SY-288GPS TYPE

AUTOPILOT FOR SHIPS

O P E R A T I O N I N S T R U C T I O N

Content

Preface Outline

Thank you for using SY-168W, SY-168GPS type Autopilot for ships. This manual will give you comprehensive description of installing method, operational method, precautions of the device and so on. For getting its best performance and keeping it in optimal working condition, please, read the manual carefully and operate the autopilot correctly.

Besides, please keep the manual in a suitable place, and not be lost or damaged. Be sure to take it when sailing.

This manual is only used to product information and our company reserves the right to change the parameters without prior notice.

Welcome to use This series of products

Attentions outline

The fault of the device or the disoperation when using the device may result in the risks of striking a reef, or collisions with other ships. Therefore, when using the device, the operators must be familiar with its operating characteristics, master its operation method skillfully and operate it carefully.

***General attentions**

1. All working modes of the device have their own specific operational method. Before using the device, please do read the manual carefully and understand the relevant chapters of this manual.

2. Operational training should be taken periodically, and operational methods and using attentions should be always understood and kept in mind.

3. The power supply must be DC24V. Using AC or other power supply may lead to the damage of device, fires, electric shock or other risks.

4. In the course of using the device, please pay attention to the sea conditions around the ship all the time in order to prevent the collisions from any emergencies.

***Attentions when emergent steering**

When there is anything abnormal or fault occurring in follow-up mode, AUTO mode and GPS mode, and at the same time of adopting reducing the ship's speed timely or other safe measures, switch the steering mode to manual mode, so that operators can directly steer the ship by using the rudder wheel.

***Attentions in follow-up mode**

During follow-up steering, please pay attentions to the changes of rudder angle and bow, and detect faults or risks timely.

***Attentions in AUTO mode**

1. AUTO mode and GPS mode will both use the azimuth signals generated by the azimuth sensor which is installed in magnetic compass. If

magnetic tools (including some ferrous metal tools) are placed near the magnetic compass, it will reduce azimuth precision or generate the possibility of rapid turn. Therefore, this kinds of tools or objects must not be placed near the magnetic compass.

2. When starting up the system, the device will load the default parameter values. Please depend on vessel loading conditions, speed, weather conditions to readjust the steering angle ratio, waves and neutral coefficients.

3. Special attentions should be paid in AUTO mode. Early detect and remove the risks of collisions, striking a reef or other risks.

***Attentions in GPS mode**

1. GPS mode is based on the target signals of the navigation device to control and adjust the ship. Therefore, the position accuracy depends on the accuracy of navigation device and magnetic compass. The error is from ten more meters to hundreds of meters according to the specific conditions.

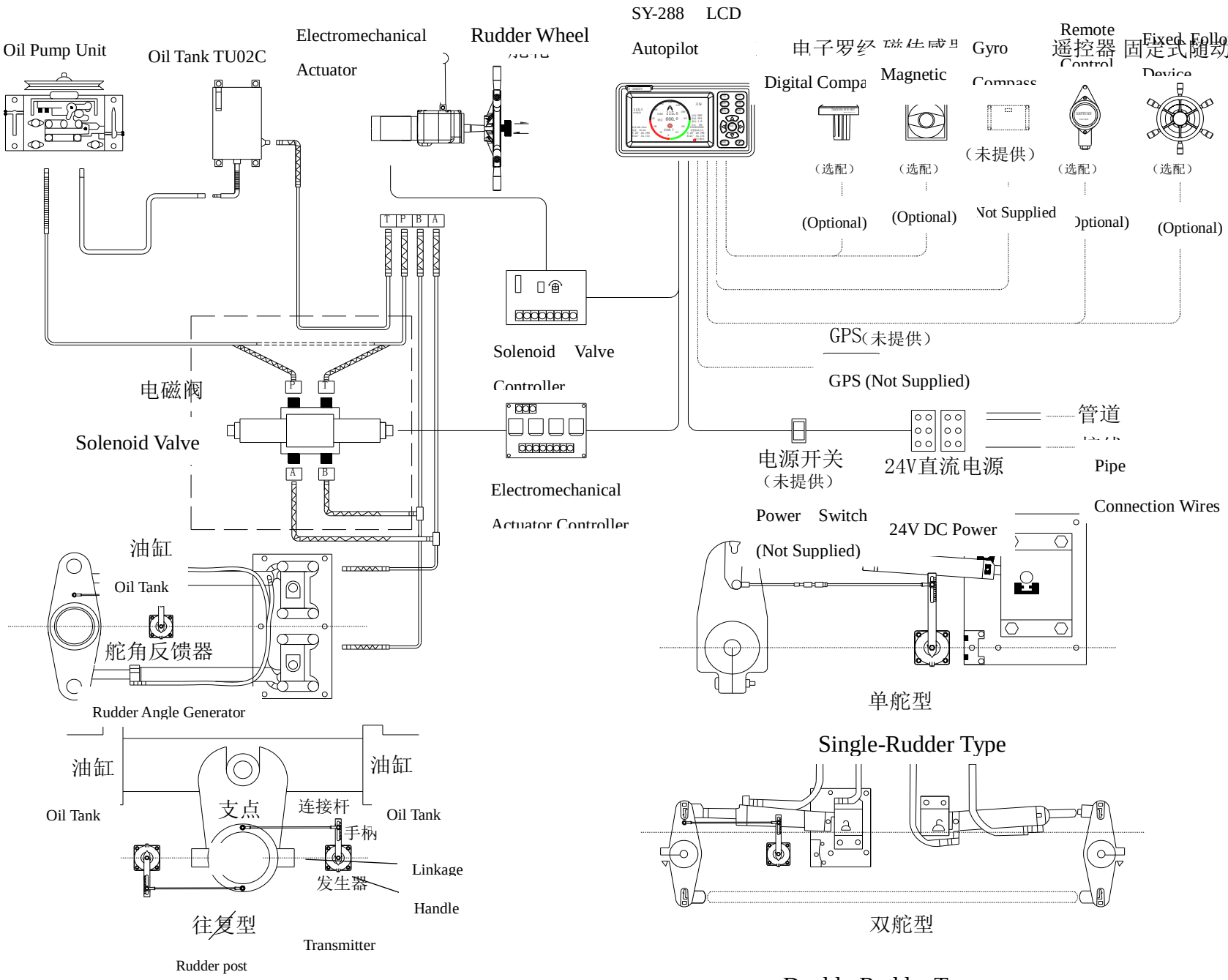
2. Because of effects of rudder angle ratio, coefficients of weather and waves, azimuth accuracy of magnetic compass and so on, it may deviate from course a few meters to dozens of meters.

3. GPS navigation device does not have the ability of identifying obstacles and reefs. Therefore, please not trust GPS steering much and also should pay special attention to the conditions around the ship.

***Suppose there are too many ships or rivers and ports are quite narrow, it is prohibited to use AUTO mode and GPS mode. It must be switched to manual mode.**

***In AUTO mode of GPS mode, the related operators must be on duty.**

Dynamical and Hydraulic Steering System + Automatic Steering System



Current Mode

GPS Course

Heading

Compass Course

Indicate rudder angle

航向设定

Mode:

模式切换：

Luma key: Adjust backlight brightness.

"ESC" button

Return to previous page in

"▲" button

Manual mode: Enter the waypoint management and arrangement of routes. After press the "cancel" button, automatically save the current value and exit.In menu mode，"▲" button

"ON" / "OFF"

Hold down for 3 seconds to

Target distance and speed

Current location

Rudder angle

Target location

Set parameters

"Function" button

Manual mode：enter menu. See details in P13.

AUTO mode：change counterclockwise rudder,

"OK" button

Manual mode：conform the settings when you change menu.

GPS mode：confirm navigation

"◀""▶" button

Manual mode：steer left or right.

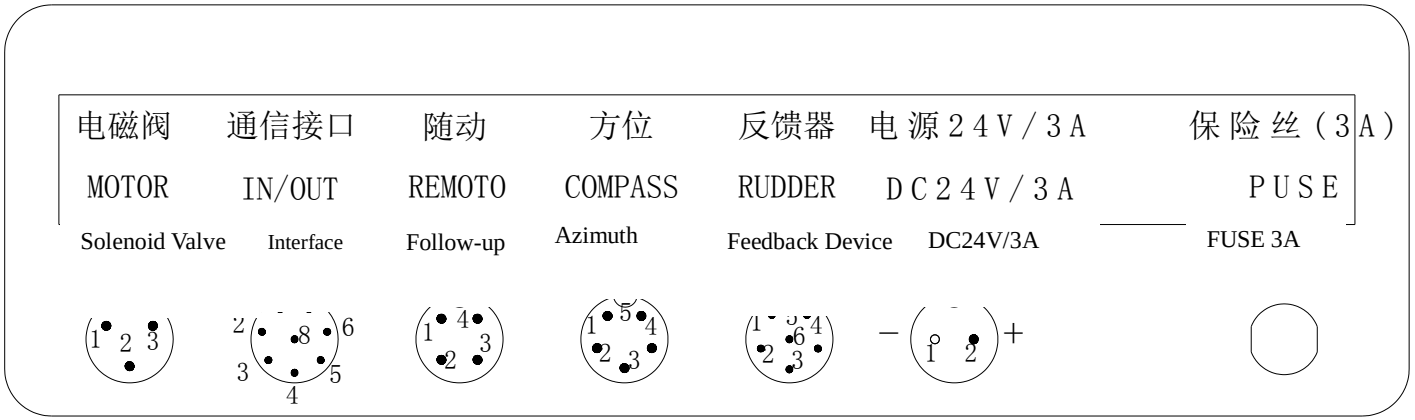
AUTO mode：set course (increase or decrease 1°).

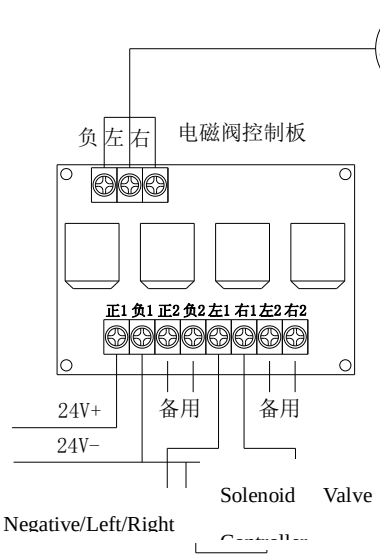
"▼" button

Press this button in manual mode to save current waypoint.

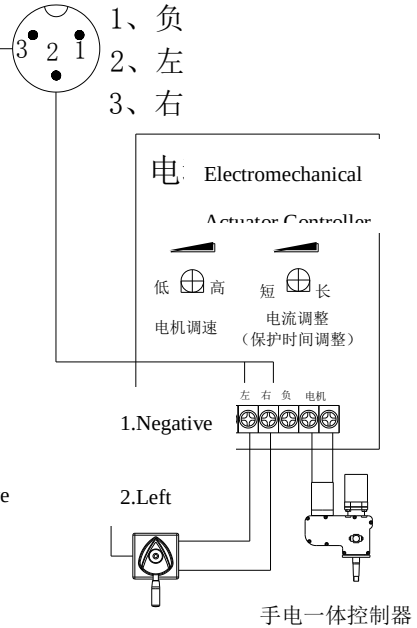
Press"▲" "▼" button，select waypoint storage location 001-020.Decrease value in all modes.

Each connection ports' wiring diagram in back panel



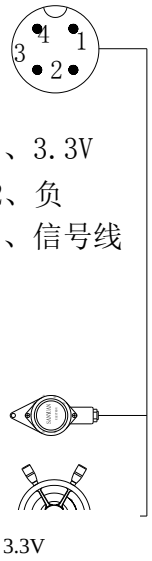


电磁阀



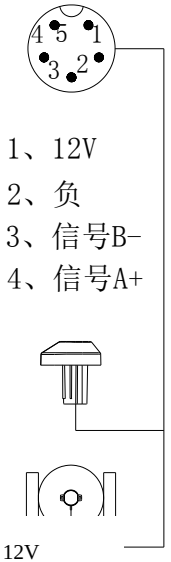
手电一体控制器

导航装置

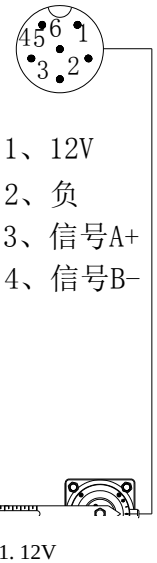


Follow-up

Steering Wheel



感器



器

Control Unit Installation

1. Control Unit SY-188GPS

As the control unit using a number of sophisticated electronic/electrical components, the installation location should meet the following requirements：

1）The place of low humidity

2）The place is easy for operation

3）The place is easy for installation and maintenance

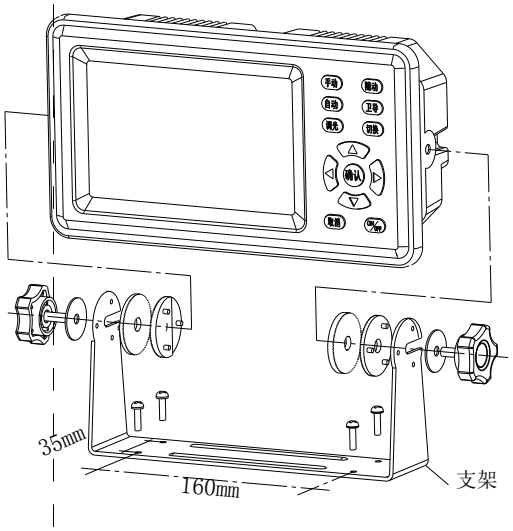
4）The place does not expose directly to sea water and sea wind.

5) The place does not expose directly to sunshine.

6）The place is far away from vibration.

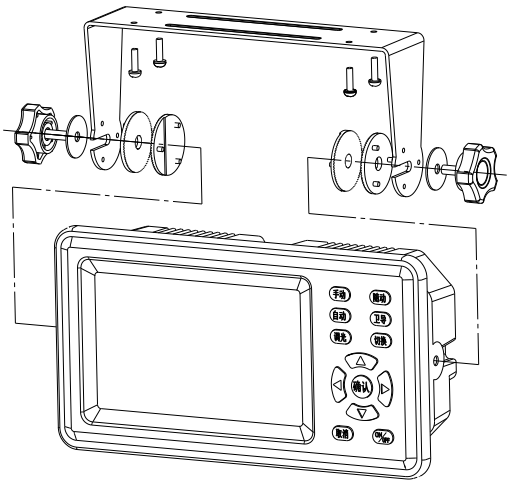
NOTE: Do not install the unit in a severely vibrated place or expose it directly to sea water, sea wind and rain. Otherwise, it will cause fault of the unit, and thus bring out the rudder be out of order.

Use brackets to install it on the desktop

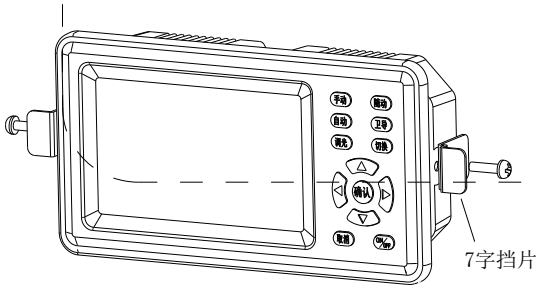


Use brackets to install it on the ceiling

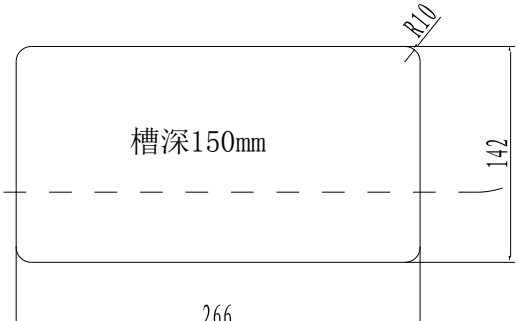
使用托架安装在天花板



嵌入安装在板面上



嵌入开槽尺寸



The slotting size

Install it on the panel

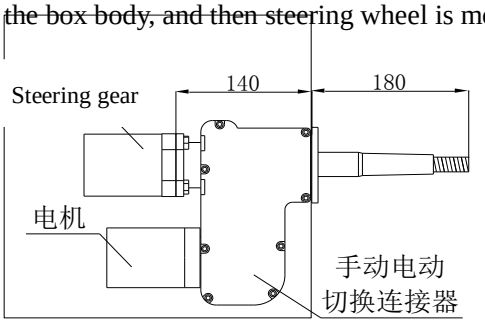
System Installation Installation

Connector for manual drive and motor drive Installation

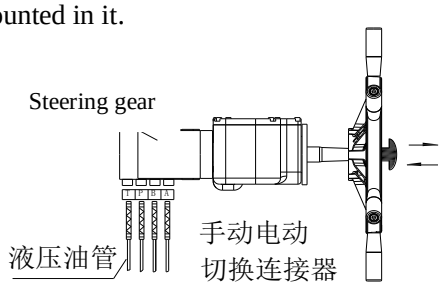
Cut along this dotted line to get the actual opening size

1. Connector installation method

Connector for manual drive and motor drive is installed in vessel with steering gear, fixed on the box body, and then steering wheel is mounted in it.

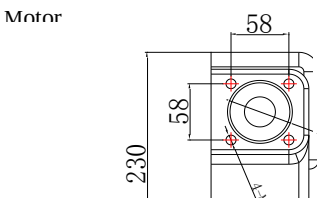


驾控箱顶视

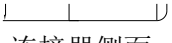


Drag out: manual drive

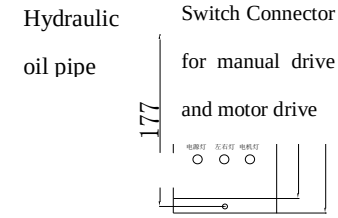
Push on: motor



Top view of driving control box



连接器侧面



连接器控制盒尺寸

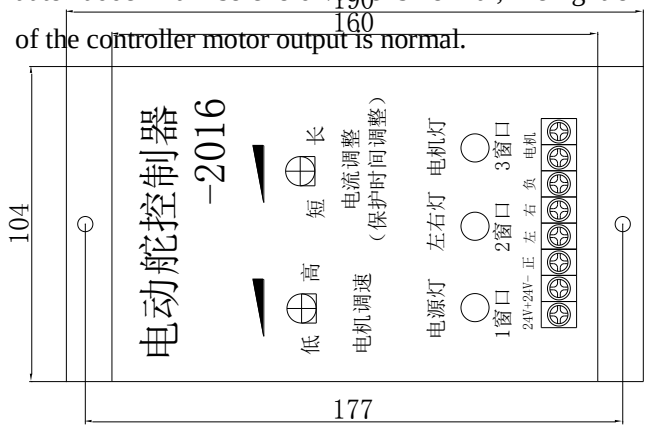
Side view of connector

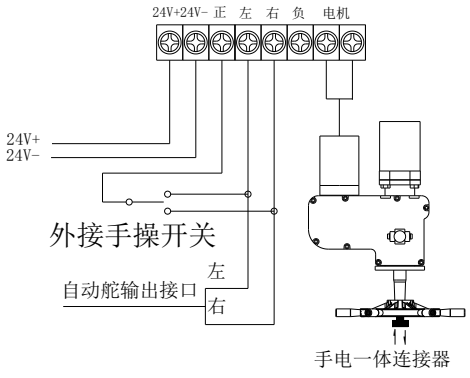
Connector control box size

Instructions: When Dragging out the center link, the steering wheel steers rudder; when pushing out it, motor steers rudder. The carbon brush on the motor is inspected every six months. If the carbon brush is found to be worn out, it should be replaced in time.

2. Controller for manual drive and motor drive

The control box is Installed in cool and dry place. Various accessories and power wires are connected up it according to connection diagram on the control box . When Power on 24V power supply, the control box power indicator light is on, and the gear position is pushed forward to separate the steering wheel. At this time, the steering gear is in the electric state. Press the left or right button or use the steering switch to pull the motor to the left or right. And check whether the steering direction is correct. (Press left key: left lamp of 2 and 3 windows will on:. Press right key: right lamp of 2 and 3 windows will on). If the direction is reversed,, change the left and right control lines. Note: The light of window 2 is on, indicating that the input voltage signal of the auto-rudder main solenoid valve is normal;The light of window 3 is on, indicating that the output of the controller motor output is normal.





External manual switch

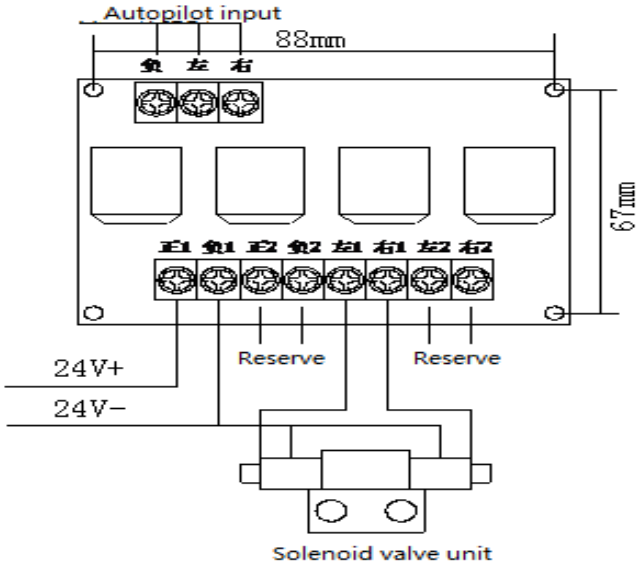
System Installation

Installation

Connector for manual drive and motor drive

3. Solenoid valve control panel

NOTE: Do not put the solenoid valve control panel on a severe vibrate place or direct exposure to the sea , wind or rain, otherwise it will have a malfunction and cause steering out of order. Positive 1/2 and negative 1/2: input power, left 1/2 right 1/2: output power (indicator light).

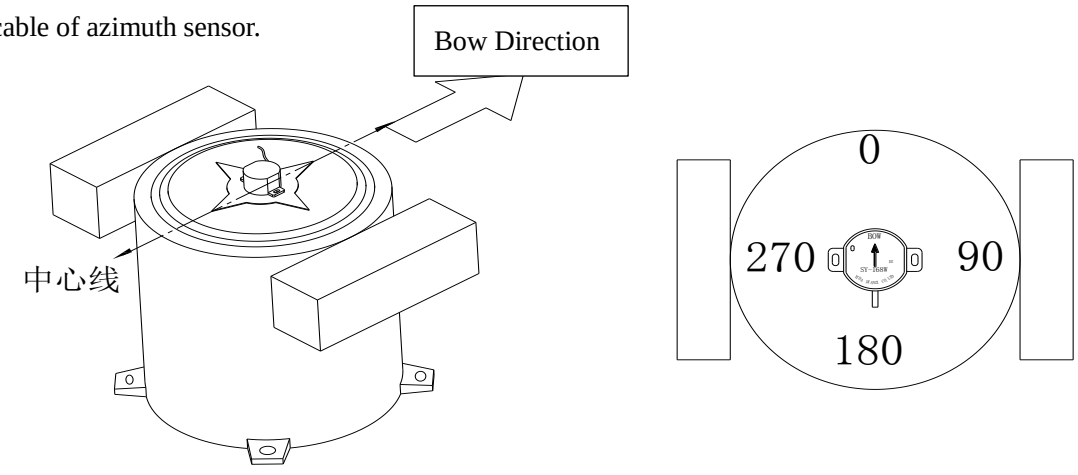


Ⅲ. Magnetic azimuth sensor's installation

The azimuth sensor is highly sensitive to magnetic field, so it will be influenced when the magnetic field around the installation position changes . When AUTO steering, sharp change of the magnetic field will cause a sharp turn of ship, which may cause danger. Therefore, it should keep more than 50cm distance between azimuth sensor and the device (such as electromagnetic valve, electrical machines and so on) with magnetic field and be sure that it can't be influenced by the magnetic field. Instruments or objects with magnetism must not be placed near it.

*Install magnetic compass in the centerline of the ship or the place parallel to the centerline and invite compass master to adjust magnetic compass. This will improve the direction's accuracy and stability when sailing。

*Aim pointed-end on the azimuth sensor at the bow line of magnetic compass. Tear down adhesive paper and then fix it in centerline position of magnetic compass. And properly fix the cable of azimuth sensor.



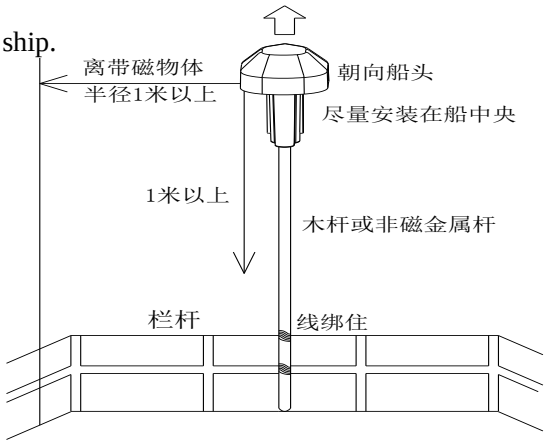
Centerline

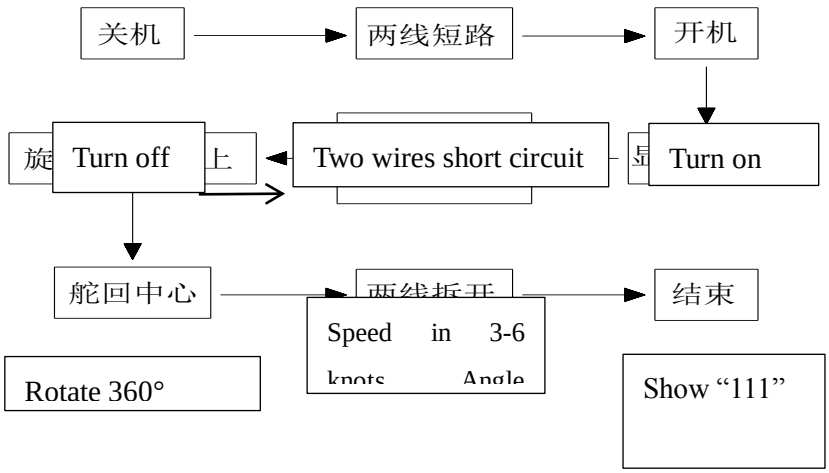
Ⅳ. Installation and debugging of digital compass.

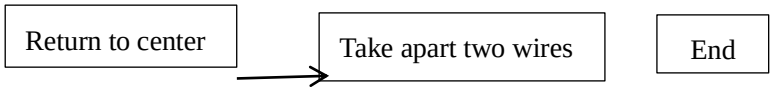
Because the compass needs to be adjusted and corrected which is trouble, wrong adjustment will cause the instability of the compass, now we replace with the 3-Axis digital compass.

Put the arrow of digital compass parallel to the bow of ship, fixed it in a stick (the one without magnetism) which is more than 1.5 meters height, and install it on the top and center part of driving cab. Be sure that there is no magnetic things in one meters.

*Note: Do not install it on iron stick nor in the side of the ship.







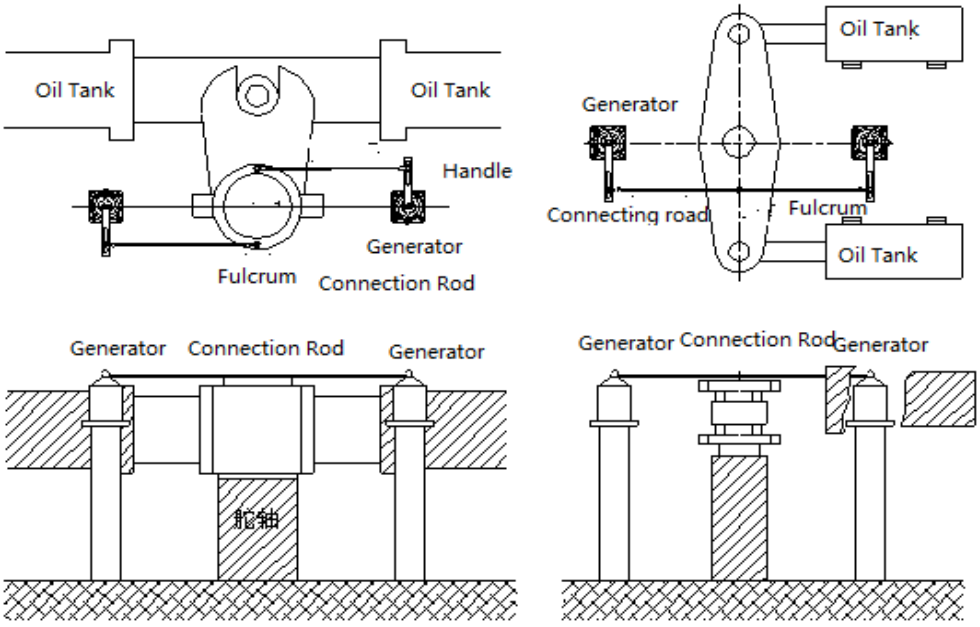
Ⅴ. The installation of rudder angle transmitter

* Rudder angle indicator can be installed around rudder. Please install it according to the specific layout of module and the actual situation of the system.

* Keep the rudder of ship straight, install the transmitter parallel to the center of main rudder holder. The length of rudder post center and generator center is the same with the length of two installation holes of connection rod. The length of generator handle is the same with rudder post center and fulcrum. Keep the generator parallel to rudder fulcrum and keep them in a parallel condition.

* NOTE: Parallel installation can have a feedback of real rudder angle to main controller.

* NOTE: It is important to adjust the rudder of ship in a straight state, otherwise it will directly effect the precision of sailing and work frequency of solenoid valve.



System Adjusting Operation Method

Ⅰ. **Debugging for ship at port**

After completely installed, operators must adjust every unit. This section will illustrate some adjustments which are needed after installation. In the occasions where the hydraulic source is

obtained through the engine-driven, please start up engine first. Please check the power supply is DC 24V again. Turn on the power and shift to “Manual “ mode. The LCD screen will display the welcome interface after hearing a sound of "di di" produced by the buzzer. After screen prompts,it will enter manual work mode. Aim the magnetic sensor at the center of compass. Rotate the magnetic sensor left and right until the course value of magnetic compass is the same with the course data of autopilot, that means they are pasted. Altering entering manual mode, if magnetic azimuth sensor or rudder angle generator works abnormally, the LCD screen will show alarm information immediately. Please check whether the corresponding parts are properly connected according to alarm information.(If there is electronic compass or GPS compass，must turn on these before starting opening the autopilot. In the GPS mode, GYRO indicator lights will turn on.) See the right figure below：

1、Turn the hydraulic controller right, and then check whether the rudder is turning to starboard and whether the rudder instruction on autopilot screen shows it turns right . Turn the hydraulic controller left, and then check whether the rudder is turning to larboard and whether the rudder instruction on autopilot screen shows it turns left. If it shows the rudder turn s to the reverse direction, please install again.When the rudder is in neutral position, check whether the shown value of steering instrument is 0°. If there is error, adjust steering instruments. After adjustment,re-tighten the screw cap and add grease to the universal joint.

2、Turn on the switching of solenoid valve or connector for manual drive and motor drive to enter the electric mode.Press PORT or STBD key on the panel, check whether the rudder turn left or right as indicated. If it is opposite, exchange the left and right lines of solenoid valve.

3、After left or right rudders are correct, press the left button to hit the rudder to the left full rudder, then press the right button to move the left full rudder to the right full rudder (check

whether the electric rudder control box has protection and alarm, if there is an alarm, it may be due to insufficient hydraulic pressure cause excessive load protection). Then set it in AUTO mode. The rudder will return to 0°, 1° or -1° in neutral position. If the rudder vibrates after returning to neutral position, it means the flow of pump is much more than the flow which the steering oil tanks require. And it will cause the rudder's changing speed to be too fast. At this time, adjust the pump flow to reduce the rudder speed or press Change Key several times in manual mode until turn out adjusting screen of rudder angle accuracy. Change the default value 002 to 003 and press Confirm button to confirm the setting. Or adjust the rudder function menu, the rudder angle rate should be 000-003, or adjust the motor speed in the controller.

Ⅱ. Trail voyage and debug

Under hydraulic system, sail the ship toward the aim destination more than 10 seconds without excursion, and check weather the rudder angle indicator within 3 degree. If more than 3 degree, please loose transmitter's nut, rotate main axis slightly until the rudder angle within 3 degree, then adjust the transmitter.If the excursion within 3 degree, press select button to 00 degree.

Ⅲ Digital compass debugging

Turn off power supply, short circuit two wires of digital compass and turn on again, with number "111" on display, keep the sail speed in 3-6 knots, let the rudder angle between 20-30 degree, rotate the ship more than 360 degree, then keep the rudder straight, separate two wires, the screen shows present course, debug finished. After debugging, please be sure the difference of digital compass and GPS course within 20 degree..

Brief Introduction of Operation Operation Method

■ Manual mode：

Manual steering is like driving a car with steering wheel. In manual mode, lightly press PORT or STBD key to control the actions of rudder to meet the required rudder angle value.

■ Follow-up mode：

Ruder is controlled by remote connected to the device in follow-up mode and it can control the rudder to shown angle value of remote. Although this mode us not AUTO mode, it can be operated at any place in the ship, and it can be used conveniently.

■ AUTO mode：

In this mode, it can control the course to the current direction and change the direction by adjusting the course. In this mode, if rotating the rudder angle of follow-up remote more than 5 degrees, the system will switch to follow-up mode automatically. If setting the remote in neutral position, the system will return to AUTO mode automatically a few seconds later.

■ GPS mode：

In AUTO mode, because of influence of wind or tide flow and after a long time sailing, although it can keep in the set direction, it may also deviate from the preset course. If connected to GPS device and after setting destination, it can correct deviation caused by wind or tide flow.

NOTE: Except for manual mode, it is prohibited to use direction rudder or the manual device in other mode. After using direction rudder or manual device to operate rudder, it still work in other mode, the ship will not deviate from the course and it will cause danger.Therefore, do use direction rudder after switching to manual mode.

Attention:

Electronic compass correction is an important part. It must be corrected in strict accordance with the steps, otherwise it will directly affect the accuracy, working frequency and stability of the automatic steering steering.

The correction is as follows: Shutdown → short circuit of the two lines on the azimuth plug → start to show 111 → turn the rudder angle to the left or right by 360 degrees or more (the ship turns more than one circle on the sea) → rudder centered → separate line → end.

Sea wave and rudder angle ratio adjustment: When the wind is weak , the sea wave are adjusted to 02-04, and it is adjusted to 04-10 when the wind is strong. When ship speed is adjusted to 6 knots and the rudder angle ratio is adjusted between 0.8-1.6 (generally about 1.0). When the ship speed is slow, the rudder angle ratio is tumbled at 1.6-3. Cargo ship: empty ship 1-2, heavy load 2-4.

Manual Steering Mode Operation Method

Manual mode will automatically enter after turning on the system. Press Manual key to switch to this mode in other work modes

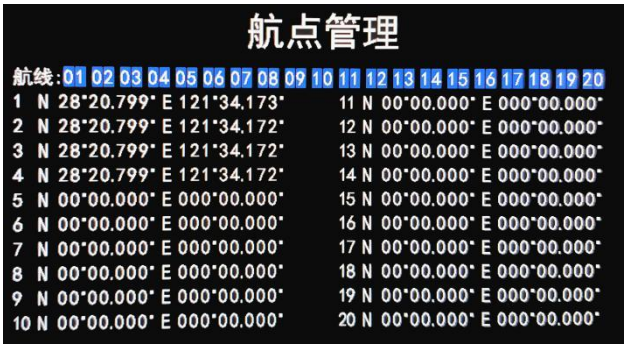
After entering manual mode, the rudder will return left when pressing "◄" key on the panel and will turn right when pressing "►" on the panel, like the picture one.

Picture 1

The function button in manual mode can change the screen into settings (for detailed settings see picture 18). Press "◄""►""▲""▼" button to move cursor; Press "OK" button to select; press "ESC" button to save and exit.

In manual mode, press ”▲” can set destinations (see picture 3), same as above.There are several routes available for selection in the waypoint management. Up to 20 waypoint can be set in the route. When tit is navigated by route, set the waypoint of the route first, and then the navigation line is automatically voyaged.. 20 way-points can be saved with “▼””OK” button.

Picture 2



Picture 3

Follow-up Steering Mode Operation mode

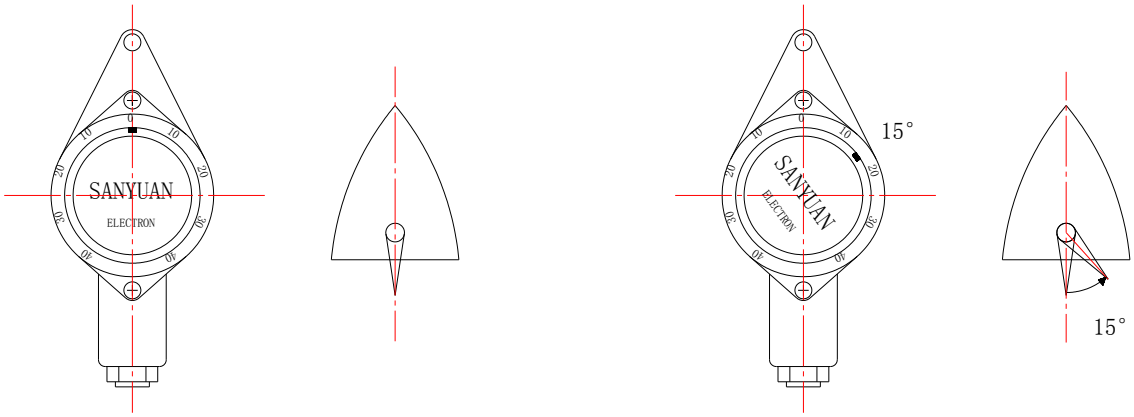
Turn the knob to follow -up mode, the system will enter follow-up mode. Before entering follow-up mode, please adjust follow-up knob to the neutral position avoid generating a big rudder angle action immediately after entering follow-up mode.

After entering follow-up mode, specific operational interface is as the following figure shown. The LCD screen will show bow azimuth value, rudder angle value, correct value indicated by follow-up controller. And it will show the steering direction of solenoid valve controller when need to operate.

In this mode, the system will automatically control the rudder to return to the redder angle position which the remote instructs.

Press ”▲” can set destinations,way-points can be saved with “▼” key.

NOTE: In follow-up mode, AUTO mode or GPS mode, the follow-up should turn to the neutral position. If the control wire is broke, please press SEL key and show “Whether start the follow-up mode”, then press STBD key to choose “NO”, then press “OK”, otherwise it will lead the system not work normally.



AUTO mode Operation methods

Before entering AUTO mode, please adjust follow-up remote controller to the neutral position firstly and then switch to AUTO mode. At this time the system will switch to AUTO mode. In this mode, the system will keep sailing in current course according to rudder angle indicator, bow direction and other signals.

In case of unset course, the system will set the current course as its default course.User can change the course with pressing "◄" and "►". Press "◄" key one time to decrease 1°and "►" key to increase 1°.If press several seconds continuously for one time, the course will increase or decrease 5°once. (See picture 1)

Please make sure follow-up mode opened if you want to use remote controller or follow-up steering wheel. See page 18. At this time, rotate the remote controller's knob more than 5°(see picture 2), follow-up mode can open automatically. And it can back to auto mode within one second if the rotate of remote controller back to neutral part (see picture 3).

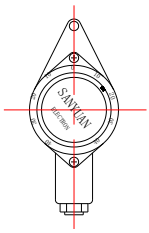
When back to auto mode again after an urgent changing to manual or follow-up mode, the course will set as current course rather than the course set before. If wanting to recover to formal course, please set it again.

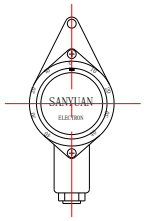
Press Function button to move cursor to change rudder, wave, rudder ratio and neutral number; press "▲""▼" to increase or decrease the number; press ESC to exit with current settings.

Way-points can be saved with "▼" key, press "▲" "▼"can set destinations.

Picture 1

Can set by remote control





Picture 2

Picture 3

Parameters adjustment Operation method

Automatic Sailing Adjustment

In order to suit the automatic sailing for different weather, different sea conditions and automatic sailing in different sailing conditions, it is necessary to adjust all kinds of parameters. Please do corresponding adjustment based on full understanding about the operation. When adjusting parameters, the system will close solenoid valve. Therefore, please switch the rudder in the neutral position before adjustment, and keep the mode in manual mode firstly, in order to avoid risks.

1. Course adjustment: Press"◄""►"to change the course direction

2. Weather parameters (waves) adjustment

When the system works in AUTO or GPS mode and even when there are no waves, the bow also will cause a little swing. However, in case of bad weather condition, the swing range will be sharply increased. If adjusting all errors caused by such swing every time, it will greatly increase work frequency of the rudder and then shorten the service life of machine. If you want to ignore swing in a certain range, you can adjust weather parameters to implement it. Specifically, if setting the weather parameters value is 4, the bow will ignore the rudder actions and do nothing when the swing value is between -2 and 2. **Set the weather parameters value is 04 in no wave, that is, the bow won't work when the deviation between setting direction and bow direction in ±2°, meanwhile, it will work at once when the deviation is more than ±2.1°. Course accuracy of ship will be higher. 03-05 in small waves, and more than 10 in big waves. The bow do not work when the swing value is between -5 and 5, do work at once when deviation value is beyond ±5°. This setting can reduce working frequency of rudder.**

In AUTO or GPS mode, press "Function" button (Background is blue), move cursor to wave parameters, the value can be turn up or down by "▲""▼"; press "Esc" button to save and exit. Boot default 04.

3. Rudder angle radio adjustment

The real working angle of ship can be adjusted by rudder angle ratio. If the ship moves fast, the rudder angle radio can be set around 1; if the ship moves slow, the value can be much bigger. The rudder angle radio value should be changed according to different ship and different sail speed. Too big rudder angle ratio will lead the ship sail like a snake walking. Too small rudder

angle ratio will lead the ship out of course.

In AUTO or GPS mode, press “Function” button, move cursor to settings, the value can be turn up or down by “▲””▼”; press “Esc” button to save and exit.

Generally, the rudder angle ratio of fishing ship is around 0.8-1.6; single boat trawler, pair trawler, shrimp boat is from 2 to 3; Empty cargo ship is from 1-2, overloaded cargo ship is from 2 to 4.

4. Neutral position modification

In AUTO or GPS mode, the default value of neutral position is “0”. The ship will be out of course because of the influence of tide flow and waves in long time sailing, so please adjust the neutral position and increase rudder balance to turn to setting course. Press “Function” button (Background is blue), move cursor to wave parameters, the value can be turn up or down by “▲””▼”; press “Esc” button to save and exit; The modification system will run in order of this setting neutral value. After running in 10 min, the neutral pointer will decrease or increase by swing left or right automatically, so as to modify automatically and accordingly.

5. Rudder balance adjustment:

Adjust rudder balance in auto mode according to the speed of course changing. If the ship sails as “S”course after amending, please turn rudder balance value up or down. Methods to adjust rudder balance: Press “Function” button under manual mode, select rudder balance, change the value with “▲””▼”from 000 to 050, save and exit with “Esc”button. Fishing boat: 000-003, cargo ship about 5,000 tons: 005-008, 10,000 tons or more: 008-012, It must adjust according to the truth. It is not better as the value be greater.

NOTES:

1. In AUTO and GPS mode, operator cannot absent from duty, and should pay attention to the conditions around the ship and keep ship’s safety all the time.

2. If meet too narrow river ways or meet too many ships in the same place, must shift AUTO or GPS mode into manual mode.

GPS Mode Operation Method

Note: When the GPS destination has been located, the ship must first be directed to the set destination, and then change the set value to avoid a large heading change. If the ship doesn’t go straight according to the destination before setting the GPS mode, and changes the setting value arbitrarily, the ship's course may be turned to the left or right by a large margin which is resulting in danger.

In AUTO mode, because of the influence of waves and tide flow and after a long time sailing,

although the ship is still sailing in the set direction, it may deviate from the preset course which will lead to the deviation with expected destination. In GPS mode, because of the real-time course adjustment of navigation device, it can avoid the above problem. Because the bow course adapts magnetic compass signals, the magnetic compass accuracy must be accordance with bow azimuth accuracy of GPS. Otherwise, too large error will affect course and generate a certain radial.

In AUTO mode, “Function” button can switch between setting way point, aim way point and course. (See picture 1-3)

Setting way point: press “◄””►” to move cursor, press “▲””▼” to increase or decrease the value; press “OK” after setting the aim destination (see picture 4) and the ship will sail as GPS mode.

Picture 1

Picture 2

Picture 3

Picture 4

Picture 5

Aim way point: there are 20 way point can be set, setting details see page 13. Press “OK”

after setting, the ship will sail as setting destination. **NOTE: Please ensure the safety around the ship, because the ship maybe will have a big turn after setting.**

Course selecting: there are two courses to select, and each course has 5 way points. Press "▲""▼" to select course; press "◄""►" to select first aim way point. When approaching the target, an approximate target alarm will appear. The closer the distance is, the faster the sound is, and there is a text prompt. Pressing the "OK" button will switch to the next waypoint to continue navigation. **NOTE: Please ensure the safety around the ship, because the ship maybe will have a big turn after setting.**

In AUTO or GPS mode, the course cannot be changed automatically nor by sailor if there is barrier. The course must be changed in manual mode.

NOTE: In AUTO mode of GPS mode, the related operators must be on duty.. Suppose there are too many ships or rivers and ports are quite narrow, it is prohibited to use AUTO mode and GPS mode. It must be switched to manual mode.

Parameters adjustment Operation method

Debugging Parameters of “Function” button:

Note: It’s valid to press “ Function” button in “manual mode”, meanwhile, it’s invalid to display when press “ Function” button in any other mode.

Press “Function” button in manual mode, move cursor (with blue background) on value setting

display by moving “◄” “►” “▲” “▼” . Press “ OK” to confirm the setting value; Press “◄” “►” can move cursor position; Press “▲” “▼” can increase or decrease value; Press “Esc” to save and exit.

1. Time of Keeping Rudder Angle

A Rudder angle was caused by ship’s turning speed rate. Time of keeping rudder angle is counted in seconds. Fishing boat is 003, cargo ship is 005.

2. Counter Rudder Sensitivity

If the sensitivity of bow azimuth is high, the bow turning speed is high, we needn’t set counter ratio too big. Factory setting value of counter rudder sensitivity is 000.

3. Wave Ratio Sensitivity

When wave ratio is set in a big value, it make rudder angle sensitivity high and keep ship sail straightly. Factory setting value is 000.

4. Deviation Modification of Rudder Direction

Deviation of rudder direction is accumulated in long time operation. Press“▲” “▼” to increase or decrease analog multiple. The bigger the value set, the quicker the analog accumulate. Factory setting value is 003.

5. Rudder neutral modification

Press “▲” “▼” to adjust neutral 0°position. The widest adjusting range is ±15°. Factory setting value is 000.

6. Set Maximum Rudder Angle

The maximum rudder angle depends on the limit value of rudder angle when the system is controlling the rudder. The setting is to ensure that solenoid value won't continue to be energized when the rudder reaches to its limit, and to ensure of devices' safety. Press "▲" "▼" on control panel, and the limit value of rudder angle will decrease or increase accordingly. At the same time, the new limit value of rudder angle will be shown on the LCD screen timely. After setting, press "OK" key to save the setting. The maximum value could be set to 50°. The factory setting value is 35°.

7. Set Automatic Maximum Rudder

In "Auto" mode or " GPS" mode, the ship is completely and automatically controlled by autopilot and in order to ensure the ship's safety, operators can set the maximum turning speed of bow. In the actual operation, the turning speed of bow depends on the rudder angle value. So setting the maximum speed of changing direction is setting the maximum rudder angle of bow turning. At this time, press "▲" "▼" button on control panel, the rudder angle value will decrease or increase accordingly. Press once and the value will increase or reduce 1°. Meanwhiles, new current value of rudder angle will be shown on the LCD screen timely. After setting, press " OK" key to save the setting. The factory setting value is 20°.

8. Set Rudder angle accuracy

When the rudder oil tanks keep on moving back and forth, on and on, operators can solve this angle accuracy problem by flow and mechanical adjustment. But these adjustments may not solve the problem sometimes.Therefore, we also can adjust the rudder accuracy by pressing "▲" "▼". The factory setting accuracy is 002. (000 < the setting accuracy < 005)

9. Rudder speed rate

Rudder keep swinging on and on, because flow of oil pump are too much and pump works too quick. Operator can reduce rudder speed rate to control switch time of motor steering device.

10. Course Modification

When magnetic course are different from GPS course, operator can adjust both of them to be same by press "▲" "▼". But Did this modification cannot ensure all other courses are same. (Generally, it needn't adjust.) Factory setting "000".

11. Azimuth Flitering

The azimuth flitering coefficient can reduce the outside influences to the azimuth. Press "▲" button, the azimuth speed will be higher. Press "▼" button , the azimuth speed will be lower.

Factory setting "005".

12. Alarm Reset (ARM RST)

In " Auto" mode or "GPS" mode, it's very convenient. After setting all parameters, autopilot control system will automatically control solenoid value to adjust rudder, the ship will sail in target setting direction. But we cannot be careless and relax security during automatic operation. Our autopilot steering system has monitoring and alarming function by time setting. Alarm will ring once in a certain time, in order to remind customers to keep attention on ship's running. The alarm is only used in "Auto" mode or " GPS" mode. Press "▲" "▼" button in control pannel, the set will become " ON" or "OFF". After setting, press " OK" key to save such a set. Factory setting value is "OFF".

13.Turn on " Remote' mode.

If wires of remote-control device are broken or weren't connect successfully, and ship cannot sail in right order, pls turn off the remote device. Press "▲" "▼" button on control panel, then setting value will be shown " ON" or "OFF", press "OK" to save and exit. If operator didn't operate in this moment, the system default is saved as "ON". Factory initial setting value is " OFF".

14. Rudder Inversion

The inverse installation of rudder feedback because of the install position limit, the actual rudder direction will be just opposite of the one displaying on autopilot system, so the rudder will be turned on inversely. The factory initial setting value is " OFF".

Alarm Operation method

1. Course deviation

If the current course has been 10° larger than the set course for more than 90 seconds and then it is unable to return to the set course, it will cause a deviation alarm. It will stop alarming if it is returned to deviation less than 10°.

2. Rudder angle ultralimit alarming

When the rudder angle of the left and right rudders is beyond its set maximum rudder angle, it will cause a rudder angle ultralimit alarming.

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3. Over time alarm

When automatic steering, the device has the timely monitoring alarm function. It will alarm once each a certain time.

4. No signal alarm in GPS mode

In GPS mode, it will alarm when there is no input signal from GPS device or when it can not receive signals normally.

5. Direction fault alarm

Alarm when the azimuth sensor is disconnected or at fault.

6. Rudder angle generator fault alarm

Alarm when the rudder angle sensor is disconnected or at fault.

7. Reaching destination alarm

Alarm when within 100 meters far away from destination programmed in navigation device.

8. Near destination alarm

In GPS mode, alarm within 1000 meters closed to destination.

9. GPS fault alarm

GPS fault appear when it matches not GPS compass or magnetic compass.

Fault Diagnosis and Treatment

Abnormal Phenomena	Cause	Correction
After power on,the LCD screen shows nothing and backlight lamp is off.	Wrongly connect the power cords.	Check and correct wires.
	The power supply is abnormal(Less than 10V).	Check the power supply(13.8-32V).
	The fuse is burned out.	Change a new 3A fuse.
After power on, the backlight lamp is on,but the LCD screen shows nothing.	LCD screen initialize abnormally.	Reboot the system.

Unable to control rudder correctly.	The power supply of electromagnetic valve is abnormal.	Check the power supply of electromagnetic valve.
Steering direction of solenoid valve is wrong.It turns right when it is set to turn left.And it turns left when it is set to turn right.	The connection of solenoid valve is wrong. The connected wires of control box for motor drive or motor is wrong.	Adjust wires of solenoid valve.
The rudder is used too frequently in AUTO or GPS mode.	Not install the rudder angle generator in the neutral position.	Adjust the netural position of the rudder angle generator.
	Bad weatherand too small wave adjustment of automatic rudder.	Turn up the wave parameters of automatic rudder.
	The amount of rudder pressure is excessive.	Reduce the frequency of using rudder.
	Small rudder angle ratio	Adjust the rudder angle ratio to the appropriate position. For details, see the P16.
The rudder angle instruction is abnormal.	The interference of transmitter cause the rudder angle to fluctuate.	Deviate automatic rudder from the transmitter.
		Don’t share the power GND with transmitter.
Rudder fault alarm.	The wires are wrongly connected,broken or the rudder angle generator is broken.	Change wires and rudder angle generator.
Bow course fault alarm.	The azimuth sensor is broken or has fault.	Change wires and azimuth sensor.

It can not keep sailing straightly in follow-up,the follow-up steering remote is in the netural position,but the LCD screen is not shown "0".	The rudder angle generator woks abnormally.	Check whether the shown rudder vale is in accordance with actual value.If there is fault,please adjust.

	Not correctly adjust the neutral position of the reomote's potentiometer.	Adjust neutral position of reomote's potentiometer.
It can not keep sailing straightly in AUTO or GPS mode.The ship sails like a snake walking.	The installation position of rudder angle generator is wrong.	Adjust the generator again according to the installation methods of rudder angle generator.
	Unwell adjust the neutral position of rudder.	Make the netural adjustment of the rudder.
	There is error between the shown value of position sensor and the the actual position value.	Check wether there is magnetic influences or the azimuth sensor works normally.
	The ratio of rudder angle is too large or small. The rudder angle works abnormally. The value of internal menu is abnormal .	Adjust the ratio of rudder angle. Check whether the shown rudder vale is in accordance with actual value. Check whether there are other installation issues.Adjust according to internal menu.
	Magnatic compass or digital compass is unstable.	Recalibrate magnatic compass or digital compass.
	Whether there is another alarm information.	Repair according to the instruction information on the screen.
	Inertia or the ratio of rudder angle is too large when ship overload.	Adjust internal value and time of pressuring rudder.
Control box for motor drive alarm.	Voltage is too low.	Confirm whether input voltage is DC24V.
	Alarm after a few seconds in AUTO mode,cause hydraulic overload and overcurrent.	Adjust guard time value of control box.

Fault Diagnosis and Treatment

Abnormal Phenomena	Cause	Correction
It woks abnormally in GPS mode.	The connected wires of GPS device is wrong.	Adjust the connected wires.
	The connected wires of GPS device is broken.	Repair connected wires.
	There is a big error between the position of GPS device and the position of autopilot.	Adjust the installation position of position sensor.Try best to reduce the error between two.
	Whether there is another alarm information.	Repair according to the instruction information on the screen.
The steering direction is turning to one side.	The lines between host and the relays and electromagnetic valve are loosed or disconnected.	Adjust and repair.
	Heading center is wrong.The ship yaws as wave or ocean current.	Adjust the installation position of rudder angle.Turn on error correction of menu.Press the “neutral” button.
In AUTO or GPS mode,the left and right rudders nonstop swing left and right.	Electronic compass is not corrected	Correct again, for details, see the P10

	The big flow of pump may lead the ship's speed too quick.	Adjust the pump flow and lower rudder speed.
Deviation alarm of ship.	The solenoid valve is damged,blocked or its wires are open.	Change or clean the solenoid valve.Change its wires.
The rudder angle shows normally and no alarm,but can operate.	The light of control box can not turn on when enter "left" or "right".	Check the left and right voltage of control box,in Manual mode,press "left" button control box input 1 and 2(1 is negative,2 is positive).Press "right"button 1 and 3 should output 24V.Check whether it inputs normally,Measure eight interfaces,1.2 is 24V.It is normal if you press "left" or "right",left 1 or right 1outputs 24V.Change dashboard if no voltage output.
	The light of control box can not turn on.	Check power supply.Change fuse.
	The buzzer of control box blews.	Press the "reset" botton,check whether the voltage is too low.
	The light of control box can turn on but rudder can not operate.	Check if there is voltage output on the motor terminal, there is voltage output, the motor is bad, replace the motor, no voltage

		output, replace the control box. Check the electric rudder control box.
When pressing the AUTO button,it switches to the follow-up mode.	The follow-up device is broken or the follow-up knob is not in the neutral position.	Repair the follow-up device or rotate the knob to the the neutral position

List Of Autopilot

■**Parts**……**AMOUNT**

■Host……....1

■Rack…… .1

■Power wires…… .1

■Screws of rack……...2

■Generator…….....1

■8x30mmscrews and nuts…….....7

■Installation board……....1

■Universal connecting rod……..1

■Follow-up chosen preparation……....1

■Magnetic azimuth sensor(optional)……..1

■Antenna for digital compass(optional)……..1

■Antenna for digital compass(optional)……..1

■3A fuse……2

■Antenna for digital compass(optional)…….....1

■Instructions……...1

■Qualification……1

Product Quality Card

Dear customers：

In order to deliver our best and faithful service for you ,and also be beneficial for the feedback of our company’s quality information,please

send your invaluable feedback and suggetions about the operational conditions and product quality to us timely.Then you will get satisfied answer and sincere thanks from us.

Yours sincerely friends！

Our information： Address No.388-1,Hongguang,Yanjiang,Linhai,Zhejiang,China

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Technical Service Deparment：013606676751

Postcode：317500

Linhai Yida Electronics Co.Ltd.

Attachment：

Users'Name：_____ Contact Tel：_____

Address：_____ Product Model：_____Postcode：_____

Purchase Date：_____ Installation Date：_____

Installation Company：_____

Views and suggestions：