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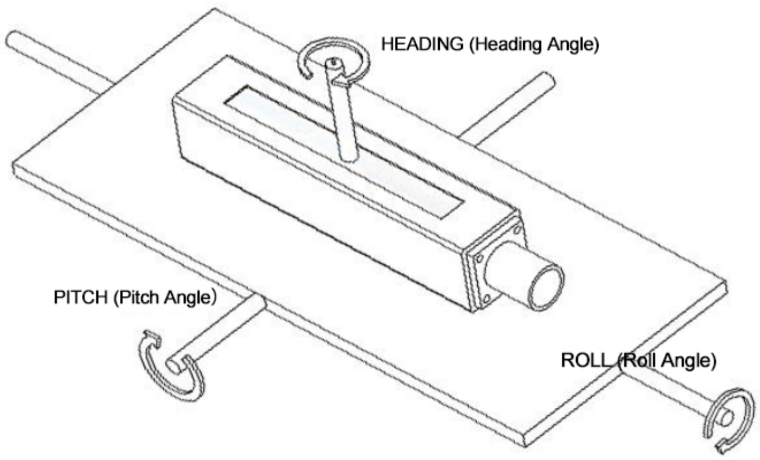
HCM365 3D Electronic Compass Sensor User Manual



1、 Product Characteristics

The HCM365 is a high-precision, all-attitude 3D electronic compass. It employs a self-developed hard and soft iron calibration algorithm, enabling it to provide high-precision heading information across a 360° roll and +/-90° tilt range. Its compact size and low power consumption make it ideal for power- and size-sensitive measurement systems.

The HCM365 outputs precise attitude data for its carrier, making it suitable for systems with full-range rotation. This product features hard magnetic, soft magnetic, and tilt compensation, providing high-precision, calibrated compass measurements. The HCM365 integrates a patented three-axis fluxgate technology, calculating heading in real-time via a central processing unit and using a three-axis accelerometer to compensate for tilt angles, ensuring accurate heading data even in extremely harsh environments. The HCM365 is compact and consumes little power, making it widely used in oil well logging, antenna pointing, vehicle navigation, attitude control systems, and many other fields.

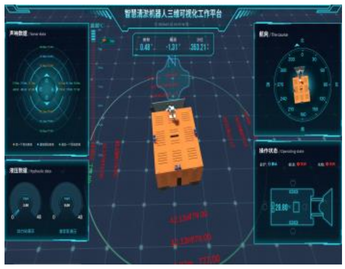
2、Product Performance

- Heading: 0-360°, all attitudes
- Accuracy: Heading 0.3-5°, Tilt 0.1°
- Operating Voltage: DC +5V (DC +9~36Vcustomizable)
- Operating Current: 40mA
- Protection Rating: IP67 (IP68 customizable)
- Features hard magnet, soft magnet, and tilt compensation
- Output: RS232/RS485/TTL/RS422 (optional)
- Wide operating temperature: -40 ~ +85℃
- Dimensions: (113*20*20mm) (customizable)

3. Product Application

- Mobile communication equipment
- Petroleum geological logging
- Underwater navigation
- Marine surveying
- Ship navigation attitude measurement
- AGV vehicle tracking
- Tilt monitoring
- Satellite solar antenna positioning
- Unmanned aerial vehicles
- GPS navigation





Product Ordering Information

HCM36□ —— (□ □ □)

Housing encapsulation

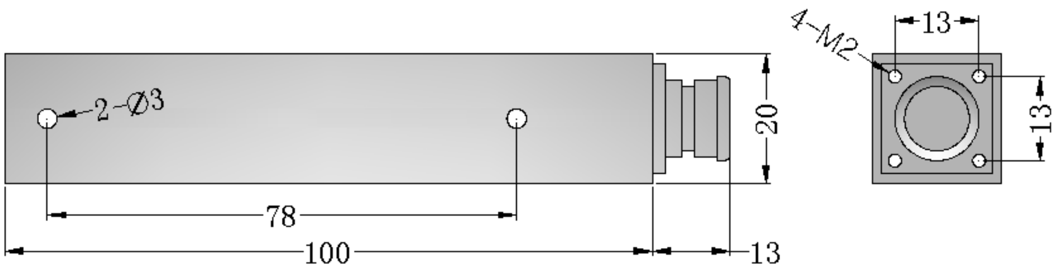
- 5 : Standard housing package
- 0 : OEM Without encapsulation

Output interface

- 232 : RS232 interface
- 485 : RS485 interface
- TTL : USART TTL
- 422 : RS422 interface

For example: HCM365 (RS232): Full attitude 3D/with encapsulation/RS232 output; horizontal installation (when the compass is placed horizontally, the roll and pitch angle outputs are zero degrees) is the default. It needs to be installed vertically downwards with the connector facing down (when the compass is placed vertically downwards, the roll and pitch angle outputs are zero degrees). Please make a note when ordering.

Product Dimensions



Product dimensions: L113*W20*H20MM.

Default horizontal installation: During installation, the sensor mounting surface should be parallel to the target surface. Please refer to the rotation diagram for installation instructions. For other installation methods, please refer to the "Product Installation Method" diagram and specify your requirements when ordering.

Mechanical properties

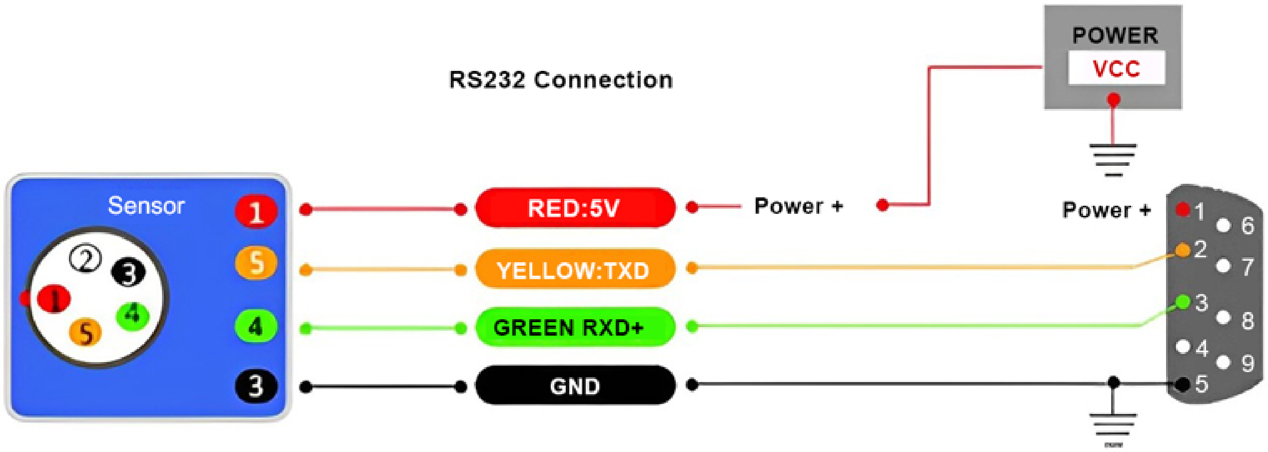
Connector	Lead cable (1.5m) or waterproof aviation socket (customizable)
Protection rating	IP67
Housing material	Aluminum alloy, brushed anodized
Mounting	Two M3 screws

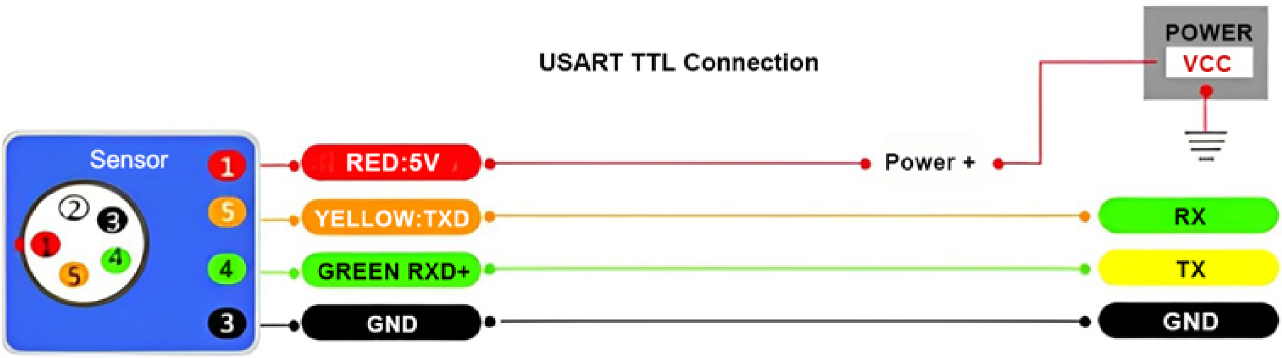
Product performance indicators

Compass heading parameters	Heading accuracy	0.3~0.5° (RMS, Pitch<85°)
	Resolution	0.1°
	Repeatability	0.05°
Compass tilt parameters	Pitch accuracy	0.1°
	Roll accuracy	0.1° (Pitch<65°)
		0.2° (Pitch<80°)
		0.5° (Pitch<86°)
	Tilt resolution	0.01°
	Tilt range	Pitch±90°; Roll 360°
Calibration	Hard iron calibration	√
	Soft iron calibration	√
	Tilt calibration	√
Physical characteristics	Dimension	L113 x W20 x H20 (mm)
	Weight	110g
	RS-232/RS485 interface connector	5 pin aviation plug
Interface characteristics	Startup delay	<50ms
	Maximum sampling rate	50 times/second
	RS-232 communication rate	2400~19200 baud rate
	RS-485 communication	Optional
	TTL communication	Optional
	Output format	Hexadecimal
Power supply	Supported voltage	DC+5V(9~36V)
	Maximum current	40mA
	Operating mode	30mA
Environment	Storage range	-40℃--+125℃
	Operating temperature	-40℃--+85℃
	Vibration resistance	3000g

Electrical Connection

Line color / function — Output interface	RED	WHITE	BLACK	GREEN	YELLOW
	1	2	3	4	5
RS232	VCC	NC	GND	RXD	TXD
RS485	VCC	NC	GND	(B、D-)	(A、D+)
TTL	VCC	NC	GND	RXD	TXD

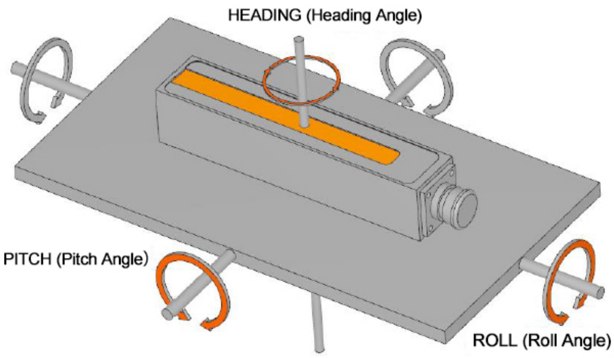




Electrical Connection

Line color / function — Output interface	RED	BLACK	GREEN	YELLOW	WHITE	BROWN
RS422	1	2	3	4	5	6
	VCC	GND	RXD- (B-)	RXD+ (A+)	TXD+ (A+)	TXD- (B-)

Measurement and Installation



Although the HCM365 can compensate for magnetic interference, users should choose an environment with minimal magnetic interference for installation and use. Keep the HCM365 away from iron, nickel, magnets, engines, and other magnetic materials as much as possible. If such magnetic media are present, maintain a distance of at least 0.5 meters. To ensure optimal measurement results, use non-magnetic screwdrivers and non-ferrous screws during installation. Strictly avoid placing magnets, motors, or other strong magnetic materials within 10cm of the compass, as this may cause irreversible degradation of the compass's measurement accuracy.

Each HCM365 electronic compass comes with a 1.6-meter cable; cable length is optional. While the HCM365 can compensate for magnetic deviations in stable magnetic environments, it cannot compensate for varying magnetic interference. For example, a DC-powered wire generates a magnetic field; if the DC current changes, the magnitude of the magnetic field will also change. Batteries are another source of varying interference. The magnetic field environment is different for each installation location; users must assess the feasibility of installation under that operating environment.

The HCM365's heading accuracy can reach 0.3~0.5°, which has been rigorously verified and is beyond doubt. Scientific testing methods are equally crucial. Our recommended testing method is to mount the HCM365 electronic compass on a vertically erected aluminum (or other non-magnetic material) rod for heading accuracy measurement (the rotating rod should be perpendicular to the rotating platform to minimize interference from large external magnetic fields).

Calibration Method

Calibration prerequisites:
1): The test compass does not achieve the required accuracy.
2): The compass installation environment has magnetic field interference. This interference is fixed, and the distance between this interfering magnetic field and the compass will not change after installation (e.g., the compass is mounted on an iron material; because iron will have magnetic field interference, the iron and compass need to be rotated together for calibration. Furthermore, this iron will not separate from the compass during use (it must be fixed in place). If they separate, recalibration is required.

This electronic compass has undergone sensor calibration in a non-magnetic environment at the factory, so no additional environmental calibration is required when using it in a non-magnetic environment. However, when ferrous or alloy materials (such as iron, nickel, etc.), batteries, microphones, high-current coils, or motors are present around the compass, the geomagnetic field around the compass will be distorted (including hard magnetic interference and soft magnetic interference: hard magnetic refers to a constant magnetic field, such as the magnetic field generated by a permanent magnet; soft magnetic refers to a magnetic field that can be altered by magnetization, such as silicon steel sheets). In such cases, we recommend environmental calibration. During environmental calibration, the relative position of surrounding interfering materials to the compass should remain unchanged during the compass's rotation (i.e., rotate with the compass). During environmental calibration, the compass can learn the surrounding interfering magnetic field environment and compensate for the effects of hard and soft magnetic fields, improving the compass's accuracy.

【Note】 The operator must not have a mobile phone, keys, or any metal or electrically powered devices that could affect the electromagnetic field during environmental calibration.

1. Manual Calibration

The principle of manual calibration is to rotate the compass to a known position where it will be used to collect more calibration points. For example, if you know the compass will be used around 0 degrees roll and 30 degrees tilt, then during calibration, place the compass around these positions and select more calibration points, while selecting fewer calibration points at other tilt and roll angles. If the azimuth position is unknown, select azimuth points evenly. After rotating to a certain position, manually send the command to save the calibration points. You can collect as many calibration points as needed (minimum 12 points). The compass will compensate for surrounding interference magnetic fields based on the data points collected at different orientations.

Calibration Procedure:

1). Fix the electronic compass in the operating environment. During calibration, the compass and any other devices affecting it need to be rotated together.

2). Send the following calibration command in hexadecimal format: **68 04 00 65 69**, and then click the Start Calibration button.

3). After rotating to a suitable orientation, send the command **68 04 00 67 6B** to save the calibration points.

4). After successful sampling, the compass will return the command **68 04 00 66 + 15 bytes of magnetic field value + 1 byte of valid point count + 1 byte of checksum**. The valid point count refers to the number of magnetic azimuth values collected by the compass for calibration calculation.

5). To exit calibration, send a stop calibration command in hexadecimal format: **68 04 00 12 16.**

6). If calibration is complete, save the calibration using the hexadecimal command **68 04 00 09 0D**. If saving the calibration data is successful, it will return the hexadecimal command: **68 09 00 89 FitErr YY** (see the command list below for details). **FitErr** is the calibration error; a smaller value is better. If this value > 10, recalibration is required. **YY** is the checksum.

2. Automatic Omnidirectional Calibration

The principle of automatic omnidirectional calibration is for the user to rotate the compass to as many attitude positions as possible. The compass's tilt, pitch, and azimuth combinations cover all attitudes. The compass will automatically collect appropriate data points; the more data points collected, the more accurate the calibration. A maximum of 96 calibration points can be collected. This method is theoretically the most accurate calibration method across all attitudes.

Calibration Procedure:

1). Fix the electronic compass in the operating environment. During calibration, the compass and other devices affecting it need to be rotated together.

2). Place the compass in a horizontal position.

3). Send the following calibration command in hexadecimal format: **68 04 00 08 0C.**

4). Rotate the compass around the z-axis (the vertical direction) for 2-3 revolutions. Use variable speed rotation as much as possible during the rotation, such as: acceleration -> deceleration -> acceleration -> deceleration... The time for one revolution can be controlled between 10 and 15 seconds.

5). Rotate the compass around the x-axis and y-axis slowly and almost uniformly, 1-2 revolutions around each axis, with one revolution taking approximately 10 seconds.

6). Rotate the compass randomly, slowly and almost uniformly, ensuring the rotation axis does not coincide with the axes in steps 4 and 5, and that the compass orientation covers all directions.

7). After successful sampling, the compass will return the command **68 04 00 66 + 15 bytes of magnetic field value + 1 byte of valid point count + 1 byte of checksum**. The valid point count refers to the number of magnetic azimuths collected by the compass for calibration calculation.

8). To exit calibration, send a stop calibration command in hexadecimal format: **68 04 00 12 16**.

9). If calibration is complete, save the calibration using the hexadecimal command **68 04 00 09 0D**. If the calibration data is saved successfully, a hexadecimal command will be returned: **68 09 00 89 FitErr YY (see the command list below for details)**. **FitErr** represents the calibration error; a smaller value is better. If this value is greater than 10, recalibration is required. **YY** is the checksum.

3. Automatic 12-Azimuth Small Tilt Calibration

This calibration method is suitable for applications where the roll angle change is very small (<5°). After starting the calibration, the compass needs to be turned to the attitude position shown in the table below. Once the compass is in the appropriate position, it will automatically collect data points. The compass can collect data points in up to 12 azimuths.

Serial Number	Heading(°)	Pitch(°)	Roll(°)
1	0	-5~+5	-5~+5
2	90	-5~+5	-5~+5
3	180	-5~+5	-5~+5
4	270	-5~+5	-5~+5
5	30	>+45	-5~+5
6	120	>+45	-5~+5
7	210	>+45	-5~+5
8	300	>+45	-5~+5
9	60	<-45	-5~+5
10	150	<-45	-5~+5
11	240	<-45	-5~+5
12	330	<-45	-5~+5

Calibration Procedure:

1). Fix the electronic compass in its operating environment. During calibration, the compass and any other devices affecting it must be rotated together.

2). Send the following calibration command in hexadecimal format: **68 04 00 64 68**, and then click the "Start Calibration" button.

3). Rotate the compass to the appropriate orientation as required.

4). After successful sampling, the compass will return the command **68 04 00 66 + 15 bytes of magnetic field value + 1 byte of valid point count + 1 byte of checksum**. The valid point count refers to the number of magnetic azimuth values collected by the compass for calibration calculation.

5). To exit calibration, send the "Stop Calibration" command in hexadecimal format: **68 04 00 12 16**.

6). If calibration is complete, save the calibration using the hexadecimal command **68 04 00 09 0D**. If the calibration data is saved successfully, a hexadecimal command will be returned: **68 09 00 89 FitErr YY** (see the command list below for details). **FitErr** represents the calibration error; a smaller value is better. If this value is greater than 10, recalibration is required. **YY** is the checksum.

4. Plane Calibration

This calibration method is suitable for compasses used only in a plane. After starting calibration, slowly and uniformly rotate the compass one full circle within the plane. During rotation, the compass will automatically sample appropriate data; the compass can collect a maximum of 12 points.

Calibration Procedure:

1). Fix the electronic compass in the operating environment. During calibration, the compass and any other devices affecting it must be rotated together.

2). Place the compass in a horizontal position.

3). Send the following calibration command in hexadecimal format: **68 04 00 60 64,** and then click the Start Calibration button.

4). Slowly and uniformly rotate the compass one full circle within the plane as required.

5). After successful sampling, the compass will return the command **68 04 00 66 + 15 bytes of magnetic field value + 1 byte of valid point count + 1 byte of checksum**. The valid point count refers to the number of magnetic azimuth points collected by the compass for calibration calculations.

6). To exit calibration, send a stop calibration command in hexadecimal format: **68 04 00 12 16**.

7). If calibration is complete, save the calibration using the hexadecimal command **68 04 00 09 0D**. If saving the calibration data is successful, it will return the hexadecimal command: **68 09 00 89 FitErr YY** (see the command list below for details). **FitErr** represents the calibration error; a smaller value is better. If this value > 10, recalibration is required. **YY** is the checksum.

The four calibration methods provided here are characterized in the table below. You can choose the appropriate calibration method based on your actual usage:

Calibration Methods	Suitable calibration scenarios	Calibration Evaluation	Application Limitations
Manual Calibration	Definitely define the pitch and roll ranges, and select the most commonly used attitude points for calibration.	Best results were achieved at the selected calibration points.	Inappropriate selection of calibration points may seriously affect the calibration results.
Automatic Omnidirectional Calibration	The compass and corresponding fixing mechanism allow for omnidirectional rotation, and are suitable for complex magnetic field environments.	Overall results were good. Highest accuracy was achieved in complex magnetic field environments.	Inappropriate calibration point selection may severely affect calibration results.
12-Aspect Planar Calibration	The compass rotates only in a plane, with pitch and roll angles both <2°.	Best results were achieved during in-plane rotation.	Pitch and roll angles should be <2° during use.
Automatic 12-Aspect Small Tilt Calibration	The compass roll angle is <5°, while pitch can move over a wide range.	Best calibration results were achieved with a roll angle < 5°.	Pitch angle must be >45°.

Device Model: Select the corresponding product model.
Serial Port: Select the COM port corresponding to the device.
Device Address: Enter the current address code of the sensor. The factory default is 00.
Baud Rate: Select the current baud rate of the sensor. The factory default is 9600.
Status Monitoring: Connect to the serial port and click Start to collect data.
Status Settings: Configure the sensor's functional parameters.

Communication Protocol

If you wish to access the compass directly, you can do so through the compass's communication protocol, allowing for easy integration into your system.

1. Data Frame Format: (8 data bits, 1 stop bit, no parity, default rate 9600)

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)		(1byte)
0x68					

Data Format: Hexadecimal

Identifier: Fixed at **0x68**

Data Length: Length from the data length to the checksum (inclusive)

Address Code: Address of the acquisition module, default is **0x00**

Data Fields: Varies depending on the content and length of the command word.

Checksum: The sum of the data length, address code, command word, and data fields, without considering carry (Note: The checksum will change when the command word or data field changes. Please change the checksum accordingly when you change the data field.)

2. Command Format

2.1 Read PITCH Axis Angle (Tilt Angle)

Send Command: 68 04 00 01 05

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(0byte)	(1byte)
0x68			0x01		

Response Command:

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(3byte)	(1byte)
0x68			0x81	SXXX.YY	

Note: The data field is a 3-byte return angle value, in compressed BCD code. S is the sign bit (0 positive, 1 negative), XXX is a two-digit integer value, and YY is a two-digit decimal value. Other axis data are the same. For example, 10 26 87 represents -26.87°.

2.2 Read ROLL Axis Angle (Roll Angle/Gravity Tool Face Angle)

Send Command: 68 04 00 02 06

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(0byte)	(1byte)
0x68			0x02		

Response Command:

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(3byte)	(1byte)
0x68			0x82	SXXX.YY	

2.3 Read HEADING Axis Angle (Azimuth Angle)

Send Command: 68 04 00 03 07

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(0byte)	(1byte)
0x68			0x03		

Response Command:

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(3byte)	(1byte)

0x68			0x83	SXXX.YY	

2.4 Read Magnetic Tool Face Angle

Send Command: 68 04 00 13 17

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(0byte)	(1byte)
0x68			0x13		

Response Command:

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(3byte)	(1byte)
0x68			0x73	SXXX.YY	

2.5 Read PITCH, ROLL, and HEADING Axis Angles

Send Command: 68 04 00 04 08

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(0byte)	(1byte)
0x68			0x04		

Response Command:

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(9byte)	(1byte)
0x68			0x84		

Note: The data field contains 9 bytes representing the pitch, roll, and heading angle values, in compressed BCD code. Each group consists of three bytes. For example, the returned command is 68 0D 00 84 10 26 80 00 33 65 03 13 71 66, where Pitch is 10 26 80, Roll is 00 33 65, and Heading is 03 13 71. For each angle return value, the three bytes are formatted as SX XX.YY, where S is the sign bit (0 for positive, 1 for negative), XXX is the three-digit integer value, and YY is the decimal value.

In this example, the corresponding angle readings are -26.8°, 33.65°, and 313.71°. For example, t**he send and return commands for reading all Pitch, Roll, and Heading values are as follows:**

68 04 00 04 08

Checksum: The sum of all bytes in the command word excluding the first byte 0x68. The external checksum is modulo 255; in this example, 0x8 = 0x04 + 0x00 + 0x04.

Command code: 0x04 represents reading Pitch, Roll, and Heading.

Device address: Can be set; factory default is 0x00.

Command length: The length of all bytes in the command excluding the first 68 bytes; in this example, it is "04 00 04 08", 4 bytes long.

Command beginning: All send and return commands always begin with 0x68.

The corresponding readings for the three angles in this example are: **-26.8°, 33.65°, 313.71°。**

68 0D 00 84 10 26 80 00 33 65 03 13 71 66

The last byte is the sum of all data except the first number (0x68). If there is a carry, the least significant bit is used.

Heading reading: angle format is the same as Pitch

Roll reading: angle format is the same as Pitch.

Pitch reading: compressed BCD code, format SX XX. YY: **The first** byte, 'S', is the sign bit; 0 indicates a positive angle, 1 indicates a negative angle. **The second** bit of the first byte (×) and the second byte (XX) are the integer bits of the angle, in compressed BCD code. **The third** byte (YY) is the decimal part of the angle, also in compressed BCD code.

Command code: 0x84 represents a return to Pitch, Roll, or Heading.

Device address: Can be set; default is 0x00.

Command length: The length of the command word excluding the initial 0x68 bytes. In this example, "0D 00 84 10 26 80 02 33 65 31 13 80 A5" is 13 bytes long.

Command prefix: All send and return commands always begin with 0x68.

2.6 Set Magnetic Declination

Send Command: 68 06 00 06 02 08 16

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(2byte)	(1byte)
0x68			0x06	SXX.Y*	

*S indicates the sign, 0 for positive, 1 for negative, XX is a two-digit integer, and Y is a one-digit decimal. For example, 02 08 represents +20.8°. The checksum of this command is 16 (hexadecimal). 16 = 06+00+06+02+08. If the magnetic declination is set to -3.2°, the command is 68 06 00 06 10 32 4E, where 4E = 06+00+06+10+32. The same logic applies when setting other magnetic declinations.

Response Command:

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(1byte)	(1byte)
0x68			0x86	0x00: Set Successfully 0xFF: Set Failed	

2.7 Read Magnetic Declination

Send Command: 68 04 00 07 0B

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(0byte)	(1byte)
0x68			0x07		

Response Command:

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(2byte)	(1byte)
0x68			0x87	SXX.Y*	

* The format of SX XY is the same as the format of the magnetic declination to be set in command 2.5.

2.8 Start Calibration

Send Command: 68 04 00 08 0C

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(0byte)	(1byte)
0x68			0x08		

Response Command:

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(1byte)	(1byte)
0x68			0x88	0x00: Set Successfully 0xFF: Set Failed	

*This command corrects for deviations in the magnetic field around the compass's operating environment. Each compass generally needs to be calibrated once when used in a new environment to avoid the magnetic field at the measurement site affecting measurement accuracy. After calibration, a save calibration command must be issued (see 2.8).

2.9 Save Calibration

Send Command: 68 04 00 09 0D

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(0byte)	(1byte)
0x68			0x09		

Response Command: 68 09 00 89 00 00 80 3F 0C E9

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(5byte)	(1byte)
0x68			0x89	N*	

*This return command returns the fitting error and the number of valid calibration points obtained during the calibration process. The 5-byte data field includes 4 bytes of floating-point representation of the calibration error and 1 byte of integer representation of the number of calibration points. For example, the data field in the example is: 00 00 80 3F 0C, where 00 00 80 3F is the floating-point number 1, and 0C is 12.

2.10 Stop Calibration

Send Command: 68 04 00 12 16

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(0byte)	(1byte)
0x68			0x12		

Response Command:

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(1byte)	(1byte)
0x68			0x72	0x00: Set Successfully 0xFF: Set Failed	

2.11 Acquire calibration point (command sent only)

Send Command: 68 04 00 67 6B

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(0byte)	(1byte)
68	04	00	67		

Response Command:

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(12byte)	(1byte)
0x68	14		0x26	N*	

* This is calibration point information and has no practical significance.

2.12 Clear calibration data

Send Command: 68 04 00 10 14

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(0byte)	(1byte)
0x68			0x10		

Response Command:

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(1byte)	(1byte)
0x68			0x90	0x00: Set Successfully 0xFF: Set Failed	

2.13 Set communication rate

Send Command: 68 05 00 0B 03 13

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(1byte)	(1byte)
0x68			0x0B		

Response Command:

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(1byte)	(1byte)
0x68			0x8B	0x00: Set Successfully 0xFF: Set Failed	

Note: 0x00 represents 2400, 0x01 represents 4800, 0x02 represents 9600, 0x03 represents 19200, 0x04 represents 115200, 0x05 represents 14400, 0x06 represents 38400, and 0x07 represents 57600. The default value is 0x02:9600. If the baud rate is set to 19200, the command is 68 05 00 0B 03 13, where 13 = 05 + 00 + 0B + 03. The same logic applies when setting other baud rates.

Note: After setting the baud rate, the device will return a response command at the original baud rate. After this, the baud rate setting takes effect, and the host computer needs to make corresponding baud rate changes to re-establish communication with the device.

2.14 Set angle mode

Send Command: 68 05 00 0C 00 11

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(1byte)	(1byte)
0x68			0x0C	0x00: Question-Answer 0x01: 5Hz Data Rate 0x02: 15Hz Data Rate 0x03: 25Hz Data Rate 0x04: 35Hz Data Rate 0x05: 50Hz Data Rate	

*The default output mode is 00; if the device is in non-acknowledgment mode, there will be a 10-second idle time after each power-on restart without sending data, and after 10 seconds, it will start continuously outputting data.

Response Command:

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(1byte)	(1byte)
0x68			0x8C	0x00: Set Successfully 0xFF: Set Failed	

Note: 5Hz Data Rate means automatically outputting data 5 times per second, and so on. When using a product with an RS485 interface, because the RS485 interface operates in half-duplex mode, it may not be able to effectively receive input commands when the product is automatically outputting data. In this case, you may need to repeatedly send commands for the product to receive them. Therefore, if you need to send commands to interact with the product while using a RS485 interface product, it is recommended to set the product to work in question-and-response mode. Additionally, when the product is set to automatic output mode, there will be no output for 10 seconds after power-on, during which time the product can effectively receive external setup commands.

2.15 Set module address

Send Command: 68 05 00 0F 01 15

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(1byte)	(1byte)
0x68			0x0F	XX Module Address	

Note: The sensor's default address is 00.

Response Command:

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(1byte)	(1byte)
0x68			0x8F	0x00: Set Successfully 0xFF: Set Failed	

1. If multiple sensors are connected to a single bus, such as RS485, each sensor must be assigned a different address to achieve separate control and response speeds.
2. After successfully changing the address, all subsequent commands and response data packets must use the new address code to take effect; otherwise, the sensor will not respond to the command.
3. The XX module address ranges from 00 to EF.

2.16 Query module address

Send Command: 68 04 00 1F

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(0byte)	(0byte)
68	04	00	1F		

Note: Checksum bits are not considered when querying the module address.

Response Command:

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(1byte)	(1byte)
0x68			0x1F		

2.17 Update flash (save settings)

Send Command: 68 04 00 0A 0E

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(0byte)	(1byte)
0x68			0x0A		

Response Command:

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(1byte)	(1byte)
0x68			0x8A	0x00: Set Successfully 0xFF: Set Failed	

* For various parameter settings, if a save setting command is not sent after setting, these settings will be lost after power failure.

2.18 Restore factory settings

Send Command: 68 04 00 0E 12

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(0byte)	(1byte)
0x68			0x0E		

Response Command:

Identifier	Data Length	Address Code	Command Word	Data Field	Checksum
(1byte)	(1byte)	(1byte)	(1byte)	(1byte)	(1byte)
0x68			0x8E	0x00: Set Successfully 0xFF: Set Failed	