7 INCH TFT LCD DOPPLER SPEED LOG

OPERATION MANUAL

Model: DS99

NINGLU

Doc No: NLT-DS99-SSEN
Version: V170704

Safety instructions

WARNING	CAUTION
ELECTRICAL SHOCK HAZARD!  **Do not open the equipment.** Only qualified personnel should work inside the equipment.	**Please follow the guide in page 31 to replace the fuse.**
Immediately turn off the power if water leaks into the equipment or an object is dropped into the equipment. Continued use of the equipment can cause fire or electrical shock. Contact NINGU for service	**Do not use chemical cleaners such as alcohol, acetone and benzene to clean the equipment.** Chemical cleaners can remove paint and markings. Use only a soft, dry cloth.
Keep the equipment away from flammable liquids and heater. A heater can melt the equipment's power cord, which can cause fire or electrical shock.	**Do not power the equipment when the transducer is in air.** The transducer may become damaged.
Do not operate equipment with wet hands. Electrical shock can result.	**Handle all units carefully.** Damage can lead to corrosion.
Do not paint the transducer face. **Handle the transducer with care.** Paint will affect equipment performance..	**When dry docked remove marine life from the transducer.** Remove marine life to maintain good sensitivity.

Content

Foreword

DS99 displays ship's speed relative to water (Fore/ Aft) and distance (Trip/ Total) in 7 inch TFT LCD, using Doppler principle.

Applying new technology of high integration and stability, DS99 provides you the optimum choice for large ship. Its rugged and modern design offers excellent user feelings.

Your Doppler speed log will perform to the utmost of its ability only if it is operated and maintained in accordance with the correct procedures.

Conditions affecting the accuracy

The DS99 measures ships speed by detecting the doppler frequency shifts of the echo reflected by a watermass (water layer containing plankton and other micro- organisms) located within the measuring area, which is usually about 2 m. In some instances, however, no signal is returned because of too little plankton in the sensing depths. This phenomenon can occur in particular areas in particular seasons. The probable cause is the plankton are lying in deep water because an ice-melted cold water mass covers the sea surface. Similar cases may also occur in a freshwater lake.

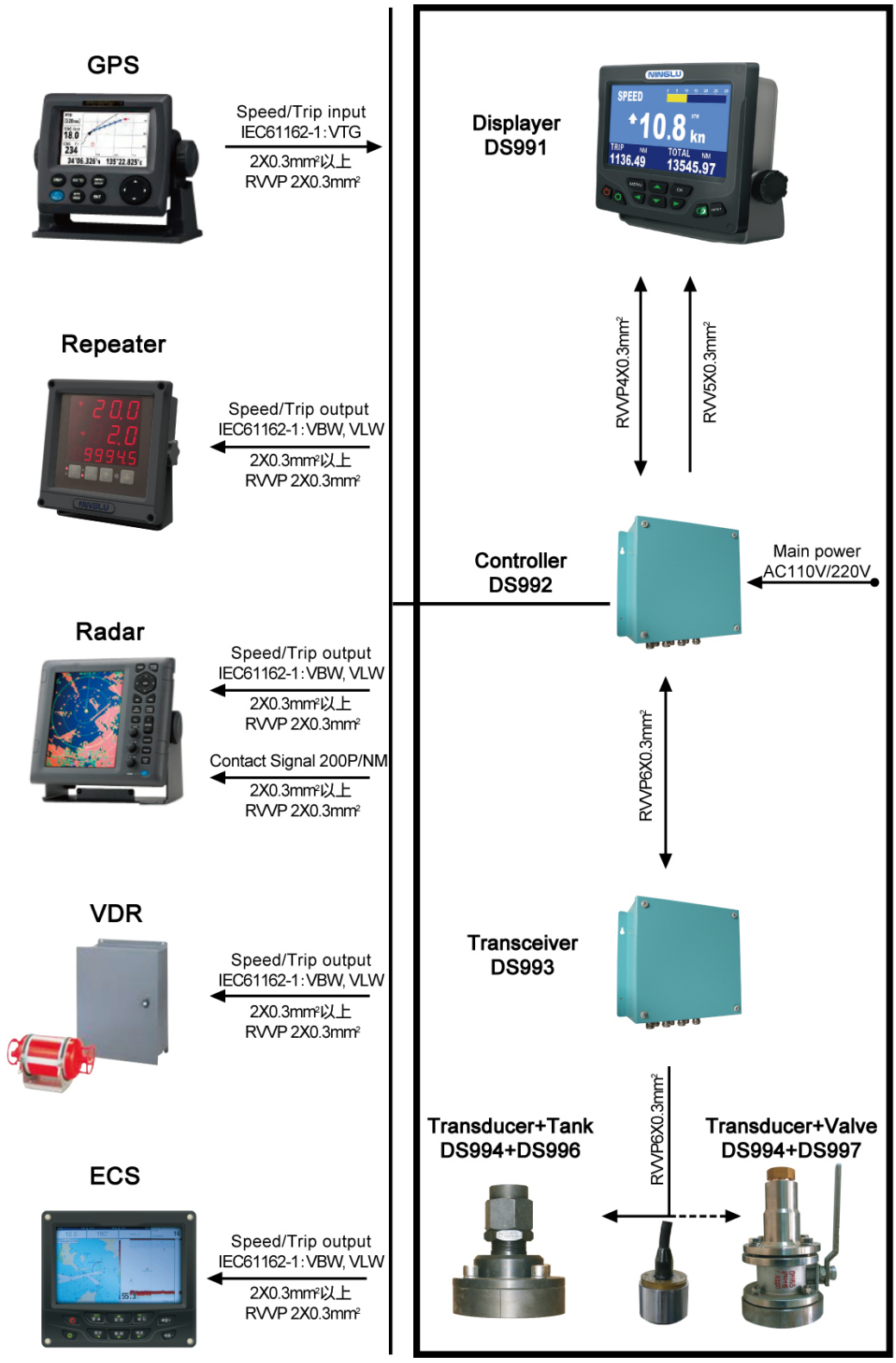
The detecting accuracy will be affected by the following factors:

- Rough weather (may be sea state 6 or severer)
- Improper location of transducer

  e.g., too close to the propeller, thrusters, drain tubes, echo sounder transducer
- Depth under the keel if less than 3 m
- Water temperature/ salinity (sound velocity)
- Roll>±10°

System

System diagram



System overview

Displayer:

Model:	**DS991 (IP23)**
Function:	ship's speed and distance (trip & total) display system operation and control
Dimensions:	188(W) × 166(H) × 65(D)
Installationsite:	navigation bridge

Controller:

Model:	**DS992 (IP23)**
Function:	signal receiving/calculation from transceiver/external equipments speed and distance signal output to displayer/external equipments
Dimensions:	350(W) × 300(H) × 128(D)
Installationsite:	navigation bridge

Transceiver:

Model:	**DS993 (IP56)**
Function:	transforming transducer ultrasonic signal to speed signal
Dimensions:	350(W) ×300(H) × 128(D) (stainless steel)
Installationsite:	20 meters away from transducer

Transducer:

Model:	**DS994 (IP68)**
Function:	transmitting/receiving ultrasonic wave
Installationsite:	ship bottom

Tank:

Model:	**DS996**
Function:	transducer replacement on dry dock

Gate valve:

Model:	**DS997**
Function:	transducer replacement in water

Specifications

Environment

Working temperature: -15～+55℃,complying to IEC60945

Working humidity: 40±3℃; 93％± 2％ relative humidity

Working depth: water depth under the keel >3m

Protection:

Items	Protection
Displayer	IP23
Controller	IP23
Transceiver	IP56
Transducer	IP68

Roll/pitch: roll ±10°, pitch ±5°, DS99 can normally work.

Safe distance of Magnetic Compass: >132cm

Performance index

Power supply: AC110/ 220V 50/60Hz

Working frequency: 1MHz

Speed display:

Numerical display: **.*, Step: 0.1kn

Speed range: Fore-Aft: -10.0～+40.0kn(-18.4～+73.6km/h)

Speed accuracy: 2% or 0.2kn whichever is the greater

Accuracy is subject to shallow water effects, to the effect of wind, current and tide, and sensor location. Any ultrasonic equipment having the same frequency may interfere with speed measurement. The Doppler Log transducer should be installed apart from the transducers of such kind of equipment.

▲**.* kn (+40.0kn/ 73.6 km/h max.)

Aft: ▼**.* kn (-10.0kn/ -18.4 km/h max.)

Analog speed: 0~30kn/ 0~60km/h

Distance display:

Numerical display: ****.**, Step 0.01NM

Trip distance (reset)/ Total distance

Trip range: 0.00~9999.99 NM (km)

Total range: 0.00~999999.99 NM

Distance accuracy: 2% or 0.2NM whichever is the greater

Accuracy is subject to shallow water effects, to the effect of wind, current and tide, and sensor location. Any ultrasonic equipment having the same frequency may interfere with speed measurement. The Doppler Log transducer should be installed apart from the transducers of such kind of equipment.

LCD display:

Users can clearly read the speed/ distance within 2 meters distance.

Input/ Output:

	Equipments	Interface	Format
Input	GPS	J6	NMEA0183 data(VTG)
Output	ECDIS VDR Repeaters Radar	J4/J5	NMEA0183 data(VBW)
			NMEA0183 data(VLW)
Output	BNWAS Radar	J7/J8/J9	Relay output (switch quantity) Load: DC30V 2A；AC125V 0.5A

Operation

Fixed keys

POWER

Turn on/off the system.

Press 【POWER】key more than 3 seconds to turn off the system.

BRIGHTNESS

Adjust the LCD brightness (9 optional levels).

MENU

Turn on the menu.

OK

Save the setting and quit from the menu.

DAY/NIGHT

Switch between day display mode and night display mode.

RESET

Reset trip distance to “0”.

Arrows (UP▲/DOWN▼/LEFT▶/ RIGHT◀)

UP▲/DOWN▼: select MENU item; LEFT▶/ RIGHT◀: value setting.

Menu

Display interface

Speed

Display mode：
STW doppler mode
GPS GPS mode
AUTO auto mode

Menu items

Note: In the following MENU list, the factory setting is marked with grey back color, such as DPL.

Menu	Parameter setting	Note (Default)
Mode	[AUTO DPL GPS]	
Language	[中文 English]	Set operation language
Speed Avg.	[1s 15s 30s]	Select time period calculating the average speed.
Speed Unit	[kn km/h]	kn(knot)
Trip. Unit	[NM km]	NM: nautical mile, km: kilometer
Speed Off.	[+0.0%]	-29.9~+29.9%
XDR Offset	[+0°]	-45～+45°
Debug Mode	[ON OFF]	Check the signal output
Debug Spd	[+10.0kn]	+0~+39.9kn
Track DPT	[2.0m]	1.0~3.0m
Default	[ON OFF]	“ON”: restore to factory settings

Mode

When the DS99 fails, the display unit can be used as a monitor display tool for GPS speed.

【AUTO】indicates Doppler speed, but if the DS99 fails, a GPS speed will be indicated. “AUTO” shows on the on the screen.

When DS99 displays GPS speed, it will not output any data.

【DPL】 indicates Doppler speed, and “STW” shows on the screen.

【GPS】 indicates GPS speed, “GPS” shows on the screen.

Set Mode in Menu 【 AUTO DLP GPS 】.

Language

Set the Language in Menu【 中文 English 】.

Speed Avg.

Select time period calculating the average speed.

Set the Speed Avg. in Menu【1s 15s 30s】.

Speed Unit

Set the Speed Unit in Menu 【kn km/h】.

Trip. Unit

Set the Trip. Unit (distance) in Menu【*NM* km】.

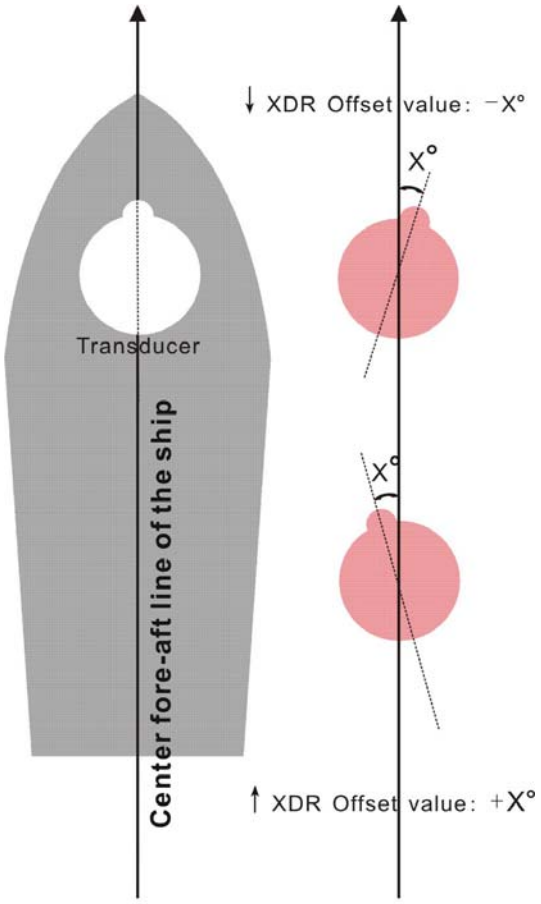
Speed Off. (speed calibration)

Compare the speed with the standard speed to calibrate.

Set Speed Off. In Menu【-29.9~+29.9%】, default: +0.0%.

This value should be confirmed during calibration and not be modified in usual use.

XDR Offset (direction calibration)



During transducer installation, make sure direction angle (X) is less than 5° !

During installation, transducer diameter line through the transducer hump should on the center fore-aft line of the ship. If not, the direction need to be calibrated as showed on the left picture.c-a=GPS speed , and ”

During transducer installation, make sure direction angle(X) is less than 5°.

Set XDR Offset In Menu【-45～+45°】, default: +0°.

This value should be confirmed during calibration and not be modified in usual use.

Debug Mode

The DS99 system simulates to be operating and outputting analog signals to external equipments. In Debug mode, the screen will show “Debug”.

Debug Spd

Set the analog speed of Debug mode.

Set Debug spd in Menu 【+0~+40kn】, default :+10.0kn.

Track DPT

When speed showed is unsteady due to underwater bubbles etc, users can adjust this value to steady the speed.

Set Track DPT in Menu【1.0~3.0m】*, default: 2.0m.*

Default

“ON”: restore to factory setting.

Please caution! If restore to factory settings, all menu settings will be back to default value.

Output & Input

GPS input--VTG

The actual course and speed relative to the ground.

$ --VTG,x.x,T, x.x,M, x.x,N, X.X,K, a*hh<CR><LF>
1 2 3 4 5 6

1. Course over ground, 000 - 359, T= degrees true
2. Course over ground, 000 - 359, M= degrees magnetic
3. Horizontal speed over ground, 0.00, N=Knots
4. Horizontal speed over ground, 0.00, K=km/h
5. Mode indicator, A= Autonomous
   D= Differential
   E= Estimated (course reckoning) mode
   M= Manual input
   S= Simulator
   N= Data invalid

   The positioning system Mode indicator field shall not be a null field.
6. Checksum

Speed log data output---VBW

Water-referenced and ground-referenced speed data format

$ --VBW,x.x, x.x, A, x.x, x.x, A, x.x, A, x.x, A*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11

1. Longitudinal water speed, Knots
2. Transverse water speed, Knots
3. Status: water speed, A=data valid V=data invalid
4. Longitudinal ground speed, Knots
5. Transverse ground speed, Knots

6. Status: ground speed, A=data valid V=data invalid
7. Stern transverse water speed, Knots
8. Status: stern water speed, A=data valid V=data invalid
9. Stern transverse ground speed, Knots
10. Status: stern ground speed, A=data valid V=data invalid
11. Checksum

Speed log data output --- VLW

The distance travelled, relative to the water.

$ --VLW, X.X, N, X.X, N, X.X, N , X.X, N *hh<CR><LF>
1 2 3 4 5

1. Total cumulative water distance, NM
2. Water distance since reset, NM
3. Total cumulative ground distance, NM
4. Ground distance since reset, NM
5. Checksum

Relay output (switch quantity) output

DS99 outputs speed signals of relay output (switch quantity) (200P) once to external equipment every 0.005NM.

DS99 outputs power-fail alarm signals of relay output (switch quantity) to BNWAS.

When DS99 works normally, contact closure.

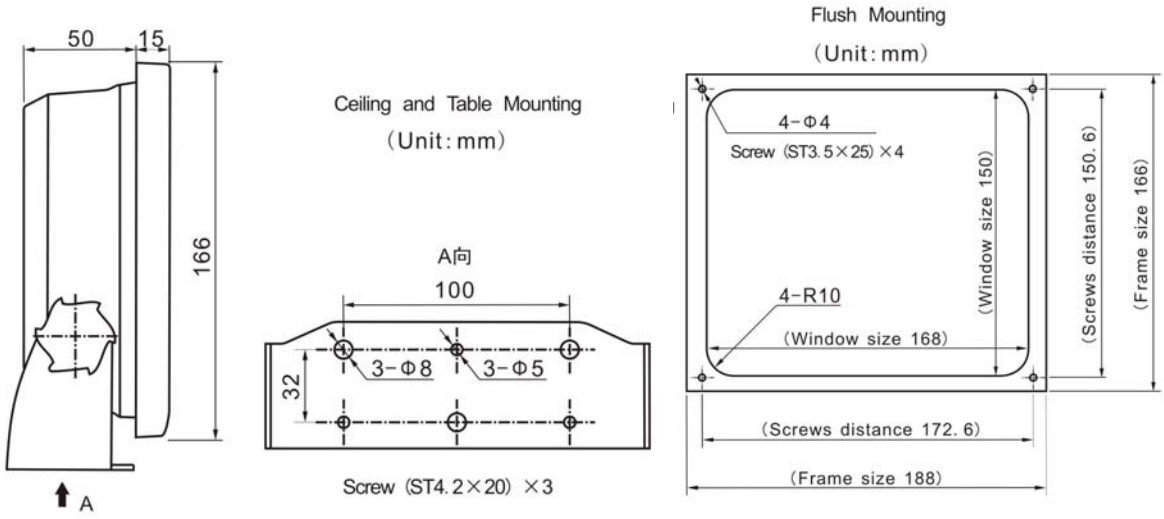
When DS99 drops power, contact open.

Note：NMEA0183 format：IEC61162-1：Edition4.0 2010-11，baud bit is 4800, 8data bits，with checksum。

Installation

Displayer installation

Hand/flush installation

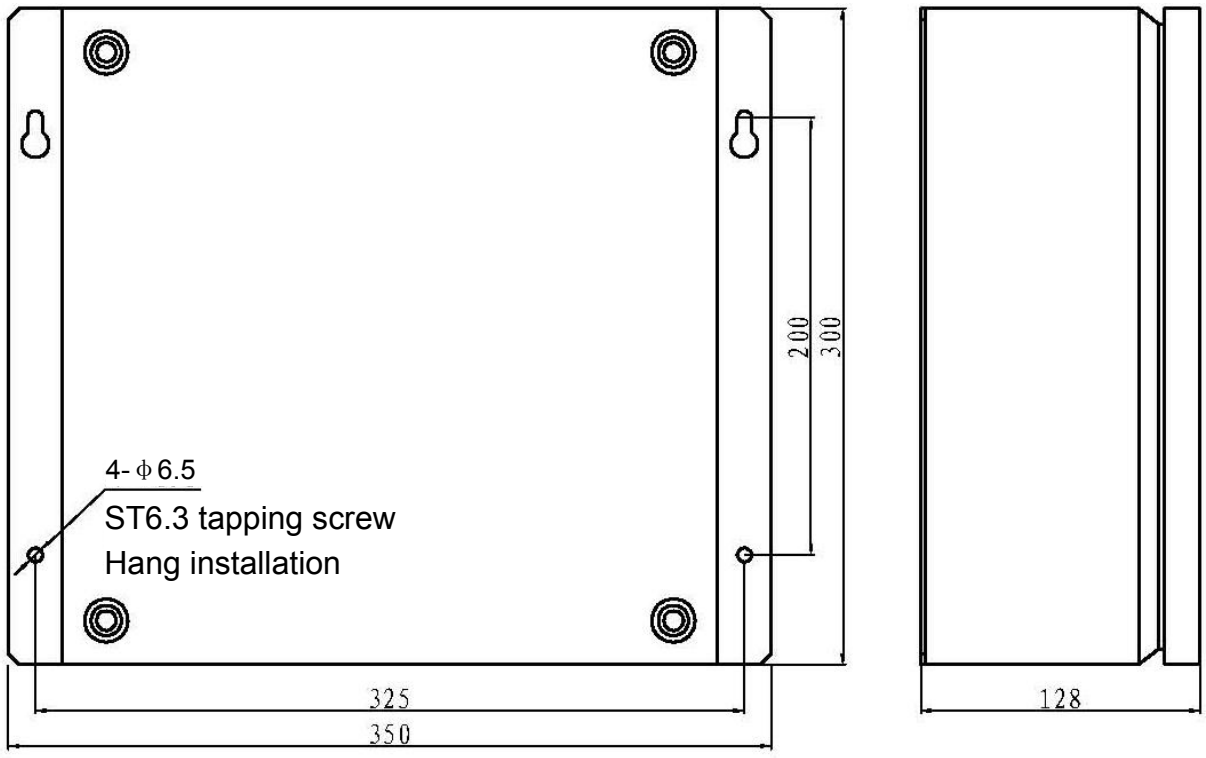


ATTENTION!

- Avoid direct sunlight, shock and vibration.
- Do not place the display near the exhaust pipes or vents.
- Operator unit should be far away from the equipment which generate electromagnetic radiation, such as: motors, generators.
- Displayer should be located in mild environment of steady temperature and humidity.
- Make sure enough maintain space of the displayer back and side.

Controller/Transceiver Installation

Unit：mm

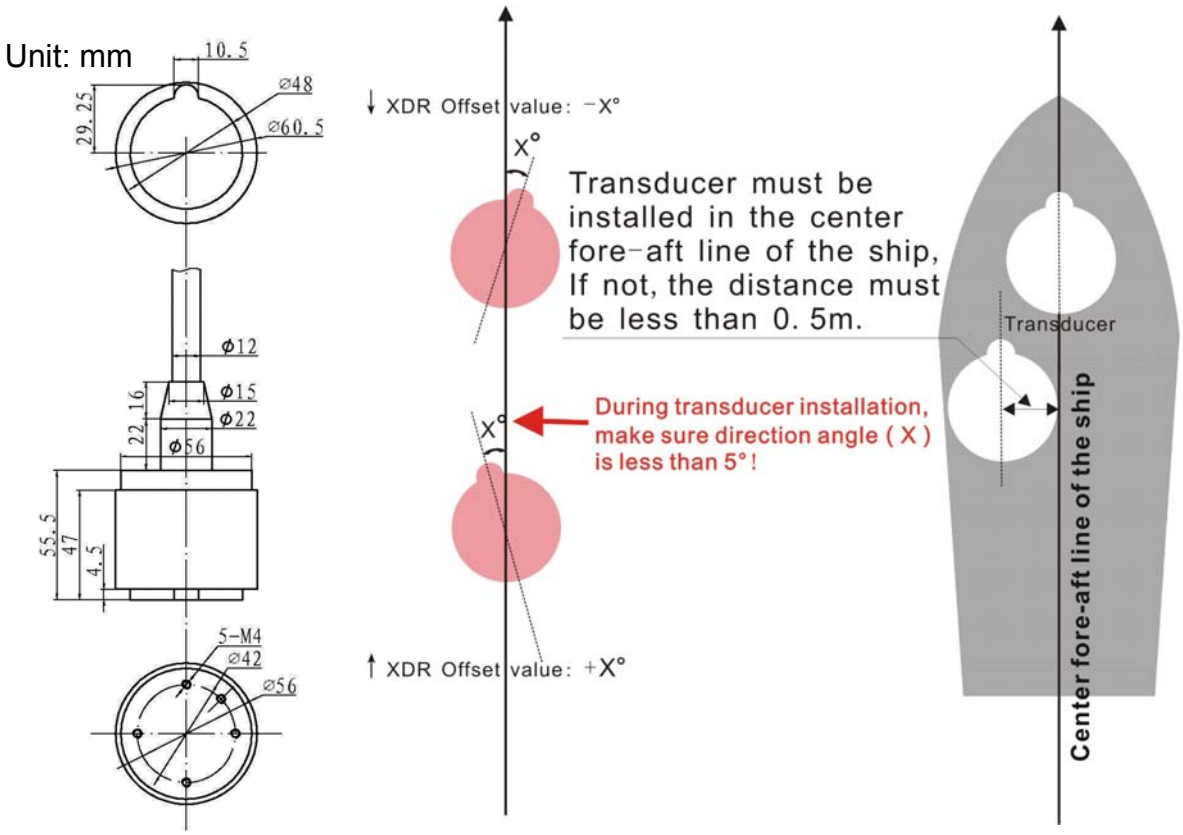


ATTENTION!

- Transceiver should be installed in ventilated and dry area and not be covered with any objects.
- Make sure enough maintain space of the displayer back and side.
- Controller and transceiver's distance with magnetic compass should be more than 132cm to avoid electromagnetic interference.
- **To the utmost of ability, make sure the cable between controller and transceiver is less than 150 meter.**

Transducer installation

Installation position



<u>It's best to mount the transducer in the fore part of the ship, in the center fore-aft line of the ship, or as close to the centerline as possible.</u> ***<u>Max distance: 0.5m. Max angle: 5°.</u>***

Optimal system operation is achieved by fitting the transducer as deep as possible on the hull.

Transducer should be away from echo sounder transducer at least 2.5m.

<u>The transmitting surface of the transducer must be installed horizontal (parallel to ship's horizontal plane).</u>

Do not mount transducers close to the bow thruster propeller outlets, or aft of other hull installations (outlets, vents or other protruding details).

It is necessary to select a part of the hull that is submerged under all load and speed conditions, and to avoid positions where air is trapped in heavy weather.

If a flat, horizontal section is not available for transducer fitting, the shipyard must construct a suitable bed. Welding seams in this area should be smoothed and rounded off, in order not to create turbulence or aeration at speed.

Protect the active element of the transducer during transport and installation, and do not paint the surface. *Because the transducer surface has already been painted with special anti-sea organism coating in factory, so please do not clean the surface with alcohol and other cleaning agents*

Transducers are delivered with a fixed cable, and this cable should not be extended by connecting to any new cables.

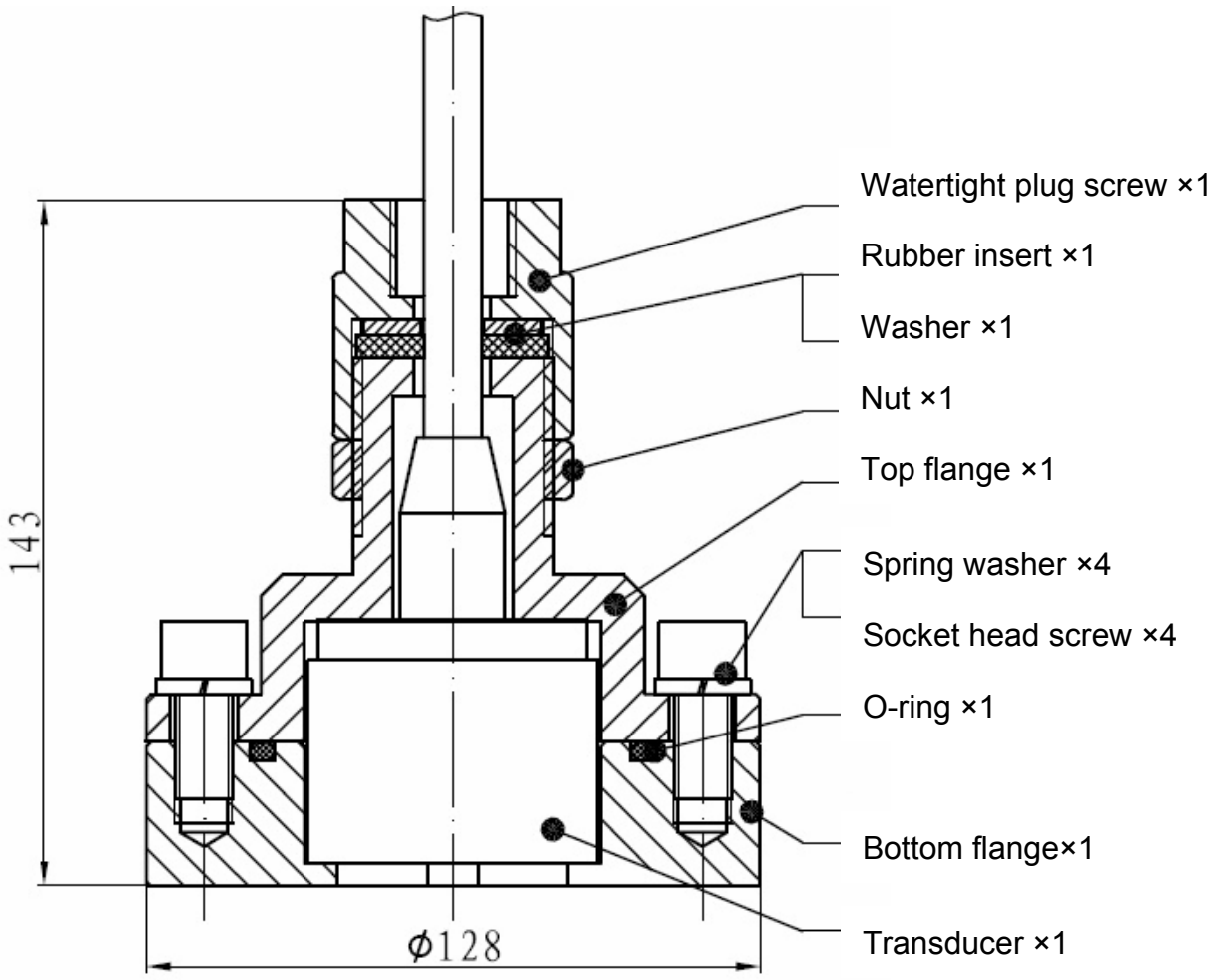
Watertight test

When transducer installation finished, watertight test will be done.

After watertight test, please take the transducer out and close the valve.

Amount the transducer again before the ship launching.

Tank installation

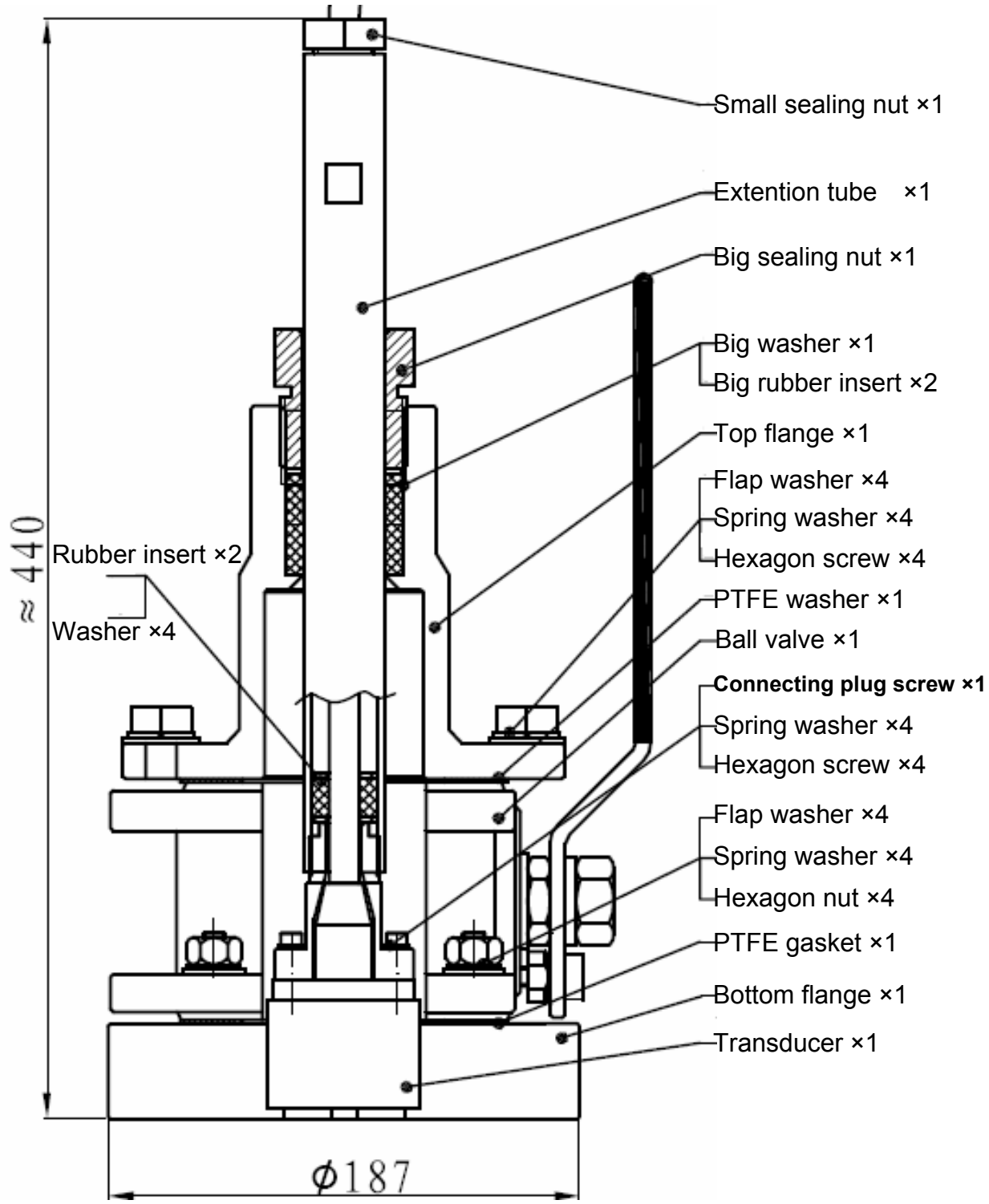


Note, the hole dimension is suggested to φ130mm

The gap must be in front of the bow and in parallel to the keel line.

Gate valve installation

The gate valve should be placed in a dry place, large enough for installation and disassembly of gate valve and transducer.

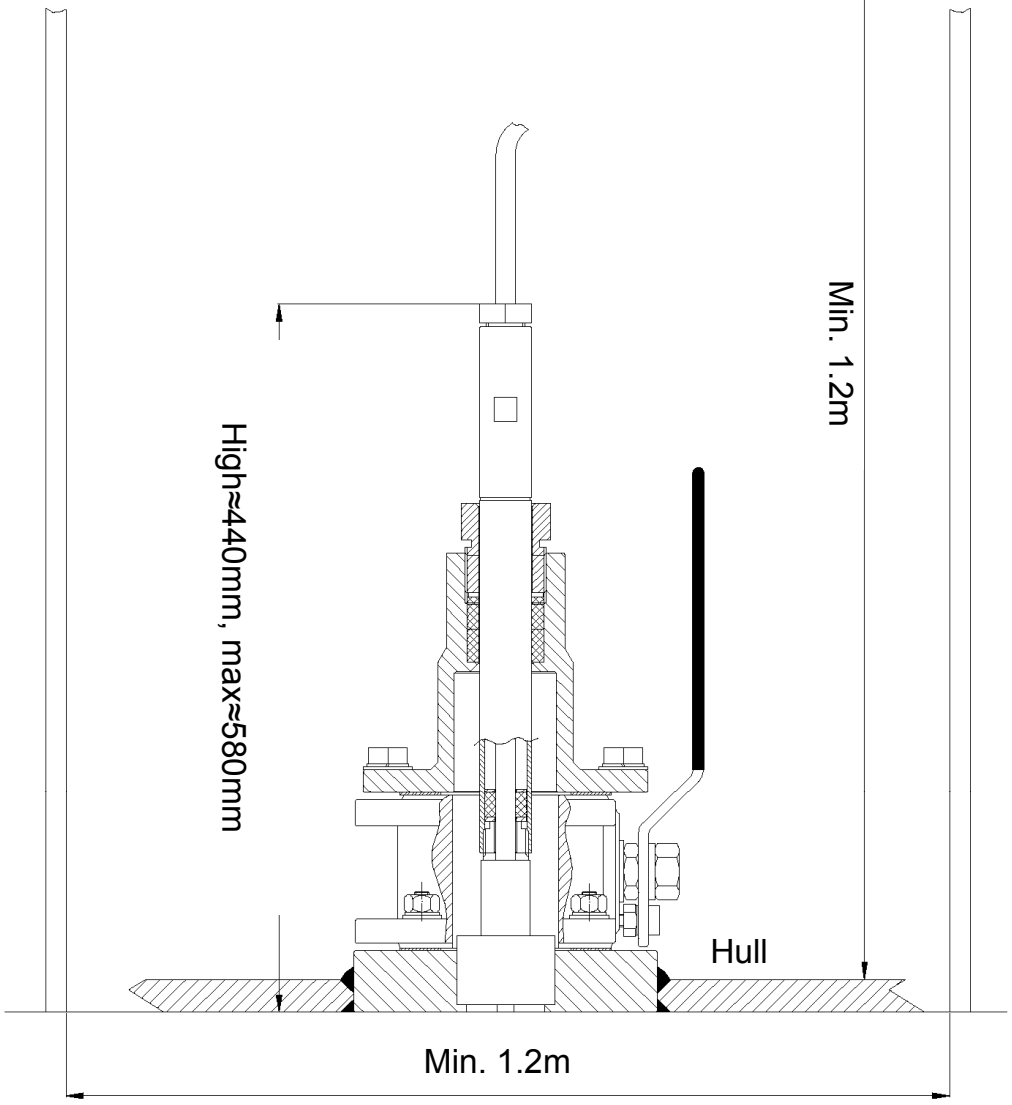


Gate valve replacement

Installation Space Necessary

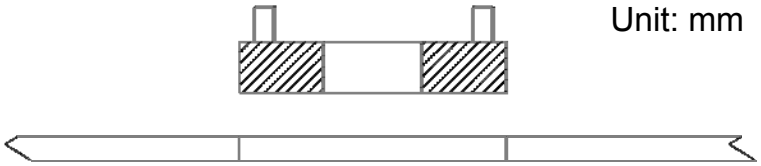
Ensure enough operation space and lighting before installation.

Exit passageway should comply with relevant standard.



Installation Step 1: Bottom flange welding

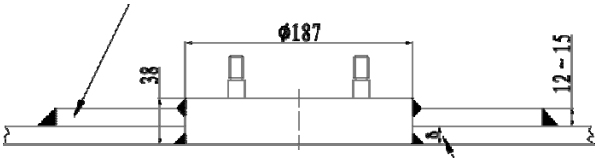
Disassemble the bottom flange (without PTFE gasket) from gate valve.
ATTENTION!
PTFE gasket must be taken off from the bottom flange to avoid heat distortion.



Unit: mm

Add assisted-steel plates according the thickness of the hull.

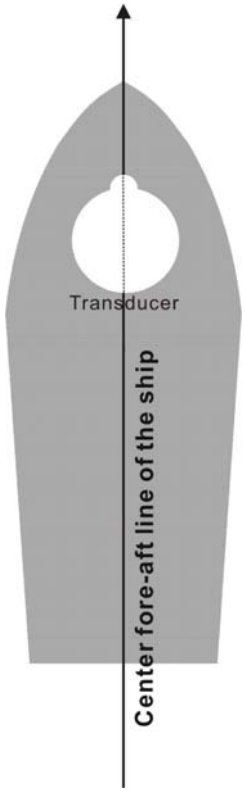
Bottom flange is made of steel 20#, please use same steel as assisted-steel plates.

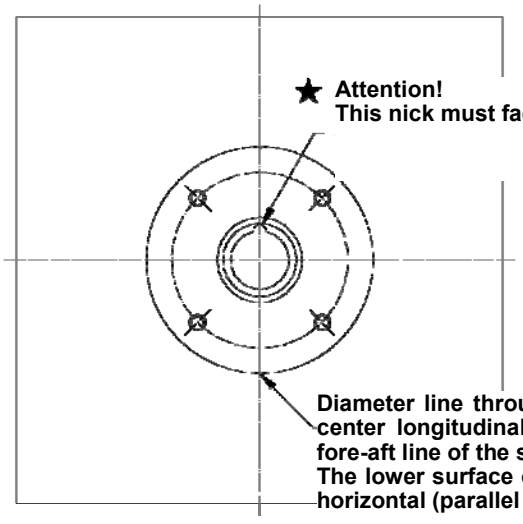


Hole size recommended: Φ190

Bottom flange lower surface should be flush with the outside hull.

δ is the hull thickness.





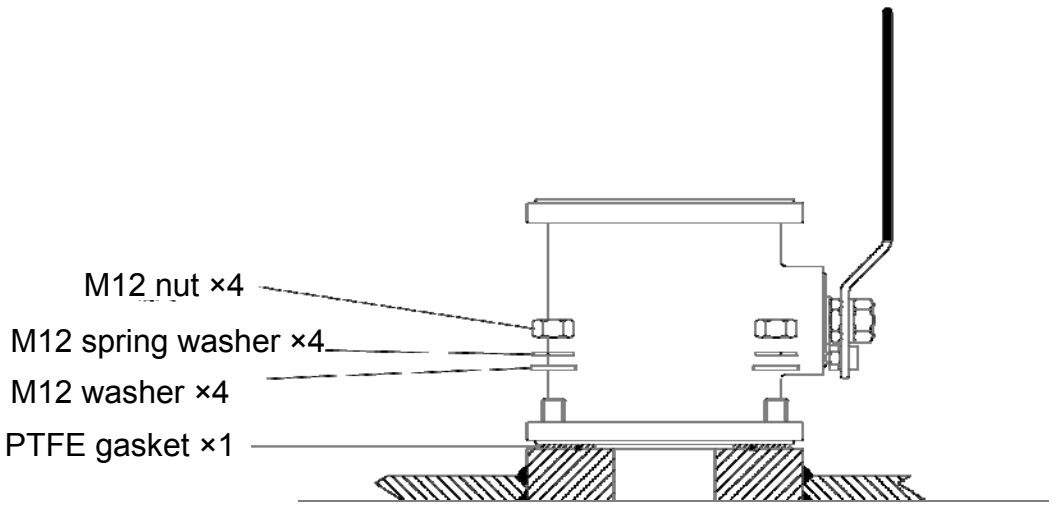
Attention!
This nick must face to the ship bow.

Diameter line through the nick must be on the center longitudinal section of the ship (center fore-aft line of the ship).
The lower surface of the bottom flange must be horizontal (parallel to ship's horizontal plane).

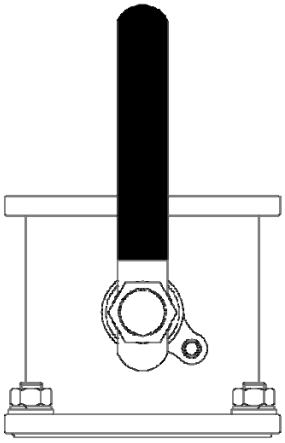
Standard welding practice and procedures should be observed.

Installation Step 2: Ball valve welding

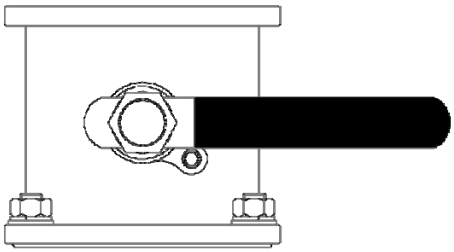
When bottom flange has cooled off, remember put PTFE gasket on the top pf bottom flange, then mount the ball valve.
The gate valve will not be waterproof without the PTFE gasket!



Ball valve open/close status

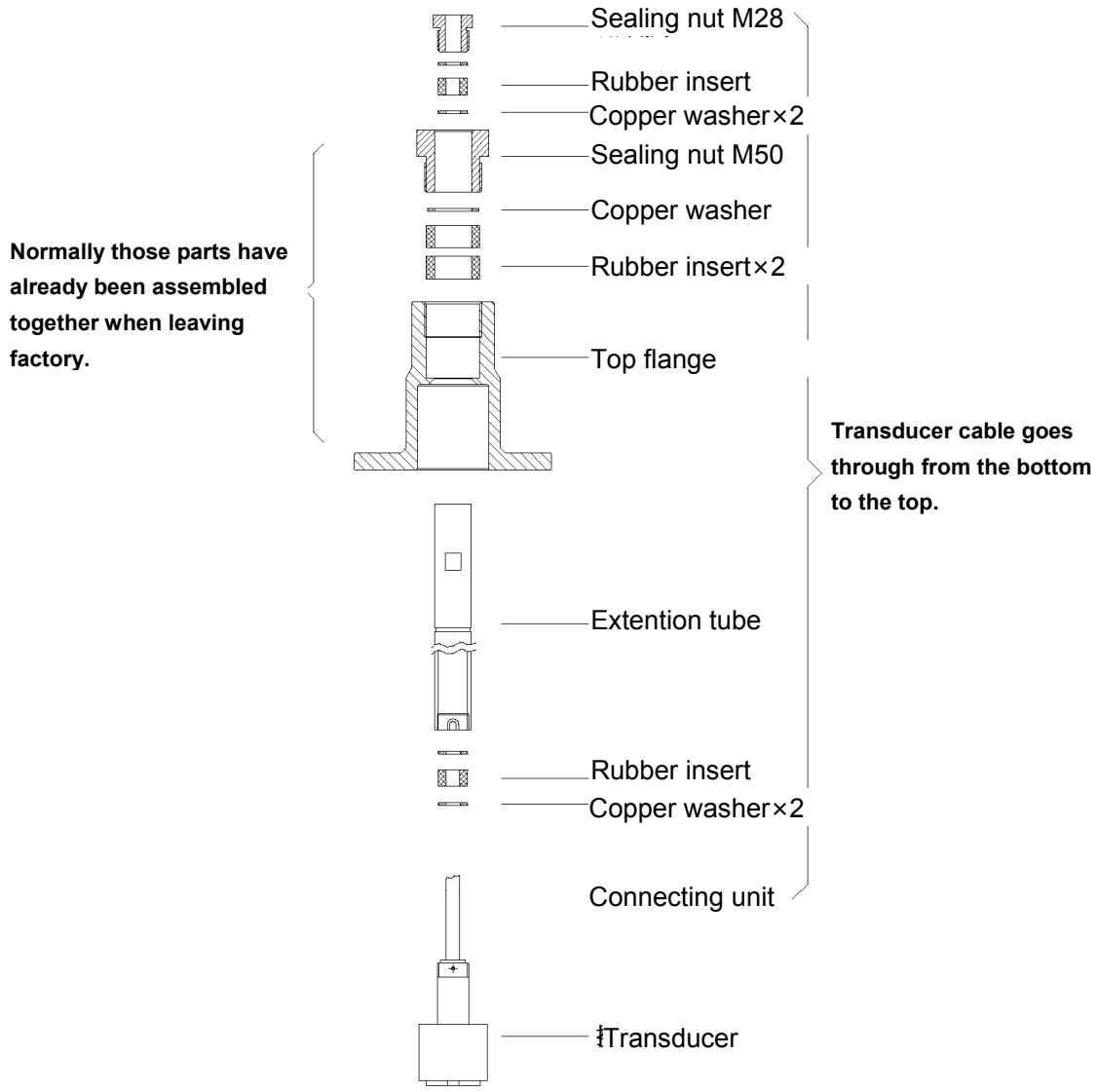


Fully open

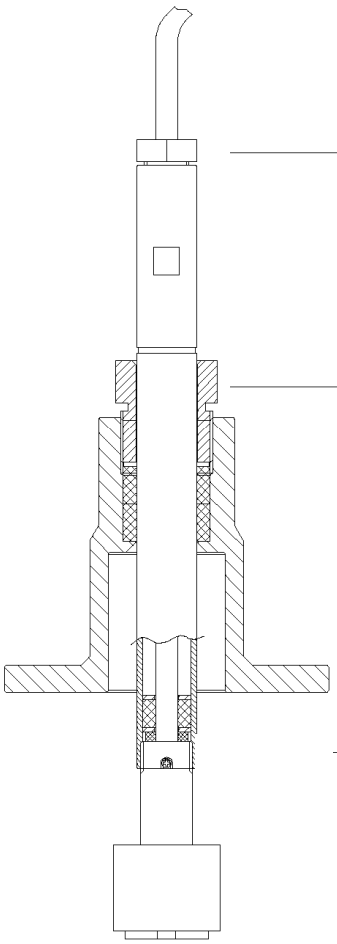


Totally closed

Installation Step 3: Transducer installation



Transducer assembly



2 Hold the extention tube with spanner，then screw the nut to tighten the transducer cable.

★ Do not screw the extention tube.

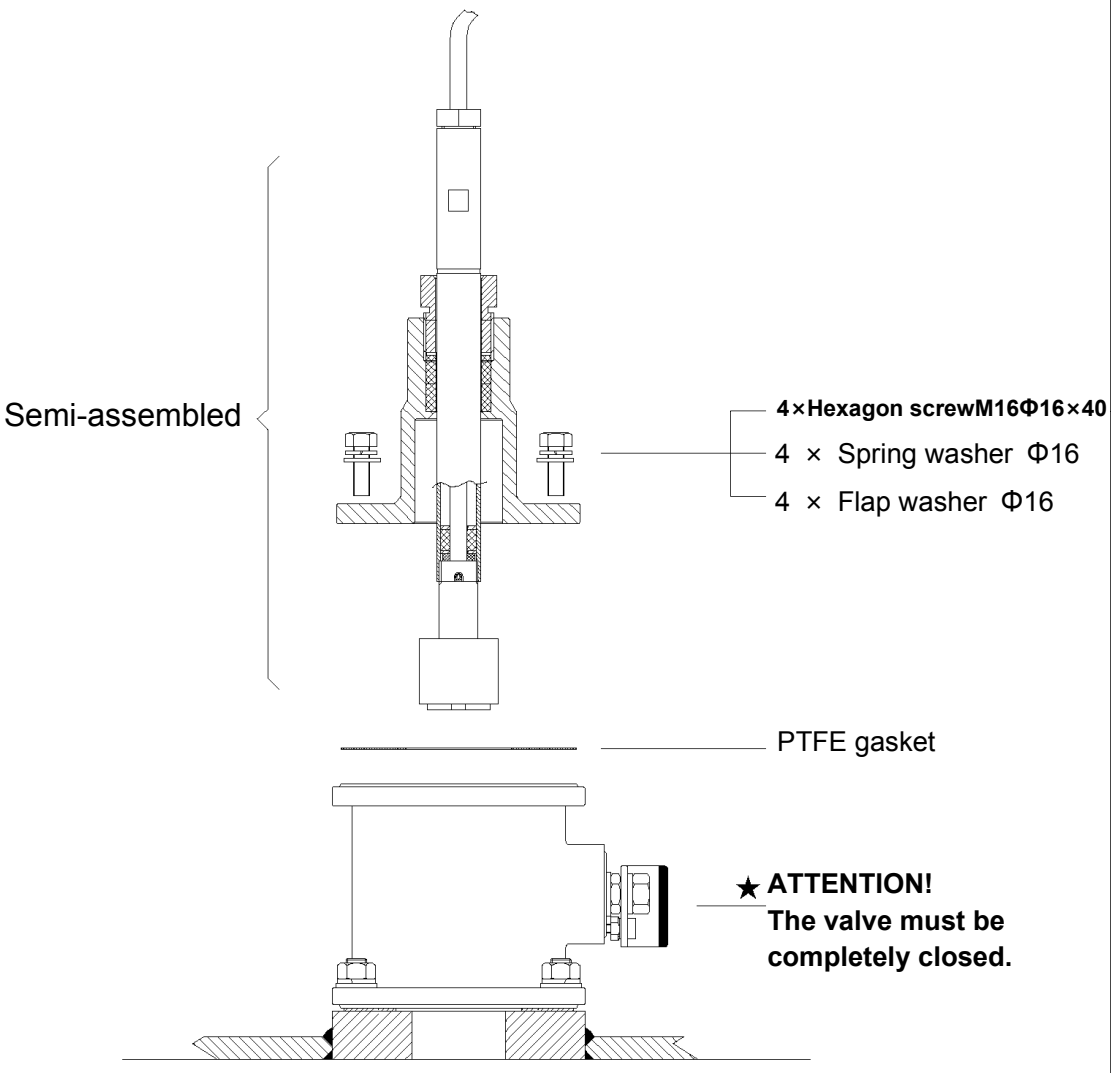
3 Tighten the sealing nut.

1 Put in copper washer + rubber insert + copper washer into the extention tube, tighten the transducer cable, screw the extention tube with connecting unit until the nick of extention tube is over the screw hole.

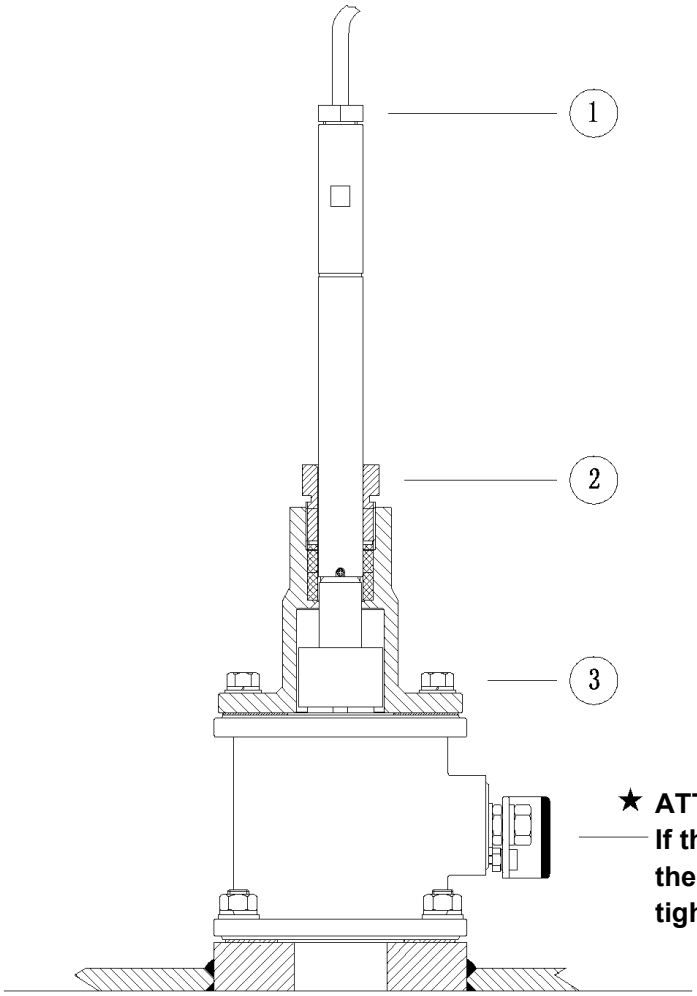
Then assemble the M4 screw into the screw hole to lock the extention tube.

Installation Step 4: Top flange installation

Use hexagon screws to tighten the top flange with ball valve.



Flange assembly



★ **ATTENTION!**
If the ship is afloat, make sure the above 3 parts are totally tightened before open the valve.

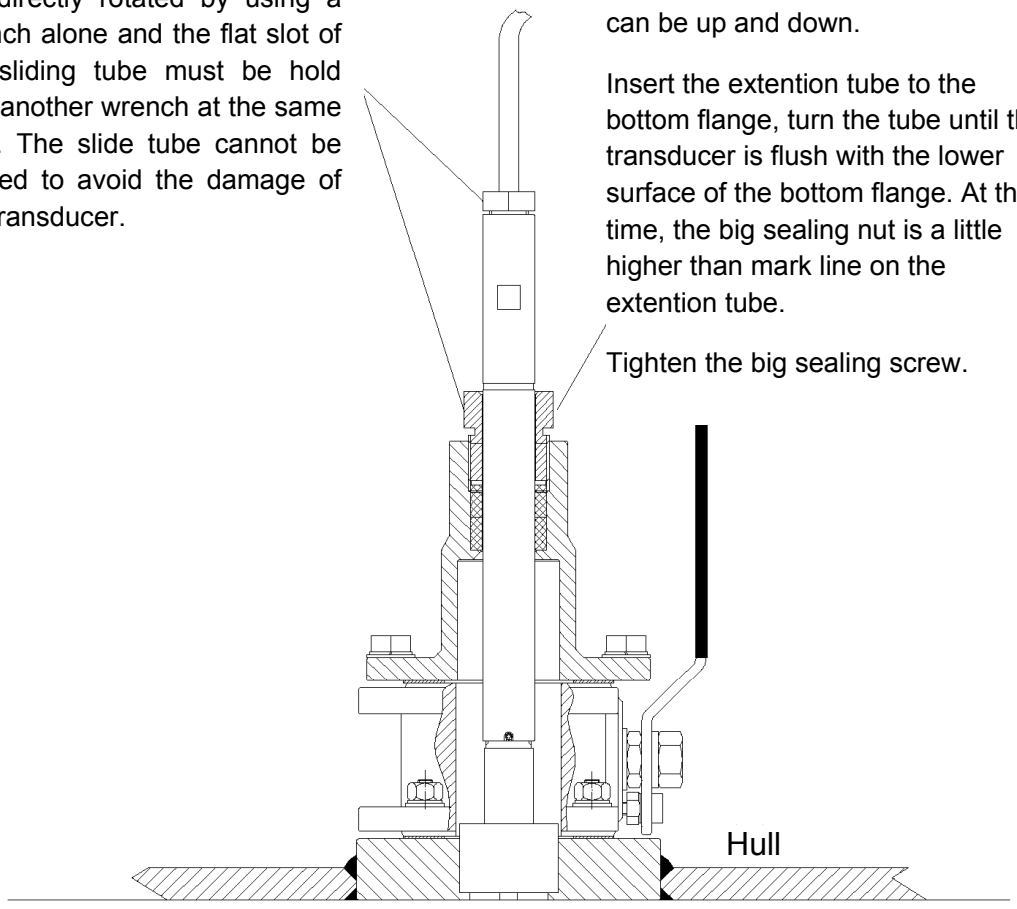
Installation finished

Note: If the two nuts are still tighten, the screw nut cannot be not directly rotated by using a wrench alone and the flat slot of the sliding tube must be hold with another wrench at the same time. The slide tube cannot be rotated to avoid the damage of the transducer.

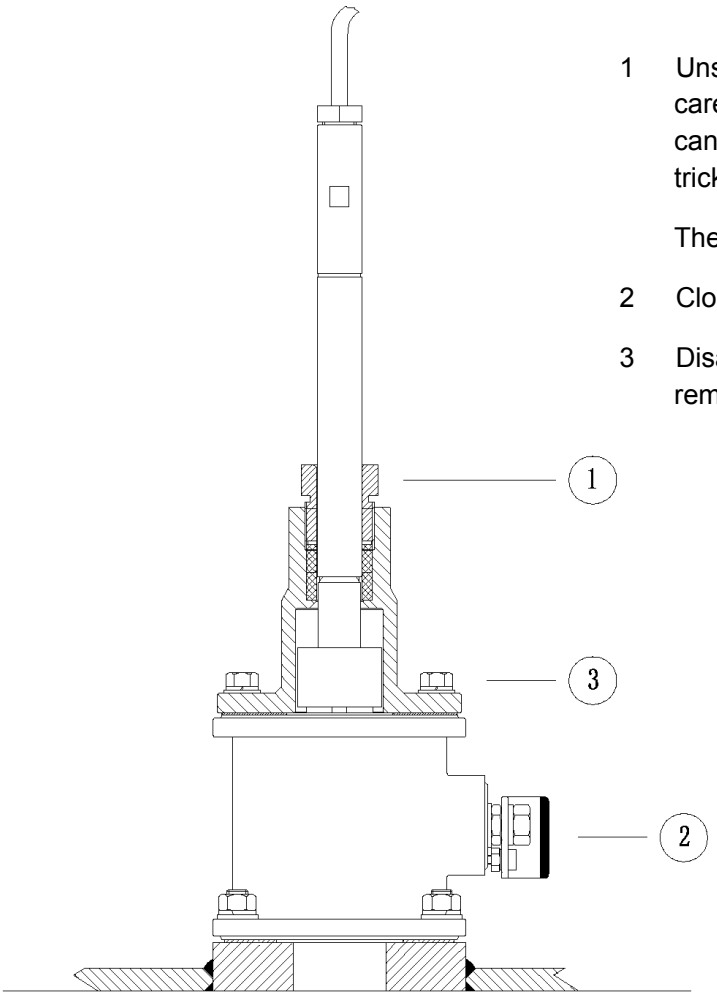
When the ship is afloat, the big sealing nut only can be unscrewed a little that allow the extention tube can be up and down.

Insert the extention tube to the bottom flange, turn the tube until the transducer is flush with the lower surface of the bottom flange. At this time, the big sealing nut is a little higher than mark line on the extention tube.

Tighten the big sealing screw.



Transducer removal



1 Unscrew the big sealing nut carefully until the extention tube can be lift and little water trickles out.

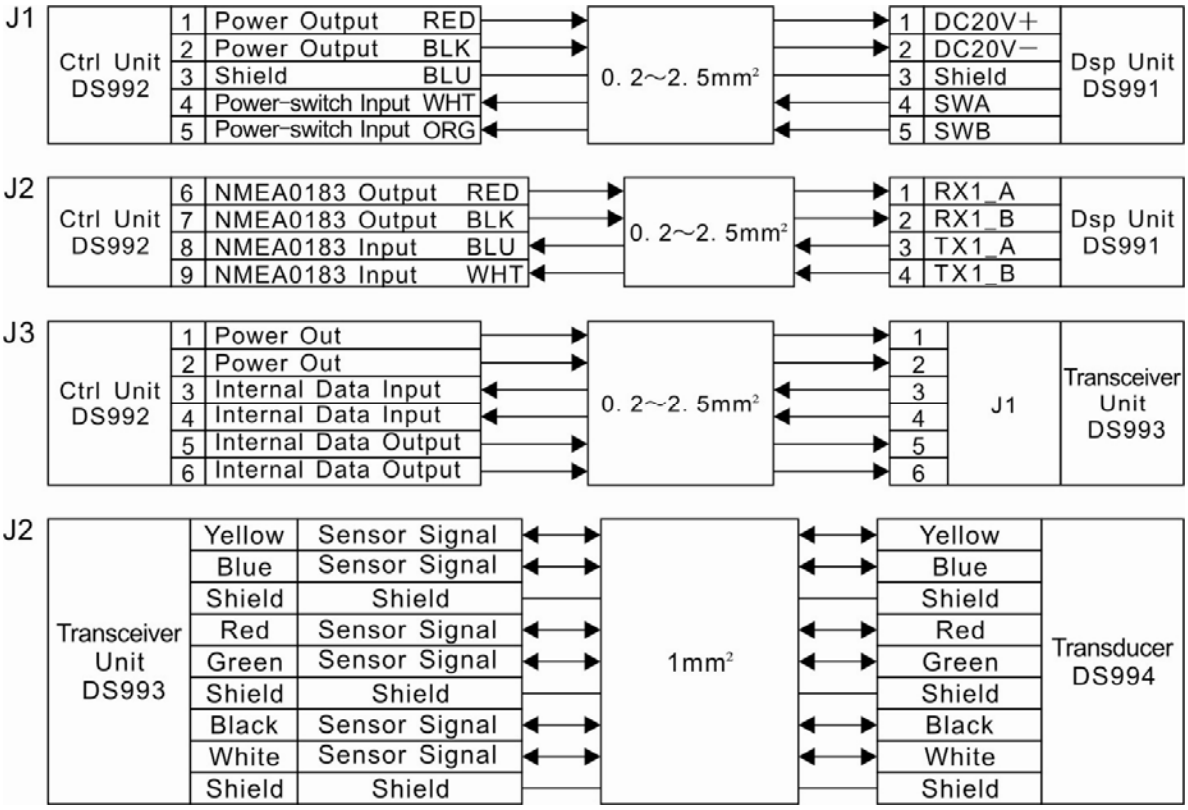
Then lift the extention tube.

2 Close the valve completely.

3 Disassemble the top flange and remove the transducer.

System wiring

Internal wiring

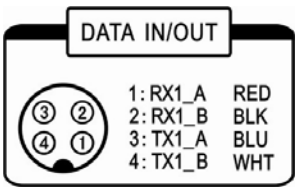


To ensure the optimum working performance, please do not extend the cable between DS994 transducer (transducer cable) and DS993 transceiver.
The cables connecting DS993 transceiver and DS992 controller should not be longer than 150m.

DS991 displayer backboard diagram

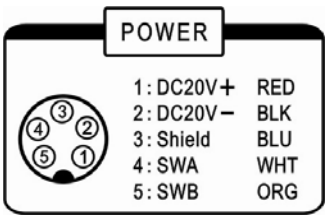
Data input/ output

To DS992 J2

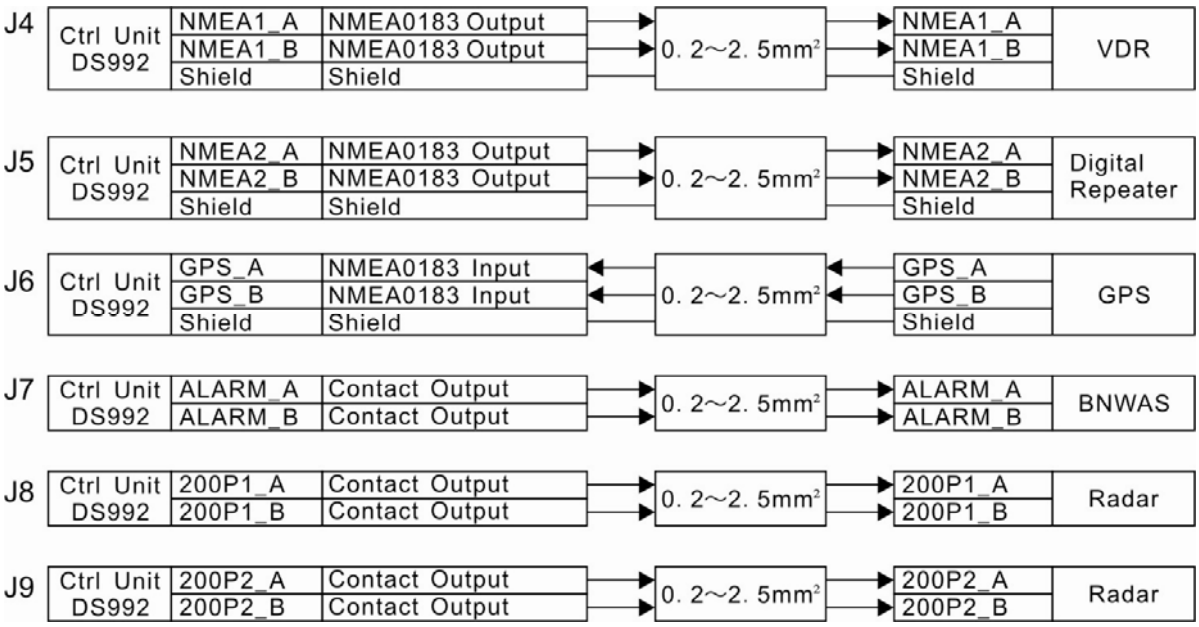


Power

To DS992 J1

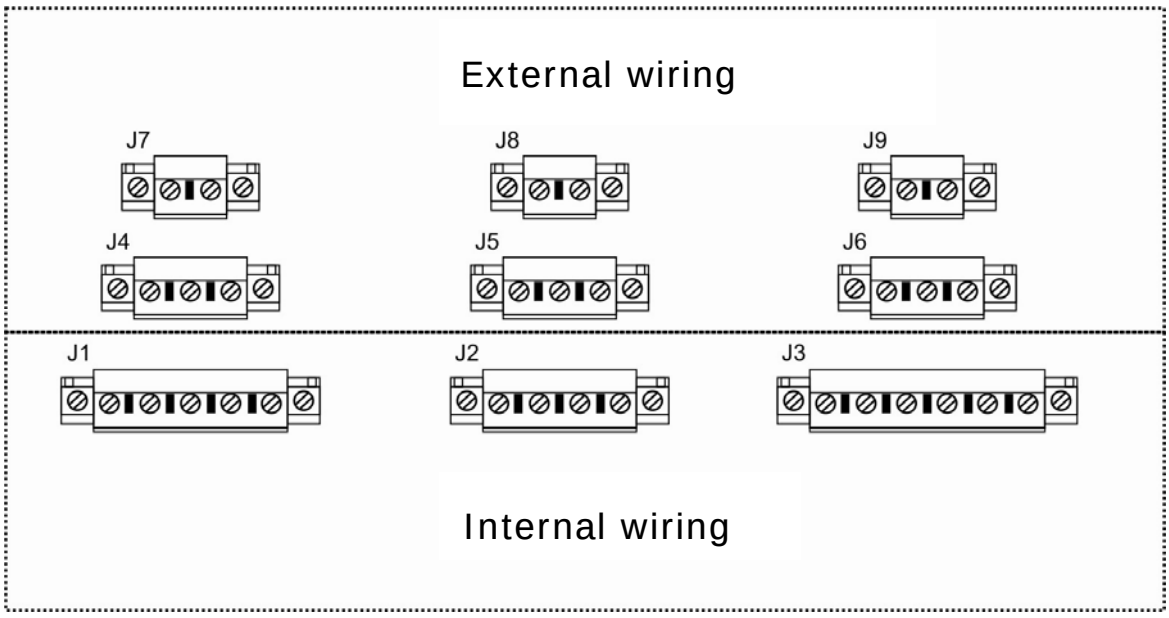


External wiring



ALARM relay output: speed log works normally, contact closure;
speed log power off, contact open.

DS992 controller terminal diagram



Trouble shooting

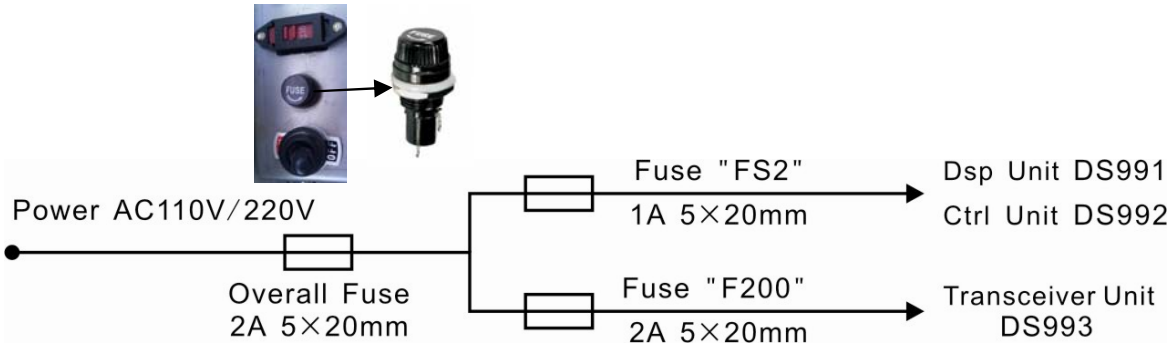
Do not disassemble the equipment when fails.

Please contact with NINGLU after-service department.

Common fault

Symptom	Cause	Remedy
Cannot turn on the power	Loosened power cable Blown fuse	Fasten the power cable Replace th se
Power is on but nothing spears on the screen	LCD brilliancy too low	Press 【 】key several times
Speed display: “**.*”		Error in data
Speed display: “--.-”		No data input

Fuse replacement



Controller DS992:

Cabinet internal: Overall fuse specification: 250V 2A 5×20mm.

Cabinet internal: 1 black cylinders at “FS2”.

Unscrew the head to find the fuse inside: 250V 1A 5×20mm.

Black cylinder

Transceiver DS993:

Cabinet internal: 1 black cylinder at“F200”.

Unscrew the head to find the fuse inside: 250V 2A 5×20mm.

IR861 speed&distance repeater

IR861, dual axis speed and distance repeate and longitudinal ships speed information. IR861 al her speed log having NMEA0183 output. (IR861 is

IR861 operation

First line: FORE (↑) --- AFT (↓) speed

Second line: PORT (←) ---STBD(→) speed

Third line: Distance

Press **TRIP/ TOTL** key to switch between trip distance and total distance.

Press **WT/BT** key to switch between ground speed and water speed.

Press **UP▲/DOWN▼** keys to adjust brightness.

Diagnostic information

- If IR861 does not receive any signal from the external source for more than 3 seconds Error (“Err”) message is indicated on the LEDs. This may happen, for example if external talker is not connected or connection polarity is not correct.
- If input messages do not contain sentences, required for indication of selected data, “_” (underline symbol) is indicated on the corresponding LEDs. As an example: if there is no VLW message available on the input, IR861 will indicate “ _____” instead if distance counter
- If fields in the received message is empty (not valid data), dots are indicated on the corresponding LEDs. As an example, if speeds over ground fields are empty in VTG or VBW sentences and BT mode is selected on IR861, “...” will be indicated instead of speed value.

IR861 accepted messages NMEA0183

VBW - Dual Ground/Water Speed.
$--VBW,x.x,x.x,A,x.x,x.x,A,x.x,A,x.xA*hh<CR><LF>

VTG - Course Over Ground and Ground speed
$--VTG,x.x,T,x.x,M,x.x,N,x.x,K,a*hh<CR><LF>
Note: Fields, containing course information (underlined) are not processed
Note: km/hour field is not processed

VHW - Water speed and heading
$--VHW,x.x,T,x.x,M,x.x,N,x.x,K,*hh<CR><LF>
Note: fields, containing heading information (underlined) are not processed
Note: km/hour field is not processed

VLW - Distance Traveled through the Water
$--VLW,x.x,N,x.x,N,x.x,N,x.x,N*hh<CR><LF>

IR861 wiring

WIRING CONNECTING			
COLOUR	SIGNAL	COLOUR	SIGNAL
RED	+24V	GREEN	DIM+
BLACK	-24V	YELLOW	DIM-
BLUE	NMEA IN+	GREY	DIMKEY
WHITE	NMEA IN/OUT-	DIM+	REMOTE DIMMER
ORANGE	NMEA OUT+	DIM-	
		DIMKEY	

Color	Signal
1 Red	+24V
2 Black	-24V
3 Blue	NMEA IN+
4 White	NMEA IN/OUT-
5 Orange	NMEA OUT+

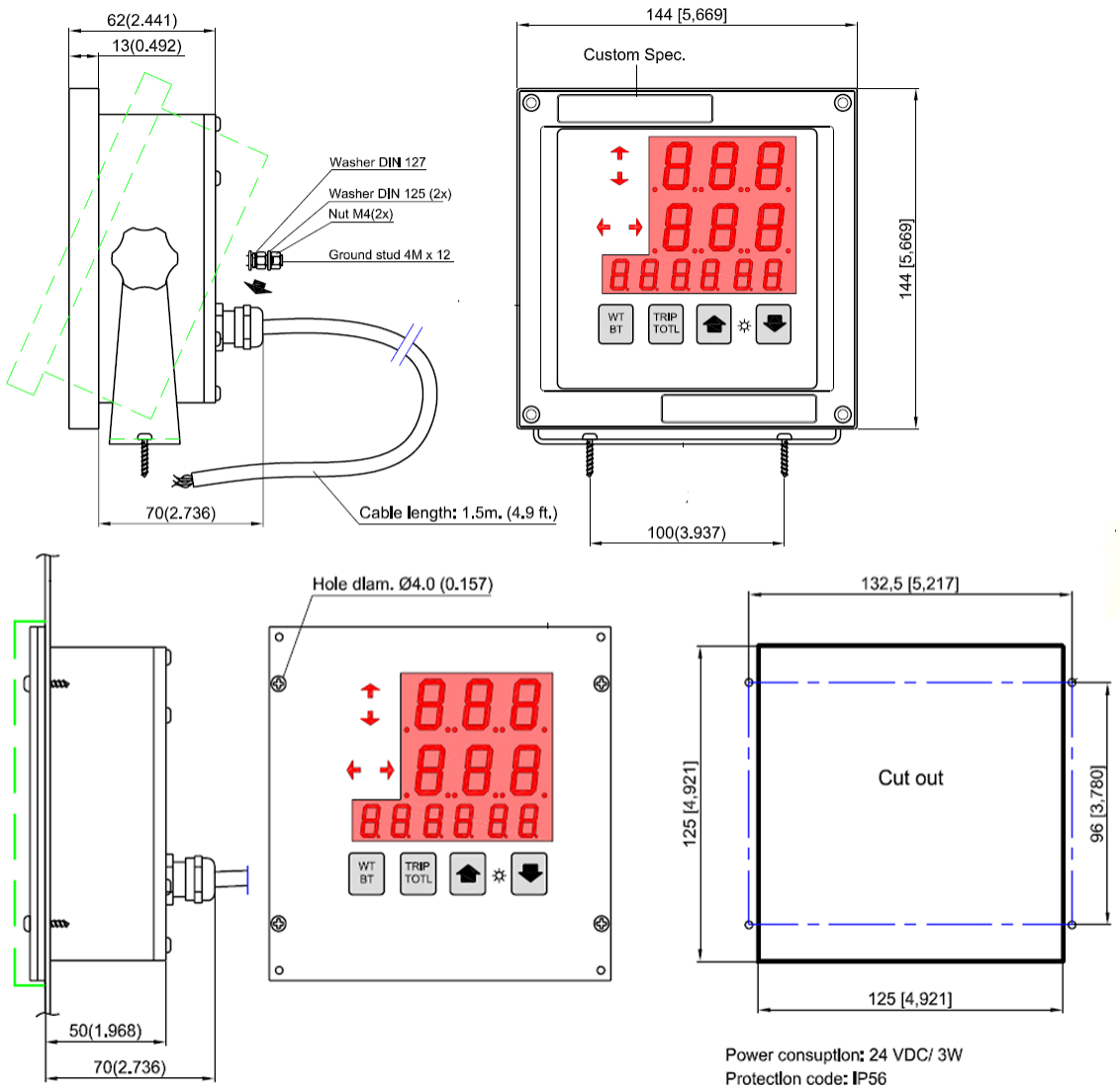
Color	Signal
6 Green	DIM+
7 Yellow	DIM-
8 Grey	DIMKEY

DIM+	DIM930
DIM-	DIMMER
DIMKEY	

Environmental according to IEC60945

Supply voltage: 24V DC (10-32V)
Power consumption: 3W at 24V
Operating temperature: **-15- +55 degree C according to IEC60945**
To increase life-time, we suggest working temperature to be held at 0 ~ +40 degrees C.
Storage temperature: -20 - +70 degree C
Humidity: 10 - 90% relative, no condensation.

IR861 installation



The unit can be mounted in panel, table, wall or ceiling.

1. For tabletop mounting, wall or ceiling mounting use the supplied bracket.
2. For panel (flush) mounting, take off the bracket and take off the front frame. Cut a 125x125mm Din size square window in the panel, fix the inside 4 holes with tapping screws, and put on the front frame again.