

Electronic Inclinometer Operation Manual

Model : IM330



NINGLU

Document: NLT-IM330-SSEN

Edition: V170525

Contents

Introduction	2
Introduction	2
Definitions	2
Introduction	3
System View	3
Technical Requirements	4
Basic Parameters	4
Technical Parameters.....	4
Operation.....	5
Operation panel	5
Alarm	5
Roll Mode.....	5
Roll-Pitch Mode.....	5
Pitch Mode	8
Zoom	8
Power.....	8
Language.....	8
Day / Night	8
Forward	8
History Display	8
Backward.....	9
Record Switch	9
Knob	9
Sentence	10
Connection	13
Wiring diagram of IM330 back cover	13
System internal wiring diagram.....	14
Installation and Calibration.....	15

Introduction

Introduction

Electronic inclinometer IM330 is a device to measure ship hull posture, including roll actual angle, roll period, roll amplitude, pitch actual angle, pitch period, pitch amplitude, date, time, longitude and latitude, and to send them to VDR. It also has alarm function for ship's officers to avoid dangerous situations and the alarm messages (date, time, longitude, latitude, roll angel and pitch angel) are recorded in the history for check.

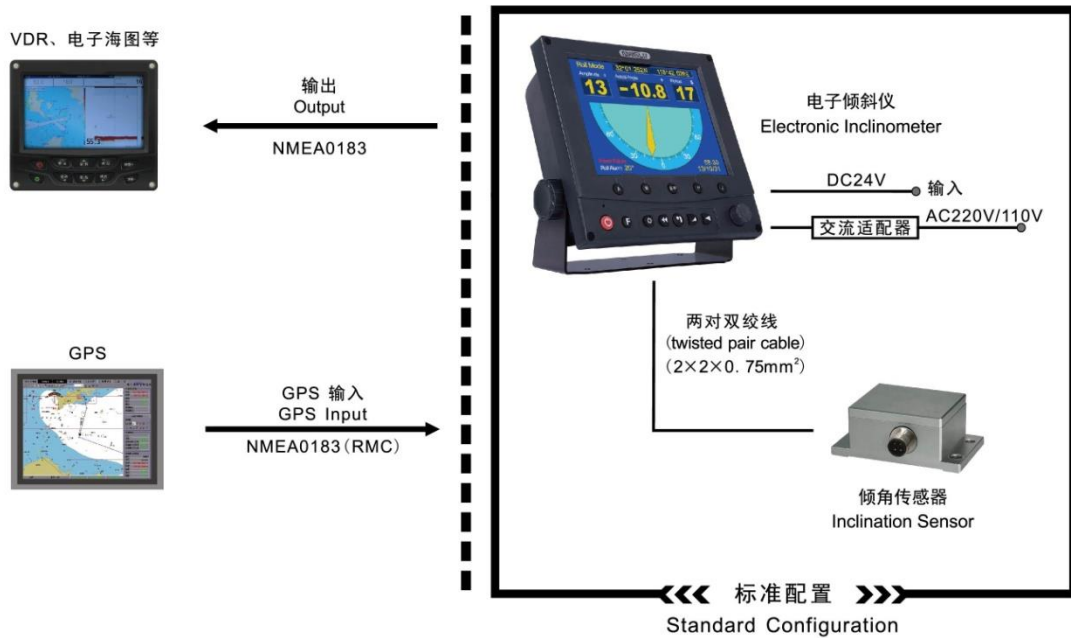
Electronic inclinometer IM330 is based on the combination of mechanical and electronic principle to provide the hull posture during the ship sailing. The main unit (display) can be separately used with the inclination sensor. The main unit can be mounted in the methods of table, hang and flush, and the inclination sensor should be mounted in horizontal direction and perpendicular to ship mast.

Definitions

Roll	motion around the longitudinal axis of the ship
Pitch	motion around the horizontal axis of the ship
Actual angle	momentary angle of roll or pitch referenced to a leveled ship to port or starboard side, or to front or back side
Period	Time between two successive maximum values of actual angle on the same side of the ship
Amplitude	maximum values of actual angle to port or starboard side, or to front or back side

Introduction

System View



Electronic inclinometer IM330 consists of the main unit and inclination sensor. The inclination sensor sends roll and pitch messages, in the form of RS485 digital interface, to the main unit. There is digital and analog display of the roll and pitch angles on the main unit. In the meanwhile, the messages of date, time, longitude and latitude are from GPS. And IM330 sends the roll angle and pitch angle to VDR, ECS and so on.

Technical Requirements

Basic Parameters

Dimension	H264 x W270 x D93 mm
LCD	10.4 inch TFT color LCD, 640X480 pixels
Power Supply	Two channels, DC 18.0V~31.2V, (24V, -25%~+30%) AC 220/110V (50/60Hz), with AC adapter
Alarm Type	Roll Alarm, Pitch Alarm and Power Failure Alarm
Alarm	Flashing and Buzzer (press any key to cancel alarm)
History Storage	20 items × 407pages
Input Baud Rate	4800bps
Output Baud Rate	4800bps
Working TMP	-15°C~+55°C
Waterproof	IP23 (main unit) and IP 67 (inclination sensor)
Weight	3.7kg

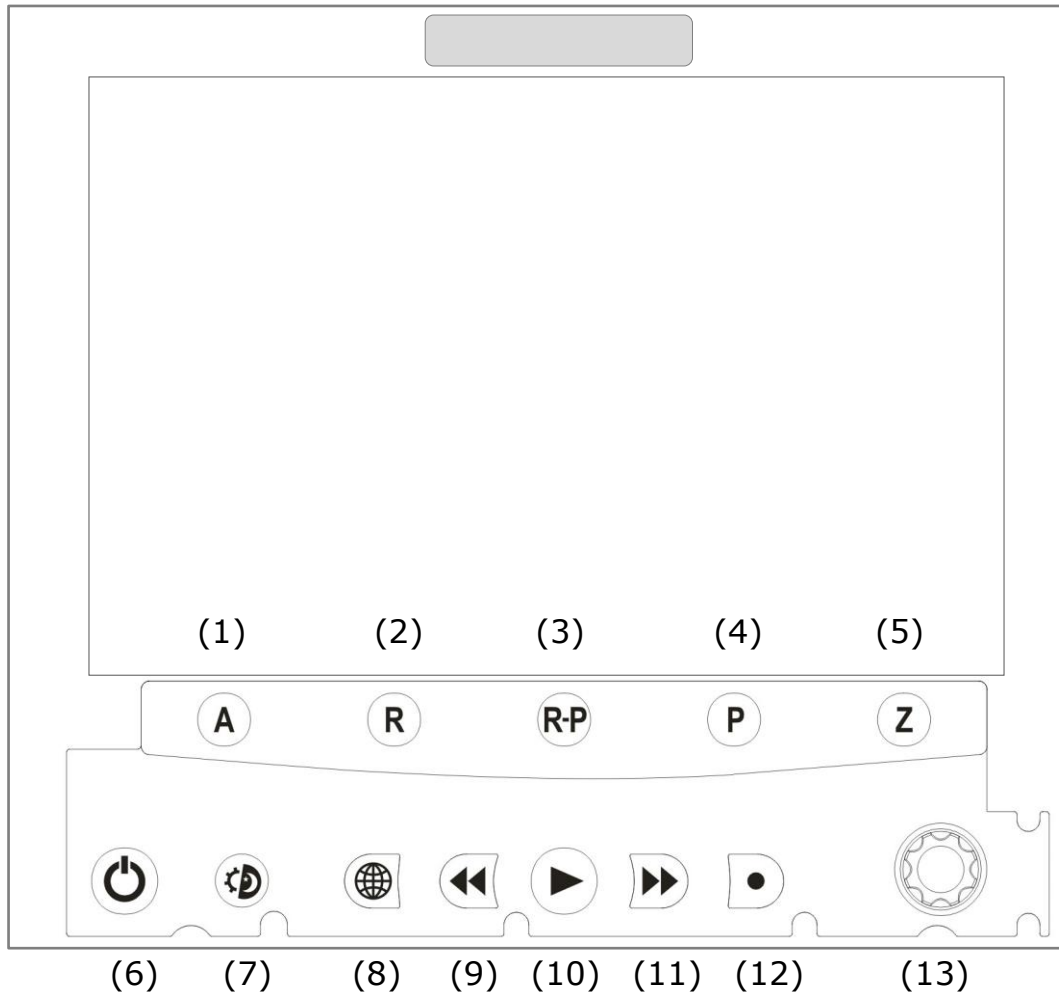
Technical Parameters

Roll / Pitch angle range	-90°~+90°
Roll / Pitch angle accuracy	±0.1°
Roll / Pitch amplitude range	0°~+90°
Roll / Pitch amplitude accuracy	±1°
Roll / Pitch period range	4~40s
Roll / Pitch period accuracy	1s

- ◇ Roll The value of roll angle is positive, when the direction of ship right side sink (lean to the right).
- ◇ Pitch The value of pitch angle is positive, when the direction of ship back side sink (lean to the back).

Operation

Operation panel



- (1) Alarm (2) Roll Mode (3) Roll-Pitch Mode (4) Pitch Mode
(5) Zoom (6) Power (7) Day / Night (8) Language
(9) Forward (10) History Display (11) Backward
(12) Record Switch (13) Knob

Operation

A Alarm

In the roll/pitch mode, press key [A], the words on the bottom left of screen 'Roll Mode'/'Pitch Mode' change to yellow colors, and adjust the knob to set the alarm value. Then press the key [A] again and the words 'Roll Mode'/'Pitch Mode' return to white color. Succeed in Alarm settings! If there is no operation in 10s, the words will become white color automatically and not in alarm mode.

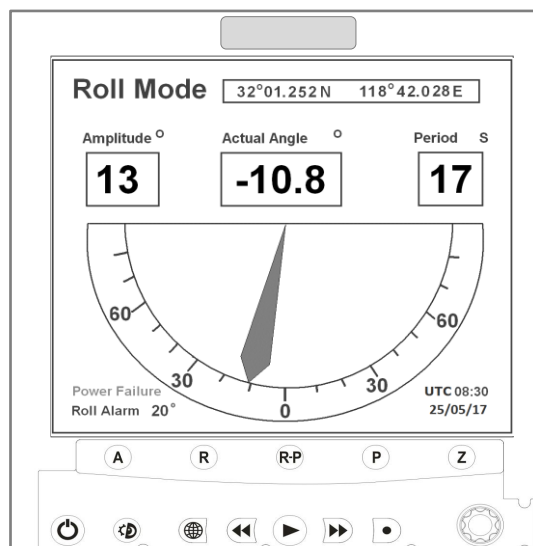
Power Failure

The LED on the front frame is used for power failure. The LED is green when dual tracking power supply. When only single power supply is on, the LED is red and the red words 'Power Failure' is flashing on the left bottom with buzzer alarm. Press any bottom to release the buzzer alarm.

Note, the main unit provides one interface, which can be used to connect with the external alarm to improve the alarm effect!!!

R Roll Mode

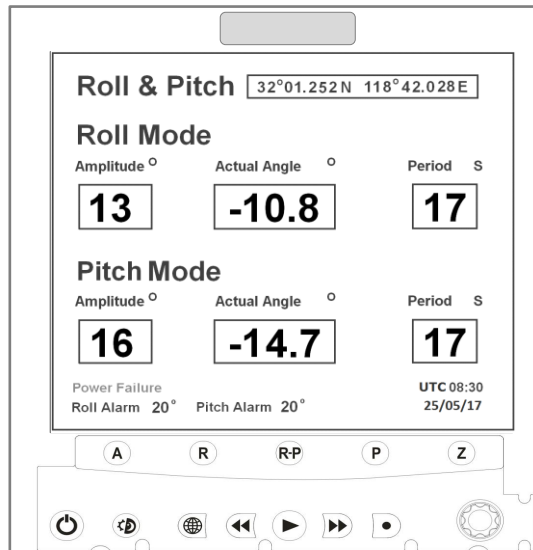
Press the key [R] to enter roll mode. On the screen, it shows roll amplitude, actual angle (digital and analog), period, alarm setting value, date, time, longitude and latitude.



Operation

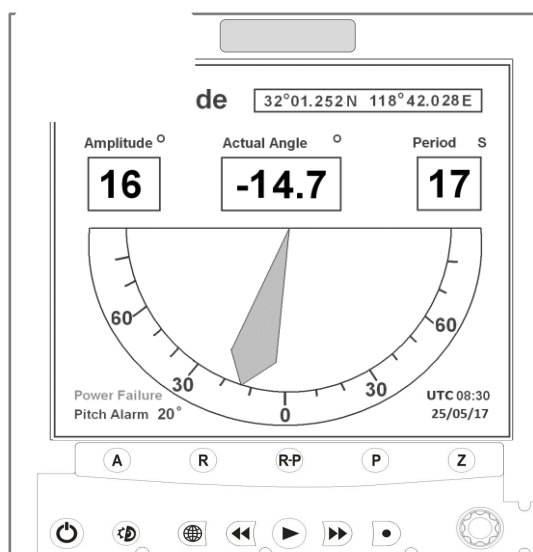
R-P Roll-Pitch Mode

Press the key [R-P] to enter roll-pitch mode. On the screen, it shows roll mode (amplitude, actual angle, period and alarm setting value), pitch mode (amplitude, actual angle, period and alarm setting value), date, time, longitude and latitude.



P Pitch Mode

Press the key [P] to enter pitch mode. On the screen, it shows pitch amplitude, actual angle (digital and analog), period, alarm setting value, date, time, longitude and latitude.



Operation

Zoom

In the roll/ pitch mode, press the key [Z] to zoom in or out the scale of the analog angle display. The angle range in the analog display is $0^{\circ}\sim 90^{\circ}$ (1°), $0^{\circ}\sim 45^{\circ}$ (0.5°), $0^{\circ}\sim 18^{\circ}$ (0.2°) and $0^{\circ}\sim 9^{\circ}$ (0.1°).

Power

Turn on or turn off the power supply. When only one power supply is disconnected, the power failure alarm will be on and press any key to mute the buzzer.

Day / Night

Press the key to select the day mode or night mode.

Language

Press the key to select the language. The option is Chinese or English.

Forward

Page forward the history record in History Display.

History Display

Display history record which the main unit have recorded before, including the date, time, longitude, latitude, roll angle and pitch angel. Press the key [R], [P] or [R-P] to return the display of roll mode, pitch mode or roll-pitch mode.

Operation



Backward

Page backward the history record in History Display.



Record Switch

Turn on or off the history record to select if recording navigation messages. When the Record Switch is on, the words "Recording" will be shown on the bottom left of the screen. Then the main unit will record the messages, only when the actual angle is larger than the value of the alarm. When the Record Switch is off, the words "Recording" will disappear, and the main unit will not record the messages anytime.



Knob

When the alarm value is set to yellow color, the knob can adjust the roll or pitch alarm value. The setting range is OFF, 1°~45°. At other times, it can adjust the screen brightness (12 levels) to apply in the current environment by rotating the knob.

Sentence

Output sentence

\$--HRM,x.x,x.x,x.x,x.x,A,x.x,x.x,hhmmss.ss,xx,xx,xxxx,x.x,a
 1 2 3 4 5 6 7 8 9 10 11 12

***hh<CR><LF>**

13

- (1) Actual roll angle, degrees
- (2) Roll period, seconds
- (3) Roll amplitude, degrees
- (4) This shall be a null field
A - Status, A=data valid, V=data invalid
- (5) This shall be a null field
- (6) This shall be a null field
- (7) This shall be a null field
- (8) This shall be a null field
- (9) This shall be a null field
- (10) This shall be a null field
- (11) Heel angle alert threshold value*
- (12) Sentence Status Flag**
- (13) Checksum

Sentence

Output sentence

\$--HPM,x.x,x.x,x.x,x.x,A,x.x,x.x,hhmmss.ss,xx,xx,xxxx,x.x,
1 2 3 4 5 6 7 8 9 10 11

a*hh<CR><LF>

12 13

- (1) Actual pitch angle, degrees
- (2) Pitch period, seconds
- (3) Pitch amplitude, degrees
- (4) x.x - This shall be a null field A - Status, A=data valid, V=data invalid
- (5) This shall be a null field
- (6) This shall be a null field
- (7) This shall be a null field
- (8) This shall be a null field
- (9) This shall be a null field
- (10) This shall be a null field
- (11) Heel angle alert threshold value*
- (12) Sentence Status Flag**
- (13) Checksum

Sentence

Input sentence

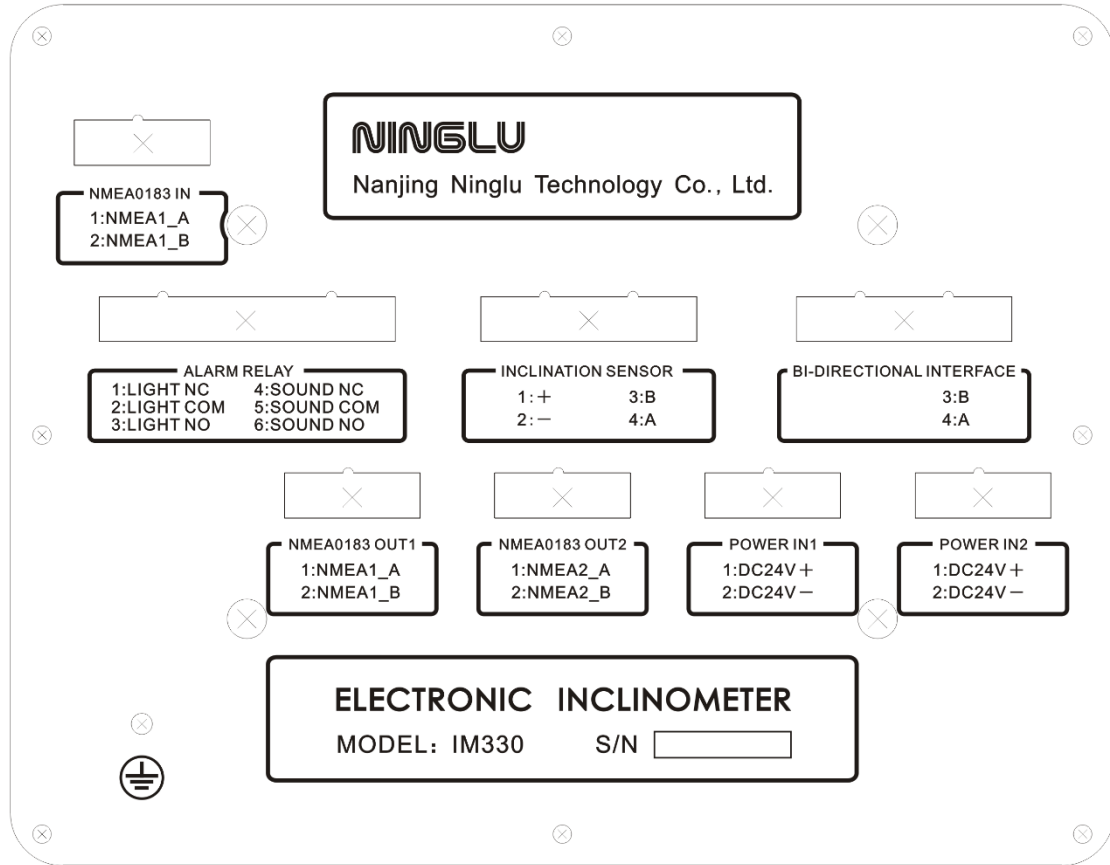
GPS data input

\$--RMC,hhmmss.ss,A,lll.ll,a,yyyy.yy,a,x.x,x.x,xxxxxx,x.x,a*hh
 1 2 3 4 5 6 7 8 9 10 11 12

- (1) UTC of position fix
- (2) Status, A=data valid, V=navigation receiver warning
- (3) Latitude
- (4) Latitude, N/S
- (5) Longitude
- (6) Longitude, E/W
- (7) Speed over ground, knots
- (8) Course over ground, degree true
- (9) UTC date, dd/mm/yy
- (10) Magnetic variation, degree, E/W
- (11) Mode indicator, A=Autonomous mode
 D=Differential mode
 E=Estimated (dead reckoning) mode
 M=Manual input mode
 S=Simulator mode
 N=Data not valid
- (12) Checksum

Connection

Wiring diagram of IM330 back cover



Connection

System internal wiring diagram

IM330 MAIN UNIT INPUT	A	NMEA_A
	B	NMEA_B

NMEA_A	A	GPS
NMEA_B	B	

IM330 MAIN UNIT ALARM RELAY	1	LIGHT NC
	2	LIGHT COM
	3	LIGHT NO
	4	LIGHT NC
	5	LIGHT COM
	6	LIGHT NO

BRIGHTNESS OFF	ALARM
BRIGHTNESS COM	
BRIGHTNESS ON	
SOUND OFF	
SOUND COM	
SOUND ON	

IM330 MAIN UNIT INCLINOMETER SENSOR	+	POWER +
	-	POWER -
	B	RS485 B
	A	RS485 A

BROWN VIN	IM330S INCLINOMETER SENSOR
BLACK GND	
BLUE B	
WHITE A	

IM330 MAIN UNIT BI-DIRECTIONAL INTERFACE		
	B	RS485 B
	A	RS485 A

		BI-DIRECTIONAL INTERFACE
NMEA B		
NMEA A		

IM330 MAIN UNIT OUTPUT	A	NMEA_A
	B	NMEA_B

NMEA_A	A	VDR,ECDIS, etc.
NMEA_B	B	

IM330 MAIN UNIT POWER IN	+	POWER +
	-	POWER -

+	DC24V DC POWER
-	

Installation and Calibration

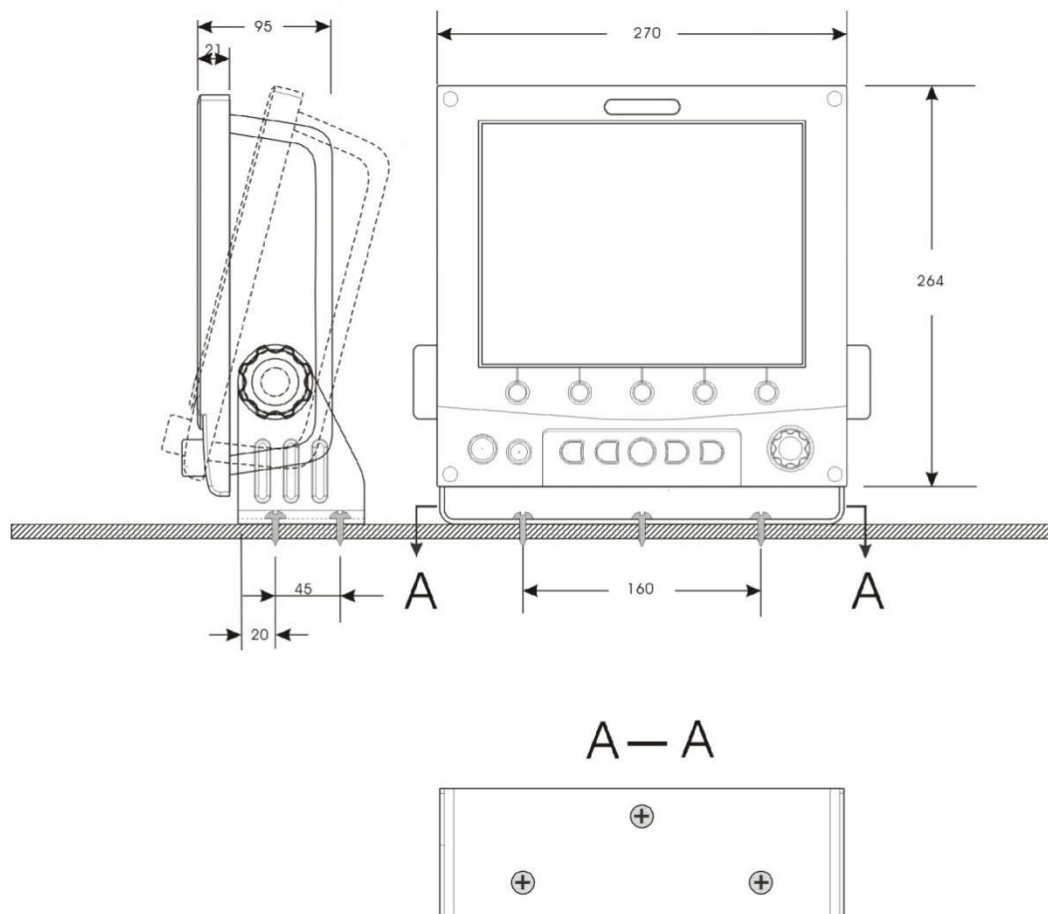
There are three methods to mount the main unit. Table, Hang and flash mounting is shown as follows.

Use three screws for Table mounting

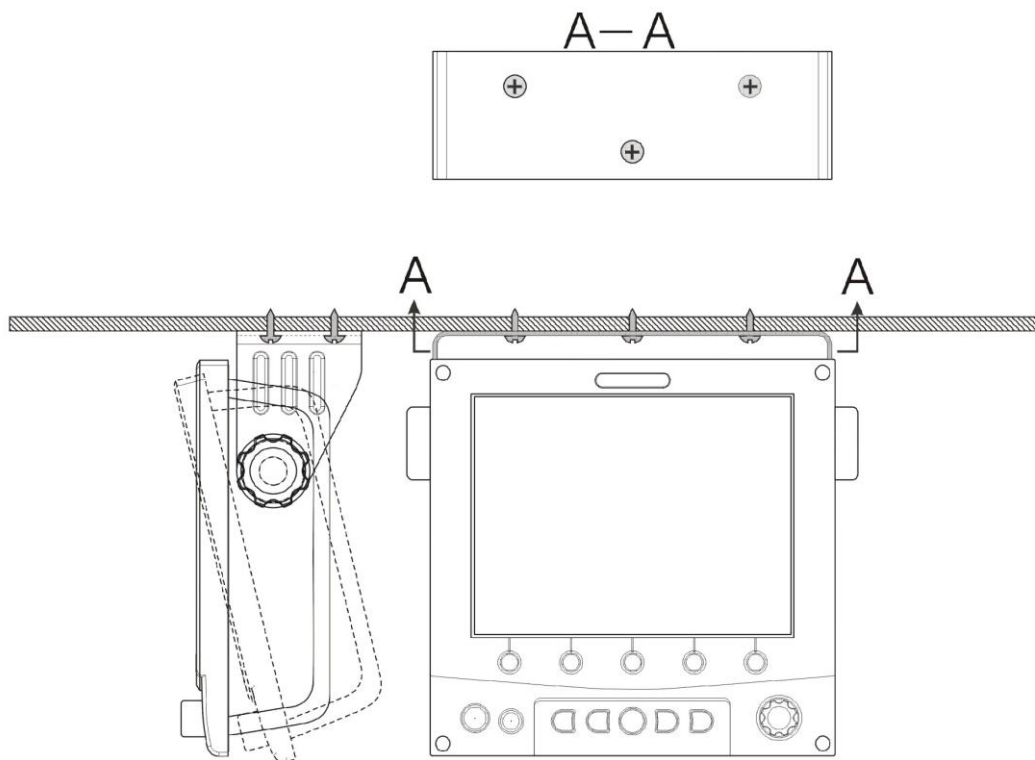
Reassemble the rear cabinet upside-down when Hang mounting.

Cut a chamfer angle square window on the working panel when Flash mounting.

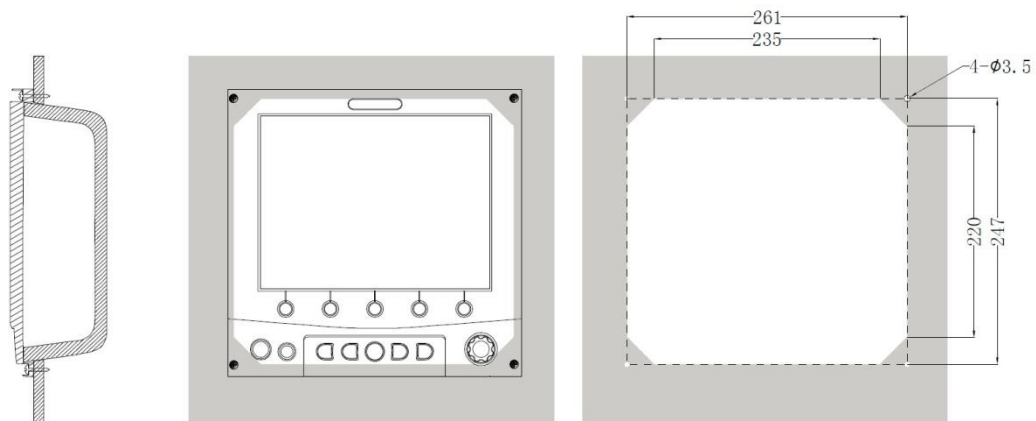
Table



Hang



Flush

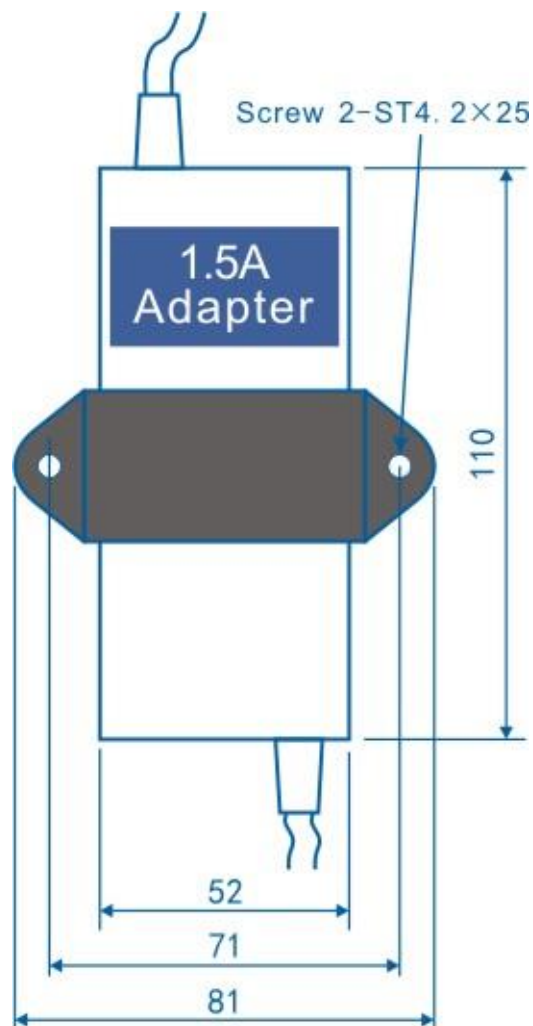


Installation and Calibration

Power adapter mounting

Power adapter (GA-240150), AC220/110V to DC24V, adapter holder and screws. Weight: 0.24kg.

Unit: mm



Installation and Calibration

The inclination sensor should be mounted towards the ship head and in a horizontal direction perpendicular to the mast.

When calibration, the ship should be static and horizontal as much as possible. After finishing the installation, press "R·P" to show the roll-pitch mode. If the actual angle of roll and pitch is not zero degree, users should calibrate the roll-pitch angle. Press "◀◀", "▶▶" and "R·P" in turn, and then the angle for roll and pitch change to zero degree. So, the calibration is finished and saved as reference.

Please do not calibrate the inclinometer when the ship is sailing!