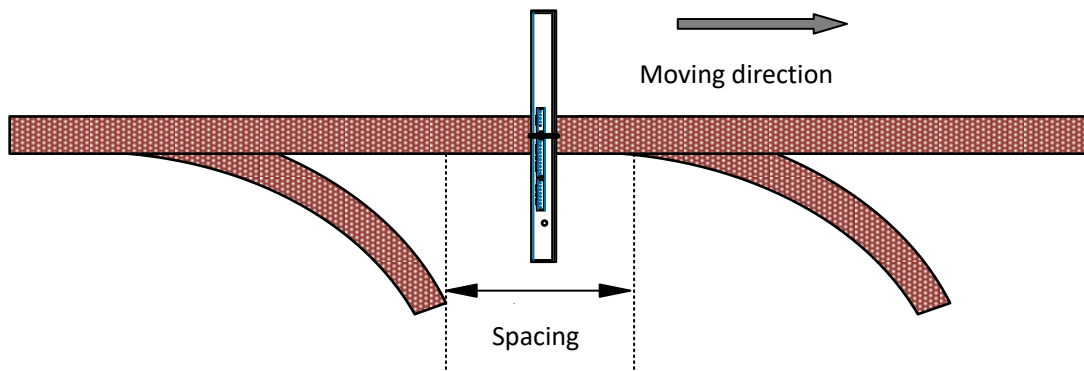
Magnetic strip forks in the road

To ensure the reliability and stability of the AGV fork selection, refer to the following parameters when pasting the fork magnetic stripe.

Single fork in the road



Double fork in the road



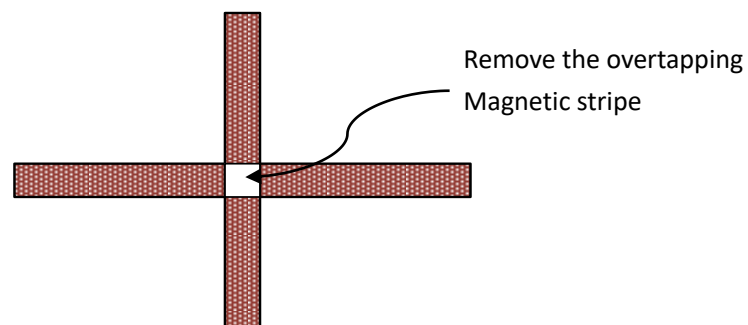
Spacing of adjacent fork roads is greater than the sensor detection range. Avoid the wrong side of the road.

Prompt

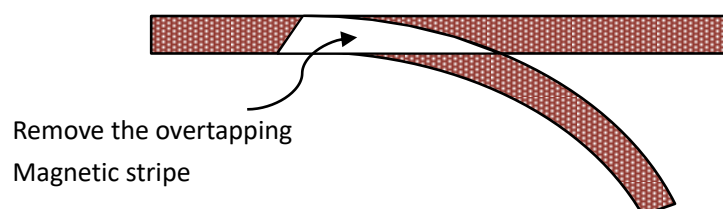
It is suggested that the AGV operating speed should be controlled within 0.5m/s when selecting the fork road. The above conditions are all reference conditions but not limiting conditions. The specific reference values can also be obtained according to the actual load test of AGV

Overlapping position processing

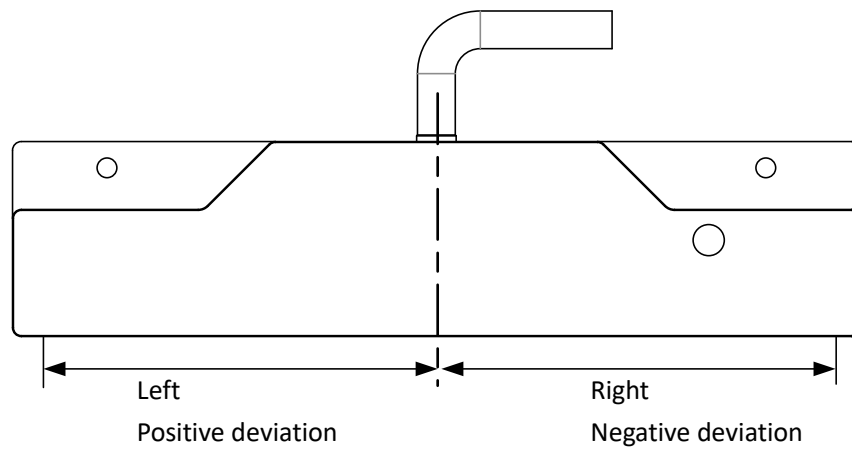
Crossroad type



Fork mouth



4.3 TESTING NOTE



The sensor 1mm detection repeatability is based on a certain magnetic field intensity. At an intensity value less than 240, repeated accuracy of detection is no longer guaranteed. but magnetic stripe can be detected. The magnetic field strength is obtained using configuration software or by sending data.

5 SETTING

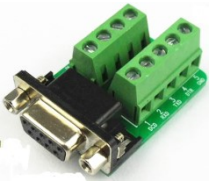
5.1 WIRING

Preparation



Rated connecting capacity

Brand	Champion
Model	Y-105D
Port	USB-DP9 (Male)
RS232 level	±15V



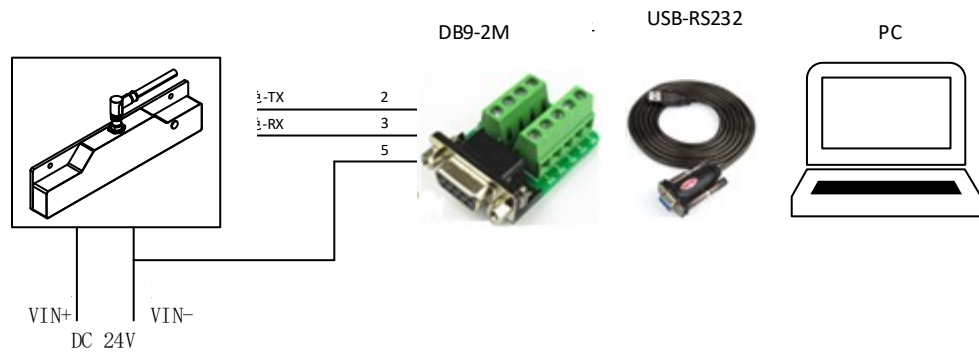
Adaptor

Brand	Hinson
Model	DB9-M2
Port	Female

RS232 Wired-direct appearance version

- 1) Host controller RX need to be cross-connected with TX of the sensor
- 2) The sensor GND is internally collinear with the negative electrode of the power supply

RS232 Wire-connector outline version



- 1) Host controller RX need to be cross-connected with TX of the sensor
- 2) GND of the sensor is collinear with the negative electrode of the power supply
- 3) Power on first and then connect to RS232

5.2 COMMUNICATION SPECIFICATION

Communication mode	Point to point
Communication speed	115200bps
Data bits	8 bit
Check bit	No parity
Stop bit	1 bit

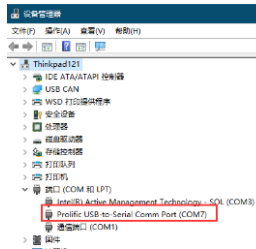
5.3 CONNECTION CONFIGURATION SOFTWARE

Get software

- 1) Visit the company's website www.hinson-xs.com
- 2) Consult sales and technical support for acquisition

Software operating environment

System requirement	Windows XP and above	
Display resolution	More than 1280*720	
USB to RS232 connecting	Driver installation completed.the system can recognize the COM port	



Software decompression



Hinson
V1.3.6.exe

- 1) Double click to open
- 2) After the file is decompressed,it will be stored in the production folder under the current directory



Hinson V1.3.6

- 3) Open the folder and select the software to run

Run configuration software



Hinson
V1.3.6.exe

Select the corresponding model



Click open

Config operation

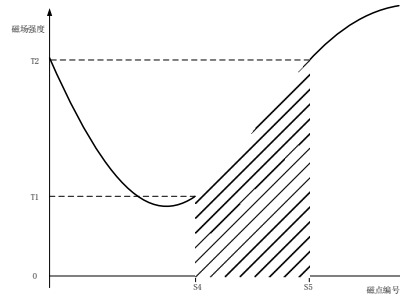
	Confirm whether the model configuration software model matches the sensor.																																										
	Serial port selection 1) Select the COM port corresponding to RS232 serial port line 2) Connect according to the default serial port parameters 3) If the baud rate of RS232 serial communication is 19200bps. The baud rate should be 19200bps																																										
	 1) Click  button 2) Wait for the successful connection prompt 3) Start setting parameters after successful connection																																										
	<table><tr><th>Parameter name</th><th>Parameter</th><th>Default parameters</th></tr><tr><td>Magnetic stripe differentt</td><td>0-70%</td><td>0%</td></tr><tr><td>Center point position</td><td>65-105mm</td><td>85mm</td></tr><tr><td>Sensor sensitivity</td><td>0-9</td><td>9</td></tr><tr><td>Sensor communication address</td><td>Parameter range1 ~ 127</td><td>127</td></tr><tr><td>Sensor control type</td><td>RS232-HS protocol RS485-HS protocol RS485-MODBUS protocol CAN-HS protocol CAN OPEN protocol</td><td>CAN OPEN protocol</td></tr><tr><td>CAN broadcast time</td><td>0-0.5s, (0: No broadcast)</td><td>0.005s</td></tr><tr><td>CAN baud rate</td><td>125 Kbps, 250 Kbps, 500 Kbps, 1000 Kbps</td><td>1000Kbps</td></tr><tr><td>RS485 rate</td><td>9600bps,19200bps, 38400bps,57600bps, 115200bps</td><td>115200bps</td></tr><tr><td>RS485 parity check</td><td>No parity, Odd parity, even check</td><td>No parity</td></tr><tr><td>RS485 stop bit</td><td>1Bit, 1.5Bit, 2Bit</td><td>1bit</td></tr><tr><td>Polarity of magnetic field</td><td>N, S, N &S</td><td>N</td></tr><tr><td>Minimun sensing points</td><td>1-3</td><td>1</td></tr><tr><td>Maximum sensing points</td><td>5-8</td><td>5</td></tr></table>	Parameter name	Parameter	Default parameters	Magnetic stripe differentt	0-70%	0%	Center point position	65-105mm	85mm	Sensor sensitivity	0-9	9	Sensor communication address	Parameter range1 ~ 127	127	Sensor control type	RS232-HS protocol RS485-HS protocol RS485-MODBUS protocol CAN-HS protocol CAN OPEN protocol	CAN OPEN protocol	CAN broadcast time	0-0.5s, (0: No broadcast)	0.005s	CAN baud rate	125 Kbps, 250 Kbps, 500 Kbps, 1000 Kbps	1000Kbps	RS485 rate	9600bps,19200bps, 38400bps,57600bps, 115200bps	115200bps	RS485 parity check	No parity, Odd parity, even check	No parity	RS485 stop bit	1Bit, 1.5Bit, 2Bit	1bit	Polarity of magnetic field	N, S, N &S	N	Minimun sensing points	1-3	1	Maximum sensing points	5-8	5
Parameter name	Parameter	Default parameters																																									
Magnetic stripe differentt	0-70%	0%																																									
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Minimun sensing points	1-3	1																																									
Maximum sensing points	5-8	5																																									

1. Magnetic stripe discrimination

Distinguish the similarity of magnetic field signals of adjacent magnetic strips.

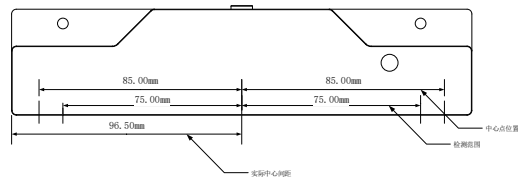
When it is set to 0, one point signal must be less than the set sensitive value to distinguish two magnetic strips.

When it is set to 1-70, the similarity of magnetic field intensity signal detected by adjacent magnetic points is greater than the set value distinguish two magnetic strips.



2. Location of center point

The position of center point is L, the position of the magnetic stripe detected by the sensor, and the value of L1 is calculated according to the position of the center point. The default value is 85mm.



When used with the following types of drives, it must be set at 85mm

CNS-BLD-2S-NC , CNS-BLD-2L-NC , CNS-MI50HDN , CNS-MI50HSN , CNS-STDR-2L-NC , CNS-STDR-2M-NC

3. Sensitivity adjustment

The minimum intensity threshold of sensor detection is set, and the magnetic field intensity signal greater than the set threshold is valid. If it is less than the set threshold strength, it will be ignored. Corresponding relationship between intensity and sensitivity

Sensitivity	Magnetic field intensity value
0	> 500
1	> 450
2	> 400
3	> 350
4	> 300
5	> 280
6	> 260
7	> 240
8	> 220
9	> 200

4. CAN communication address

Setting CAN bus communication address

In the CAN-HS protocol mode.it is the node address

In the CAN Open protocol mode .it is the node-ID of the CAN-Open node

5. CAN broadcast time

CAN-HS protocol mode.set the time interval for the sensor to send data automatically

The following models of drivers must be set at 0.005s broadcast time when used together

CNS-BLD-2S-NC, CNS-BLD-2L-NC, CNS-MI50HDN, CNS-MI50HSN, CNS-STDR-2L-NC

6. Communication mode and protocol

Set the receiving port and protocol of control command such as sensor branch selection.and the configuration software can read parameters through RS232 without this restriction

When used with the following types of drivers. It must be set in CAN-HS

CNS-BLD-2S-NC, CNS-BLD-2L-NC, CNS-MI50HDN, CNS-MI50HSN, CNS-STDR-2L-NC

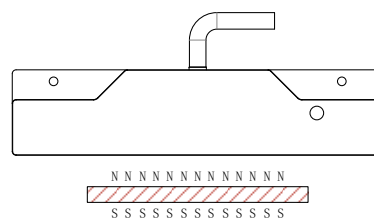
7. Baud rate of CAN bus communication

Set the baud rate of CAN bus communication.try to use the maximum baud rate for communication in AGV equipment and other applications with short communication distance.

8. Induction polarity

Induced N-pole magnetic stripe

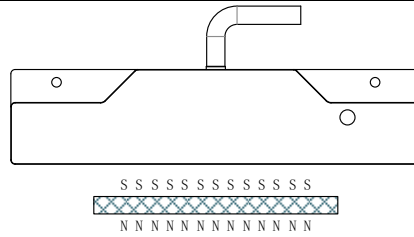
The sensor only detects N-pole magnetic field signal



The N-pole magnetic field surface of the navigation magnetic stripe is close to the sensing surface of the sensor

Induced S-pole magnetic stripe

The sensor only detects S-pole magnetic field signal



The S-pole magnetic field surface of the navigation magnetic stripe is close to the sensing surface of the sensor

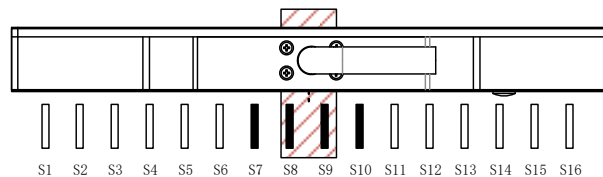
Note:

In the magnetic navigation mode,the sensor must only sense S-pole or N-pole according to the navigation magnetic stripe.

9. Minimum sensing points

This parameter means that the magnetic stripe position detection can only be detected when the magnetic field signal detected by the magnetic point more than the set value.this parameter is mainly used for filtering magnetic field interference.the threshold value of magnetic field intensity is controlled by the sensitivity value.

For example:



As shown in the figure above.under the detection state

Minimum sensing points:set to 1 or 2. If both S8 and S9 detect the magnetic stripe signal. The magnetic stripe position is calculated by using the magnetic field signal of S8 and S9.

Minimum number of sensing points:set to 3.only S8 and S9 points can detect the signal.which is less than the set value of 3. The sensor thinks that no effective magnetic stripe is detected.and the signal is not output.

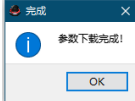
10. Maximum sensing points

The number of signal points that can be sensed when the magnetic stripe is at the specified height of 30mm

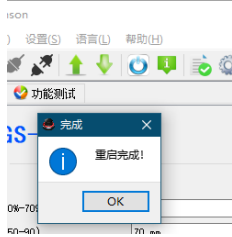
Parameter download



1) Click  download parameters to sensor

2)  Prompt that the parameter setting is completed

Restart to take effect

	1) Click  restart button to take effect
---	---

5.4 FUNCTIONAL TEST

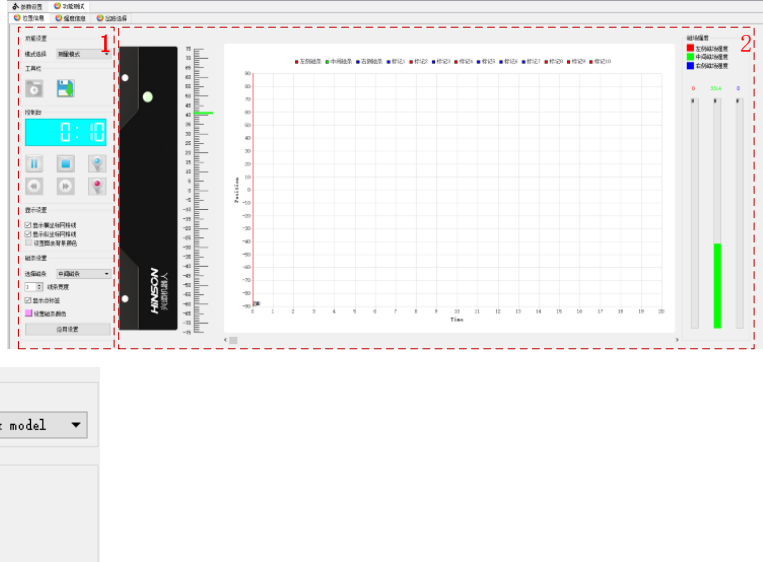
After the configuration parameters of the sensor are completed, the function test is carried out to verify whether the detection function of the sensor is normal

Enter the function test page

1) Enter the function test page after the configuration software is successfully connected.

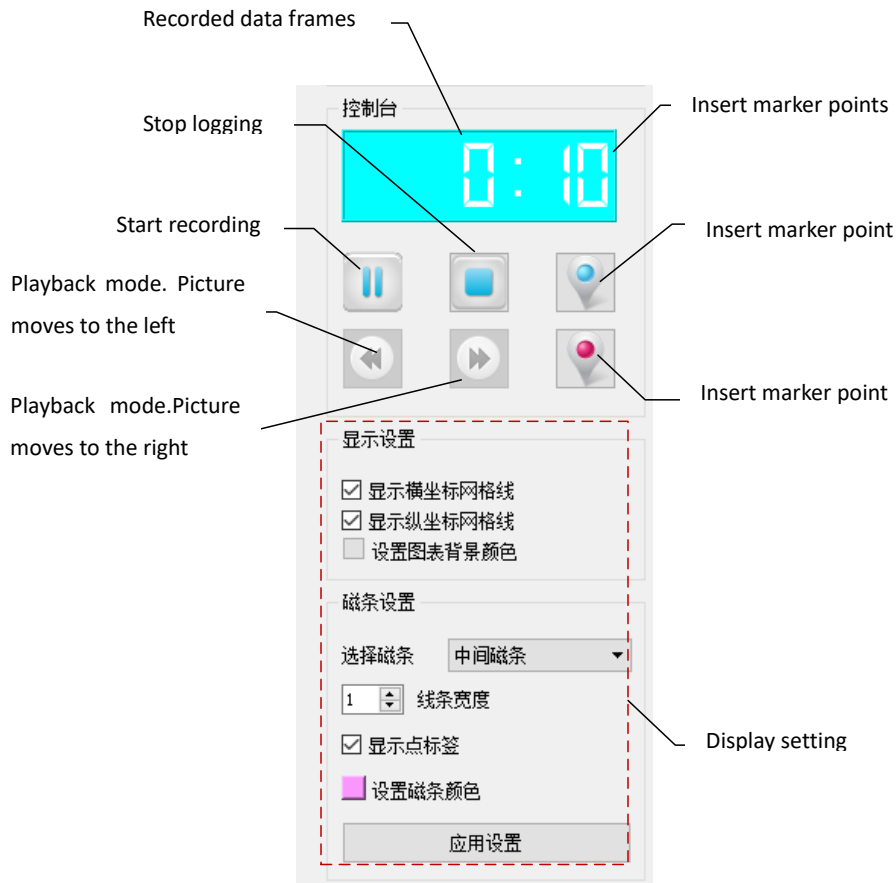
Position information	Display the currently recognized magnetic stripe position
Intensity information	Display the signal strength and switch signal status of the current detected magnetic stripe
Fork road selection	Display the current switch control status

Position information

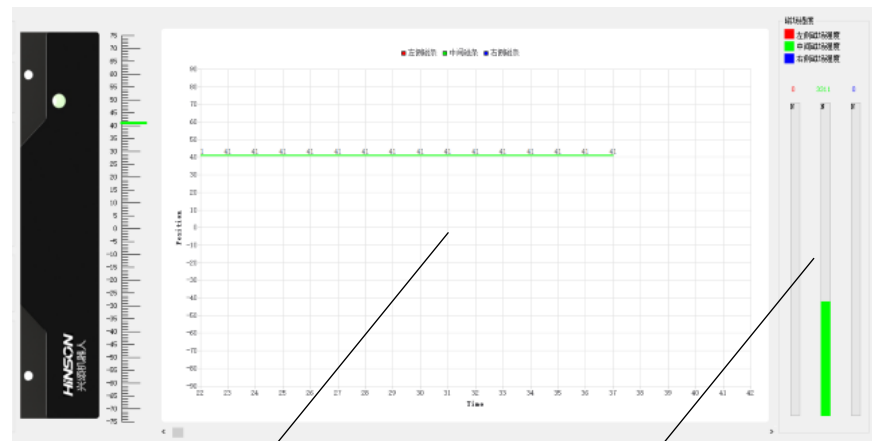
1) 

Mode select: Measurement mode—recording sensor position signal
Playback mode—Play back the recorded data

2) Display console



Maximum number of recording frames is 6000



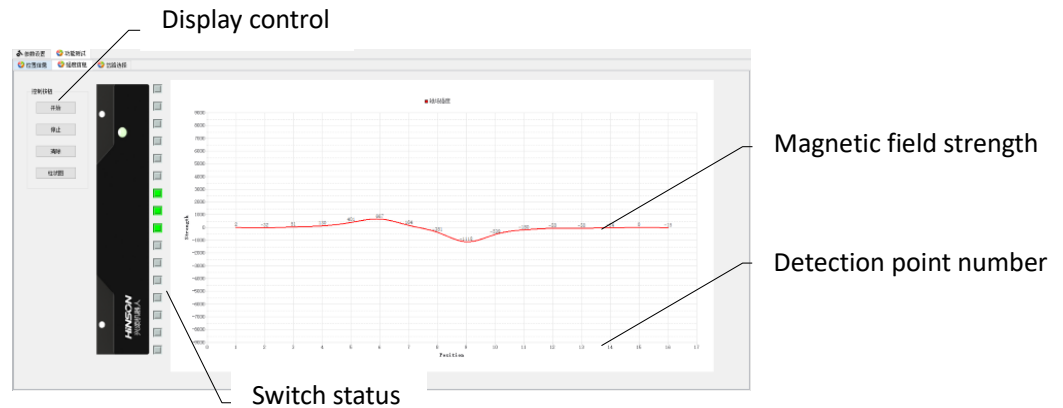
Magnetic stripe position and quantity display

Magnetic stripe signal average intensity display

Magnetic stripe position and quantity display: Display the number and the position of magnetic strips detected by the current sensor.

Magnetic stripe signal average intensity display: Display the average value of the magnetic field intensity for the current magnetic stripe. The positive value is the S-pole, and the negative value is the N-pole.

Intensity information



Display control: Control the graphic display on the right side

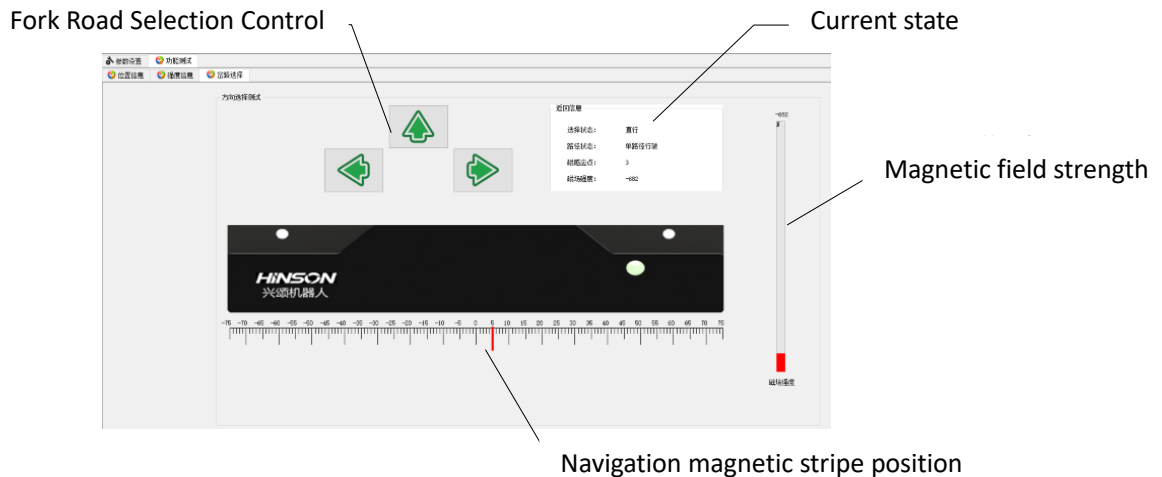
控制按钮	Start: start getting sensor strength data
开始	
停止	Stop: stop getting sensor strength data
清除	Erase: erase the intensity display of the current record
柱状图	Histogram: histogram is used to show the magnetic field intensity

Switch status: Display the switch position of the current output

Magnetic field intensity: Display the magnetic field intensity value of each point detected by the current sensor. the positive value is the S-pole. and the negative value is the N-pole.

Inspection point number: detection point of sensor magnetic field.

Fork road selection

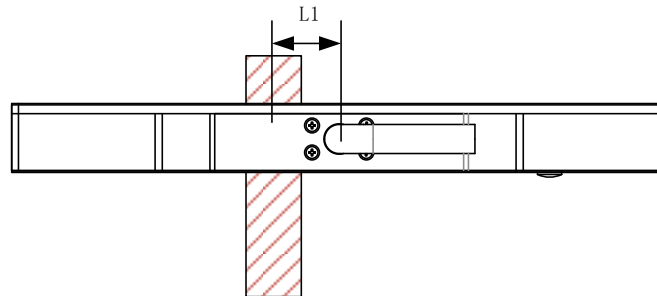


- 1) **Switch selection control:** The sensor branch is controlled by function test to select the direction after the AGV is running.
- 2) **Current status:** Feedback current status.
- 3) **Magnetic field intensity:** Displayed the average value of the magnetic field intensity of the current magnetic stripe. the positive value is the S-pole. and the negative value is the N-pole.
- 4) **Navigation magnetic stripe position:** the deviation position of the current navigation magnetic stripe relative to the sensor.

6 FUNCTION

6.1.1 Obtaining multiple magnetic stripe positions

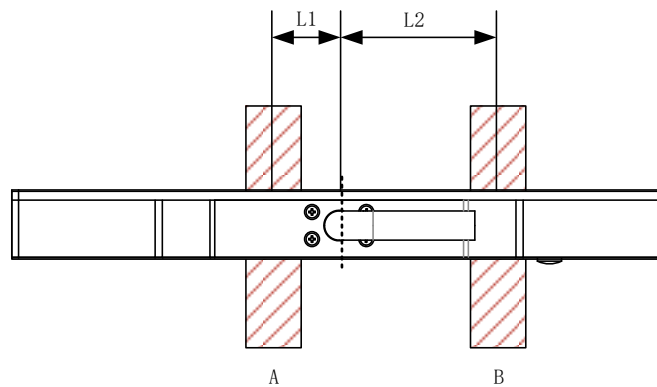
Single magnetic stripe detection



Display the position L1 of the middle magnetic stripe, which is the position value of the magnetic field center of the current magnetic stripe and the center of the sensor.

When two magnetic strip are detected

Situation one

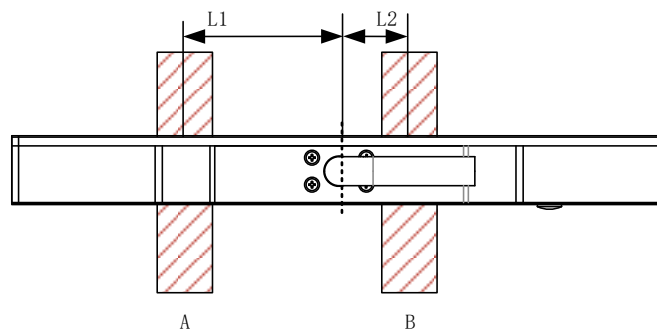


(3-2)

$$L1 < L2$$

Magnetic stripe A is in the middle, and magnetic stripe B is in the right

Situation two



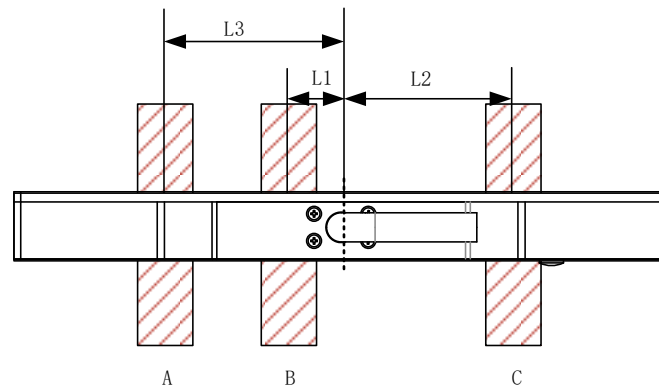
(3-3)

$$L1 > L2$$

Magnetic stripe A is in the left, and magnetic stripe B is in the middle

When three magnetic stripe are detected

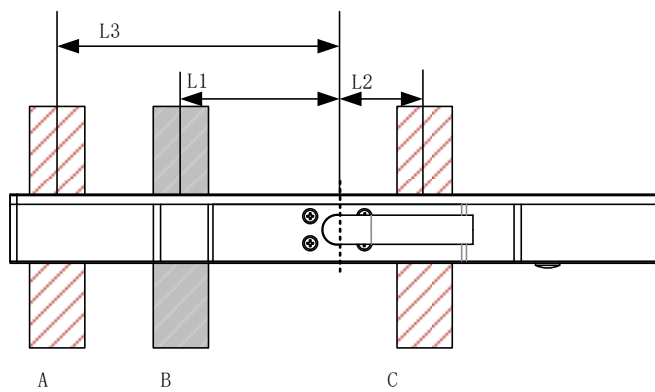
Situation one



$$L1 < L2$$

Magnetic stripe A is the left, magnetic stripe B is the middle, and magnetic stripe C is the right.

Situation two



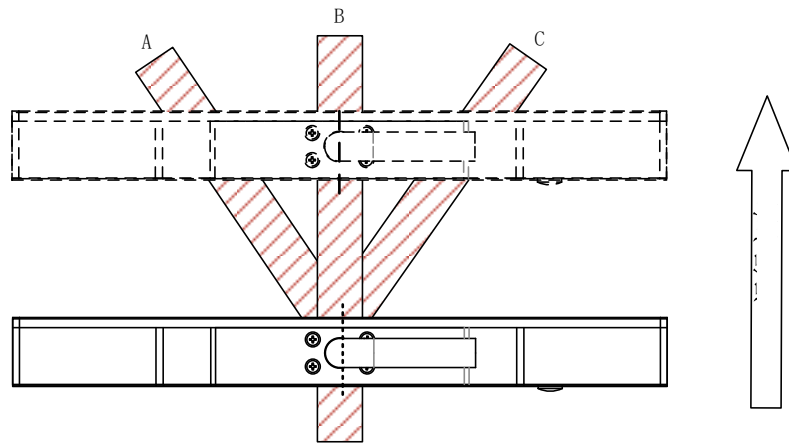
$$L3 > L1 > L2$$

Magnetic stripe A is the left, magnetic stripe B is ignored, and magnetic stripe C is the middle.

Selection of branch magnetic stripe

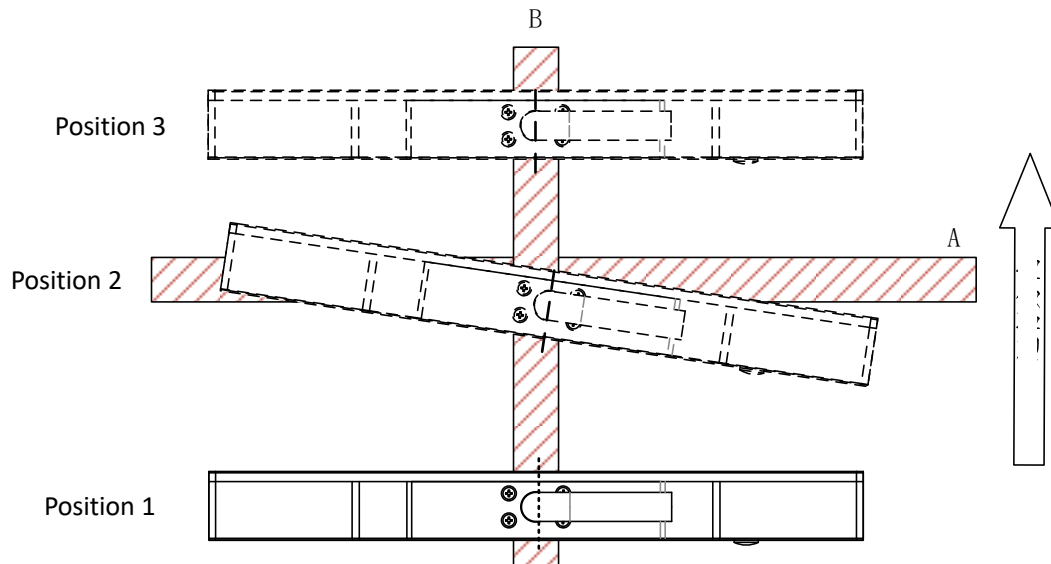
Line not selected

Three magnetic stripe cross road



Select the middle B magnetic stripe to run

Crossroad magnetic stripe



Position 1: Select magnetic stripe B signal output.

Position 2: Due to the sensor position and the signal distribution magnetic stripe, there will be a certain magnetic stripe signal offset and swing at the cross edge.

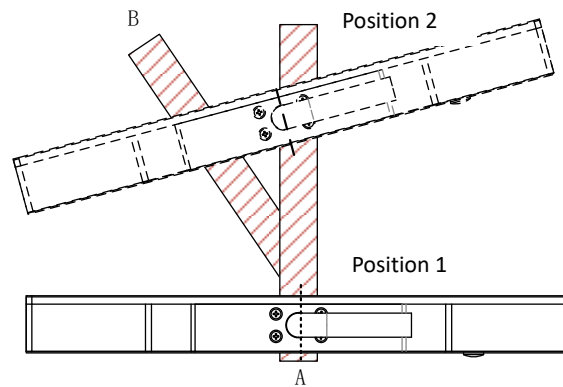
Position 3: B magnetic stripe signal is preferred in straight running state.

Fork road magnetic stripe

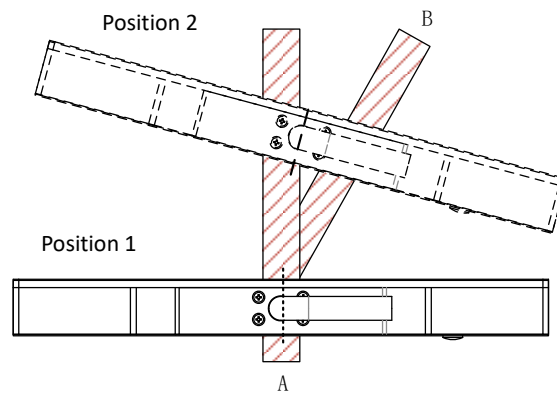
In the state of crossing the magnetic stripe, the center of the sensor will shift to a certain position due to the magnetic field center shift. Partial offset at position 2, offset to middle, select B, and move to position 3.

Note

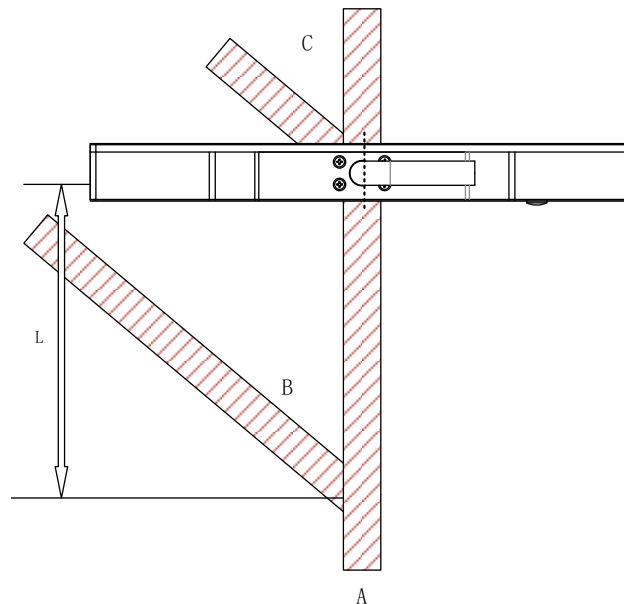
1) The problem of navigation center offset can be avoided by using the reverse branch command.

Left fork selection status

Double fork road recognition

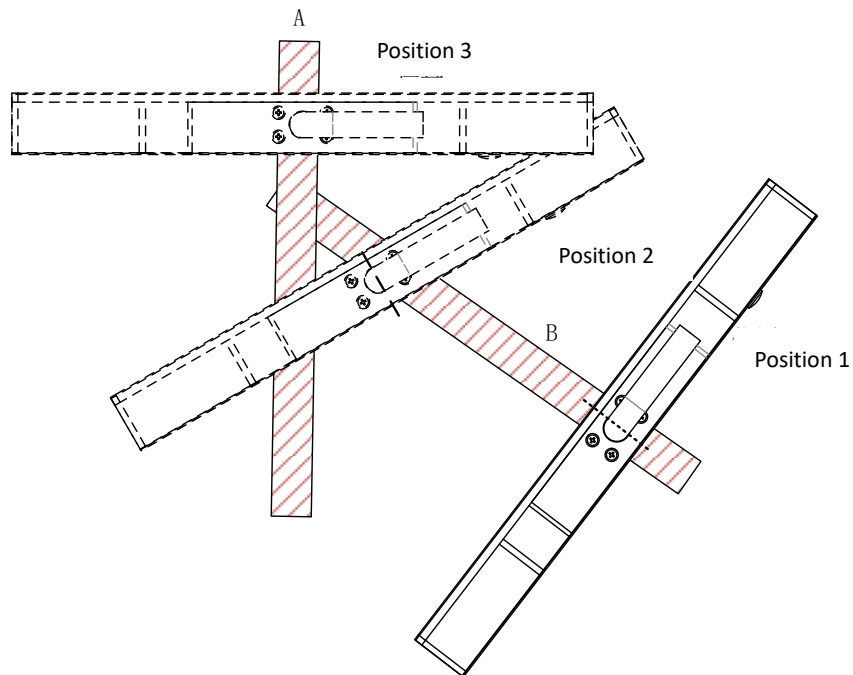
Right fork selection status

Double fork road recognition

Double fork in the same direction**Note**

The distance between magnetic stripe B and magnetic stripe C is larger than the position of magnetic navigation sensor, so as to avoid wrong judgment of branch road.

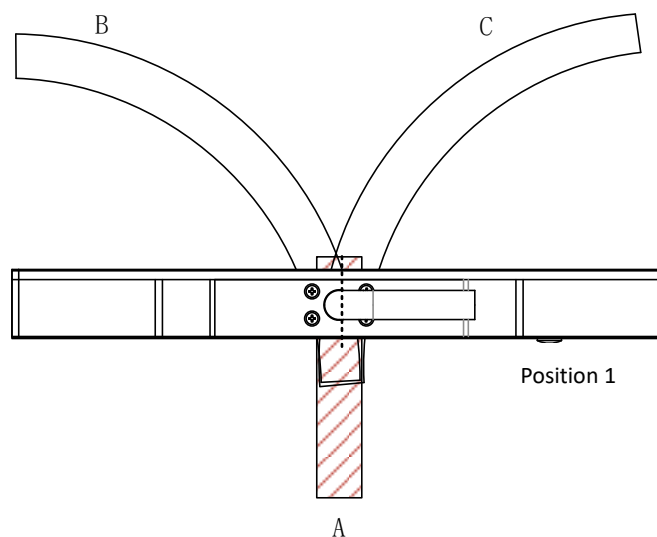
Merging intersection



Note

- 1) When the left intersection is combined, it is forbidden to use the left branch road.
- 2) When the right intersection is combined, it is forbidden to use the right branch road.

The fork in the road



Note

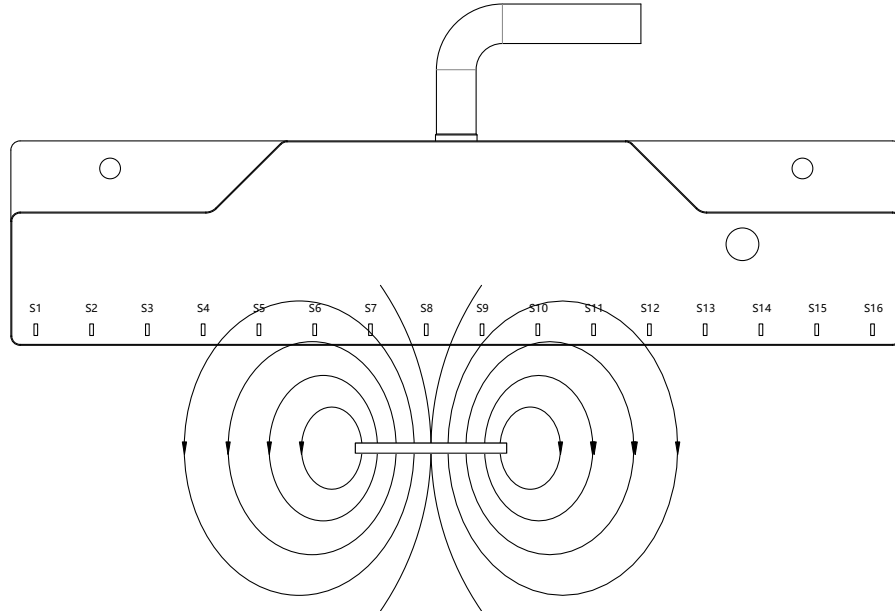
In the case of double arc intersection, it is necessary to specify the selection magnetic stripe, and it is forbidden to use the direct travel with no selection command.

6.1.2 Sensor magnetic field strength

S1-S8 points respectively detect the current magnetic field intensity signal and output the corresponding value.

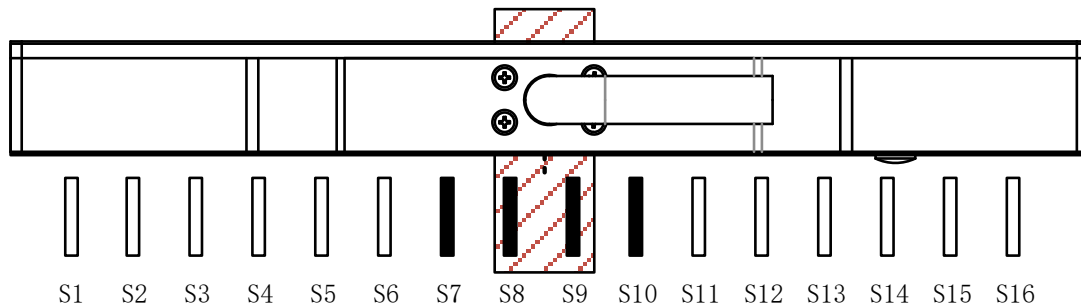
The N polarity output is a negative intensity value.and the smaller the value is.the greater the intensity is.

The S polarit output is a positive intensity value.and the higher the value is.the greater the intensity is.



6.1.3 Sensor switch signal status

The signal of induction magnetic stripe is assigned by the sensitivity of parameter setting.and the switch signal is output.



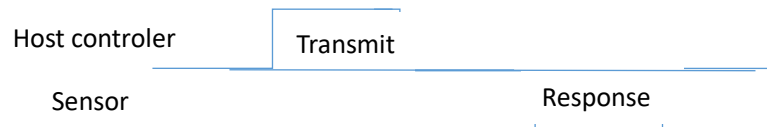
7 COMMUNICATION PROTOCOL

7.1 RS232/RS485 FREE PROTOCOL

For the following data to take effect, it is necessary to set the parameter in the sensor named-sensor control mode to RS232 HS/RS485 HS protocol.

7.1.1 Communication mode

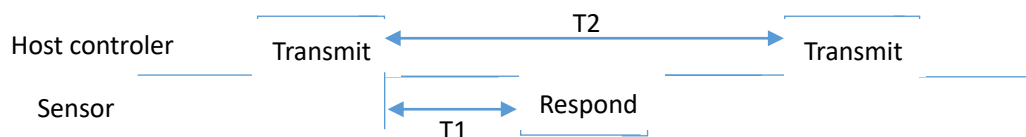
The communication mode of RS232 and RS485 is single master and single slave.



7.1.2 Communication specifications

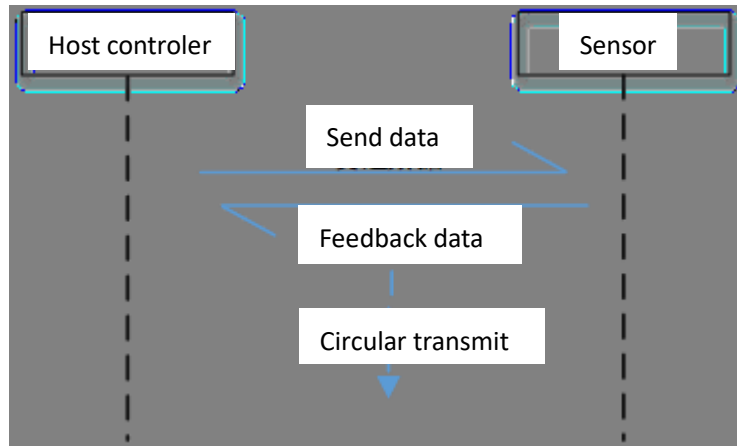
Communication mode	Point to Point
Communication speed	115200bps
Data bit	8 bit
Check bit	No parity
Stop bit	1 bit

7.1.3 Communication sequence



T1	≤2ms
T2	The recommended time is within 5-40ms

7.1.4 Communication content



The following communication contents are listed in hexadecimal mode.and the data transmission process is that the byte is sent before.

◆ Send data 1-get magnetic stripe position

First byte	Data identifier	
Second byte		
Third byte		
Fourth byte		
Fifth byte		
Sixth byte	Check bit	Low
Seventh byte		High

■ Data identifier (5byte)

The identifier is fixed data: 0x52 0x4d 0x70 0x6F 0x73 The function of marking this data is to obtain the magnetic stripe position.

■ Check bit (2byte)

The data check bit adopts the CRC 16 check mode of Modbus low bit first.The calibration value is calculated by the calibration formula.and the specific calculation method is shown in the appendix.

◆ Response data 1-Response magnetic stripe position

First byte	Data identifier	
Senond byte		
Third byte		
Fourth byte		
Fifth byte		
Sixth byte	Invalid	
Seventh byte	Sensor status	
Eighth byte	Magnetic stripe induction state	

Ninth byte	Left magnetic stripe position	High
Tenth byte		Low
Eleventh byte	Middle magnetic stripe position	High
Twelfth byte		Low
Thirteenth byte	Right magnetic stripe position	High
Fourteenth byte		Low
Fifteenth byte	Check bit	Low
Sixteenth byte		High

■ Data identifier (5byte)

- ◆ The identifier is fixed data: 0x52 0x4d 0x70 0x6F 0x73 The function of marking this data is to return to the magnetic stripe position.

■ Invalid (1byte)

Invalid value: 0x00;

■ Sensor status (1byte)

The sensor status of 0x00 is normal.and non-zero value is the sensor error.

■ Magnetic stripe induction status (1byte)

The magnetic stripe status displays the data and position of the current magnetic stripe.the values of the magnetic stripe are shown in the following table.

Right magnetic stripe sensing	Middle magnetic stripe sensing	Left magnetic stripe sensing
4	2	1

In the state of multiple magnetic stripe.the return value is the accumulation of magnetic stripe values.

For example:

When two magnetic strips are detected.the magnetic strips are located in the middle and left of the sensor.the return value is $1+2=3$.

When two magnetic strips are detected.the magnetic strips are located in the middle and right of the sensor.the return value is $4+2=6$.

When three magnetic strips are detected.the magnetic strips are located in the middle .left and right position of the sensor.the return value is $4+2+1=7$

■ Left magnetic stripe position (2byte)

- ◆ When the sensor detects more than two magnetic strips.the deviation distance value of the magnetic strip near the left side of the sensor is -80mm to +80mm

■ Middle magnetic stripe position (2byte)

- ◆ When the magnetic stripe is detected.the deviation distance of the magnetic stripe near the center of the sensor is -80mm to +80mm.

■ Right magnetic stripe position (2byte)

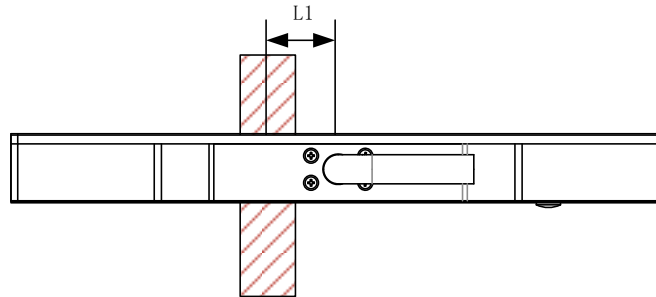
- ◆ When the sensor detects more than two magnetic strips.the deviation distance between the magnetic strips on the right side of the sensor is -80mm to +80mm.

■ Check bit (2byte)

Data check bit. The CRC 16 check mode of Modbus low bit first is adopted. the calibration value is calculated by the calibration formula. and the specific calculation method is shown in the appendix.

For Example:

The magnetic stripe signal status is shown in the figure below. there is only one magnetic stripe in the state. and the sensor thinks it is the middle magnetic stripe detection.



Send and obtain magnetic stripe position data:

Data identifier	Check bit
52 4d 70 6F 73	E7 6E

Return magnetic stripe position data

Data identifier	Invalid	Sensor status	Magnetic stripe induction state	Left magnetic stripe position	Middle magnetic stripe position	Right magnetic stripe position	Check bit
52 4d 70 6F 73	00	00	02	00 00	FF F2 (-14mm)	00 00	DA 77

◆ Send data 2-Selection of branch magnetic stripe

Parameters must be set for fork selection function: Sensor control mode-RS232-HS protocol.

Other control mode will have data returned. The branch selection command needs to be sent continuously in order to be in the selection state.

First byte	Data identifier	
Second byte		
Third byte		
Fourth byte		
Fifth byte		
Sixth byte	Fork road selection	
Seventh byte	Check bit	Low
Eighth byte		High

■ Data identifier (5byte)

The identifier is fixed data: 47 55 69 73 65 the function of marking this data is to control the selection of magnetic navigation sensor.

■ Fork road selection (1byte)

Control sensor magnetic stripe switch selection

0x00: Go straight without fork road

0x01: Select the left magnetic stripe to run

0x02: Select the right magnetic stripe to run

0x03: Select the bifurcated straight magnetic stripe to run

	0x00: Go straight	0x01: Select left fork road	0x02: Select Right fork road	0x03 : Select straight magnetic stripe to run
Left fork road	○	√	×	√
Right fork road	○	×	√	√
Crossroads	√	×	×	×
Herringbone road	×	√	√	×
Left side branch merging	√	×	√	√
Right side branch merging	√	√	×	√
√: Applicable ×: Inapplicable ○: Applicable at low speed				

■ Check bit (2byte)

The data check bit adopts the CRC16 check mode of Modbus low bit first. The calibration value is calculated by the calibration formula, and the specific calculation method is shown in the appendix

◆ Response data 2-response switch selection status

First byte	Data identifier	
Second byte		
Third byte		
Fourth byte		
Fifth byte		
Sixth byte	Switch selection status	
Seventh byte	Sensor status	
Eighth byte	Magnetic stripe induction state	

Ninth byte	Magnetic stripe position	High
Tenth byte		Low
Eleventh byte	Magnetic stripe strenght	High
Twelfth byte		Low
Thirteenth byte	Magnetic stripe points	High
Fourteenth byte		Low
Fifteenth byte	Check bit	Low
Sixteenth byte		High

■ Data identifier (5byte)

- ◆ The identifier is fixed data: 47 55 69 73 65 Mark this data function to control the switch selection of magnetic navigation sensor

■ Switch selection status (1byte)

0x00: Go straight

0x01: Select left fork road

0x02: Select Right fork road

0x03: Select straight magnetic strip to run

■ Sensor status (1byte)

The status of sensor 00 is normal.and the non-00 value is the error of the sensor

■ Magnetic stripe induction status (1byte)

The magnetic stripe status displays the data and position of the current magnetic stripe.the values of the magnetic stripe are shown in the following table.

Right magnetic stripe sensing	Middle magnetic stripe sensing	Left magnetic stripe sensing
4	2	1

In the state of multiple magnetic strips.the return value is the accumulation of magnetic strip values.

For example:

When two magnetic strips are detected.the return value is $1+2=3$ when the magnetic strips are located in the middle and left of the sensor.

When two magnetic strips are detected.the return value is $4+2=6$ when the magnetic strips are located in the middle and right of the sensor.

When three magnetic strips are detected.the return value is $4+2+1=7$ when the magnetic strips are located in the middle.left and right position of the sensor.

■ Current magnetic stripe position (2byte)

Current selected magnetic stripe deviation position value.

■ Current magnetic stripe strength (2byte)

The magnetic field intensity value of the currently selected magnetic strip.

■ Current magnetic stripe points (2byte)

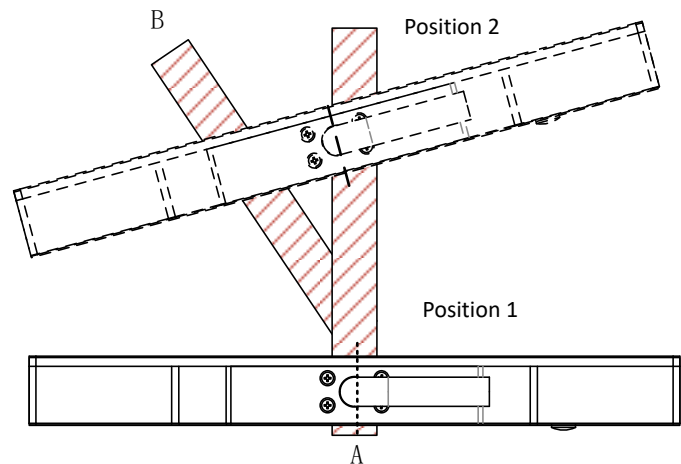
Number of switch points of the currently selected magnetic stripe.

■ Check bit (2byte)

The data check bit adopts the CRC16 check mode of Modbus low bit first.The calibration value is calculated by the calibration formula.and the specific calculation method is shown in the appendix

For example:

- Necessary to choose the fork road.
- Position 1: send the left side branch selection command.
- Position 2: only provide the position and signal of the left magnetic stripe to the host computer.



Send and obtain magnetic stripe position data:

Data identifier	Fork road selection status	Check bit
0x47 0x55 0x69 0x73 0x65	0x01	0x05 0xB7

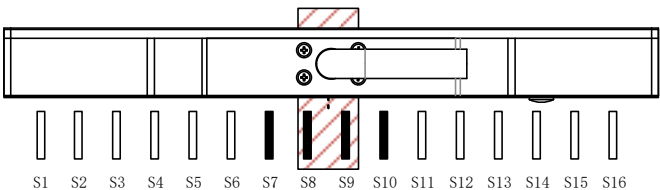
Return magnetic stripe position data:

Data identifier	Fork road selection status	Sensor status	Magnetic stripe induction state	Magnetic stripe position	Magnetic stripe strength	Magnetic stripe points	Check bit
0x47 0x55 0x69 0x73 0x65	0x 01	0x 00	0x 01	0xFF 0xF5 (-11)	0x00 0x45 (69)	0x 00 0x 08	0x9F 0xFD

Note

The fork road selection command must be sent before the magnetic stripe reaches the position 1. The status data will be sent once.and the status will be kept until the fork road selection command is received again.

◆ Send data 3-get magnetic field strength



First byte	Data identifier	
Second byte		
Third byte		
Fourth byte		
Fifth byte		
Sixth byte	Check bit	Low
Seventh byte		High

■ Data identifier (5byte)

The identifier is fixed data: 52 4D 67 64 61 mark this data.and the function is to obtain the magnetic field intensity of each sensing point.

■ Check bit (2byte)

Data check bit, Adopted the CRC16 check mode of Modbus low bit first. The calibration value is calculated by the calibration formula.and the specific calculation method is shown in the appendix.

◆ Response data 3-feedback magnetic field strength

First byte	Data identifier	
Second byte		
Third byte		
Fourth byte		
Fifth byte		
Sixth byte	Invalid	
Seventh byte		
Eighth byte	S1	High
Ninth byte		Low
Tenth byte	S2-S15	High
.....		
The 37 th byte		Low
The 38 th byte	S16	High
The 39 th byte		Low
The 40 th byte	Invalid	Low
The 41 st byte		
The 42 nd byte	Check bit	Low
The 43 rd byte		High

■ Data identifier (5byte)

The identifier is fixed data: 52 4D 67 64 61 mark this data function as the magnetic field intensity of each sensing point.

■ Invalid bit (2byte)

Invalid data bits.the value is 00.

■ Magnetic field strength at S1 (2byte)

The field intensity data detected at S1 position range from -10000 to+10000. The N-pole magnetic field signal is negative and the S-pole magnetic field signal is positive.

■ S2-S15 (28byte)

For the field intensity data detected at S2-S15 position points.the length of each position value is 2 byte.ranging from-10000 to +10000.the N-pole magnetic field signal is negative .and the S-pole magnetic field signal is positive.

■ Invalid bit (2byte)

Invalid data bit.the value is 00.

■ Check bit (2byte)

The data check bit adopts the CRC16 check mode of Modbus low bit first. The calibration value is calculated by the calibration formula.and the specific calculation method is shown in the appendix.

Fox example:

Send and get signal strength of magnetic stripe

Data identifier	Check bit
0x52 0x4d 0x67 0x64 0x61	0xD0 0x57

Return magnetic stripe strength data:

52 4D 67 64 61 00 00 FF FE FF FF 00 04 00 05 00 10 00 1B 00 2B 00 31 00 37 00 28 00 24 00 12 00 09 00 07 00 03 FF
FD 00 00 3D 53

Data identifier	Invalid	S1	S2	S3	S4	S5	S6	S7	S8	S9
0x52 0x4d 0x67 0x64 0x61	0x 00 0x 00	0xFF 0xFE	0xFF 0xFF	0x00 0x04	00 05	00 10	00 1B	00 2B	00 31	00 37

S10	S11	S12	S13	S14	S15	S16	Invalid	Check bit		
00 28	00 24	00 12	00 09	00 07	00 03	FF FD	00 00	3D 53		

◆ Send data 4-get switch point data

First byte	Data identifier	
Second byte		
Third byte		
Fourth byte		
Fifth byte		
Sixth byte	Check bit	Low
Seventh byte		High

■ Data identifier (5byte)

The identifier is fixed data: 52 4d 67 73 77 mark this data function to obtain the switching value status of each point.

■ Check bit (2byte)

The data check bit adopts the CRC16 check mode of Modbus low bit first. The calibration value is calculated by the calibration formula.and the specific calculation method is shown in the appendix.

◆ Response data 4-feedback switching point data

First byte	Data identifier	
Senond byte		
Third byte		
Fourth byte		
Fifth byte		
Sixth byte	S1-S7	Switch data
Seventh byte	S8-S15	
Eighth byte	S16	
Ninth byte	Check bit	Low
Tenth byte		High

■ Data identifier (5byte)

The identifier is fixed data. 52 4D 67 73 77 marks this data function as the switch state of each point.

■ Switch data (3byte)

The sixth byte

Data	S1-S7 (1Byte)							
Hexadecimal	0x 00							
Binary system	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	S7	S6	S5	S4	S3	S2	S1	Invalid
Explain	It is 1 if there is a signal point.and it is 0 if there is no signal.							

The Seventh byte

Data	S8-S15 (1Byte)							
Hexadecimal	0x 00							
Binary system	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	S15	S14	S13	S12	S11	S10	S9	S8
Explain	It is 1 if there is a signal point.and it is 0 if there is no signal.							

The Eighth byte

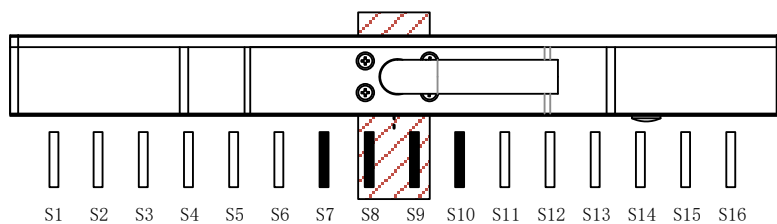
Data	S16 (1Byte)							
Hexadecimal	0x 00							
Binary system	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Explain	It is 1 if there is a signal point.and it is 0 if there is no signal.							

■ Check bit (2byte)

The data check bit adopts the CRC16 check mode of Modbus low bit first. The calibration value is calculated by the calibration formula.and the specific calculation method is shown in the appendix.

For example:

The magnetic stripe signal status is shown in the figure below:



Send and acquire magnetic stripe switch data

Data identifier	Check bit
52 4d 67 73 77	5E 69

Return magnetic stripe switch data:

Data identifier	S1-S7 Switch data	S8-S15 Switch data	S16 Switch data	Check bit
52 4d 67 73 77	01	E0	00	57 82

7.1.5 CRC Check

C language verification instructions

cBuffer: Calculate the array of CRC check codes

iBufLen: The length of the array

unsigned int CRC_Verify(unsigned char *cBuffer, unsigned int iBufLen)

```
{
    unsigned int i, j;                //define wPolynom 0xA001
    unsigned int wCrc = 0xffff;
    unsigned int wPolynom = 0xA001;

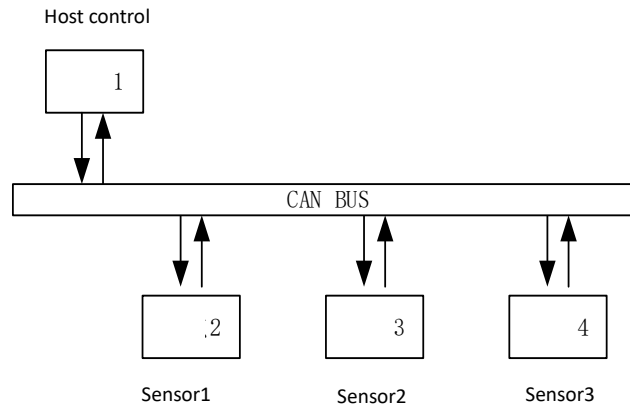
    /*-----*/
    for (i = 0; i < iBufLen; i++)
    {
        wCrc ^= cBuffer[i];
    }
    for (j = 0; j < 8; j++)
    {
        if (wCrc & 0x0001)
        {   wCrc = (wCrc >> 1) ^ wPolynom;   }
        else
        {   wCrc = wCrc >> 1;   }
    }
}
return wCrc;
}
```

7.2 CAN-HS PROTOCOL

For the following data to take effect, it is necessary to set the parameter named sensor control mode to CANBUS-HS protocol mode.

7.2.1 Communication mode

CAN BUS communication mode is adopted.

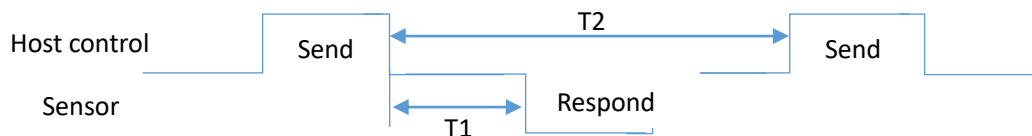


7.2.2 Communication specifications

Communication model	BUS mode
Communication speed	1000k (default) , 500k, 250k, 125k
Data frame	Standard frame
Communication standard	CAN BUS 2.0 B
Broadcast time	0 (No broadcast) -500ms
Support protocol	CAN-HS protocol CAN OPEN protocol

7.2.3 Communication sequence

No broadcast mode



T1	<1ms
T2	The recommended time must be within 5-40ms

Broadcast mode



T1 The broadcast time must be 5ms-40ms.

7.2.4 Communication data

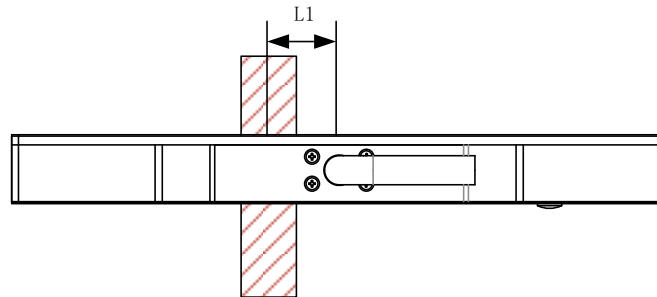
The sensor has two data output modes, which are the following:

Location data mode: The output magnetic stripe position data is accurate 1 mm, and can be used for branch control.

Switch data mode: Output switch state data of sensor.

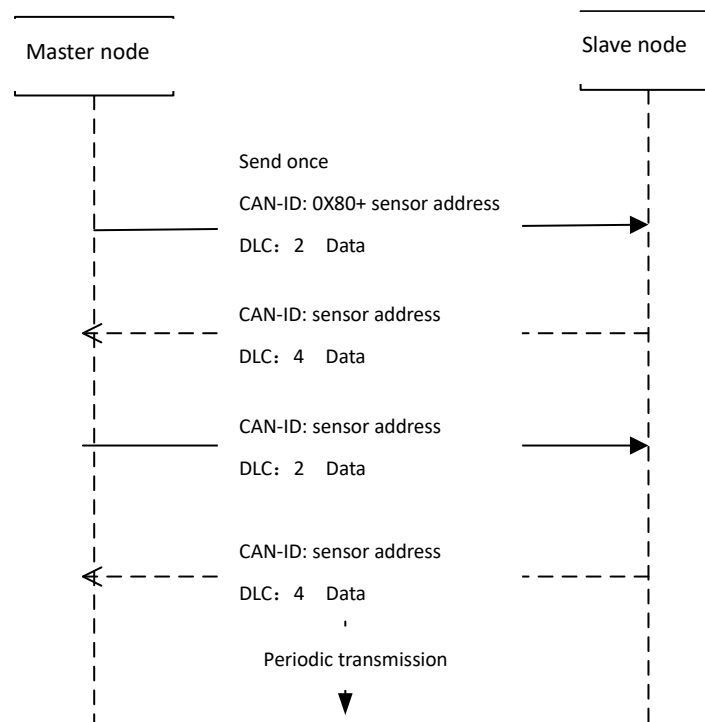
Location data mode

Magnetic stripe detection

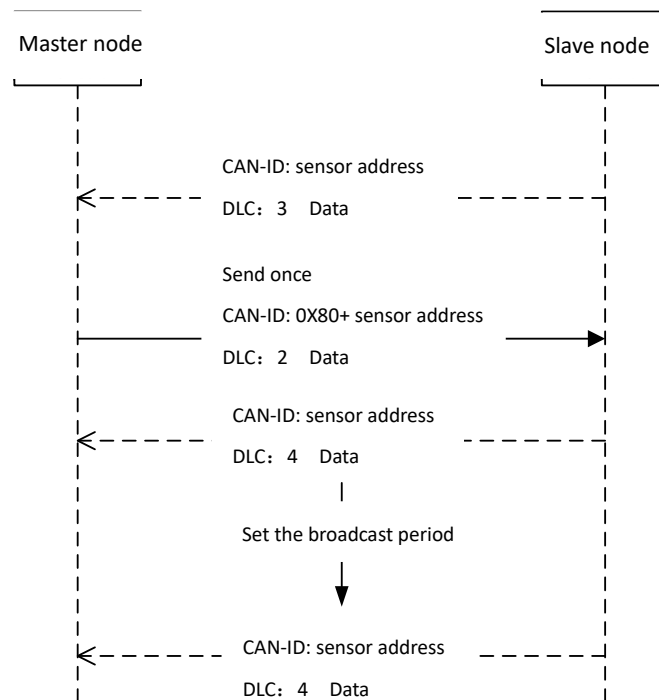


The display is the middle magnetic stripe position L1, which is the current magnetic stripe magnetic field center and sensor center position value.

No broadcast mode



Broadcast mode



Send data

CAN ID	DLC	Data	
0x80 +CANBus communication address	2	0 byte	1 byte
		0x 88	Fork road selection status

- CAN ID
- ◆ 0x80+sensor address

For example:

Sensor parameter setting. CANBus communication address is 0X05.(please refer to configuration software manual for specific setting)

Then the CAN ID sent is:0x80+0x05+=0x85;

- 0 byte
- ◆ Current byte fixed data 0x88。
- 1 byte Fork road selection status

Control sensor branch selection

0x00: Go straight without fork road

0x01: Select the left magnetic stripe to run

0x02: Select the right magnetic stripe to run

0x03: Select the bifurcated straight magnetic strip to run

	0x00: Go straight without fork road	0x01: Select the left magnetic stripe to run	0x02: Select the right magnetic stripe to run	0x03: Select the bifurcated straight magnetic strip to run
Left fork road	○	✓	×	✓
Right fork road	○	×	✓	✓
Crossroads	✓	×	×	×
Herringbone road	×	✓	✓	×
Left side branch merging	✓	×	✓	✓
Right side branch merging	✓	✓	×	✓
✓ : Applicable ×: Inapplicable ○: Applicable at low speed				

Response data

CAN ID	DLC	Data			
CAN bus communication address	4	0 byte	1 byte	2 byte	3 byte
		Sensor tatus	Magnetic stripe induction statu	Current magnetic stripe position	

■ Sensor tatus (1byte)

The status of the sensor 00 is normal.and the non-00 value is error.

■ Magnetic stripe induction status (1byte)

The magnetic stripe status displays the data and position of the current magnetic stripe.the values of the magnetic stripe are displayed in the following table.

Right magnetic stripe sensing	Middle magnetic stripe sensing	Left magnetic stripe sensing
4	2	1

In the state of multiple magnetic strips.the return value is the accumulation of magnetic strip values.

Fox example:

When two magnetic strips are detected, which are located in the middle and left positions of the sensor, the return value is 1+2=3

When two magnetic strips are detected, which are located in the middle and right positions of the sensor, the return value is 4+2=6

- When 3 magnetic strips are detected, they are located in the middle position of the sensor, the left position and the right position of the magnetic strips, the return value is $4+2+1=7$
- Current magnetic stripe position (2byte)

The currently selected magnetic stripe deviation position value

Send fork control data:

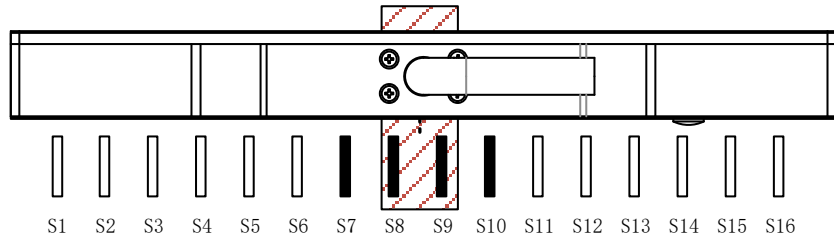
CAN ID	DLC	Data	
0x81	2	0 byte	1 byte
		0x88	0x01(Choose the fork on the left)
Prompt	For the fork road selection command, the magnetic stripe must be sent before the position 1 before the fork road, and the selection state shall be maintained		

Return sensor data:

CAN ID	DLC	Data			
0x 01	4	0 byte	1 byte	2 byte	3 byte
		Sensor status	Status	Magnetic stripe position	

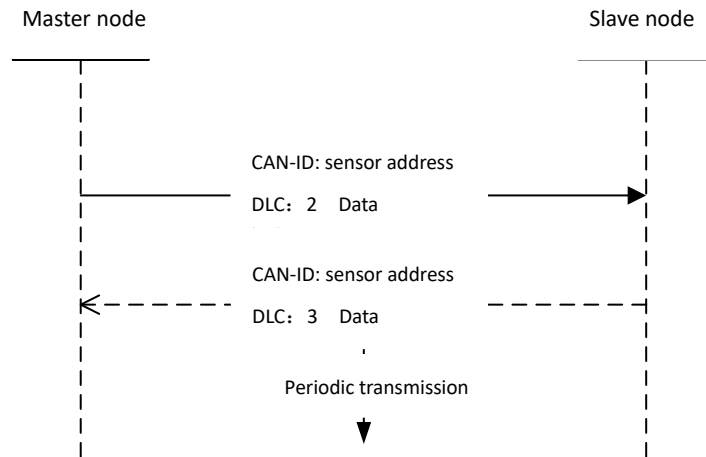
Switch data mode

Magnetic stripe detection

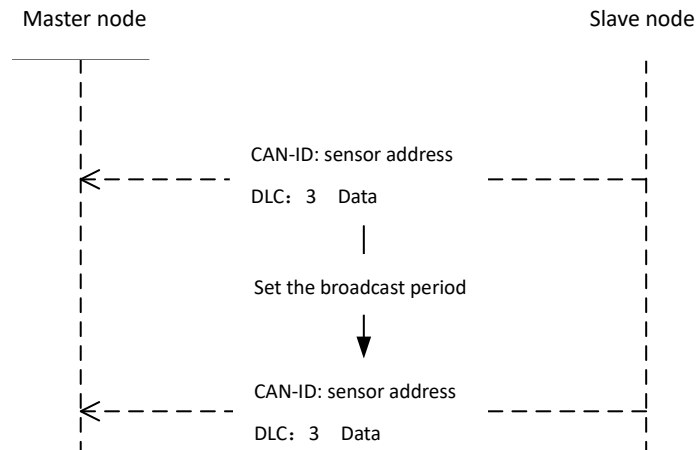


Data is S1-S16 point switch signal state

No broadcast mode



Broadcast mode



Send data

CAN ID	DLC	Data	
CAN bus communication address	2	0 byte	1 byte
		0x88	Invalid

■ CAN ID

◆ Sensor address

For example:

Sensor parameter setting, CAN bus communication address is 0x05; (For specific setting, please refer to the configuration software manual)

The CAN ID sent is $0x05+0x80=0x85$

- 0 Byte
- The position data output mode must start with 0x881 Byte

Invalid data transmission: 00

Response data

CAN ID	DLC	Data		
CAN bus communication address	3	0 Byte	1 Byte	2 Byte
		S1-S7	S8-S15	S16

Byte 0

Data	S1-S7 (1Byte)							
Hexadecimal	0x 00							
Binary	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	S7	S6	S5	S4	S3	S2	S1	invalid
Description	A signal point is displayed as 1, and no signal is displayed as 0							

Byte 1

Data	S8-S15 (1Byte)							
Hexadecimal	0x 00							
Binary	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	S15	S14	S13	S12	S11	S10	S9	S8
Description	A signal point is displayed as 1, and no signal is displayed as 0							

Byte 2

Data	S16 (1Byte)							
Hexadecimal	0x 00							
Binary	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	S16
Description	A signal point is displayed as 1, and no signal is displayed as 0							

7.3 CAN-OPEN PROTOCOL

7.3.1 Communication specifications

Communication way	Bus mode
Communication rate	1000k（default）, 500k, 250k, 125k
Communication address	1-127（default）

EDS file

Please visit the website to obtain the EDS file

7.3.2 Index definition

Object index	Object subindex	Object description	Data type	Attributes	Defaults			
1800	00		UNS08	R	6			
	01	TPDO1 responds to CAN ID	UNS32	R/W	\$NODEID+0x180			
1801	00		UNS08	R	6			
	01	TPDO2 responds to CAN ID	UNS32	R/W	\$NODEID+0x280			
1802	00		UNS08	R	6			
	01	TPDO3 responds to CAN ID	UNS32	R/W	\$NODEID+0x380			
1A00	00	TPDO1 mapping	UNS08	R	8			
	01		UNS32	R/W	0x20020008			
	02		UNS32	R/W	0x20030008			
	03		UNS32	R/W	0x20050010			
	04		UNS32	R/W	0x20060010			
	05		UNS32	R/W	0x20070010			
1A01	00	TPDO2 mapping	UNS08	R	8			
	01		UNS32	R/W	0x20020008			
	02		UNS32	R/W	0x20030008			
	03		UNS32	R/W	0x20080010			
	04		UNS32	R/W	0x20090010			
	05		UNS32	R/W	0x200A0010			
1A02	00	TPDO3 mapping	UNS08	R	8			
	01		UNS32	R/W	0x20020008			
	02		UNS32	R/W	0x20030008			
	03		UNS32	R/W	0x20000020			
2000h	00h	Magnetic field point switch signal data	UNS32	RO	3 00	2 00	1 00	0 00
2001h	00h	Number of sub-indexes of magnetic field intensity data object	UNS8	RO	18h			
	01h	Magnetic field strength data 1	INT16	RO	0000h			
	02h	Magnetic field strength data 2	INT16	RO	0000h			

	03h	Magnetic field strength data 3	INT16	RO	0000h
	04h	Magnetic field strength data 4	INT16	RO	0000h
	05h	Magnetic field strength data 5	INT16	RO	0000h
	06h	Magnetic field strength data 6	INT16	RO	0000h
	07h	Magnetic field strength data 7	INT16	RO	0000h
	08h	Magnetic field strength data 8	INT16	RO	0000h
	09h	Magnetic field strength data 9	INT16	RO	0000h
	0Ah	Magnetic field strength data 10	INT16	RO	0000h
	0Bh	Magnetic field strength data 11	INT16	RO	0000h
	0Ch	Magnetic field strength data 12	INT16	RO	0000h
	0Dh	Magnetic field strength data 13	INT16	RO	0000h
	0Eh	Magnetic field strength data 14	INT16	RO	0000h
	0Fh	Magnetic field strength data 15	INT16	RO	0000h
	10h	Magnetic field strength data 16	INT16	RO	0000h
2002h	00h	Sensor status	UNS8	R	00h
2003h	00h	Magnetic stripe induction status	UNS8	R	00h
2004h	00h	Fork choice	UNS8	R/W	00h
2005h	00h	Fork choice to return the magnetic stripe position	INT16	R	0000h
2006h	00h	Fork choice to return the magnetic field strength	INT16	R	0000h
2007h	00h	Fork choice to return the magnetic induction points	UNS16	R	0000h
2008h	00h	Left magnetic stripe position	INT16	R	0000h
2009h	00h	Middle magnetic stripe position	INT16	R	0000h
200Ah	00h	Right magnetic stripe position	INT16	R	0000h
200Bh	00	Average intensity value of the left magnetic stripe	INT16	R	0000h
200Ch	00	Average intensity value of the middle magnetic stripe	INT16	R	0000h
200Dh	00	Average intensity value of the right magnetic stripe	INT16	R	0000h
200Eh	00	Left magnetic stripe induction points	UNS16	R	0000h
200Fh	00	Middle magnetic stripe induction points	UNS16	R	0000h
2010h	00	Right magnetic stripe induction points	UNS16	R	0000h
2011h	00	Magnetic stripe induction polarity	UNS16	R/W	
2012h	00	Minimum induction points	UNS16	R/W	
2013h	00	Maximum induction points	UNS16	R/W	
2014h	00	Magnetic stripe discrimination	UNS16	R/W	
2015h	00	Sensitivity adjustment	UNS16	R/W	

2016h	00	Middle offset (155mm-195mm)	UNS16	R/W	
2017h	00	CAN BUS address (1-127)	UNS16	R/W	
2018h	00	CAN BUS baud rate	UNS16	R/W	
2019h	00	Parameter write	UNS16	R/W	
201Ah	00	Sensor restart	UNS16	R/W	

Data analysis

2000 00h-- Switch signal data

- Byte 0

Data	S1-S7 (1Byte)							
Hexadecimal	0x 00							
Binary	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	S7	S6	S5	S4	S3	S2	S1	Invalid
Description	A signal point is displayed as 1, and no signal is displayed as 0							

- Byte 1

Data	S8-S15 (1Byte)							
Hexadecimal	0x 00							
Binary	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	S15	S14	S13	S12	S11	S10	S9	S8
Description	A signal point is displayed as 1, and no signal is displayed as 0							

- Byte 2

Data	S16 (1Byte)							
Hexadecimal	0x 00							
Binary	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	S16
Description	A signal point is displayed as 1, and no signal is displayed as 0							

2001-- Magnetic field strength data

02h-24h

The magnetic field intensity data detected at S1-S16 position points, each value is 2 bytes in length, and the value range is -10000--+10000. The N pole magnetic field signal is negative, and the S pole magnetic field signal is positive.

2002h—Sensor status

The sensor status 0x00 is the normal status, and the non-00 value is the sensor error.

2003h—Magnetic stripe induction status

The magnetic stripe status displays the current data and position of the magnetic stripe; the following table shows the value of the magnetic stripe

Right magnetic stripe induction	Middle magnetic stripe induction	Left magnetic stripe induction
4	2	1

In the state of multiple magnetic strips, the return value is the accumulation of the magnetic stripe values

For example:

When two magnetic strips are detected, which are located in the middle and left positions of the sensor, the return value is $1+2=3$

When two magnetic strips are detected, which are located in the middle and right positions of the sensor, the return value is $4+2=6$

When three magnetic strips are detected, which are located in the middle position of the sensor, the left position and the right position of the magnetic strips, the return value is $4+2+1=7$

2004h—Fork choice

Control the selection of the magnetic stripe fork road of the sensor

0x00: Go straight

0x01: Select the left magnetic stripe to run

0x02: Select the Right magnetic stripe to run

0x03: Select a fork to go straight to run the magnetic stripe

	0x00: Go straight	0x01: Select the left magnetic stripe to run	0x02: Select the Right magnetic stripe to run	0x03: Select a fork to go straight to run the magnetic stripe
Left fork road	○	√	×	√
Right fork road	○	×	√	√
Crossroads	√	×	×	×
Herringbone road	×	√	√	×
Merge on the left fork road	√	×	√	√
Merge on the right fork road	√	√	×	√

√ : Applicable

×: Not applicable

○: Applicable under low speed conditions

2005h—Choosing the position of the magnetic stripe

The currently selected distance of the magnetic stripe relative to the center of the sensor, the position range is -75mm-75mm

2006h—Choosing the magnetic field strength

The average magnetic field strength of the currently selected magnetic stripe is 2byte in length, and the value range is -10000--+10000. The N pole magnetic field signal is negative, and the S pole magnetic field signal is positive.

2007h—Select the number of magnetic stripe points

The currently select the number of magnetic stripe points, the length is 1 byte, and the data range is 1-16

2008h—Left magnetic stripe position

When the sensor detects more than two magnetic strips, the deviation distance value of the magnetic strip at the left side of the sensor, the position range is -75mm-75mm

2009h—Middle magnetic stripe position

When the sensor detects more than two magnetic strips, the deviation distance value of the magnetic strips at the center of the sensor, the position range is -75mm-75mm

200Ah—Right magnetic stripe position

When the sensor detects more than two magnetic strips, the deviation distance value of the magnetic strips on the right side of the sensor, the position range is -75mm-75mm

200Bh—Average magnetic field strength of left magnetic strip

When the sensor detects more than two magnetic strips, the average magnetic field intensity value of the magnetic strip at the left side of the sensor, the length is 2 bytes, the value range is -10000--+10000, the N pole magnetic field signal is negative, and the S pole magnetic field signal is a positive value

200Ch—Average magnetic field strength of the middle magnetic strip

When the sensor detects more than two magnetic strips, the average magnetic field intensity value of the magnetic strip near the center of the sensor, the length is 2 bytes, the value range is -10000--+10000, the N pole magnetic field signal is negative, the S pole magnetic field signal is a positive value

200Dh—Average magnetic field strength of the right magnetic strip

When the sensor detects more than two magnetic strips, the average magnetic field intensity value of the magnetic strip at the right side of the sensor, the length is 2 bytes, the value range is -10000--+10000, the N pole magnetic field signal is negative, and the S pole magnetic field signal is a positive value.

200Eh—Magnetic stripe induction points on the left

The current number of switching signal points sensed by the magnetic stripe on the left, the length is 1 byte, and the data range is 1-16

200Fh—Middle magnetic stripe induction points

The number of switching signal points sensed by the current middle magnetic stripe, the length is 1 byte, and the data range is 1-16

2010h—Magnetic stripe induction points on the right

The current number of switching signal points sensed by the magnetic stripe on the right, the length is 1 byte, and the data range is 1-16

7.3.3 PDO Data

RPDO and TPDO are mapped in advance in the sensor, but the communication parameters are configured

RPDO

RPDO default allocation

Index	Subindex	Description	Data type	Default initial value
1600h	00h	Number of parameters	Un8	6
	01h	COB-ID;PDO address	Un32	RPDO1: 0x200+ Node address
	02h	Delivery type	Un8	00
	03h	Production prohibition time	Un16	0000
	05h	Event timer trigger time	Un16	0000
	06h	SYNC synchronization initial value	Un8	00

RPDO1

CAN ID	DLC	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x200+node ID	8	Fork choice	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Control the selection of the magnetic stripe fork circuit of the sensor

0x00: Go straight

0x01: Select the left magnetic stripe to run

0x02: Select the right magnetic stripe to run

0x03: Choose a fork to go straight

	0x00 : Go straight	0x01: Select left magnetic stripe to run	0x02: Select right magnetic stripe to run	0x03: Choose a fork to go straight
Left fork road	○	✓	×	✓
Right fork road	○	×	✓	✓
Crossroads	✓	×	×	×
Herringbone road	×	✓	✓	×
Merge on the left side of the road	✓	×	✓	✓
Merge on the right side of the road	✓	✓	×	✓
✓ : Applicable × : Not applicable ○ : Applicable under low speed conditions				

TPDO

TPDO default allocation

Index	Subindex	Description	Data type	Default initial value
1800h 1801h 1802h	00h	Number of parameters	Un8	6
	01h	COB-ID;PDO address	Un32	TPDO1: 0x180+ Node address TPDO2: 0x280+ Node address TPDO3: 0x380+ Node address
	02h	Delivery type	Un8	00
	03h	Production prohibition time	Un16	0000
	05h	Event timer trigger time	Un16	0000
	06h	SYNC synchronization initial value	Un8	00

TPDO1

CAN ID	DLC	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x180+ node ID	8	Sensor status	Magnetic stripe induction status	Fork choice to return the magnetic stripe position		Fork choice to return the magnetic field strength		Fork choice to return magnetic the induction points	

TPDO2

CAN ID	DLC	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x280+ node ID	8	Sensor status	Magnetic stripe induction status	Left magnetic stripe position		Middle magnetic stripe position		Right magnetic stripe position	

TPDO3

CAN ID	DLC	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x380+node ID	8	Sensor status	Magnetic stripe induction status	0x00	0x00	0x00	0x00	0x00	0x00

7.4 RS485-MODBUS PROTOCOL

The parameter name in the sensor must be set to the RS485 MODBUS protocol

Communication specifications

The basic parameters of the serial port need to be set before communication. The following parameters are the basis for establishing communication

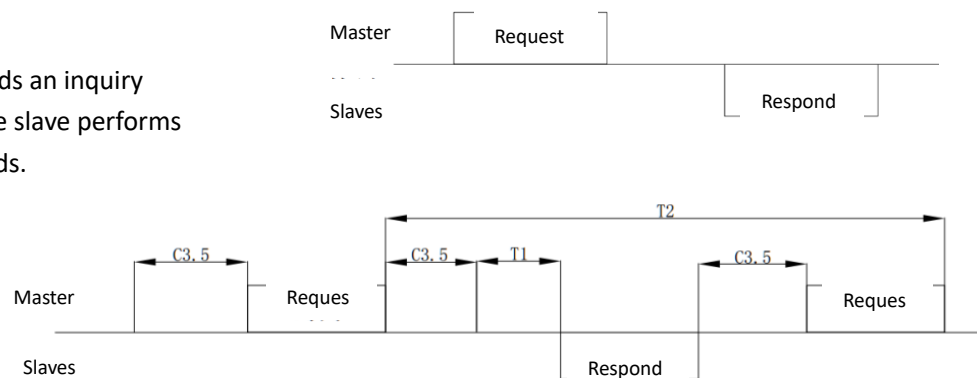
	Parameter	Default setting
Communication way	Single master/multi-slave mode	
Working mode	MODBUS RTU mode	RTU mode
Receiving/sending method	Half-duplex communication mode	
Communication ID	1-127 configurable	127
Communication rate	9600bps , 19200bps , 38400bps , 576000bps , 115200bps	115200bps
Data bit	8 bit	8 bit
Check bit	No verify. Odd verify. Even verify	No verify
Stop bit	1 bit. 2 bit	1 bit

7.4.1 Master-Slave Communication Sequence

The communication mode of MODBUS protocol is single-master/multi-slave mode

Unicast mode

The master station sends an inquiry to one slave station. The slave performs processing and responds.



Serial number	Name	Content
C3.5	Quiet interval	As the sending waiting time, be sure to leave an interval of 3.5 words or more. If the number of words is not full, the drive cannot respond. When the communication speed exceeds 19200 bps, please keep an interval of 1.75 ms or more.
T1	Send waiting time	After receiving the inquiry from the master station, the slave station switches the communication line to the sending state, and the time until it starts to reply. To

		send a waiting time of 10 ms. The actual sending waiting time will become the static interval (C3.5) + command processing time + sending waiting time (T1).
T2	Communication timeout	Can be configured within 0.05s – 1s

Important Prompt

Since RS485 communication cannot be sent and received at the same time, it is recommended that the communication interval be controlled at 30-50ms during the communication sequence. And after confirming the completion of the previous transmission, the next transmission can be continued.

7.4.2 Register address function

Write to holding register—function code 16

Register address	Data	Data content				
2000	00-02	0x00: Go straight				
		0x01: Select the left magnetic stripe to run				
		0x02: Select the right magnetic stripe to run				
		0x03: Select the fork road to go straight				
			0x00 : Go straight	0x01: Select the left magnetic stripe to run	0x02: Select the right magnetic stripe to run	0x03 : Select the fork road to go straight
		Left fork road	○	√	×	√
		Right fork road	○	×	√	√
		Crossroads	√	×	×	×
		Herringbone road	×	√	√	×
		Merge on the left fork road	√	×	√	√
Merge on the right fork road	√	√	×	√		
√ : Applicable						

× : Not applicable
○: Applicable under low speed

Read input register—Function code 04

Register address	Data	Definition	Description								
1000	00-02	Sensor status	The sensor status 0x00 is the normal status, and the non-00 value is the sensor error.								
1001	00-07	Magnetic stripe induction status	The magnetic stripe status displays the current data and position of the magnetic stripe; the following table shows the value of the magnetic stripe <table border="1"> <thead> <tr> <th>Right magnetic stripe induction</th><th>Middle magnetic stripe induction</th><th>Left magnetic stripe induction</th><th>No magnetic stripe detected</th></tr> </thead> <tbody> <tr> <td>4</td><td>2</td><td>1</td><td>0</td></tr> </tbody> </table> In the state of multiple magnetic strips, the return value is the accumulation of the magnetic stripe values For example: When two magnetic strips are detected, which are located in the middle and left positions of the sensor, the return value is 1+2=3 When two magnetic strips are detected, which are located in the middle and right positions of the sensor, the return value is 4+2=6 When 3 magnetic strips are detected, which are located in the middle position of the sensor, the left position and the right position of the magnetic strips, the return value is 4+2+1=7	Right magnetic stripe induction	Middle magnetic stripe induction	Left magnetic stripe induction	No magnetic stripe detected	4	2	1	0
Right magnetic stripe induction	Middle magnetic stripe induction	Left magnetic stripe induction	No magnetic stripe detected								
4	2	1	0								
1002	-75mm-75mm	Fork choice to return the magnetic stripe position	The distance of currently selected magnetic stripe relative to the center of the sensor MGS-160N ,The position range is -75mm-75mm								
1003	-8000---+8000	Fork choice to return the magnetic field strength	The average magnetic field strength of the currently selected magnetic stripe is 2byte in length, and the value range is -8000---+8000. The N pole magnetic field signal is negative, and the S pole magnetic field signal is positive								
1004	0-16	Fork choice to return the magnetic induction points	The number of digital signal points sensed by the currently selected magnetic stripe 0: No magnetic stripe is detected The data range of MGS-160N is 1-16								
1005	-150-0mm	Left magnetic stripe position	When the sensor detects more than 2 magnetic stripes, the deviation distance value of the magnetic stripes on the left side of the sensor; The position range of MGS-160N is -75mm-0								
1006	-630mm-630mm	Middle magnetic stripe position	When the sensor detects more than one magnetic stripe, the deviation distance value of the magnetic stripe at the center of the sensor;								

			The position range of MGS-160N is -75mm-75mm
1007	0-630mm	Right magnetic stripe position	When the sensor detects more than 2 magnetic strips, the deviation distance value of the magnetic strips on the right side of the sensor The position range of MGS-160N is 0-75mm
1008	-8000--+8000	Average intensity value of the left magnetic stripe	When the sensor detects more than two magnetic strips, the average magnetic field intensity value of the magnetic strip on the left side of the sensor, the length is 2 bytes, the value range is -8000--+8000, the magnetic field signal of the N pole is negative, and the magnetic field signal of the S pole is negative. Is a positive value.
1009	-8000--+8000	Average intensity value of the middle magnetic stripe	When the sensor detects more than one magnetic stripe, the average magnetic field intensity value of the magnetic stripe at the center of the sensor, the length is 2 bytes, the value range is -8000--+8000, the N pole magnetic field signal is negative, and the S pole magnetic field signal is Positive value.
1010	-8000--+8000	Average intensity value of the right magnetic stripe	When the sensor detects more than two magnetic strips, the average magnetic field intensity value of the magnetic strip on the right side of the sensor, the length is 2 bytes, the value range is -8000--+8000, the magnetic field signal of N pole is negative, and the magnetic field signal of S pole is negative. Is a positive value.
1011	0-6	Left magnetic stripe induction points	The number of digital signal points sensed by the current left magnetic stripe 0: No magnetic stripe is detected The data range of MGS-160N is 1-6
1012	0-16	Middle magnetic stripe induction points	The number of digital signal points sensed by the current middle magnetic stripe 0: No magnetic stripe is detected The data range of MGS-160N is 1-6
1013	0-6	Right magnetic stripe induction points	The number of digital signal points sensed by the current right magnetic stripe 0: No magnetic stripe is detected The data range of MGS-160N is 1-6
1014	0-255	Digital signal data 1*	S16 digital signal
1015	0-65535	Digital signal data 2*	S1-S15 digital signal
1016	-8000--+8000	S1 magnetic field strength value	The S1 magnetic field value ranges from -8000--+8000, the N pole magnetic field signal is negative, and the S pole magnetic field signal is positive.
.	-8000--+8000		The S2-S15 magnetic field value ranges from -8000--+8000, the N pole magnetic field signal is negative, and the S pole magnetic field signal is positive.
1032	-8000--+8000	S16 magnetic field strength value	The S16 magnetic field value ranges from -8000--+8000, the N pole magnetic field signal is negative, and the S pole magnetic field signal is positive.

1014 Register data

Data	S16 (1Byte)							
Hexadecimal	0x 00							
Binary	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	S16
Description	A signal point is displayed as 1, and no signal is displayed as 0							

1015 Register data

- Low 8 bits

Data	S1-S7 (1Byte)							
Hexadecimal	0x 00							
Binary	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	S7	S6	S5	S4	S3	S2	S1	Invalid
Description	A signal point is displayed as 1, and no signal is displayed as 0							

- High 8 bits

Data	S8-S15 (1Byte)							
Hexadecimal	0x 00							
Binary	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	S15	S14	S13	S12	S11	S10	S9	S8
Description	A signal point is displayed as 1, and no signal is displayed as 0							

Prompt

1) Fork road selection command must be sent at position 1 before the fork road junction. The state will be maintained after the status data is sent once, and it will be updated after receiving the fork road selection command again.

8 FAULT STATUS

8.1 TROUBLESHOOTING

When this product has abnormal faults and cannot operate normally, please refer to the fault list for troubleshooting.

Failure phenomenon	Check and confirm	Treatment measures
LED does not light up	Check whether the power supply voltage is normal Check whether the 24V and GND wire sequence is correct	Give the correct voltage power supply Correct the line sequence

Signal is not continuous	Check whether the set induction polarity matches the magnetic stripe polarity Whether the distance between the sensor and the magnetic strip is less than 15mm	Adjust configuration parameters Adjust the installation position
No signal	Whether the installation height exceeds 50mm Check whether the set induction polarity matches the magnetic stripe polarity	Adjust configuration parameters Adjust the installation position

9 AFTER SALE

9.1 WARRANTY PERIOD

CNS-MGS-160N provides a limited time warranty. During the warranty period, if the product cannot be used normally due to quality problems, design defects, etc., we will carry out after-sales maintenance for free.

- Warranty period: 2 years from sale.

9.2 WARRANTY SCOPE

- If the product is within the scope of the warranty during the warranty period, we will repair or replace it for free
- The product warranty and after-sales service are only limited to mainland China
- The product cannot be used normally when it is out of the box due to transportation
- Failure to work normally caused by damage to the product's own components
- Product design defects can not be used normally

9.3 EXEMPTION SCOPE

Please pay attention to the following conditions during the use of the product, we will not provide free after-sales and warranty.

- Failure to install the product according to the instructions correctly, causing damage to the product
- Use this product under unsuitable environments and conditions, causing product damage
- Damage to the product due to non-compliance with the product specification
- Disassemble or repair the product without the permission of the company
- Product damage caused by irresistible external forces such as natural disasters and fires

9.4 TECHNICAL SUPPORT

Company website: www.hinson-xs.com

Wechat: 13928672909

WhatsApp: +86 13928672909