Electronic Inclinometer

User Manual

Marinelite

Nantong Saiyang Electronics Co., Ltd.

REVISION RECORD

Version	Revision Record	Date
01A	Initial Version	18. 09. 2025

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FOREWORD

Thank you for purchasing the EI9000/HEI9000 electronic inclinometer by Nantong Saiyang Electronics. This series of products adopts multi-axis sensor technology, conforms to the relevant performance standards of the IMO (International Maritime Organization), and provides accurate ship roll and pitch attitude information, supporting roll excess warning and roll digital and dial display.

- This manual is written in simplified grammar to meet the needs of international users.
- The operator of this equipment must read and comply with the instructions in this manual. Incorrect operation or maintenance may invalidate the warranty or cause personal injury.
- The copyright of this manual is owned by Nantong Saiyang Electronics Co., Ltd., and any part of this manual may not be copied without the written permission of this company.
- If this manual is lost or worn, please contact the dealer for replacement.
- No separate notice will be given if there are any changes to the content of this manual or the specifications of the equipment.
- The example screens (or illustrations) shown in this manual may differ from what you see on your display. The screens you see depend on your system configuration and device settings.
- Any modification to the equipment (including software) by personnel unauthorized by the company will invalidate the warranty.
- All brand and product names are trademarks, registered trademarks, or service marks of their respective holders.
- Dispose of this product in accordance with local industrial waste disposal regulations.

INTRODUCTION

Operating Principle

The electronic inclinometer is a high-performance three-axis motion attitude measurement system based on MEMS technology. When the sensor tilts, the component of gravitational acceleration along the sensing axis changes. The internal sensing elements detect this change and convert it into an electrical signal. By calculating the proportion of gravitational components on each axis, the tilt angle is determined. It includes a three-axis gyroscope and a three-axis accelerometer. By integrating high-performance sensors and a core algorithm engine for attitude dynamics, combined with a high-dynamic Kalman filter fusion algorithm, it provides high-precision, high-dynamic, and real-time compensation of attitude angles.
The EI9000/HEI9000 electronic inclinometer has obtained CCS certification. The electronic inclinometer not only provides ship roll and pitch attitude information to assist in the safe navigation and decision-making of the bridge system, and avoid the occurrence of dangerous situations, but can also be connected to the VDR system to store real-time ship attitude information. This device provides a roll limit alarm function, which can effectively remind the bridge system of the current ship's attitude information in real time.

Product Features

- 7-inch color LED display, with color-separated left and right side displays, alarm-filled display to effectively highlight attitude information.
- Combination of angle gauge display and numerical display for greater flexibility and convenience.
- Equipped with a high-precision capacitive touch screen, one-touch on/off for easy and safe operation.
- Integrated multi-channel NMEA0183 output, sound and light alarm, and alarm switch interface.
- Excellent industrial product design, stylish appearance, easy installation, maintenance-free, unaffected by water temperature and salinity.

Factors affecting

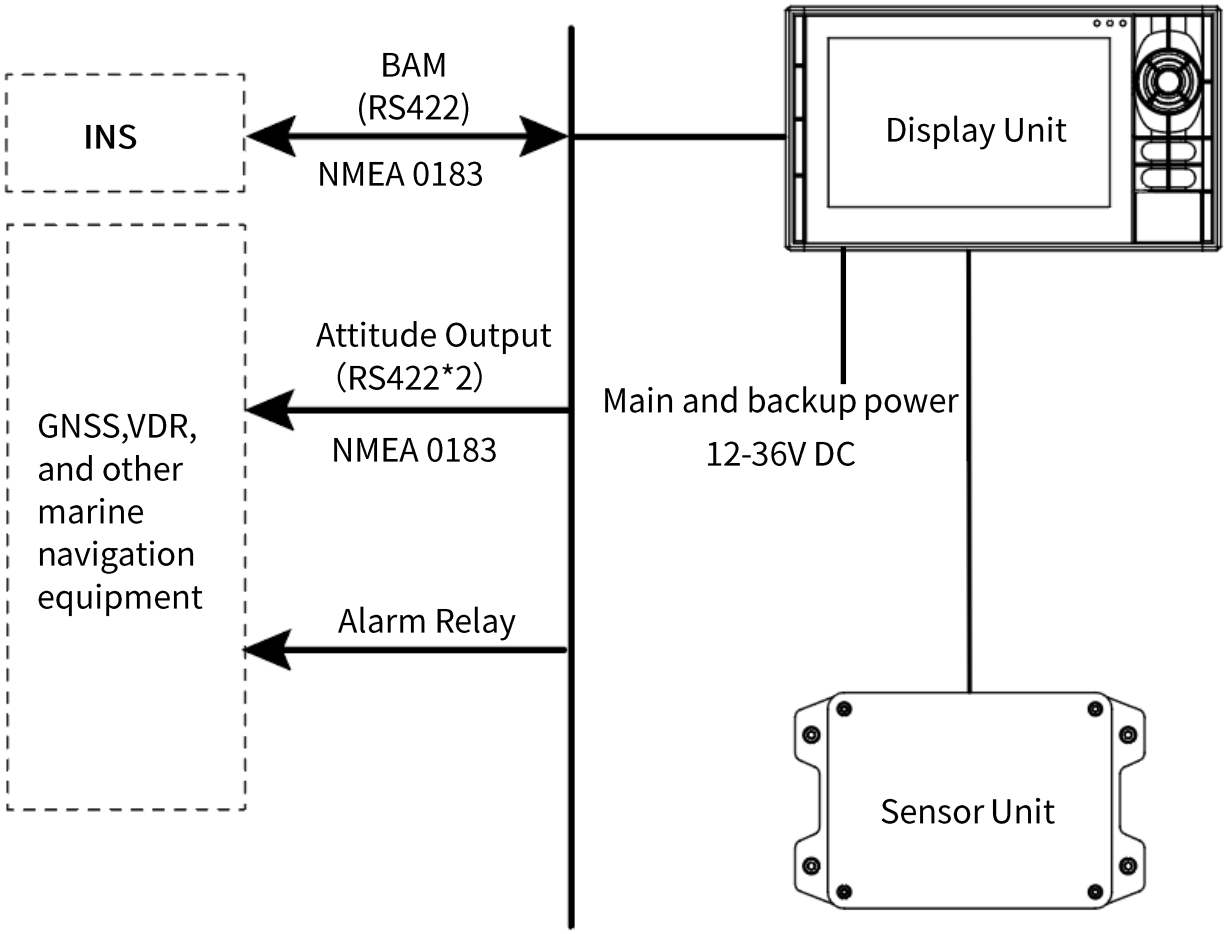
- Environmental factors (such as severe sea conditions causing violent ship movement, extreme high or low temperatures);
- Acceleration or vibration interference (influence of ship's inertia force during sudden acceleration/deceleration).

SAFETY INSTRUCTIONS

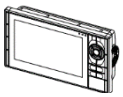
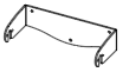
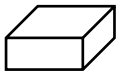
Warning: The user is responsible for exercising common sense and judgment regarding navigation and should not rely on this product.

⚠ Warning	⚠ Attention
 **The main unit contains high voltage; do not open without authorization!** Only professionals may disassemble the equipment for operation.	 **This device is only for specified use!** Improper use may cause injury to personnel or damage to equipment.
 **If water or foreign objects fall into the device, just turned off immediately!** Continuing to use the device may cause a fire or electric shock Hit. Please contact the agent for maintenance.	 **Once an abnormality is detected, the device should be shut down immediately!** If the equipment emits unusual noises or overheats, please immediately shut down the device and contact the agent for maintenance.
 **Do not place containers filled with liquid on top of the device!** Spilling liquid into the equipment can cause a fire or an electric shock.	 **Operating environment temperature range is -15°C ~ 55°C!** Do not use the device outside the specified range.
 **Keep the device away from rain or splashing water! Do not operate the device with wet hands!** Water splashes can cause fires or electric shocks.	 **Do not plug in the device when it is not in use for a long time!** For safety, please turn off the power when the device is not in use for a long time.
 **Use a qualified fuse!** The device displays the rated value of the fuse. Using the wrong fuse can damage the device.	 **Keep the device away from heat sources!** Heat can deform the device, melt the power cord, Causes fire or electric shock.
 **Use a qualified power source!** Do not use voltage outside the specified voltage range (DC 12-36V), otherwise it may cause fire, electric shock, or inability to use the device, even damage.	 **Do not clean the equipment with cleaners such as alcohol, acetone, or benzene!** Chemical cleaners may damage the coating and markings. Please only use a soft dry cloth. For stubborn stains, use a soft cloth dampened with watered-down neutral cleaner.

SYSTEM CONFIGURATION



EQUIPMENT LIST

Illustration	Name
	Display Unit HEI9007/EI9007
	Sensor Unit HEI900S/EI900S
	9-core data cable NDP9
	8-core data cable NDP8
	7-core data cable NDP7
	4-core power cord PIP4
	Display unit bracket
	M5*8 Black ear nut
	M3*20 Large flat head self-tapping screw
	M4*20 Flat round head self-tapping screw
	5A Fuses
	MI100 Display repeater(Optional)
	User manual
	E70 Installation dimension diagram
	CCS Marine product certificate(Optional)

CONTENTS

1. INSTALLATION

Notice
Painting or anti-corrosion sealant should not be applied directly or indirectly on the coating and plastic parts of the equipment. These items contain organic solvents that can damage the equipment's coating and plastic components, especially the plastic connection parts.

1.1 Display Unit Installation

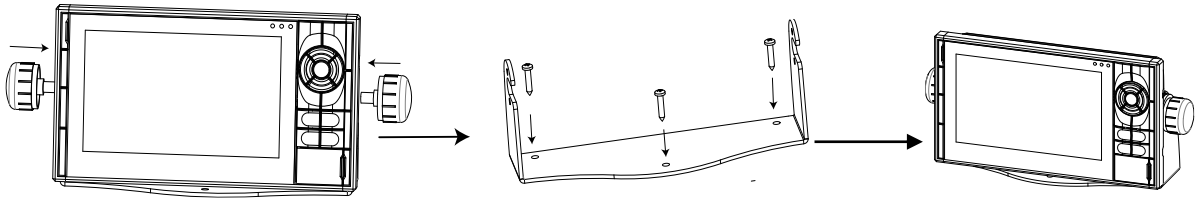
The display unit can be installed in an embedded, suspended, or desktop configuration. For desktop and suspended installations, it is recommended to use the bracket provided by the manufacturer.

1.1.1 Installation precautions

- The instrument should be kept away from direct sunlight, and should be protected from impacts and vibrations.
- Place the equipment away from exhaust pipes and ventilation openings.
- To facilitate maintenance and inspection, leave sufficient space on both sides and the back of the equipment, and leave the cables slightly loose.
- Keep away from equipment that generates electromagnetic radiation, such as motors and generators.

1.1.2 Installation steps

- **Steps for Hanging or Desktop Installation(Bracket Optional):**



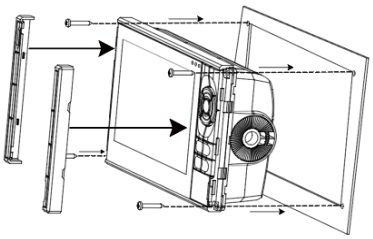
① Installation opening: Based on the bracket's hole pattern, mark and drill holes on the mounting surface;

② Bracket fixation: Securely fasten the bracket to the surface using M4x20 screws;

③ Equipment fixation: Mount or place the display unit onto the bracket and secure it by tightening the knob;

④ Installation inspection: Upon completion, verify that the unit is firmly installed.

- **Steps for Embedded Installation:**



① Installation opening: Cut a rectangular opening in the mounting panel according to the installation dimension diagram;

② Remove the decorative strips: Remove the decorative strips from both sides of the display unit;

③ Embedded Installation: Insert the display unit into the opening from the front side of the panel;

④ Equipment fixation: Secure the display unit from the rear using M4x20 self-tapping screws;

⑤ Restore the decorative strip: Reinstall the decorative strips until they lock securely into place;

⑥ Installation inspection: After installation, check and confirm that the unit is seated flush and firmly on the panel.

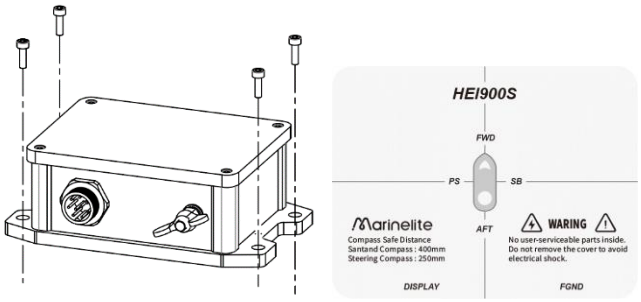
NOTE: The 10-inch repeater display unit is installed in the same manner as described above.

1.2 Sensor Unit Installation

1.2.1 Installation precautions

- The arrowhead marked on the sensor indicates the direction towards the bow of the vessel.
- Use a high-precision level or laser calibration tool to confirm that the installation surface is in a horizontal or vertical state.
- Equipment should be kept away from devices that generate electromagnetic radiation, such as motors and generators.

1.2.2 Installation steps



Equipment fixation: Install the electronic tilt sensor horizontally, perpendicular to the mast, using four M3 screws.

2. WIRING

2.1 Cable Installation Precautions

This system uses standard RS-422 communication for both internal and external digital information output. To ensure normal communication and avoid signal interference, please follow the following wiring suggestions.

- Use twisted shielded cable to reduce common mode interference.
- Ground the shield, which can reflect or absorb noise, thereby reducing the impact of noise on the signal.
- Separate the cable layout, separating cables that are susceptible to noise from the noise source.
- Ensure that all equipment is properly grounded to prevent interference caused by grounding loop currents.
- Use the shielded cable components provided with the device, insert the aviation connectors at both ends into the sensor and display unit, and tighten the connector locknut.

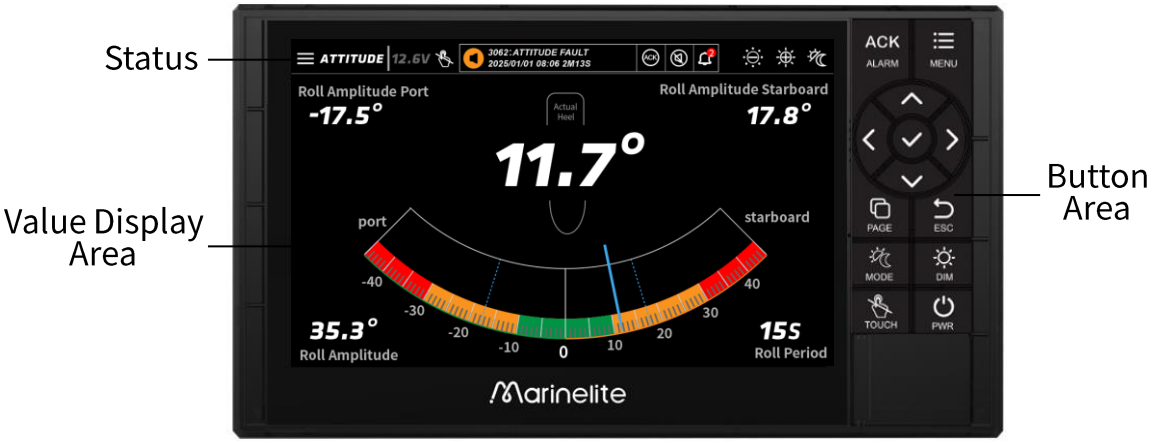
2.2 Grounding Inspection

This device may cause interference to other electronic equipment. It is strongly recommended to ground all cables according to the following guidelines.

- Keep all equipment as far away from radio equipment as possible.
- Prohibit placing interconnection cables near radio equipment and their cables.
- Run cables along the shortest feasible path.
- Ground all units with grounding wires.

3. OPERATION OVERVIEW

3.1 Button Operation Instructions



Button descriptions are as follows:

Button	Description
ACK ALARM	When triggering an alarm, the button is used for alarm confirmation
MENU	Menu On/Off
	Cursor moves to switch options, ✓ confirms the current operation, or saves settings
PAGE	Used to switch the main page display
ESC	Cancel settings or return to the previous operation page
MODE	Toggle between day and night modes
DIM	Loop to adjust screen brightness and key brightness
TOUCH	Used to turn on or off the touch lock feature
PWR	Long press to turn on/off; short press to open the brightness adjustment shortcut menu

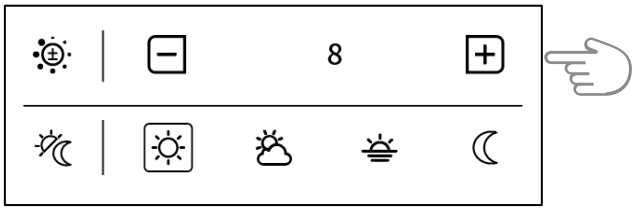
3.2 Power on/off

Long press the key PWR for 3 seconds to turn on the device, the screen enters startup interface, and the interface bottom displays the version information and system startup process. Long press the key PWR for 3 seconds to turn off the device.

Note: If the ship power supply system is turned off while the device is running normally, the device will automatically start the next time the ship power supply system is turned on.

3.3 Brightness Adjustment

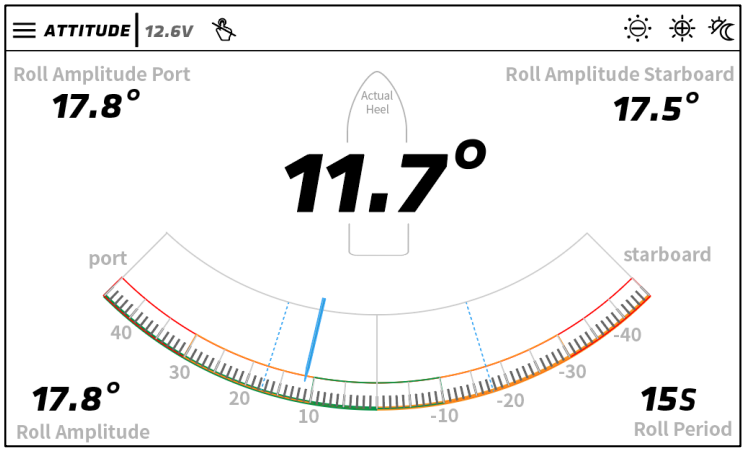
- Adjust brightness by clicking the status bar and pressing the button.
- Click the button DIM to cycle through brightness adjustment.



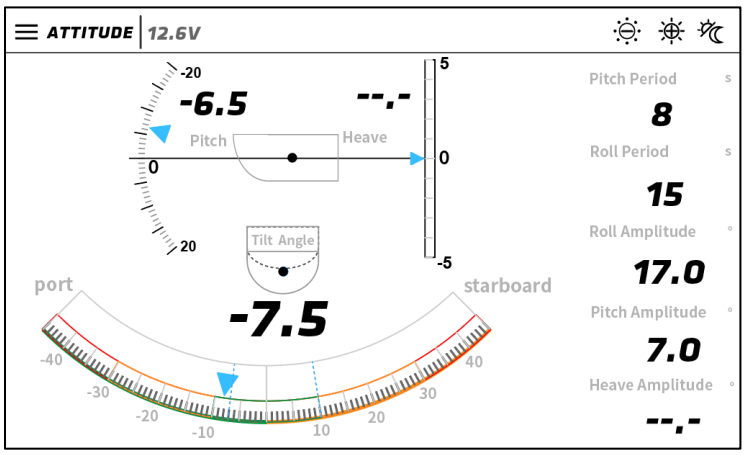
- Click the status bar icon or short press the button PWR to pop up the brightness adjustment window. In the window, you can set the brightness level and brightness mode(daytime mode, cloudy mode, dusk mode, night mode). Touch the status bar icon or press the power button shortly again to close and save the settings.
- This device supports an external dimming function, which can be controlled by COM2 inputting DDC sentences compliant with the NMEA 0183 standard.

3.4 Display Instructions

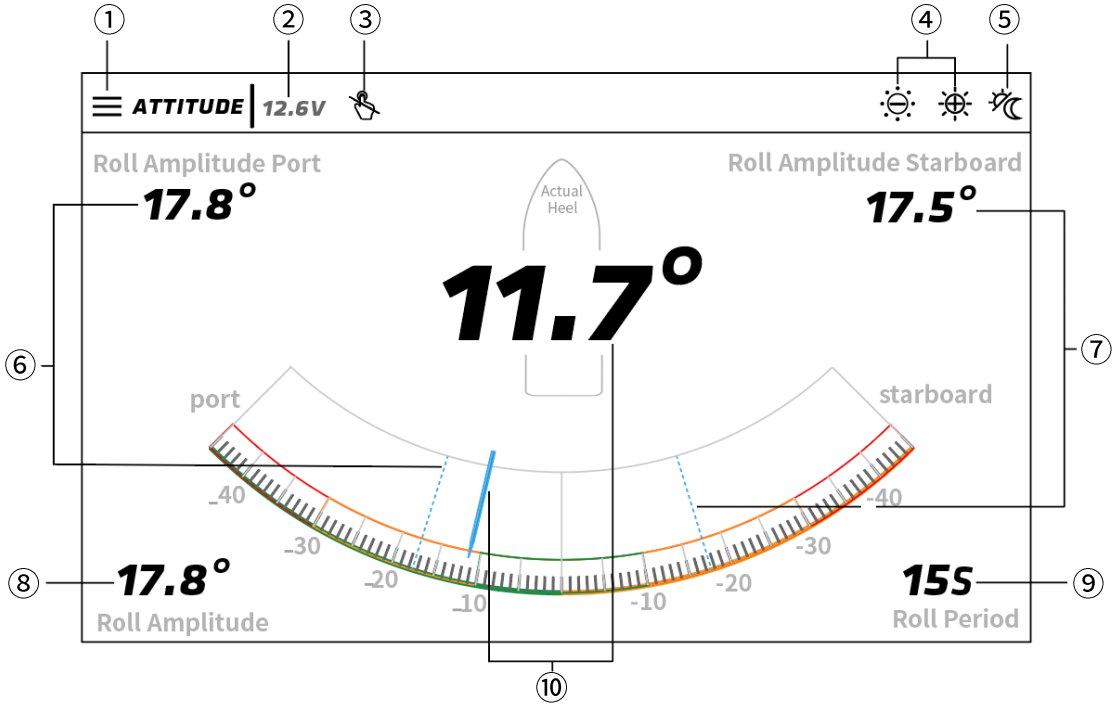
- Support page switching through up and down swiping on the screen, left and right swiping, or using the key PAGE.



Roll Page

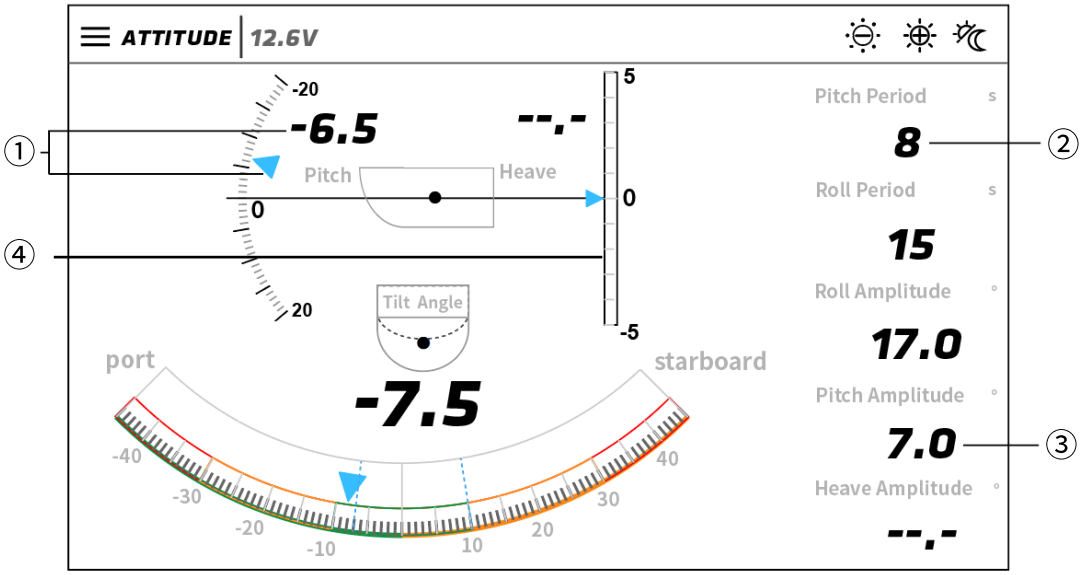


Pitch Page



Specific details of the roll page are as follows:

No.	Description	Function
①	Menu	Click to enter the menu page
②	Voltage Indication	White is the main power source, gray is the auxiliary power source
③	Touch Lock Prompt	When touch to close, prompt ; when touch is available, no prompt
④	Brightness Adjustment	Brightness - / Brightness +
⑤	Mode Switch	Open the brightness adjustment quick menu
⑥	Roll Amplitude Port	Used to display roll amplitude port within the last period
⑦	Roll Amplitude Starboard	Used to display roll amplitude starboard within the last period
⑧	Roll Amplitude	Used to display the maximum roll amplitude within the last period
⑨	Roll Period	Used to display the heel period within the last period
⑩	Real-time Heel Value	Real-time heel value numerical/pointer display



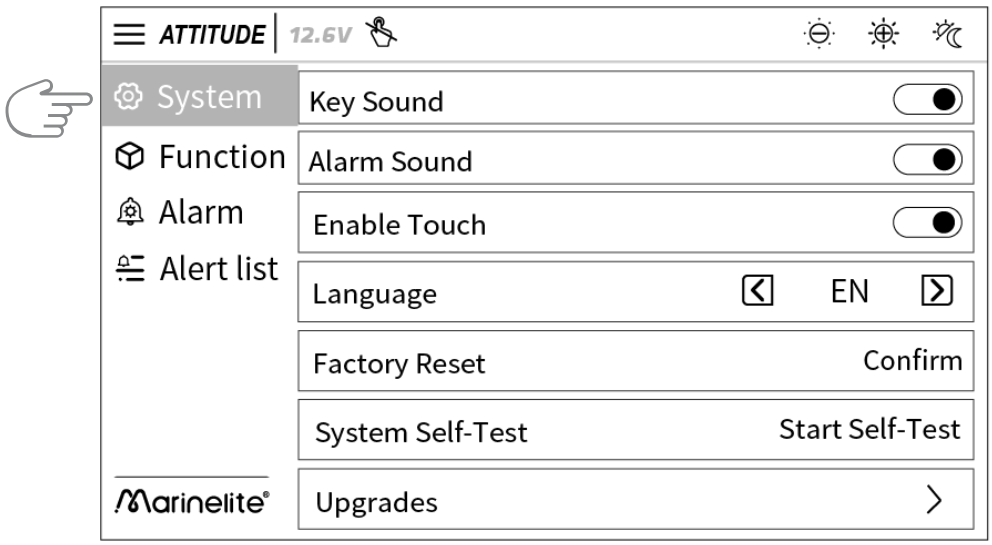
Detailed description of the pitch page is as follows:

No.	Description	Function
①	Pitch Indication	Real-time numerical/pointer display of pitch
②	Pitch Period	Used to display the maximum amplitude of pitch in the previous period
③	Pitch Amplitude	Used to display the pitch period in the previous cycle
④	Heave Indication	The heave indication(Currently not supported)

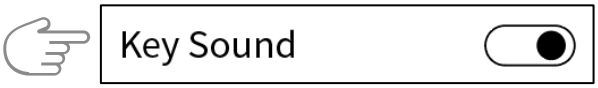
4. MENU SETTINGS

4.1 System Settings

System settings include key sound, alarm sound, enable touch, language, factory reset, system self-test, and upgrades functions.



4.1.1 Key sound



Open the menu, select System, and set the key sound to on/off. After opening, there will be a prompt sound for touch and key operations, and no prompt sound when turned off.

4.1.2 Touch switch

Open the menu, select System, and select the enable touch to turn off the touch function. After turning off the touch, please use the key LOCK to unlock the touch. When the touch is locked, a lock touch prompt will be visible in the screen status bar, and the prompt will disappear after unlocking.

Note:

① To ensure the touch function, do not wear gloves or operate the capacitive screen with wet hands; please dry your hands;

② Do not place heavy or hard objects above the screen to avoid scratching the surface and causing the capacitive screen to shift or fail;

③ If there are water droplets or foreign objects above the screen, please turn off the power and use a soft microfiber cloth dipped in screen-specific cleaning agent to wipe in a single direction. After wiping, dry with cold air (or let it stand for 5 minutes);

④ To avoid scratching or corroding the touch screen, do not use alcohol, acetone, or other chemical agents, or hard paper towels.

4.1.3 Language

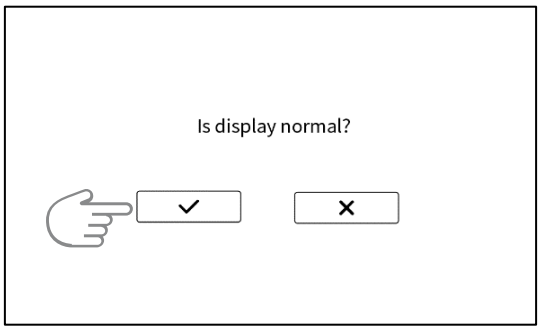
Open the menu, select System, click on Language, and you can set it to Chinese or English.

Note: Language settings will not be restored after system settings are reset.

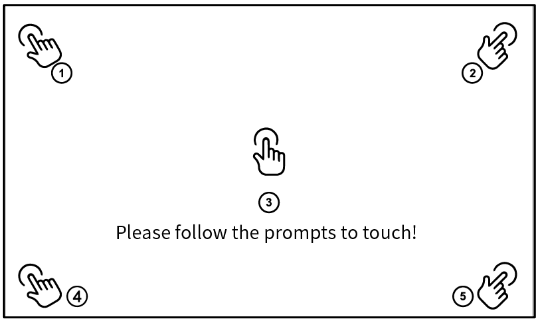
4.1.4 System self-Test

Open the menu, select System Self-Test. After clicking Confirm, Enter Self-Test:

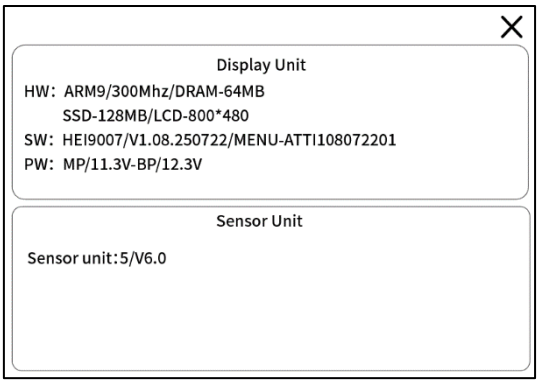
① Screen Self-Test: Self-Test after confirmation, the system will automatically display black, red, blue, yellow, green, and pink in full screen in sequence. After the end, please click to observe the screen's good condition and select the corresponding self-test result;



② Touch Detection: After confirming the screen self-check, enter the touch detection. Please follow the operation prompts to click the screen in sequence to complete the self-check;



③ Self-inspection result: After the normal operation of touching in order, enter the self-inspection result display window.



Note:

① Please enable the touch function before the self-check, otherwise you will not be able to enter the self-check;

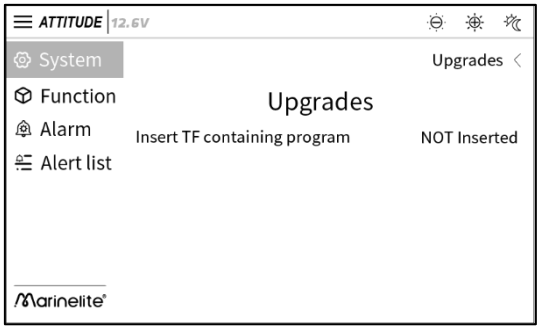
② During the self-check, please follow the steps above. If the touch function cannot be executed, please press the confirm key to proceed to the next step or the cancel key to exit the self-check;

③ If there is a connection failure or damage to the sensor, the sensor unit will display as empty.

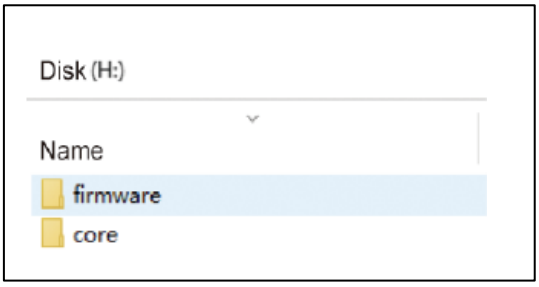
4.1.5 System upgrade

The system upgrade is used to configure the upgrade for the display unit. The detailed operation is as follows:

① Open the menu, select System > Upgrades, confirm the upgrade in the pop-up window, enter the upgrade operation page, and you will see a reminder "NOT inserted";

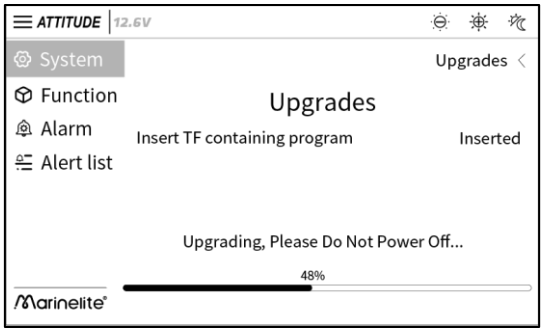


② Place the upgrade file in the root directory of the TF card;



③ Insert the TF card into the TF card slot. At this time, the interface will prompt "Inserted" and an upgrade confirmation icon will pop up;

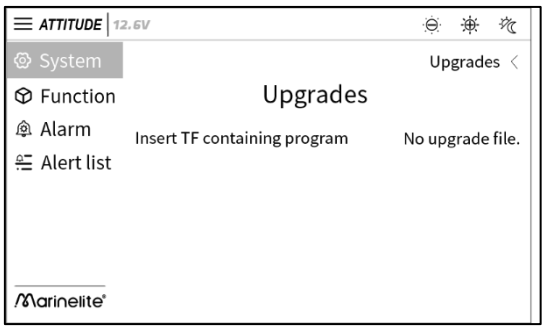
④ Click the upgrade icon, and the page will prompt " Do not power off the upgrade program ". At this time, please wait patiently for the system to automatically upgrade;



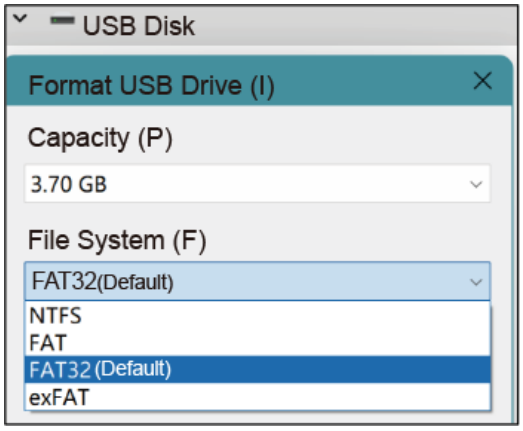
⑤ After the progress bar reaches 100%, the device will automatically restart and complete the upgrade.

Note:

① Please use TF cards with a capacity of 32G or less. The card upgrade file must be placed in the root directory. For example, use a computer to read the TF card, unzip the files, and check the firmware folder. You will see that the firmware folder contains an app file. If your file path is incorrect, the system upgrade confirmation icon will not appear, and only a prompt "No upgrade file" will be displayed. In this case, the system will not be able to upgrade;



② Before saving the upgrade file to the TF card, please confirm that your TF card file system is in FAT format (can be configured as FAT 32, FAT 16, FAT, EXFAT). If it does not meet the requirements, please use a computer to format the TF card to the FAT file system type. If the file system does not meet the requirements, the system will prompt "Not inserted", at which point the system will be unable to upgrade;

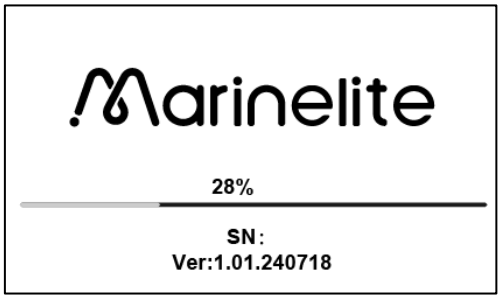


③ To ensure a successful upgrade, please choose a quality-reliable TF card, such as brand cards or TF cards provided by distributors;

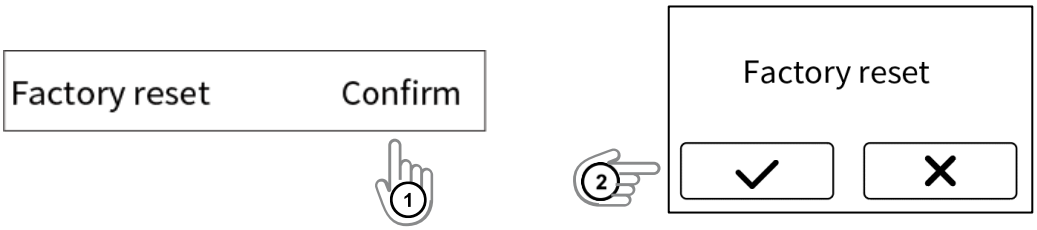
④ The upgrade is in progress, please do not power off or perform any other operations, and be patient.

⑤ The normal upgrade can be completed within about 3 minutes. If there is no response for a long time, please remove the TF card, shut down and restart to enter the original system for normal use. You can try the upgrade operation again. If it fails multiple times, please contact the dealer for assistance!

⑥ If you are unable to enter the upgrade submenu page during the operation, please remove the TF card, power off and restart the device, then re-enter the submenu for the upgrade and insert the TF card to perform the operation. The updated software version will be visible during the startup animation when the device restarts!



4.1.6 Factory reset

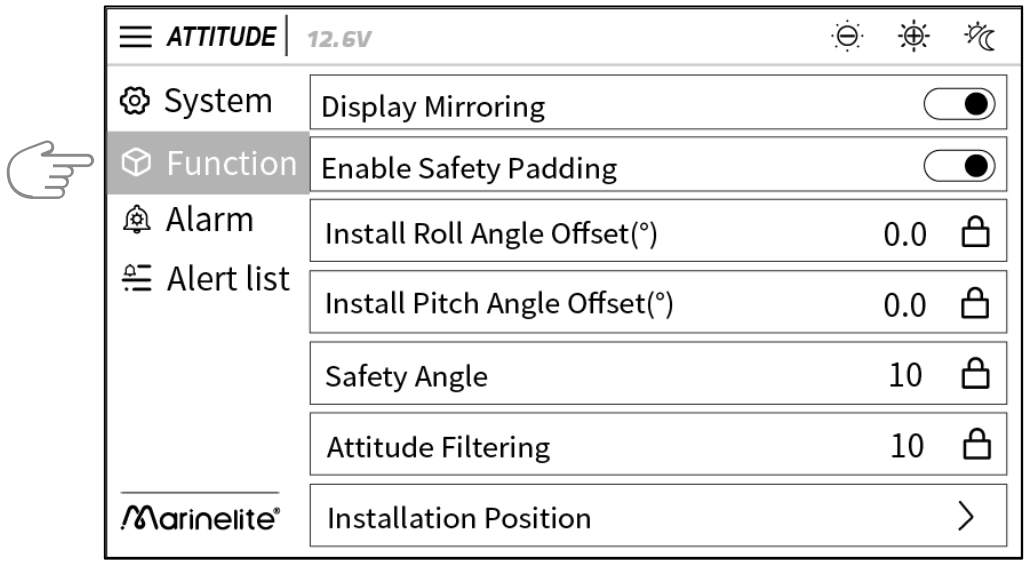


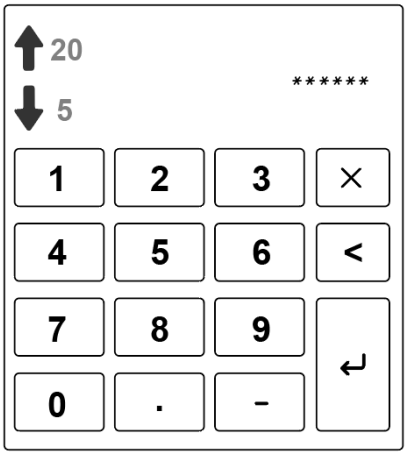
Open the menu, select System, click Factory Reset, and choose Confirm in the confirmation pop-up to restore to factory settings.

Note: After recovery, the device will be restored to factory settings, which may affect the actual usage effect. Please operate with caution!

4.2 Function Settings

Function settings include display mirroring, enable safety padding, installation calibration, safety angle settings, attitude filtering settings, installation position, and COM output settings.





To prevent user errors, all numerical menu options within the system require a password to be changed. Click the icon to open the password input interface, enter the unlock password 321456, click the icon to enter unlock mode , and then click the

numerical option that needs to be modified on the screen. A numeric keypad will pop up to complete the numerical modification.

4.2.1 Display mirroring

Open the menu, select the display mirroring switch under Function Settings.

Mirror Display is mainly used to enhance the intuitiveness and accuracy of measurements, especially in complex installation environments. When inclinometers are installed in positions that are difficult to directly observe (such as on the back, side, or upside down), mirror display can present data symmetrically, making the left and right chord directions facing the user consistent with those displayed on the screen.

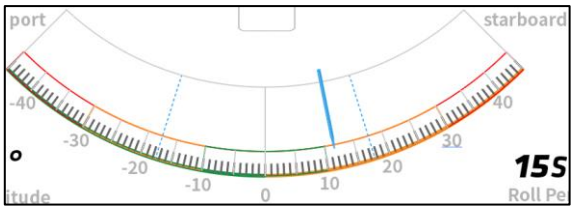


Image Off

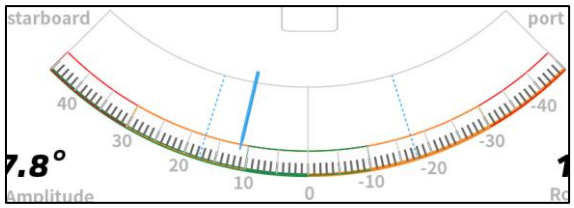
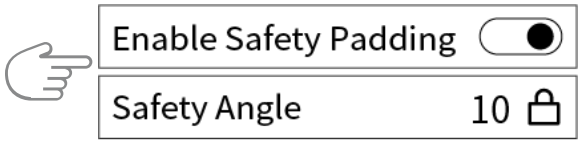


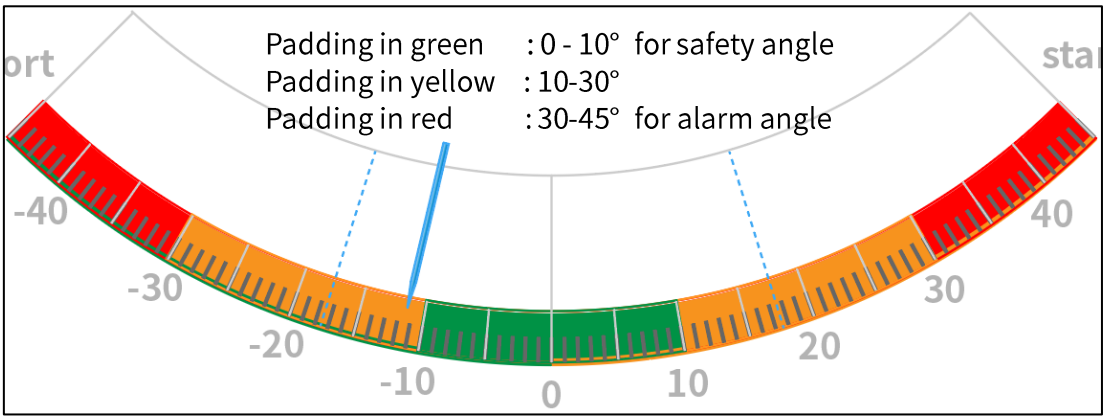
Image On

4.2.2 Enable safety padding and safety angle



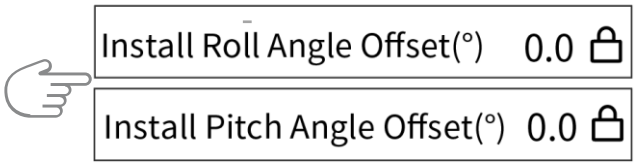
Open the menu, select Function Settings to choose whether to enable Safe Padding. Once enabled, the padding within the safe tilt angle on the main page will be green, the padding outside the alarm angle will be red, and the remaining part will be yellow.

Safe fill color improves monitoring efficiency and security through visual intuition, especially in high-risk or fast response scenarios, helping users reduce reaction time and avoid artificial misreading of data.



Note:When the safety angle is the same as the alarm angle, only the safety fill color (green) and the alarm fill color (red) are displayed; it is recommended to set the safety angle value less than the alarm angle value during actual use.

4.2.3 Installation and calibration

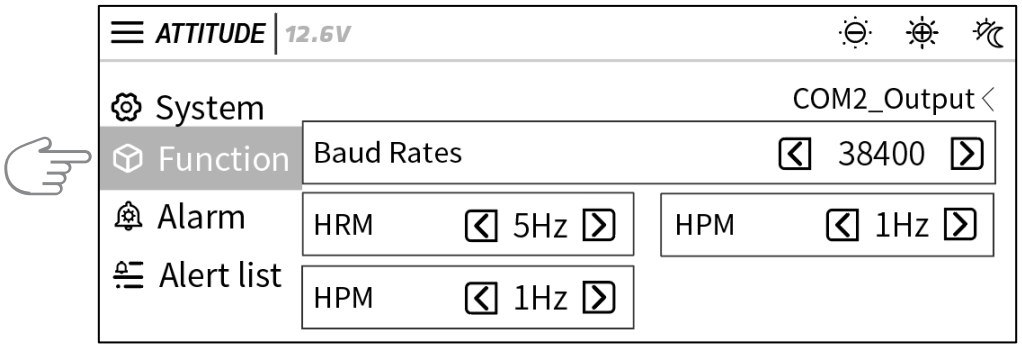


After the sensor is installed, zero-point calibration must be performed to correct installation errors, ensuring that the displayed angle readings are consistent with the ship's roll angle values.

4.2.4 Attitude filtering

Open the function settings, set the attitude filtering value, the higher the value, the more stable the measurement. During the tilt sensor measurement process, filtering is used to eliminate or reduce noise interference in the signal, improving the stability and reliability of the measurement data.

4.2.5 Output settings



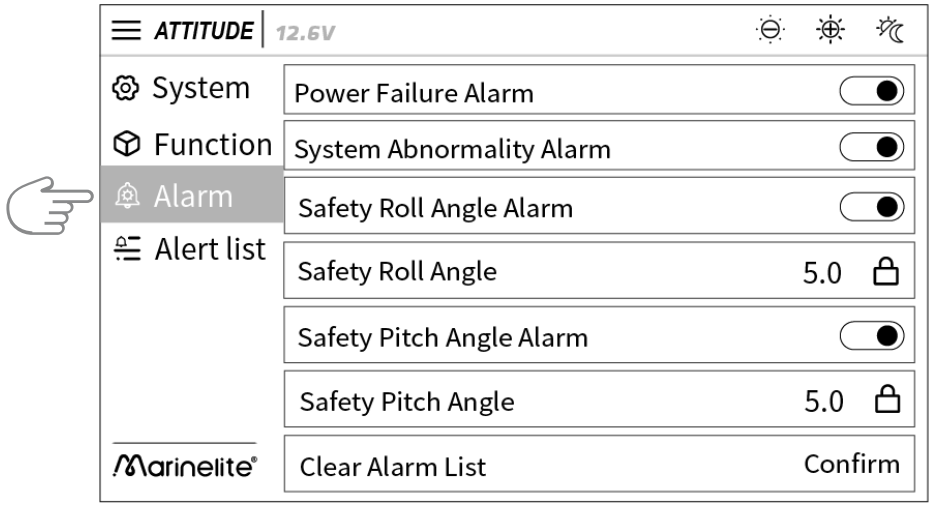
Open the menu, select function settings, set the target serial port baud rate and statement output frequency according to the requirements of the connected serial port, provide actual roll angle, swing period, and swing amplitude (HRM) in accordance with the standard protocol (IEC 61162-1), provide sensor coordinate parameters (POS), the default baud rate for serial port 2 is 4800bps, and the default baud rate for serial port4 is 38400bps.

4.3 Alarm Settings

4.3.1 Alarm settings

- **Alarm switch and safety angle settings**

The alarm settings include power failure alarm, system abnormal alarm, safety roll angle alarm, and safety pitch angle alarm switches, as well as the settings for safety roll angle values and safety pitch angle values.

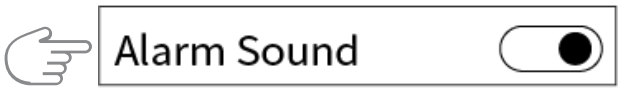


Alarm Code Indication Description:

Alert identifier	Cate-gory	Prio -rity	Alert inst-ance	Alert title (example)	Alert description Text	Reaction of the system
3022	B	W	1	Power fail	ATTI is not working due to failure of Power supply	Stop operation
3023	B	C	1	Power fail	ATTI is working Normally by switching another power supply	Continue operation
3025	B	W	1	Roll limit	ATTI system detects roll limit has been exceeded	Continue operation
3026	B	C	2	Pitch limit	ATTI system detects pitch limit has been exceeded	Continue operation
3062	B	W	4	System fault	ATTI Attitude loss sensor	Stop transmission

From a safety perspective, the setting is in degrees, with a default of 5 degrees. When the real-time list or roll angle exceeds the safety angle, an over-limit alarm for list or roll is triggered.

- **Alarm Sound Settings**

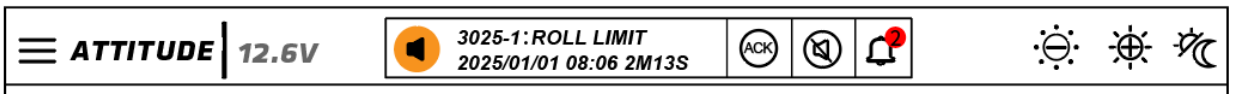


Open the menu, select System Settings, and set the switch after selecting the alarm sound.

Note: After the alarm sound is turned off, there will be no sound reminder when the alarm is triggered. Please set it with caution.

4.3.2 Alarm display description

When an alarm is triggered, the status bar adds an alarm status information display, showing the current total number of system alarms. Clicking on it allows you to view the current alarm list.



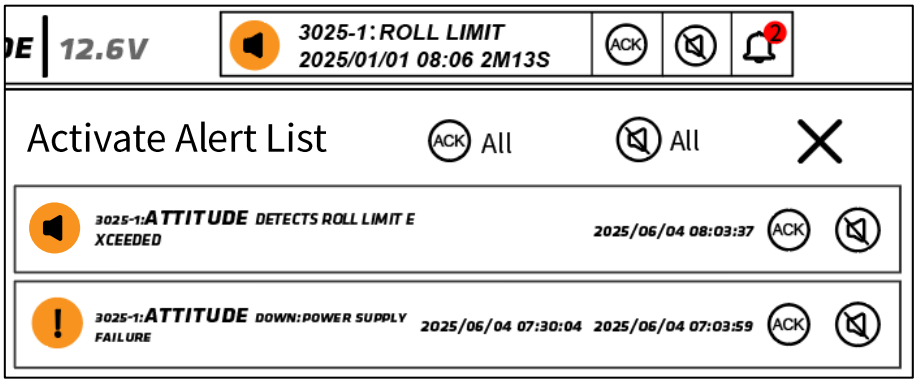
For alarm status, 3025-1: ROLL LIMIT is the alarm name. The detailed alarm status description is as follows:

Visual presentation	Priority	Alert state	Audible annunciation
	Warning	"active - unacknowledged"	2 short audible signals. Speech output optional
	Warning	"active - silenced"	No audible signal and no speech output
	Warning	"active - acknowledged"	No audible signal and no speech output
	Warning	"active – responsibility transferred"	No audible signal and no speech output
	Warning	"rectified - unacknowledged"	No audible signal and no speech output
	Caution	"active"	No audible signal and no speech output

4.3.3 Alarm interaction

- **Human-Machine Interaction**

① Alarm Confirmation: When an alarm is triggered, click the status bar ACK, or click the alert list icon 3 on the status bar to enter the current alert list page, and click the target alert list ACK to achieve independent confirmation.



Note: According to the standard protocol (IEC62923), alarm confirmation must be done item by item, and one-click confirmation of all alarms is not supported.

② **Alarm Silent All:**When an alarm is triggered, click the alarm list icon 3 on the status bar to enter the current alarm list page, and click All to execute silent all.

③ **Single alarm silence:**When an alarm is triggered, click the status bar, or click the alert list icon 3 on the status bar to enter the current alert list page, and click the target alert list to execute independent silence.

- **Serial Communication**

Provide alarms and faults (ALF, ARC, ALC, HBT) to external devices according to standard protocols (IEC 61162-1) and accept the responses and silencing (ACN) from external devices for alarms.

- **Relay Output**

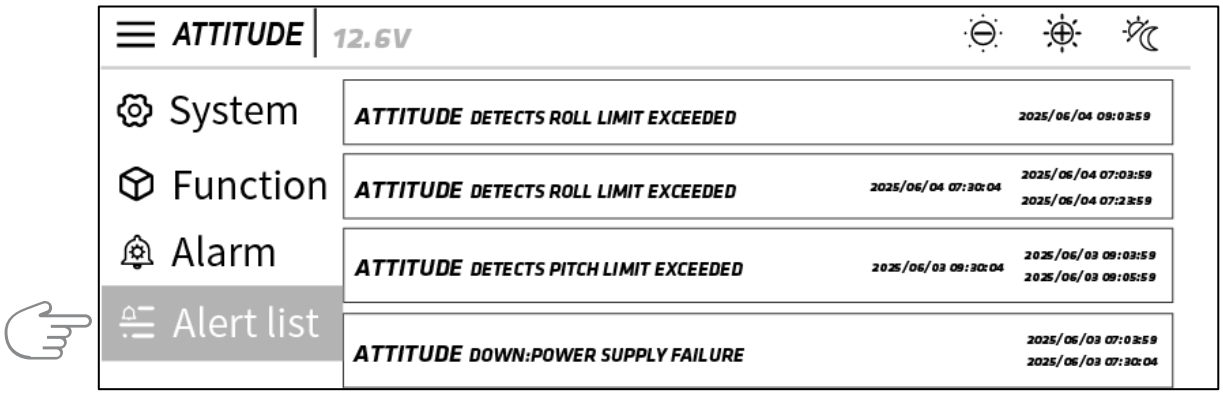
When the equipment is operating normally without any alarms, the alarm relay is in the normally open state; after the alarm is triggered, it automatically switches to the closed state, and the alarm is automatically released to return to the normally open state.When

the device is turned off or experiences an abnormal power outage, the alarm relay is in the closed state.

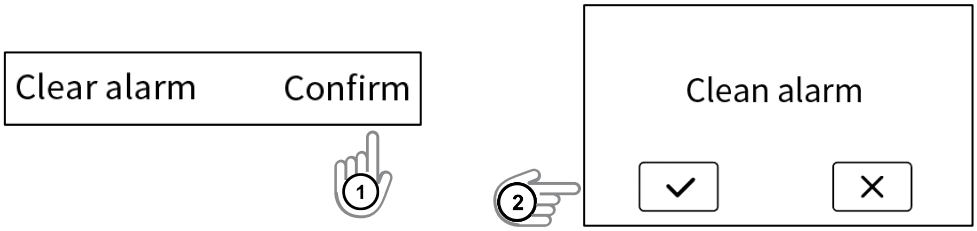
4.3.4 Alert list

- **View Alert List**

Open the menu, select the alert list to view the alert list, and swipe up and down to page through the historical alert list.



- **Clear Alert List**



Open the menu, select alert list, select clear alert, and choose confirm in the pop-up clear confirmation window to complete the clearing.

5. SYSTEM MAINTENANCE

5.1 Maintenance

- Check that all connectors of the devices in the system are firm and free of rust. If there is dirt or corrosion, clean it.
- Check that all grounding wires are securely fastened.
- Check if there is any dust or dirt on the LCD screen. Gently wipe the LCD screen with a tissue and LCD screen cleaner to prevent scratching. To remove dust or salt deposits, use LCD screen cleaner, wipe with a soft cloth slowly to dissolve the dust or salt. Change the soft cloth frequently to avoid scratching the LCD screen with salt or dust. Do not use solvents such as thinners, acetone, or benzene for cleaning. Also, do not use degreasers or defogging solutions, as they may peel off the coating on the LCD screen.

5.2 Troubleshooting

This section provides basic troubleshooting methods. For advanced troubleshooting, please contact a professional technician. If the equipment cannot be restored to normal, do not disassemble the equipment to check the internal components. Contact a professional technician to resolve the issue! This equipment does not contain user-repairable parts. If the equipment is damaged in any form, please contact your dealer.

Phenomenon	Reason	Exclusion Methods
Unable to boot up	Device not properly powered on	Check if the power is connected properly, inspect for any damage to the power lines
	Power fuse blown	Replace the fuse
	Input voltage abnormal	Check if the output voltage of the power line is normal
Power is normal, but the screen is black	Display unit brightness setting too low	Adjust brightness mode and brightness level
No data results ; Page display --,-	Sensor not connected	Check if the screen displays Loss Sensor!!!Prompt, please check if the line connection is tight.

APPENDIX 1 MENU LIST

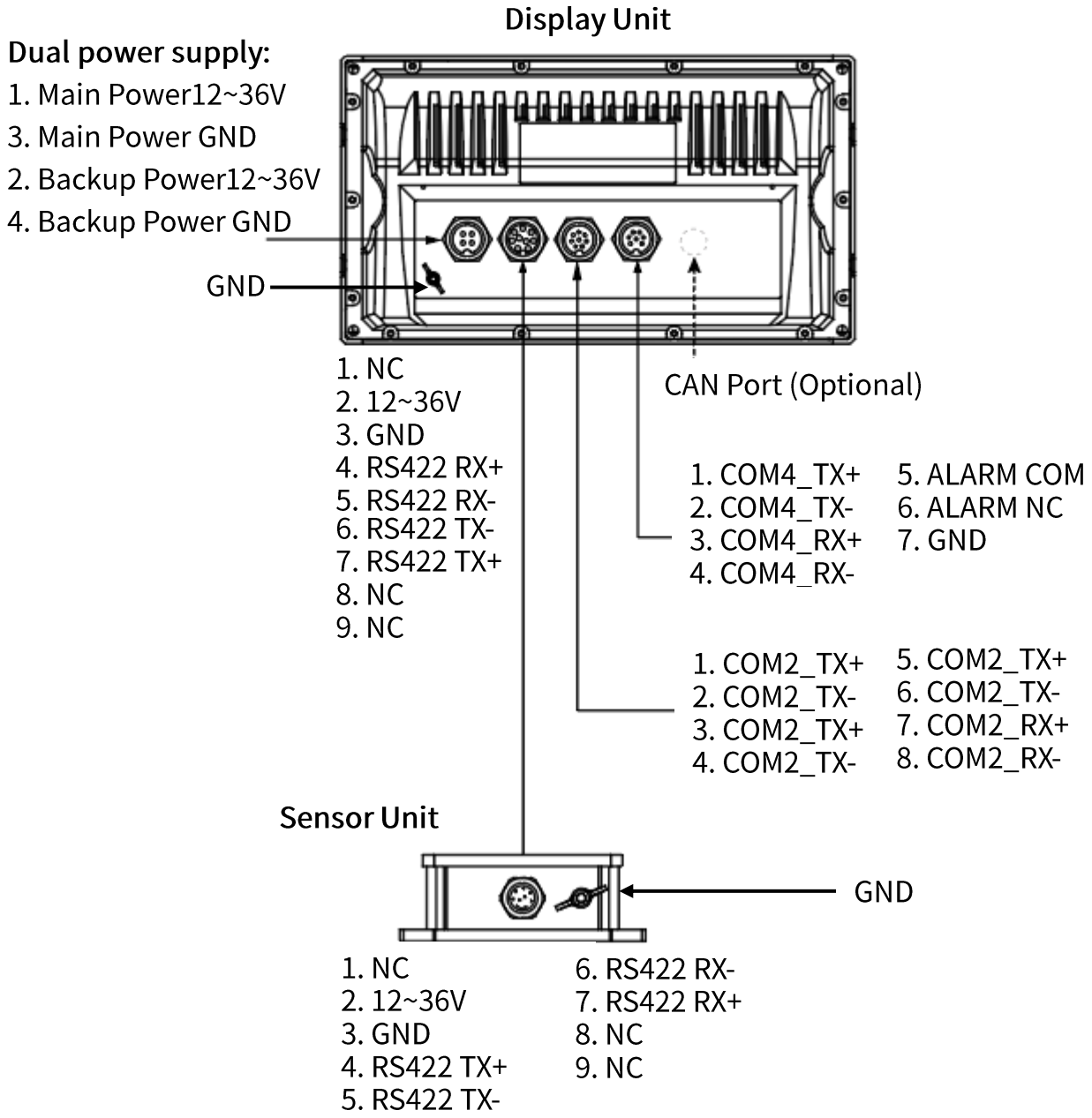
Menu Category	Menu Item	Submenu Item	Configuration Value
System	Key Sound	-	**ON**, OFF
	Alarm Sound	-	**ON**, OFF
	Enable Touch		**ON**, OFF
	Language		Chinese, **English**
	Factory Reset	-	Confirm
	System Self-test	-	Self-Test after confirmation
	Upgrades	Upgrades	Confirm Upgrade
Function	Display Mirroring	-	ON, **OFF**
	Enable Safety Padding	-	**ON**, OFF
	Install Roll Angle Offset (°)	-	0~90, 0*
	Install Pitch Angle Offset (°)	-	0~90, 0*
	Safety Angle	-	0~20,10*
	Attitude Filtering	-	0 ~ 100, 1 0*
	Installation Position	Length of Ship (m)	0 ~ 99.9, 0*
		Width of Ship (m)	0 ~ 499.9, 0*
		Sens Distance to Portside (m)	0 ~ 499.9, 0*
		Sens Distance to Stern (m)	0 ~ 999.9, 0*

Continued: menu list

Menu Category	Menu Item	Submenu Item	Configuration Value
Function	COM2 Setting	Baud Rate	**4800**, 9600, 19200, 38400, 57600, 115200
		HRM	OFF, 1Hz,2Hz,**5Hz**,10Hz
		HPM	OFF, **1Hz**,2Hz,5Hz,10Hz
		POS	OFF, **1Hz**
	COM4 Setting	Baud Rate	4800, 9600, 19200, **38400**, 57600, 115200
		HRM	OFF, 1Hz, 2Hz,**5Hz**,10Hz
		HPM	OFF, **1Hz**, 2Hz,5Hz,10Hz
		POS	OFF, **1Hz**
Alarm	Power Failure Alarm	-	ON, **OFF**
	System Abnormality Alarm	-	ON, **OFF**
	Safety Roll Angle Alarm	-	**ON**, OFF
	Safety Roll Angle	-	0~45, 5*
	Safety Pitch Angle Alarm	-	ON, **OFF**
	Safety Pitch Angle	-	0~45, 5*
	Clear Alarm List	-	Confirm
Alert List	-	-	-

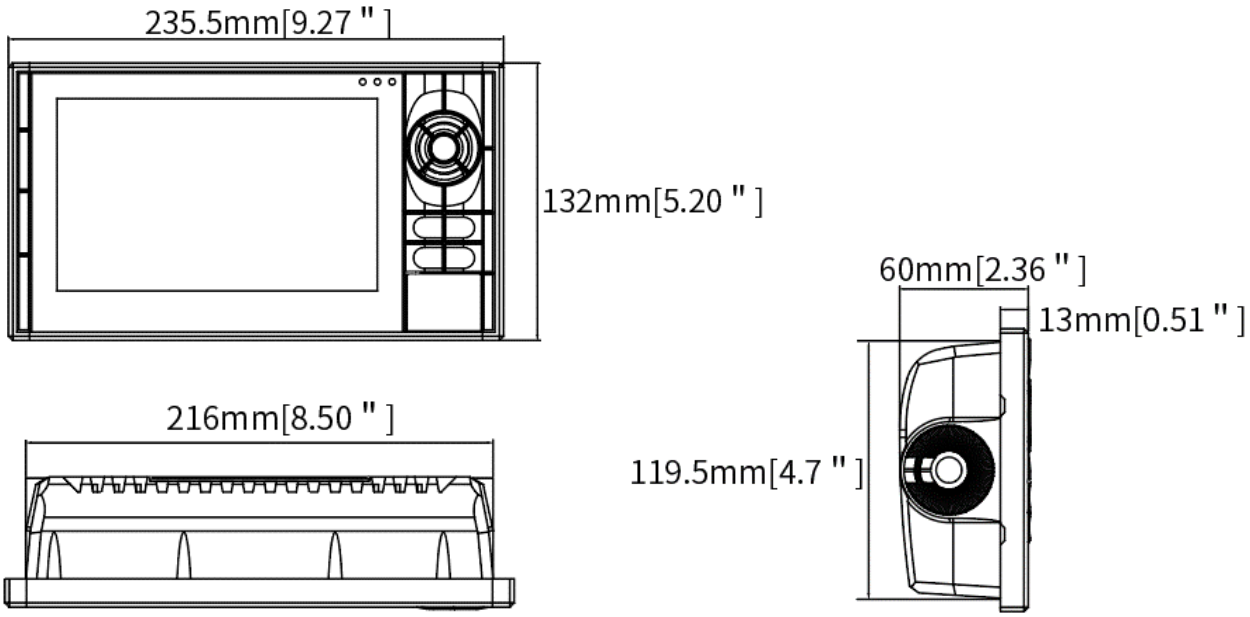
In the table, bold and asterisk (*) indicate that the value is the factory preset

APPENDIX 2 CONNECTION DIAGRAM

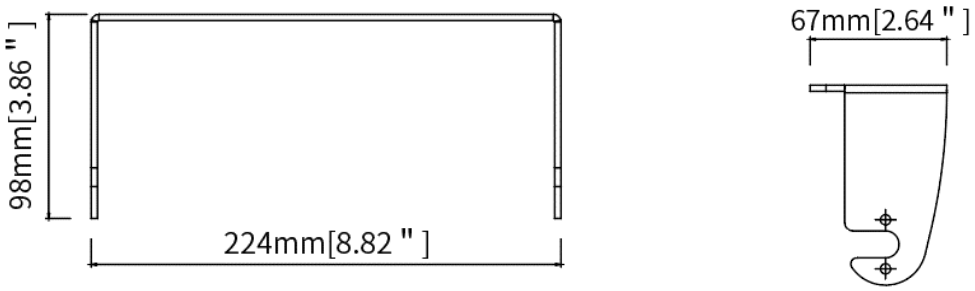


APPENDIX 3 DIMENSION DRAWING

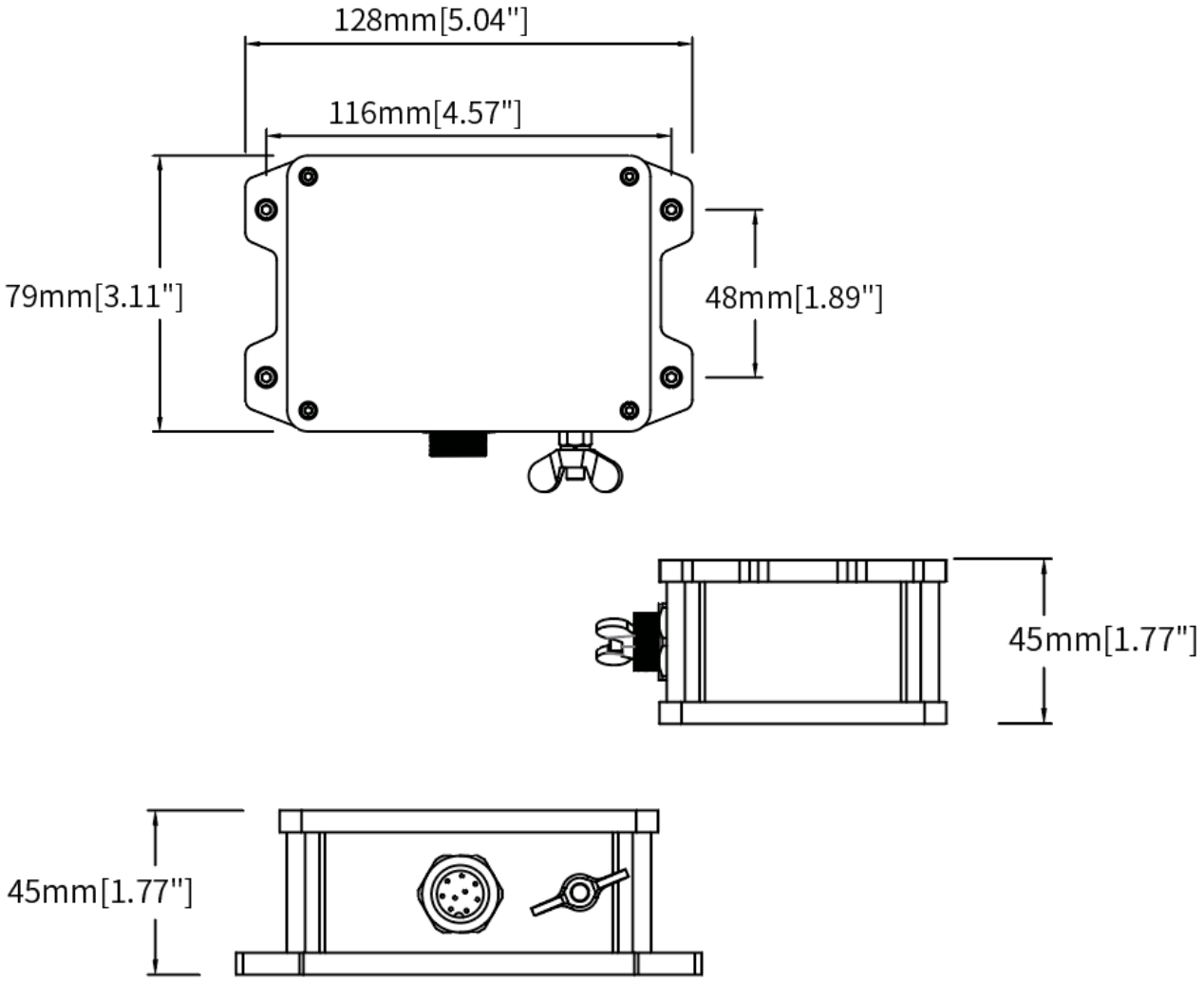
Display Unit: HEI9007/EI9007



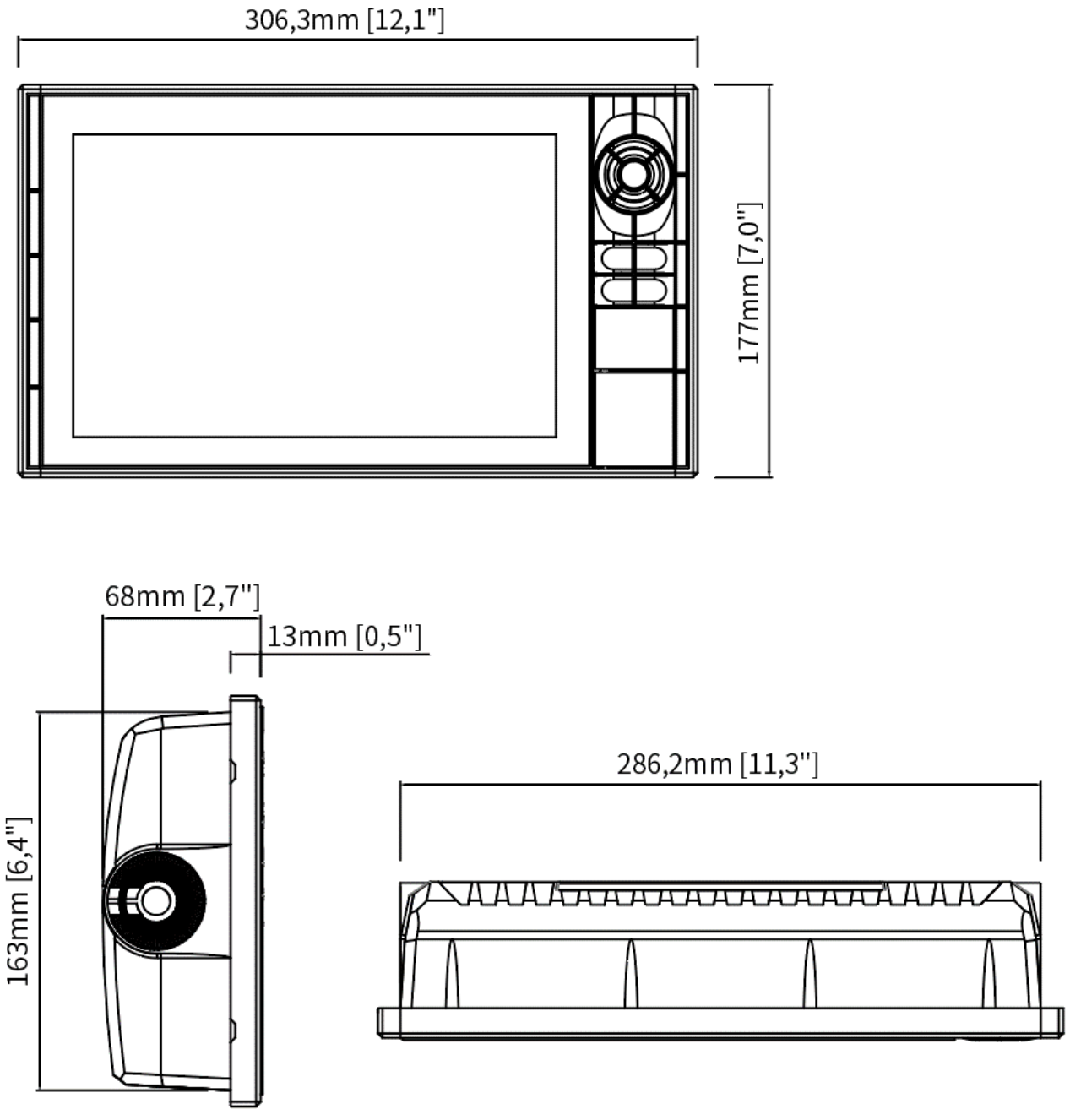
Display Unit Bracket:



Sensor Unit: HEI900S



Display Repeater: MI100



APPENDIX 4 ABBREVIATION

Abbreviation	Meaning	Abbreviation	Meaning
ACK	Acknowledge	MENU	Menu
PAGE	Turn the page	ESC	Escape
MODE	Mode Switch	DIM	Brightness Dimming
TOUCH	Touch	PWR	Power Supply
TX	Transmit	RX	Receive
DRAM	Dynamic Random Memory	ARM	Advanced RISC Machine
LCD	Display	SSD	Solid-state memory
MHz	Megahertz	SN	Serial Number
Ver	Version	MEMS	Microelectronic Mechanical System

APPENDIX 5 STANDARD STATEMENT

◆ $--HRM,x.x,x.x,x.x,x.x,A,x.x,x.x,hhmmss.ss,xx,xx,xxxx,x,x*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13 14

1: Actual heel angle, degrees
2: Roll period, seconds
3: Roll amplitude, port side, degrees
4: Roll amplitude, starboard side, degrees
5: Status
6: Roll peak hold value, port side, degrees
7: Roll peak hold value, starboard side, degrees
8: Peak hold value reset time
9: Peak hold value reset day, 01 to 31
10: Peak hold value reset month, 01 to 12
11: Peak hold value reset year
12: Heel angle alert threshold value
13: Sentence status flag
14: Checksum

◆ $--POS,cc,xx,a,x.x,x.x,x.x,a,x.x,x.x,a*hh<CR><LF><CR><LF>
1 2 3 4 5 6 7 8 9 10 11

1: Equipment identification
2: Equipment number 00 to 99
3: Position validity flag
4: Position X-coordinate (m)
5: Position Y-coordinate (m)
6: Position Z-coordinate (m)
7: Ship ' s width/length Valid/Invalid
8: Ship ' s width (m)
9: Ship ' s length (m)
10: Sentence status flag
11: Checksum

◆ $--ALF,x,x,x,hhmmss.ss,a,a,a,aaa,x.x,x.x,x.x,x,c---c*hh <CR><LF>

1 2 3 4 5 6 7 8 9 10 1112 13 14

1: Total number of ALF sentences for this message, 1 to 2
2: Sentence number, 1 to 2
3: Sequential message identifier, 0 to 9
4: Time of last change
5: Alert category, A, B or C
6: Alert priority, E, A, W or C
7: Alert state, A, S, N, O, U or V
8: Manufacturer ' s mnemonic code
9: Alert identifier
10: Alert instance, 0 to 999999
11: Revision counter, 1 to 99
12: Escalation counter, 0 to 9
13: Alert text
14: Checksum

◆ $--ALC,xx,xx,xx,x.x,aaa,x.x,x.x,x.x,……..,aaa,x.x,x.x,x.x*hh <CR><LF>>

1 2 3 4 5 6 7 8 9 10 11 12 13 14

1: Total number of sentences for this message, 01 to 99
2: Sentence number, 01 to 99
3: Sequential message identifier, 00 to 99
4: Number of alert entries
5: Manufacturer ' s mnemonic code
6: Alert identifier
7: Alert instance
8: Revision counter
9~13: Other alarm entries consisting of manufacturer-defined alarm codes, warning identifiers, alarm instances, and revision counters
14: Checksum

◆ $--ACN,hhmmss.ss,aaa,x.x,x.x,c,a*hh
1 2 3 4 5 6 7

1: Time

2: Manufacturer ' s mnemonic code

3: Alert Identifier

4: Alert Instance, 0 to 999999

5: Alert command, A, Q, O or S

6: Sentence status flag

7: Checksum

◆ $--ARC,hhmmss.ss,aaa,x.x,x.x,c*hh <CR><LF>
1 2 3 4 5 6

1: Time

2: Manufacturer ' s mnemonic code

3: Alert identifier

4: Alert instance, 1 to 999999

5: Refused alert command, A, Q, O or S

6: Checksum

◆ $--HBT,x.x,A,x*hh<CR><LF>
1 23 4

1: Configured repeat interval

2: Equipment status

3: Sequential sentence identifier

4: Checksum

◆ $--GLL, llll.ll, a, yyyyy.yy, a, hhmmss.ss, A, a *hh<CR><LF>
1 2 3 4 5 6 7 8

1~2: Latitude, N/S

3~4: Longitude, E/W

5: UTC of position

6: Status: A=data valid V=data invalid

7: Mode indicator

8: Checksum

◆ $--RMC, hhmmss.ss, A, llll.ll, a, yyyyy.yy, a, x.x, x.x, xxxxxx, x.x, a, a, a*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 111213 14

1: UTC of position fix

2: Status: A = data valid V = navigation receiver warning

3~4: Latitude, N/S

5~6: Longitude, E/W

7: Speed over ground, knots

8: Course over ground, degrees true

9: Date: dd/mm/yy

10~11: Magnetic variation,degrees, E/W

12: Mode indicator

13: Navigational status

14: Checksum

◆ $--ZDA, hhmmss.ss, xx, xx, xxxx, xx, xx*hh<CR><LF>
1 2 3 4 5 6 7

1: UTC

2: Day, 01 to 31 (UTC)

3: Month, 01 to 12 (UTC)

4: Year (UTC)

5: Local zone hours 1) , 00 h to ±14 h

6: Local zone minutes 1) , 00 to +59

7: Checksum

◆ $--GGA, hhmmss.ss, llll.ll,a,yyyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1: UTC of position
2~3: Latitude, N/S
4~5: Longitude, E/W
6: GPS quality indicator
7: Number of satellites in use, 00 - 12, may be different from the number in view
8: Horizontal dilution of precision
9: Antenna altitude above/below
10: Units of antenna altitude, m
11: Geoidal separation
12: Units of geoidal separation, m
13: Age of differential GPS data
14: Differential reference station ID, 0000-1023
15: Checksum

◆ $--GST, hhmmss.ss, x.x, x.x, x.x, x.x, x.x, x.x, x.x*hh<CR><LF>

1 2 3 4 5 6 7 8 9

1: UTC time of the GGA or GNS fix associated with this sentence
2: RMS value of the standard deviation of the range inputs to the navigation process. Range inputs include pseudoranges and DGNSS corrections
3: Standard deviation of semi major axis of error ellipse (m)
4: Standard deviation of semi minor axis of error ellipse (m)
5: Orientation of semi major axis of error ellipse
6: Standard deviation of latitude error (m)
7: Standard deviation of longitude error (m)
8: Standard deviation of altitude error (m)
9: Checksum

◆ $--GBS, hhmmss.ss, x.x, x.x, x.x, xx, x.x, x.x, x.x, h, h*hh <CR><LF>

1 2 3 4 5 6 7 8 9 10 11

1: UTC time of the GGA or GNS fix associated with this sentence
2: Expected error in latitude
3: Expected error in longitude
4: Expected error in altitude
5: ID number of most likely failed satellite
6: Probability of missed detection for most likely failed satellite
7: Estimate of bias on most likely failed satellite(in metres)
8: Standard deviation of bias estimate
9: GNSS System ID
10: GNSS Signal ID
11: Checksum

◆ $-- GNS, hhmmss.ss,llll.ll,a,yyyyy.yy,a,c--c,xx,x.x,x.x,x.x,x.x,x.x,a*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11 12 13 14

1: UTC of position
2~3: Latitude, N/S
4~5: Longitude, E/W
6: Mode indicator
7: Total number of satellites in use, 00-99
8: HDOP
9: Antenna altitude, m
10: Geoidal separation, m
11: Age of differential data
12: Differential reference station ID
13: Navigational status indicator
14: Checksum

◆ $--GRS, hhmmss.ss,x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,h,h*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11 12 13 14 151617

1: UTC time of the GGA or GNS fix associated with this sentence

2: Mode

3~14: Range residuals for satellites used in the navigation solution Order shall match the order of satellite ID numbers in GSA. When GRS is used, GSA and GSV are generally required. Null fields for unused fields.

15: GNSS System ID

16: Signal ID

17: Checksum

◆ $--DDC,a,xx,a,a,a*hh<CR><LF>

1 2 3 4 5 6

1: Display dimming preset

2: Brightness percentage 00 to 99

3: Colour palette

4: Sentence Status Flag

5: Command Mode

6: Checksum

APPENDIX 6 SPECIFICATIONS

1. Basic Performance Parameters

Roll Angle Range	0 to 90°
Roll Amplitude	-90~90 °
Roll Period	4 ~ 40 s
Resolution	0.1 °
Accuracy	Heeling Angle: 5% of the measured value or ±1°, whichever is greater Roll Amplitude: 5% of the measured value or ±1°, whichever is greater Roll Period: 5% of the measured value or ±1s, whichever is greater

2. Display Unit

Screen	7-inch LCD 800*480
Luminance	600 cd/m²
Visual Distance	Unit Indication: 0.85 m
System language	Simplified Chinese/English

3. Interface

NMEA 0183	IEC 61162-1 Ed5 Input/Output 2
Output statements	HRM, HPM, POS, ALF, ALC, ARC, HBT
Input statements	ACN, HBT, RM, ZDA, GLL, GNS, GGA, GRS, GBS, GFA, GST

4. Power supply

	Main/auxiliary power supply 12-36V

5. Working environment

Sensor unit ambient temperature	-5 ℃ ~ +35 ℃
Display unit ambient temperature	-15 ℃ to +55℃
Relative humidity	93% or + 55
Display unit protection level	IP20
Vibration	IEC 60945 Ed.4
Compass Safe distance	Standard Compass Safe Distance 60 cm Steering Compass Safe Distance 35 cm

APPENDIX 7 PRODUCT CERTIFICATE

Marinelite

Certificate of Conformity

Product Name: Electronic Inclinometer

Qualified

Product Model: _____

Nantong Saiyang Electronics Co., Ltd.

Cut along this dotted line ✂

Cut along this dotted line ✂

Marinelite

Warranty

Product Name:	Electronic Inclinometer
Product Model:	
Device Number:	

User Name: _____

Contact Phone: _____

Contact Address: _____

Dealer's Seal: _____

Note: Users please keep this warranty card properly. This warranty card must be presented for repairs during the warranty period!

Warranty Terms

1. This product enjoys a one-year warranty for the entire unit from the date of purchase.
2. Manuals, brackets, power cables, outer packaging boxes, and other accessories are not covered by the warranty.
3. Damage caused by water ingress within the warranty period, exposure to high external temperatures, drop damage, unauthorized disassembly without manufacturer consent, damage caused by using the wrong power supply, or human faults such as replacing fuses with copper wire will not be covered under warranty.
4. Damage caused by force majeure is not covered by warranty! Maintenance service:
   Saiyang Electronics certified / approved local authorized dealers or distributors
   After-sales service telephone: 0513-83535455

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