EC1000

High Performance 3D Electronic Compass

Main Features

- 3D Angle Output (Heading, Pitch, Roll)
- Hard/Soft Magnetic Compensation, Tilt Compensation
- Heading Accuracy: ±2° RMS (25°C, Any Tilt Angle)
- Pitch and Roll Accuracy: ±0.1° (25°C, Full Range)
- Wider Input Voltage: 5~24VDC (up to 36VDC)
- Interface: RS232 (Default) or RS485 (Optional)
- Wide Working Temperature: -40~+85ºC
- Small Size: 113*20*20mm

EC1000 digital compass is a high-performance, low-power consumption, tilt-compensated electronic compass module that provides industry-leading heading accuracy. EC1000 adopts hard and soft magnetic calibration algorithm, uses special calibration technology and provides high accuracy inclination signal, and it has perfect cross connect performance.

EC1000 integrates 3-axis magneto-inductive sensors, 3-axis MEMS accelerometer and central processing unit to calculate the heading data in real time and compensate the heading when it has inclination angle. EC1000 enjoys compact size, high accuracy, low power consumption, which is widely used in antnna poiting, vehicle, system integration fields.

- ✓ **12-Step Quality Control, Super Reliability, More Functions**
- ✓ **Adopting Original Big Brand Component, High-class Material, Competitive Price**
- ✓ **Real Actual Precise after Calibration, Perfect Performance**
- ✓ **Successful Applications in Tens of Fields, More than 1000 Customers are Using**

Typical Applications

Thermal Imagers

Artillery Launching System

Antenna Poiting

Ship Platform

Super Reliability & Performance

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Focus on MEMS Measurement & Control Technologies, Products include:

MEMS Acc | MEMS Gyro | IMU | Vertical Gyro | AHRS
INS | GNSS/INS | E-compass | Inclinometer | FOG

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Technical Specifications

Technical Specs		
Parameters	**Value**	**Comments**
Heading		
Range	0~360°	
Accuracy	2.0° RMS	25°C, any tilt angle
Resolution	0.1°	
Tilt Angle		
Range	roll: ±180°, pitch: ±85°	
Accuracy (Full Range)	0.1°	25°C
	0.5°	-40~+70°C
Resolution	< 0.01°	
Hard Iron Calibration	Yes	
Soft Iron Calibration	Yes	
Tilt Calibration	Yes	
Electronical Performance		
Input Voltage	5~24VDC	
Current	11mA@12VDC	
Power Consumption	<0.2W	
Startup Time	≤500ms	
Environment Condition		
Working Temperature	-40~+85°C	
Protection Level	IP67	
Communication Protocol		
Interface	RS232 or RS485	optional
Baud Rate	2400~115200	settable
Maximum Output Rate	20Hz	ODM supported
Physical Parameter		
Dimensions (L x W x H)	113*20*20	mm
Weight	80	grams

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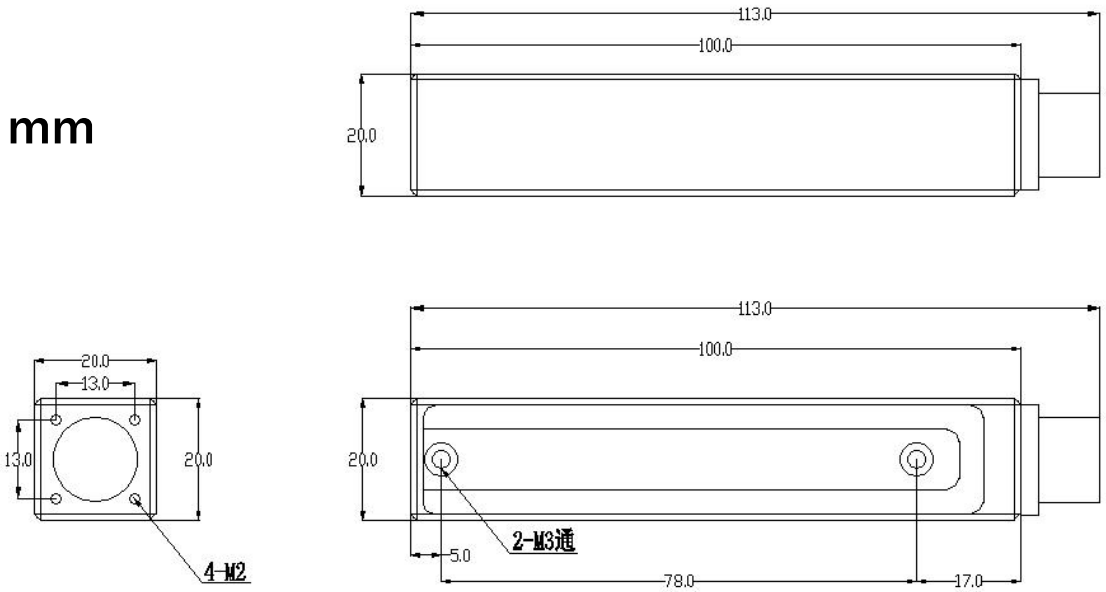
Pins Definition

No.	Line Color	Name	Comments
1	Red	Vcc	Power supply positive pole (5~24VDC)
2	Black	GND	Power GND
3	White	RS232-RX/RS485+	RS232 data receiving/RS485 positive pole
4	Green	RS232-TX/RS485-	RS232 data transmitting/RS485 negative pole

Dimension & Package

mm



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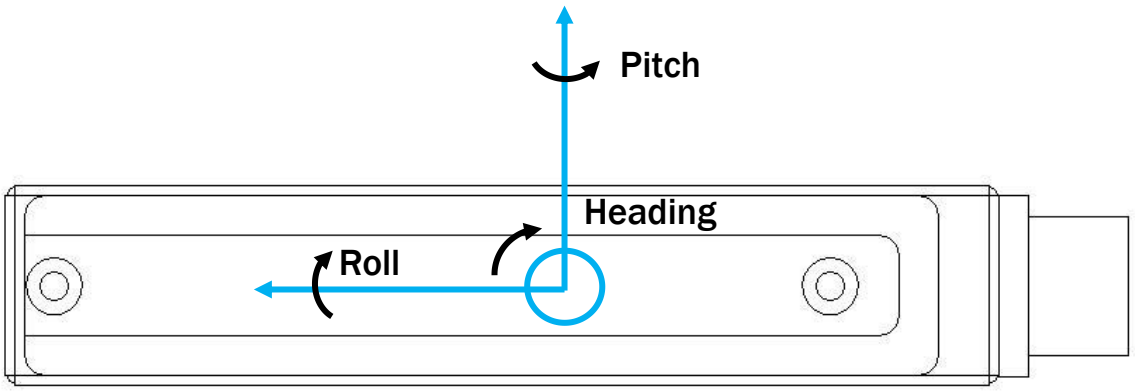
Axis/Angle Definition



Remarks:

- Arrow direction indicates positive angle direction
- Heading angle that directs true north is 0°
- Heading angle that directs true south is 180°

Installation

Though SkyMEMS E-Compass can compensate magnetic interference, please install and use the compass in the environment that has no or very little magnetic interference. And please keep the compass far away from iron, nickel, magnetic-iron, motors and other types of magnetic materials.

Be sure that keeping strong magnetic materials (such as magnetic iron and motors) away from the compass, which will damage the compass' accuracy, and the damage can't be recovered.

SkyMEMS E-Compass has done calibration in the factory, if using it in the environment where there is no or less magnetic interference, it can be used without the environment calibration. It is better to do the magnetic calibration in the actual application. The calibration procedure please refers to "User Manual of SkyMEMS E-Compass Second Calibration Software".

Remarks: during the calibration, the operator should not have mobile phone, keys, and other material that can generate the magnetic field.

Communication Protocol

You may get direct access to the product through communication protocol (**RS232**), with which the product can be easily integrated into your system

1 Data Frame Format: (the default rate is 9600)

Send the Command:

Preamble Code (1 byte)	Data Length (1 byte)	Address (1 byte)	Command Code (1 byte)	Data Domain	Checksum (1 byte)
68	XX	XX	XX	XX	XX

Data format：Hexadecimal System

Preamble Code: 68 (fixed)

Data Length: the length from Data Length to Checksum (including Checksum)

Address: the module's address, the default address is 00)

Data Domain: the content and length of Data Domain will be different according to the different command.

Checksum: it is the sum of Data Length, Address, Command Code (command response), (No carry). for example, if the command is 68 06 00 06 02 08 16, so the checksum=06+00+06+02+08=16

2 Command Description

2.1 Read Angle of Pitch, Roll, Yaw

Send Command: 68 04 00 04 08

Preamble Code (1 byte)	Data Length (1 byte)	Address (1 byte)	Command Code (1 byte)	Data Domain	Checksum (1 byte)
68	04	00	04	-	08

Command response:

Preamble Code (1 byte)	Data Length (1 byte)	Address (1 byte)	Command Code (1 byte)	Pitch (3bytes)	Roll (3bytes)	Yaw (3 bytes)	Checksum (1 byte)
68	0D	00	84	SXXXYY	SXXXYY	SXXXYY	XX

Remarks: the datat domain is 9 bytes, they are representing Pitch, Roll, and Yaw. S is sign bit (0: positive, 1 negative) , XXX is 3 bit integer value, YY is decimal fraction, for example, if the command response is 68 0D 00 84 00 10 50 10 10 05 01 04 01 1C, it means that the pitch: +010.50°, roll: -010.05°, yaw: +104.01°

2.2 Set magnetic declination angle

Send Command: 68 06 00 06 02 08 16

Preamble Code (1 byte)	Data Length (1 byte)	Address (1 byte)	Command Code (1 byte)	Data Domain (2 bytes)	Checksum (1 byte)
68	06	00	06	SXXY	XX

Remarks: the datat domain is 2 bytes, SXXY, S is sign bit (0: positive, 1 negative) , XX is 2 bit integer value, YY is decimal fraction, for example, if the command response is 68 06 00 06 02 08 16, it means that the data domain is 02 08, it is +20.8degree.

Command response:

Preamble Code (1 byte)	Data Length (1 byte)	Address (1 byte)	Command Code (1 byte)	Data Domain (1 byte)	Checksum (1 byte)
68	05	00	86	00 (setting success) FF (setting failed)	8B 8A

Communication Protocol

2.3 Read magnetic declination angle

Send Command: 68 06 00 06 02 08 16

Preamble Code (1 byte)	Data Length (1 byte)	Address (1 byte)	Command Code (1 byte)	Data Domain (2 bytes)	Checksum (1 byte)
68	04	00	07	-	0B

Command response:

Preamble Code (1 byte)	Data Length (1 byte)	Address (1 byte)	Command Code (1 byte)	Data Domain (2 bytes)	Checksum (1 byte)
68	06	00	87	SXXY	XXXX

Remarks: the datat domain is the returned magnetic declination angle, 2 bytes, SXXY, S is sign bit (0: positive, 1 negative) , XX is 2 bit integer value, YY is decimal fraction, for example, if the command response is 68 06 00 87 02 08 97, it means that the magnetic declination angle is +20.8degree.

2.4 Set communication rate

Send Command: 68 05 00 0B 02 12

Preamble Code (1 byte)	Data Length (1 byte)	Address (1 byte)	Command Code (1 byte)	Data Domain (1 byte)	Checksum (1 byte)
68	05	00	0B	XX	XX

Remarks: the datat domain is 1 byte, XX is the baud rate option: 00 means 2400, 01 means 4800, 02 means 9600, 03 means 19200, 04 means 115200, the default is 02: 9600.

Command response:

Preamble Code (1 byte)	Data Length (1 byte)	Address (1 byte)	Command Code (1 byte)	Data Domain (1 byte)	Checksum (1 byte)
68	05	00	8B	00 (setting success) FF (setting failed)	90 8F

Communication Protocol

2.5 Set module address

Send Command: 68 05 00 0F 01 15

Preamble Code (1 byte)	Data Length (1 byte)	Address (1 byte)	Command Code (1 byte)	Data Domain (1 byte)	Checksum (1 byte)
68	05	00	0F	XX	XX

Remarks: the datat domain is address XX, the range is from 00 to FE; we reserved FF address as backup address, if forgetting the setting address, user can use FF to operate the module.

Command response:

Preamble Code (1 byte)	Data Length (1 byte)	Address (1 byte)	Command Code (1 byte)	Data Domain (1 byte)	Checksum (1 byte)
68	05	00	8F	00 (setting success) FF (setting failed)	94 93

2.6 Set output mode

Send Command: 68 05 00 0C 00 11

Preamble Code (1 byte)	Data Length (1 byte)	Address (1 byte)	Command Code (1 byte)	Data Domain (1 byte)	Checksum (1 byte)
68	05	00	0C	00 (QA mode) 01 (Auto mode)	11 12

Remarks: output mode: 00 is question and answer mode, 01 is output automatically (default)

Command response:

Preamble Code (1 byte)	Data Length (1 byte)	Address (1 byte)	Command Code (1 byte)	Data Domain (1 byte)	Checksum (1 byte)
68	05	00	8C	00 (setting success) FF (setting failed)	91 90

Communication Protocol

2.7 Query output mode

Send Command: 68 04 00 42 46

Preamble Code (1 byte)	Data Length (1 byte)	Address (1 byte)	Command Code (1 byte)	Data Domain (0 byte)	Checksum (1 byte)
68	04	00	42	-	46

Command response:

Preamble Code (1 byte)	Data Length (1 byte)	Address (1 byte)	Command Code (1 byte)	Data Domain (1 byte)	Checksum (1 byte)
68	05	00	C2	00	C7

Remarks: The data domain indicate the output mode : 00 is question and answer mode, 01 is output automatically.

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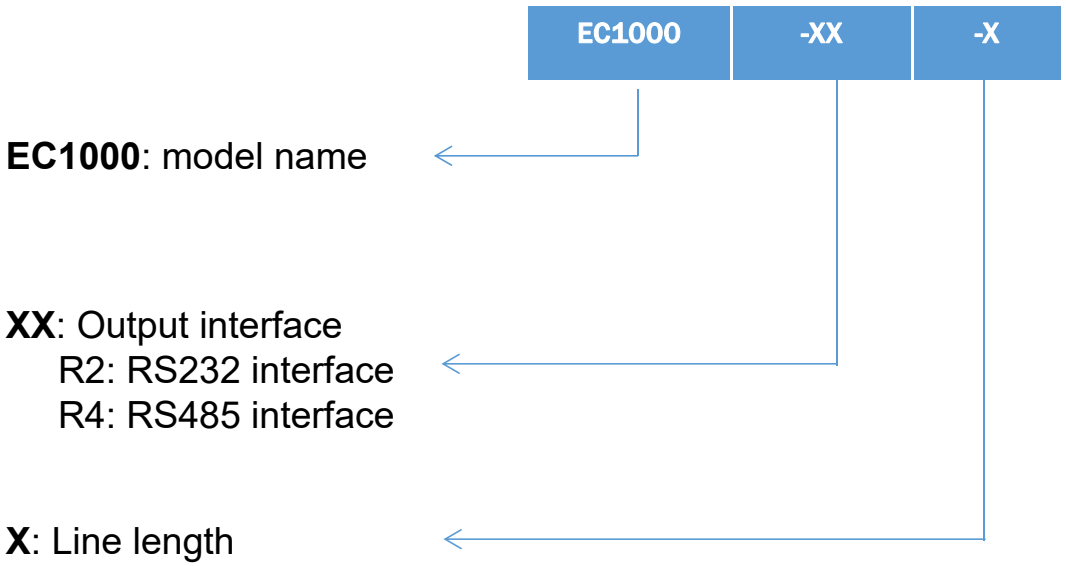
Order Information



For example, EC1000-R2-1 means that the EC1000 with RS232 interface and 1 meter length cable.