FURUNO

Installation Manual
DOPPLER SONAR
Model DS-60

FURUNO ELECTRIC CO., LTD.

www.furuno.com

(Elemental Chlorine Free)

The paper used in this manual
is elemental chlorine free.

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・FURUNO Authorized Distributor/Dealer

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SAFETY INSTRUCTIONS

WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Warning, Caution Prohibitive Action Mandatory Action

WARNING

Have a qualified serviceman do the installation.

Only qualified personnel should work inside the equipment.

Turn off the power at the switchboard before installing the equipment.

Fire or electrical shock can result if the power on.

Do not install the unit in a place subject to rain or water splash.

Fire or electrical shock can result.

Use the specified power cable.

Fire can result if an incorrect cable is used.

CAUTION

Attach protective earth securely to the ship's body.

The protective earth (grounding) is required for the AC power supply to prevent electrical shock.

Do not weld the tank with transducer to the ship's hull.

CAUTION

Confirm that the power supply voltage is compatible with the voltage rating of the equipment.

Connection to the wrong power supply can cause fire or damage to the equipment.

The mounting location for the display, distributor and transceiver unit must satisfy the following conditions:

-Away from rain and water splash
-Out of direct sunlight
-Away from air conditioner vents
-Moderate and stable in temperature and humidity

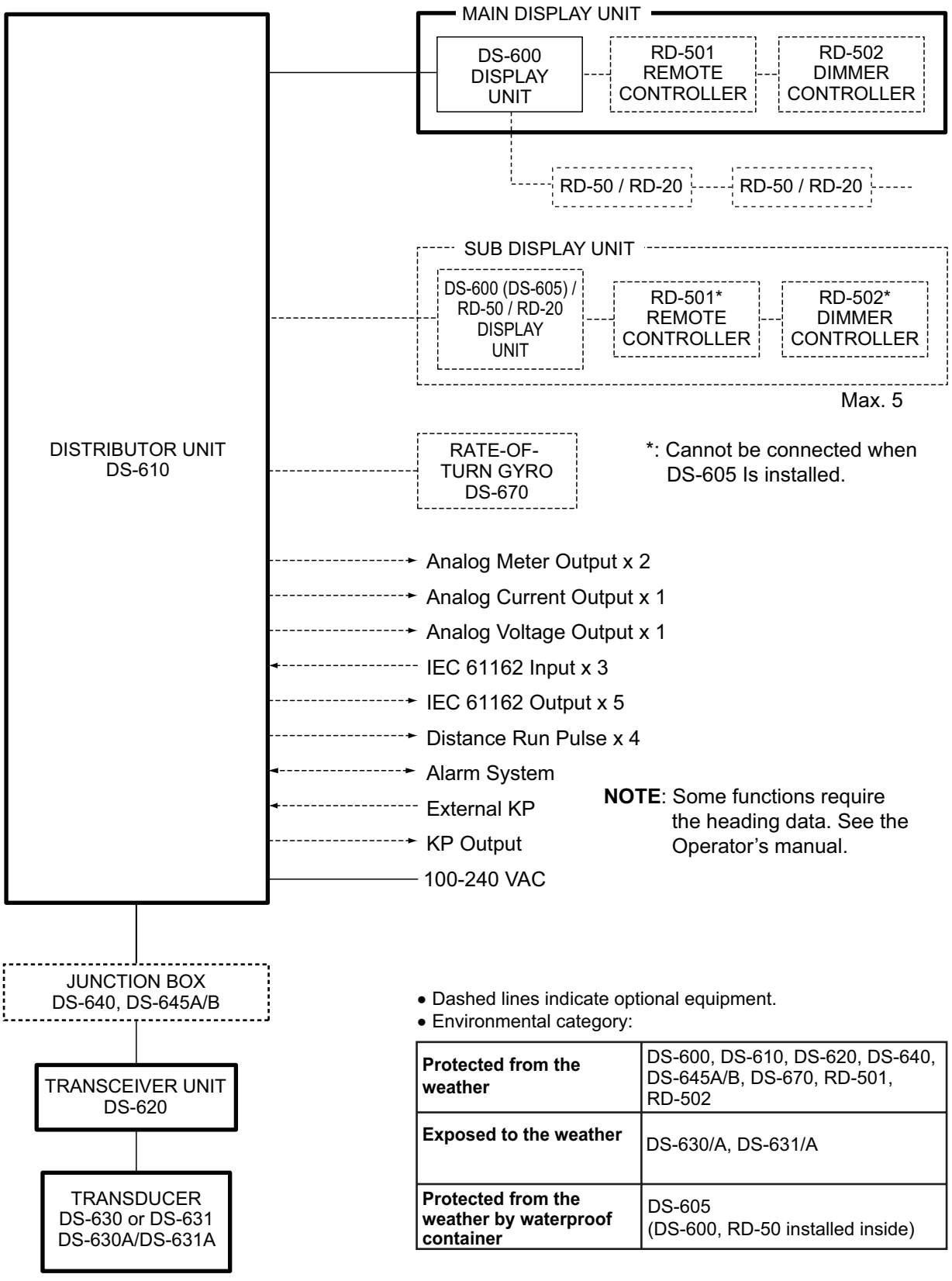
Use Chugoku Toso brand Marine Star 20 anti-fouling paint or the equivalent for the transducer.

Coat thinly and evenly. A thick coat can reduce output power.

Observe the compass safe distances to prevent interference to a magnetic compass.

	Standard	Steering
DS-600	0.60 m	0.40 m
DS-605	0.95 m	0.60 m
DS-610	3.15 m	2.00 m
DS-620	3.20 m	2.05 m
DS-640	1.15 m	0.70 m
DS-670	1.65 m	1.05 m
DS-645A	1.90 m	1.25 m
DS-645B	2.00 m	1.30 m

SYSTEM CONFIGURATION



- Dashed lines indicate optional equipment.
- Environmental category:

Protected from the weather	DS-600, DS-610, DS-620, DS-640, DS-645A/B, DS-670, RD-501, RD-502
Exposed to the weather	DS-630/A, DS-631/A
Protected from the weather by waterproof container	DS-605 (DS-600, RD-50 installed inside)

EQUIPMENT LISTS

Standard supply

Name	Type	Code No.	Qty	Remarks
Display Unit	DS-600	-	1	8.4” color LCD
Distributor Unit	DS-610	-	1	
Transceiver Unit	DS-620	-	1	
Transducer	DS-630	-	Select one.	No watertight connector. No fixing flange.
	DS-630A	-		No watertight connector. Fixing flange. (Type: 66-027-7003.)
	DS-631	-		With watertight connector. No fixing flange.
	DS-631A	-		With watertight connector and flange. Fixing flange. (Type: 66-027-7003.)
Transducer Tank	DS-660-A	-	Select one.	For DS-630/631. Tank with flange. (Type: 66-027-7002.)
	DS-660-N	-		For DS-630/631. Tank without flange.
	DS-660-S	-		For DS-630/631. Tank with sleeve. (Type: 66-027-7301.)
	DS-660A-A	-		For DS-630A/631A. Tank with flange. (Type: 66-027-7002.)
	DS-660A-N	-		For DS-630A/631A. Tank without flange.
	DS-660A-S	-		For DS-630A/631A. Tank with sleeve. (Type: 66-027-7301.)
Gate Valve	DS-661	-	1	For DS-630 only (Select one.)
Installation Material	CP26-01501	001-081-900	1 set	For DS-600
	CP66-01701	001-082-190	1 set	For DS-610
	CP66-01702	001-082-290	1 set	For DS-620
	CP66-01703	001-082-630	1 set	For DS-630
	CP66-01740	000-016-374	1 set	For DS-631 (CP66-01704, 30m cable)
	CP66-01750	000-016-375	1 set	For DS-631 (CP66-01704, 40m cable)
	CP66-01760	000-016-376	1 set	For DS-631 (CP66-01760, 50m cable
	CP66-01770	000-016-377	1 set	For DS-631 (CP66-01760, 60m cable)
	CP66-01710	001-082-830	1 set	For DS-661 (when shipped assembled.)
	CP66-01711	001-082-800	1 set	For DS-661 (when shipped separate.)
	CP66-01712	001-082-820	1 set	For DS-661, gasket (when shipped separate.)

Name	Type	Code No.	Qty	Remarks
Spare Parts	SP26-00101	001-076-450	1 set	For DS-600 (other than Deep Sea)
		001-077-030	1 set	For DS-600 (Deep Sea)
	SP66-00901	001-082-200	1 set	For DS-610 (other than Deep Sea)
		001-082-210	1 set	For DS-610 (Deep Sea)
	SP66-00902	001-082-520	1 set	For DS-620 (other than Deep Sea)
		001-082-530	1 set	For DS 620 (Deep Sea)
Accessories	FP66-00701	001-082-140	1 set	For DS-600

Optional Supply

Name	Type	Code No.	Qty	Remarks
Rate-of-turn Gyro	DS-670	-	1	
Display Unit	DS-600	-	1	8.4” color LCD
Hanger	OP26-8	000-016-313	1	For DS-600
Junction Box	DS-640	-	1	w/installation materials (CP66-01721)
	DS-645A/B	-	1	
Waterproof Box	DS-605-R	000-016-398	1	w/installation materials (CP66-01731), right-hand open door
	DS-605-L	000-016-727	1	w/installation materials (CP66-01731), left-hand open door
Flange	OP66-6	000-016-400	1	For DS-660
Tightening Handle	OP66-7	001-082-950	1	
Remote Controller	RD-501	000-016-197	1	
Dimmer Controller	RD-502	000-016-198	1	
Analog Indicator	FL-200S-1	000-015-997-10	1	-10 to 30kn, flush mount
	FL-200S-2	000-015-998-10	1	-10 to 40kn, flush mount
	SL-200-1	000-016-000-10	1	-10 to 30kn, bulkhead mount
	SL-200-2	000-016-164-10	1	-10 to 40kn, bulkhead mount
	FL-200S-1W	000-174-599-10	1	-10 to 30kn, flush mount
	FL-200S-3	000-174-600-10	1	-10 to 40kn, flush mount

1. INSTALLATION

NOTICE

Do not apply paint, anti-corrosive sealant or contact spray to coating or plastic parts of the equipment.

Those items contain organic solvents that can damage coating and plastic parts, especially plastic connectors.

1.1 Display Unit DS-600

Mounting Consideration

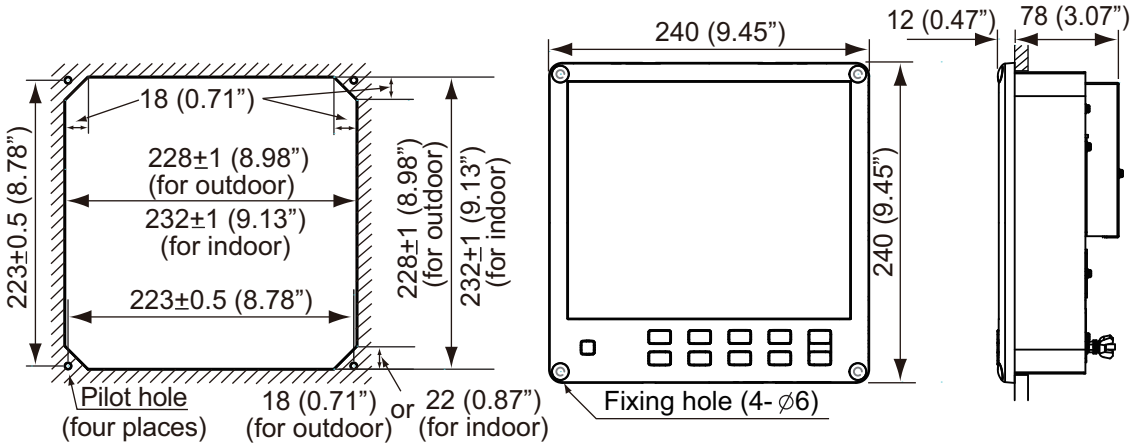
The display unit can be installed on a desktop, on the underside of a table, or flush mounted in a panel. When you select a mounting location, keep in mind the following points:

- Locate the display unit away from exhaust pipes and vents.
- Select an installation location that is well ventilated.
- Locate the display unit where shock and vibration are minimal.
- Allow enough maintenance space at the sides and rear of the display unit and leave enough slack in cables to facilitate maintenance and servicing.
- Observe the compass safe distances (see page i) to prevent the interference to a magnetic compass.
- The nominal viewing distance for the display unit is 1 m. Select a suitable mounting location considering that distance.

Flush Mount

See the outline drawing in the back of this manual. Before you fasten the display unit to the cutout, first connect the cables referring to chapter 2.

1. Make a cutout in the mounting location as shown in the illustration below.



Note: Dimensions for the cutout are different depending on the mounting location, indoor or out-door. For the outdoor mouting, ask dockyard to construct a waterproof case for the display unit.

2. Make four pilot holes for self-tapping screws (diameter: 5 mm) in the location indicated in the illustration on "Flush Mount" on page 1-1.
3. Insert the sponge to the display unit from the rear side.
4. Set the display unit to the cutout and fasten the display unit with four self-tapping screws (5x20).
5. Set a cosmetic cap to each fixing hole on the front panel. See page 1-3.

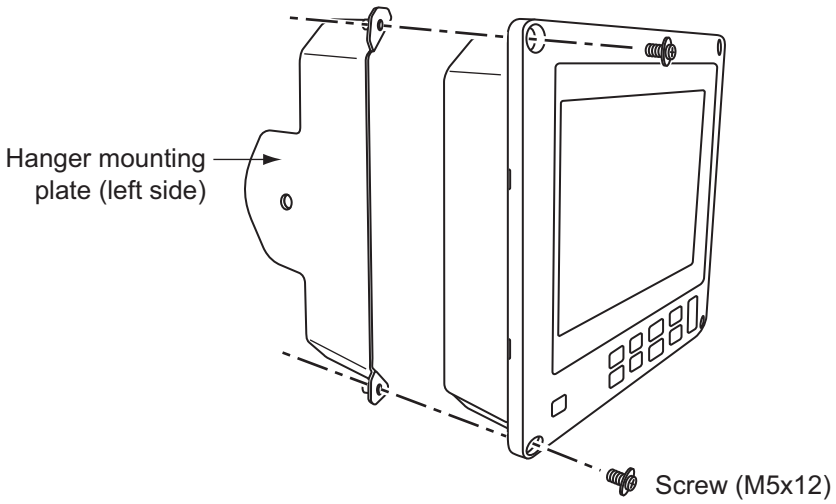
Desktop or table underside mount

The display unit can be mounted on a desktop or on the underside of a table using the optional hanger. See the outline drawing for details.

Hanger assembly (Type: OP26-8, Code No.: 000-016-313-00)

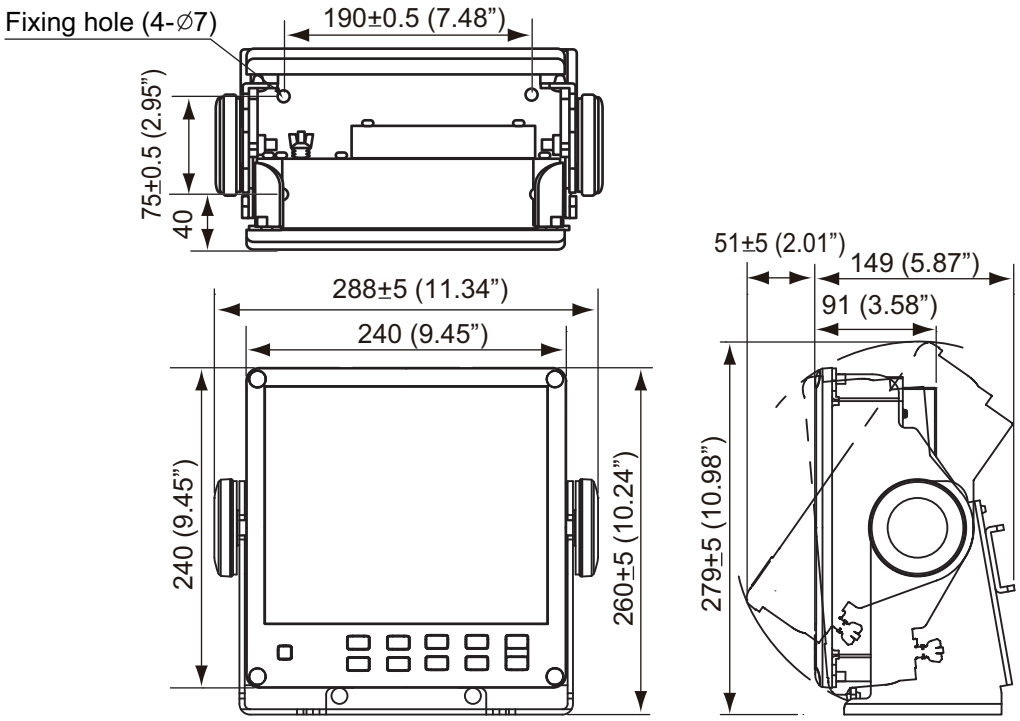
Name	Type	Code No.	Qty
Self-tapping screw	5x20	000-171-997-10	4
Binding head screw	M5x12	000-171-999-10	4
Hanger Assembly	OP26-8-1	001-081-920-00	1

1. Remove the hanger mounting plate from the hanger assembly.
2. Fasten the hanger mounting plate to the display unit from the left side and right side with four binding head screws (M5x12).



3. Make a four pilot holes for self-tapping screws (5x20) in the mounting location.
4. Fix the hanger to the mounting location with four self-tapping screws (5x20).
5. Screw knobs into the display unit loosely.
6. Set the display unit to the hanger.
7. Tighten the knobs to fasten the hanger to the display unit.

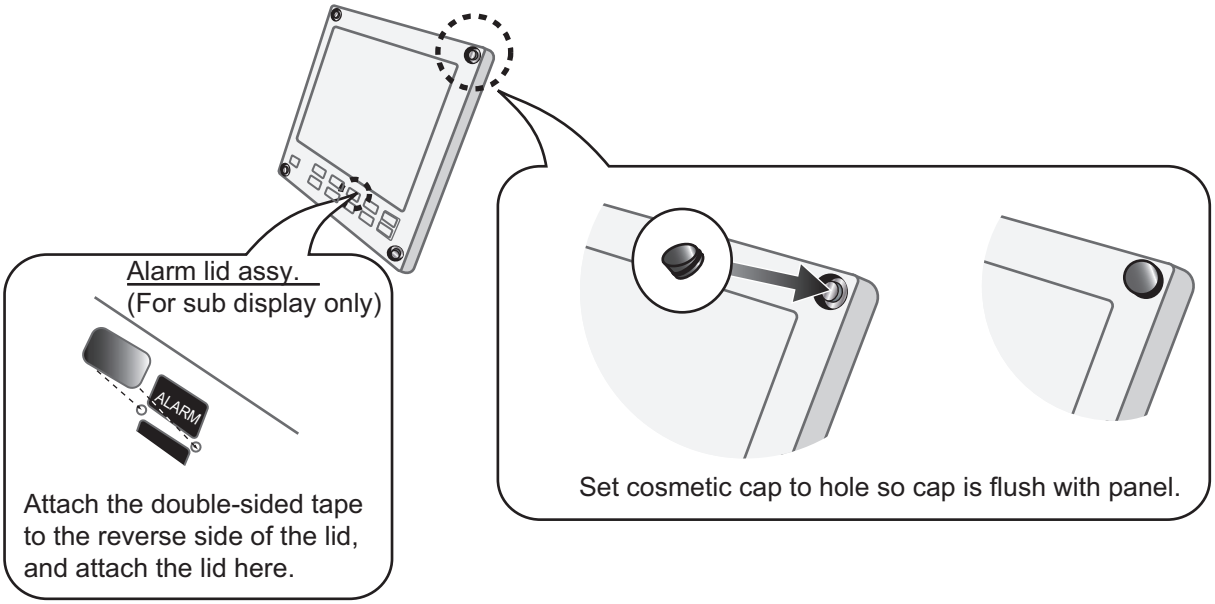
8. Set a cosmetic cap to each fixing hole on the front panel.



How to set the cosmetic cap and alarm lid assembly

Set a cosmetic cap to each fixing hole on the front panel as shown in the illustration below.

For the display unit to be used as a sub display, attach the alarm lid (supplied as accessories) to the **ALARM ACK** key to prevent accidental operation of the key.



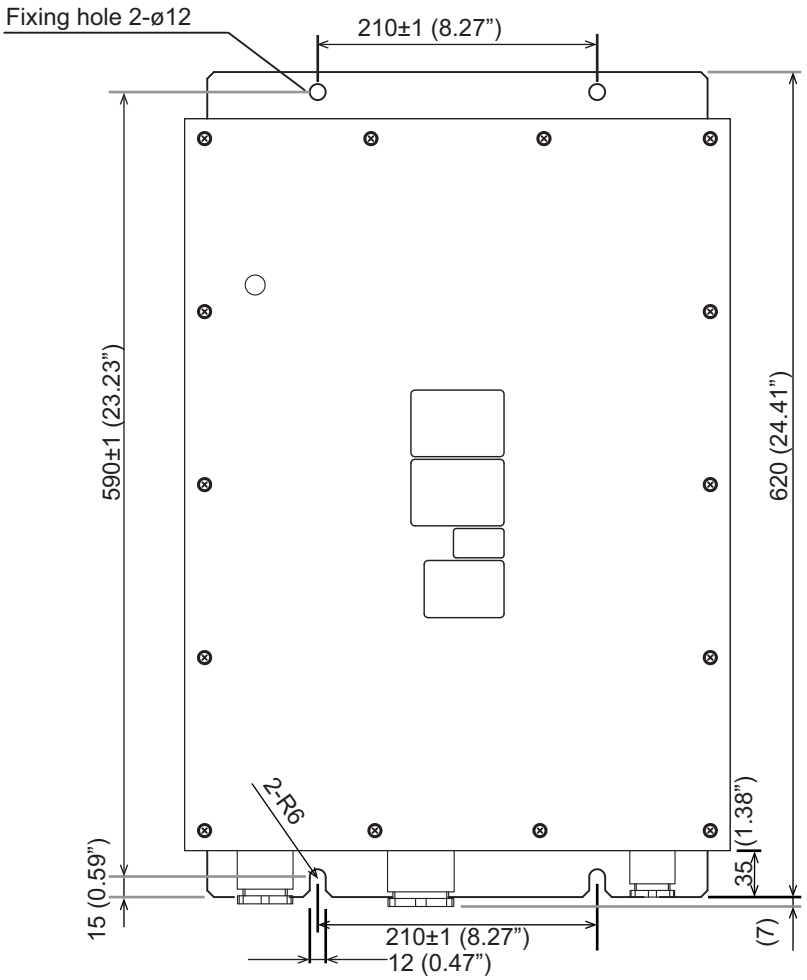
1.2 Transceiver Unit DS-620

Installation considerations

- Since the transceiver unit generates heat, install it in a dry, well-ventilated place. The cooling fans at the top of the unit must not be obstructed, to allow heat to escape.
- This unit is designed for bulkhead mounting to permit dissipation of heat. If bulkhead mounting is absolutely impossible, mount the unit on the floor leaving at least 350 mm clearance between it and the floor to permit dissipation of heat.
- Reinforce the mounting area, if necessary.
- Leave space around the unit for maintenance and checking. Refer to the drawing at the back of this manual for minimum recommended maintenance space.
- A magnetic compass will be affected if the transceiver unit is placed too close to it. Observe the compass safe distances to prevent disturbance to the magnetic compass (page i).

Use four hex. bolts (M10x20) to fix the transceiver unit to the mounting area. See the outline drawing at the back of this manual.

1. Screw in lower hex. bolts so there is 5 mm clearance between bottom of screw head and bulkhead.
2. Hang the unit on the bolts, then tighten the bolts.
3. Fasten the unit with upper hex. bolts.

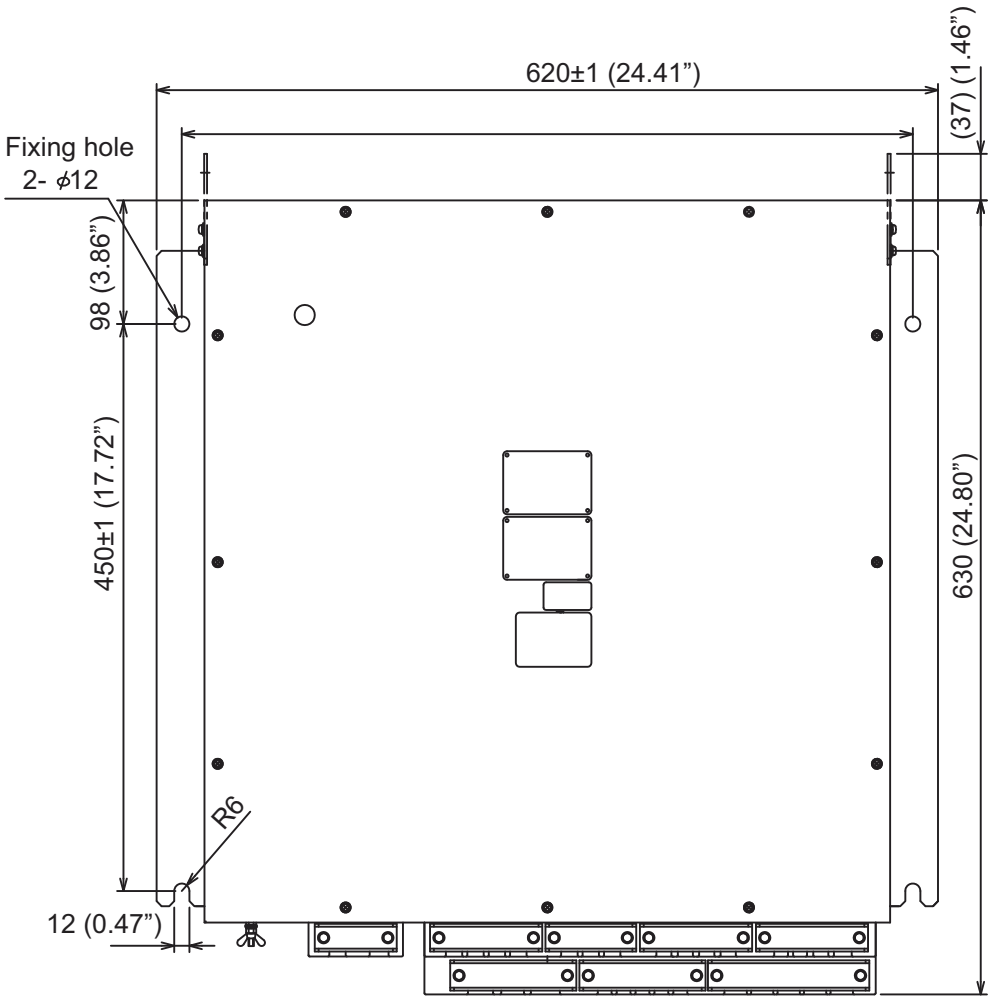


1.3 Distributor Unit DS-610

The distributor unit can be mounted on the deck or on a bulkhead. Consider the following points when selecting a mounting location.

- Select a location which is both well ventilated and low in humidity to keep the unit cool.
- For bulkhead mounting, be sure the mounting location is strong enough to support the weight under the continued vibration normally encountered on the vessel.
- A magnetic compass will be affected if the distribution box is too close. Observe the compass safe distances to prevent disturbance to the magnetic compass.

1. Screw in lower hex. bolts so there is 5 mm clearance between bottom of screw head and bulkhead.
2. Hang the unit on the bolts, then tighten the bolts.
3. Fasten the unit with upper hex. bolts.



1.4 Transducer

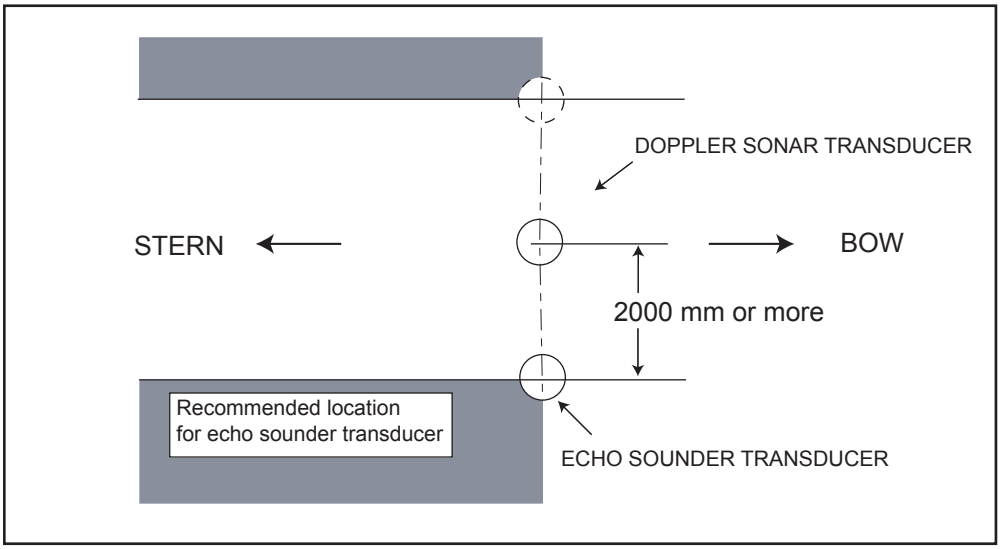
The performance of this equipment is directly dependent on the installation of the transducer.

The installation of the transducer and the tank must be accomplished by a dockyard referring to the installation drawings at the later part of this manual.

1.4.1 Installation location

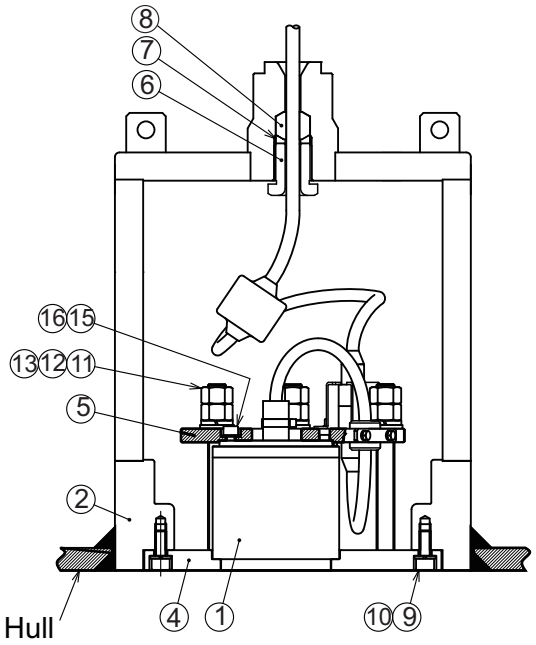
To decide the location of the transducer, the following points must be taken into account.

- Locate the transducer of DS-60 at least 2 m from the transducer of an echo sounder.



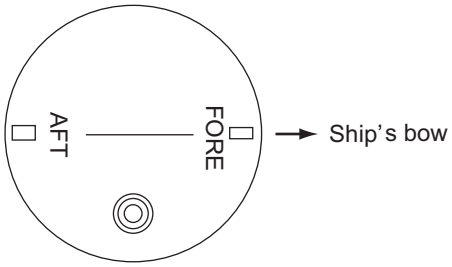
- Separate as far as possible from air bubble sources; e.g., side thruster and water disposal pipes.
- Install in close proximity to the keel, for uniform water flow.
- Generally, best performance is obtained by mounting on the bow; the stern side is influenced easily by air bubbles and propeller cavitation.
- Do not apply any paint to the transducer face.
- Visually confirm that the “FORE” mark on the transducer is oriented to the ship’s bow direction after the installation.

1.4.2 Installation using the transducer tank DS-660



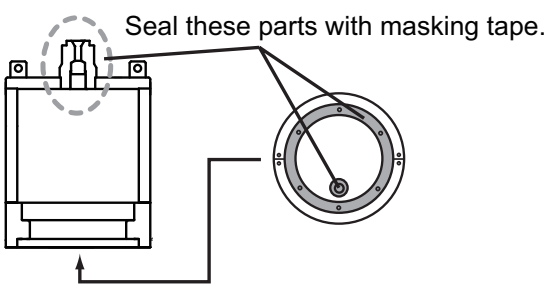
Transducer tank DS-660, sectional view

1. Remove flange (4), fixing plate (5), fixing gland (6), washer (7) and gasket (8) from the tank.
2. Set the tank to the place which was selected at paragraph 1.4.1.
   The “FORE-AFT” line on the tank must be parallel with the line between ship’s fore and aft (error: within 3°).
   For horizontal direction, the bottom of the tank (2) must be parallel to the draft.



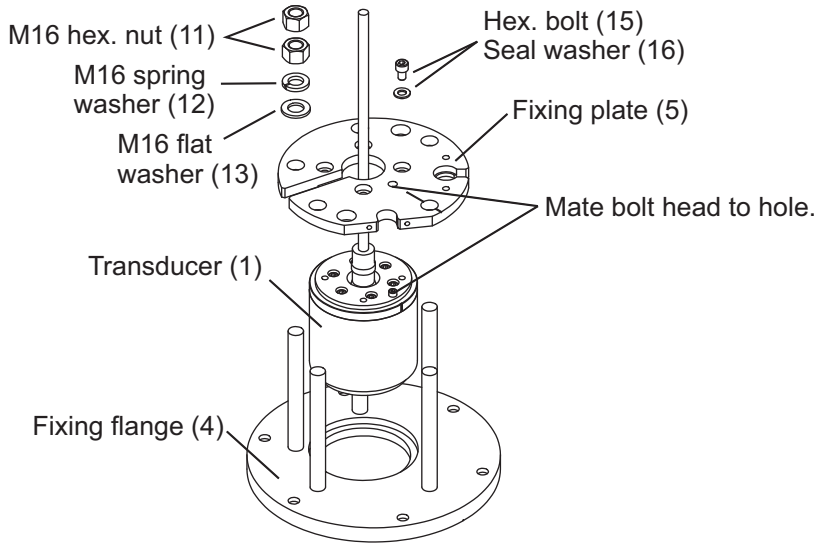
DS-660 Tank, top view

3. Weld the tank (2) to the ship’s hull. The doubling and welding methods are left up to the shipyard.
4. Paint the tank (2), flange (4) and fixing plate (5) the same color as the ship’s body.
   - The tank (2) is pre-painted with zinc rich primer.
   - The flange (4) and fixing plate (5) are pre-painted with zinc rich primer and anti-corrosion coat (BANNOH 500). If necessary, remove it with the sandblast, then paint the flange (4) and fixing plate (5) the same color as the ship’s body.

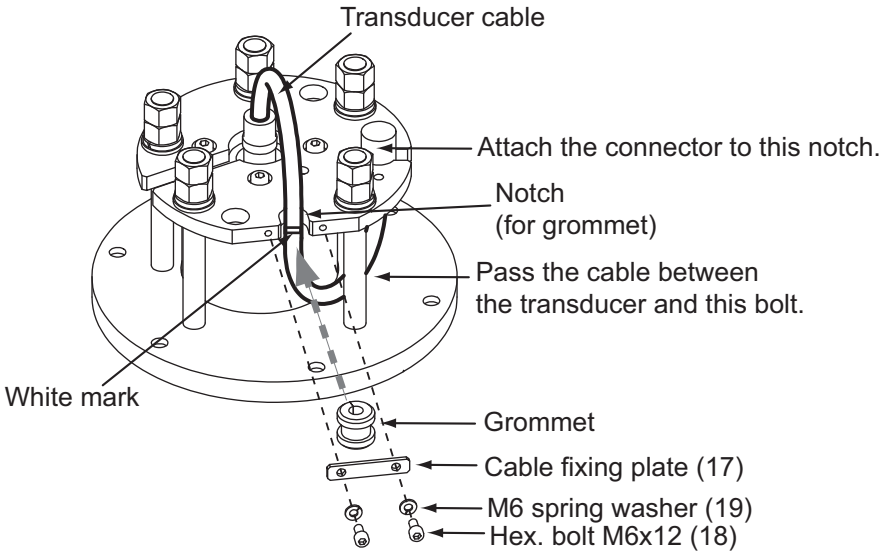


5. Apply adhesive (supplied) to the top of the transducer evenly.

6. Mount the fixing plate (5) on the transducer (1).
7. Attach seal washer (16) to hex. bolt M8x12 (15).
8. Use hex. bolt (15)(16) assembled at step 7 to fasten the transducer (1) and fixing plate (5).
   Mate bolt head at the top of the transducer with the hole on the fixing plate as shown in the fig-ure below.
9. Use M16 nut (11), spring washer (12) and flat washer (13) to fix the transducer (1) w/fixing plate to the fixing flange (4).

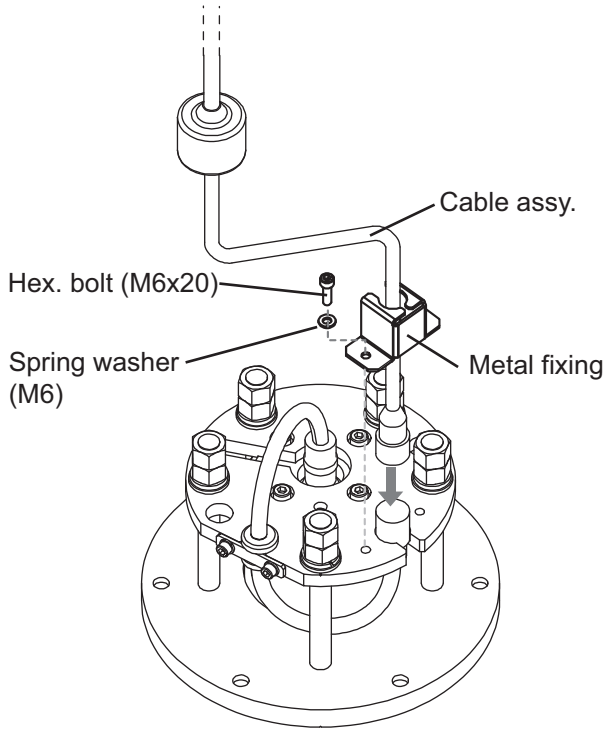


10. For the transducer DS-631, do the following steps:
    1) Attach the grommet (supplied) to the location marked with a white line on the transducer cable.
    2) Fix the grommet attached at step 1) to the notch shown below, by using the cable fixing plate (17), hex. bolt M6x12 (18), spring washer M6 (19).
    3) Pass the connector at the end of the transducer cable between the transducer and M16 bolt, and attach the notch as shown below.

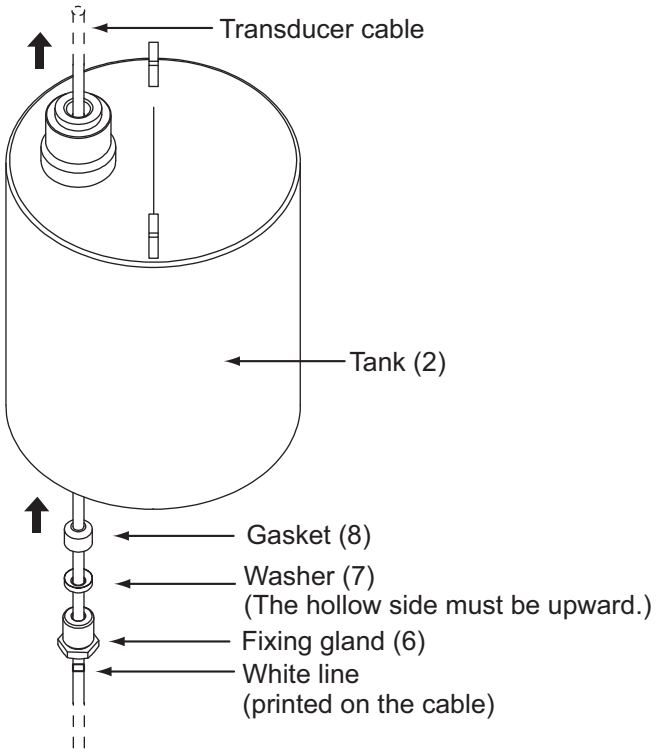


    4) Connect the cable assy. (supplied) to the connector attached at step 3). Clean the connector faces and pins before the connection.

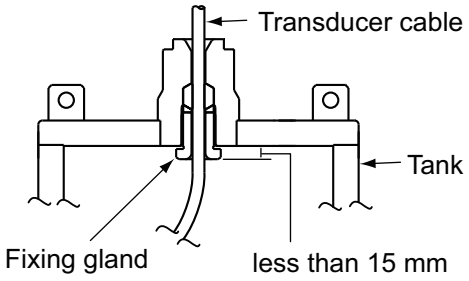
5) Attach the metal fixing (supplied) to the connector, and use two bolts M6x20 and spring washers M6 to fix them.



11. Pass the fixing gland (6), washer (7) and gasket (8) through the transducer cable (DS-631: cable assy), and slide them to the white line on the cable.
12. Pass the cable through the hole at the top of the tank (2).

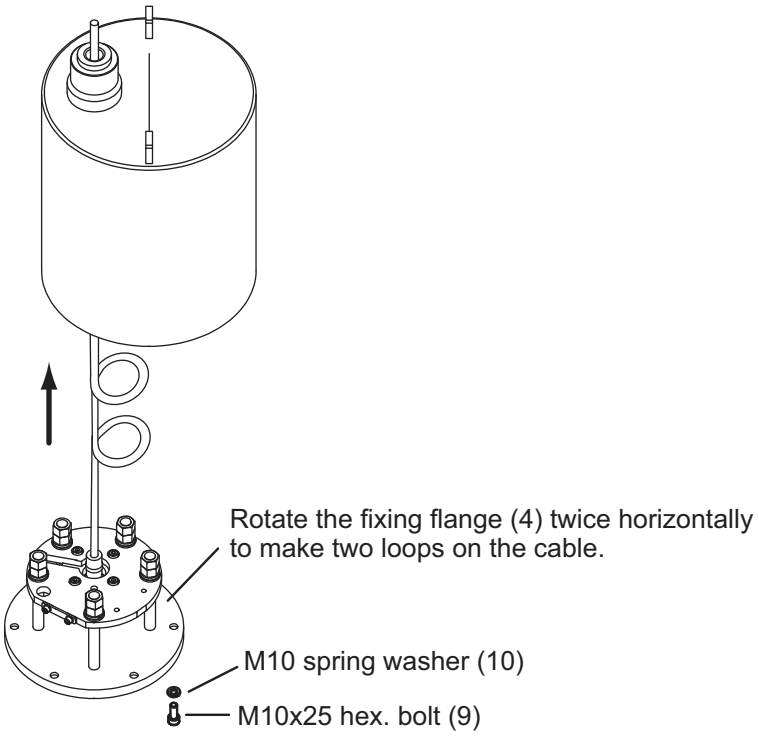


13. Use the tightening handle (option) to fasten the fixing gland (6) from the inside of the tank (2). The distance between the bottom of the fixing gland (6) and tank must be less than 15 mm.

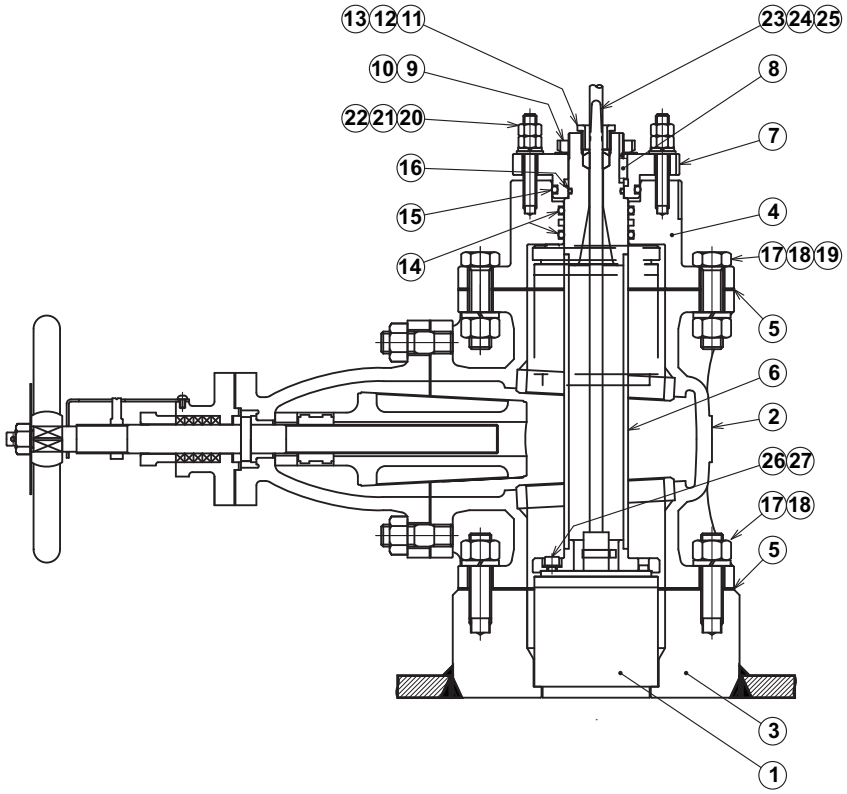


Transducer tank, sectional view

14. Rotate the fixing flange (4) twice horizontally to make two loops. These loops make it easy to put the cable in the tank.
15. Use the bolt M10x25 (9) and spring washer M10 (10) to fasten the fixing flange (4) to the tank (2).



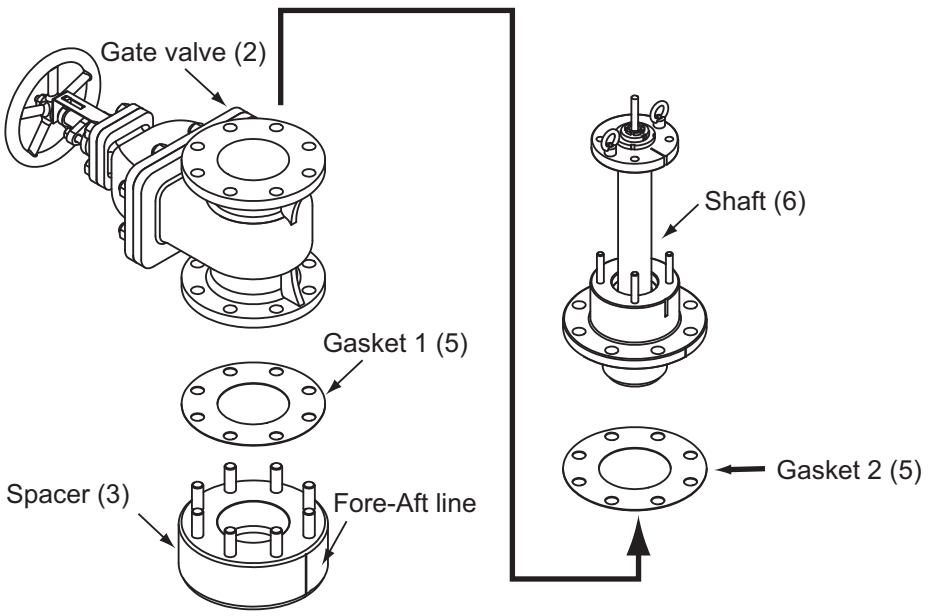
1.4.3 Installation with gate valve DS-661



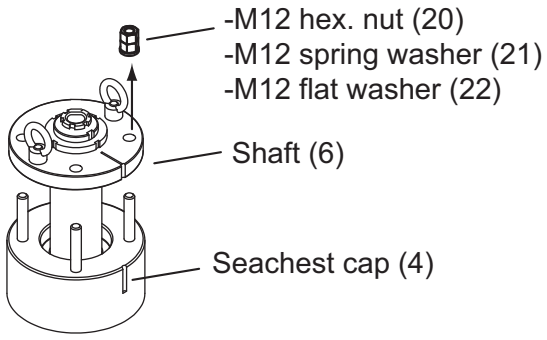
DS-661 gate valve, sectional view

Note: To install the gate valve, service space of 1000 mm height is necessary. For details, see the installation drawing at the back of this manual.

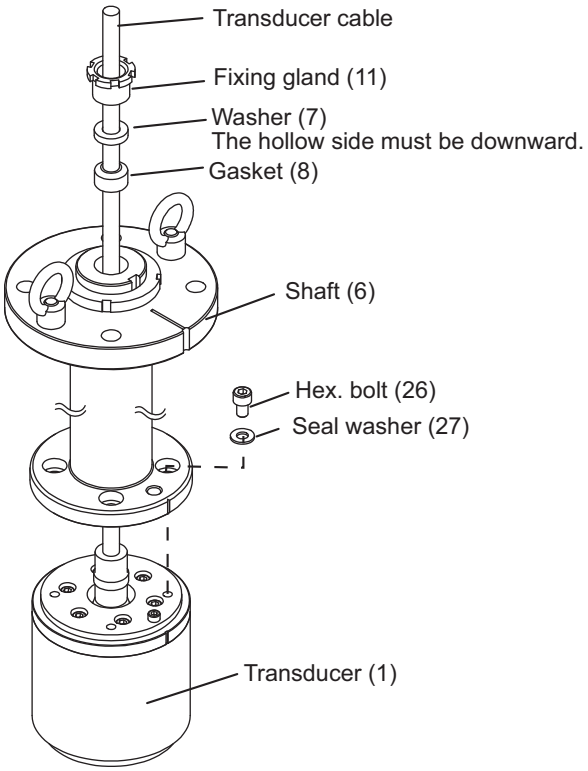
1. When your unit is shipped assembled, remove the five items shown below:
   - Gate valve (2)
   - Spacer (3)
   - Gasket (5), 2 pcs.
   - Shaft (6)



2. Set the spacer (3) to the place selected at paragraph 1.4.1.
   The “FORE-AFT” line on the spacer must be parallel with the ship's fore and aft line (within 3°). For horizontal direction, the bottom of the spacer must be parallel with the ship's draft.
3. Weld the spacer (3) to the ship's hull. The welding and doubling methods are left up to the shipyard.
4. Unfasten M12 hex. nut (20), spring washer (21) and flat washer (22) to remove the shaft (6) from the seachest cap (4).

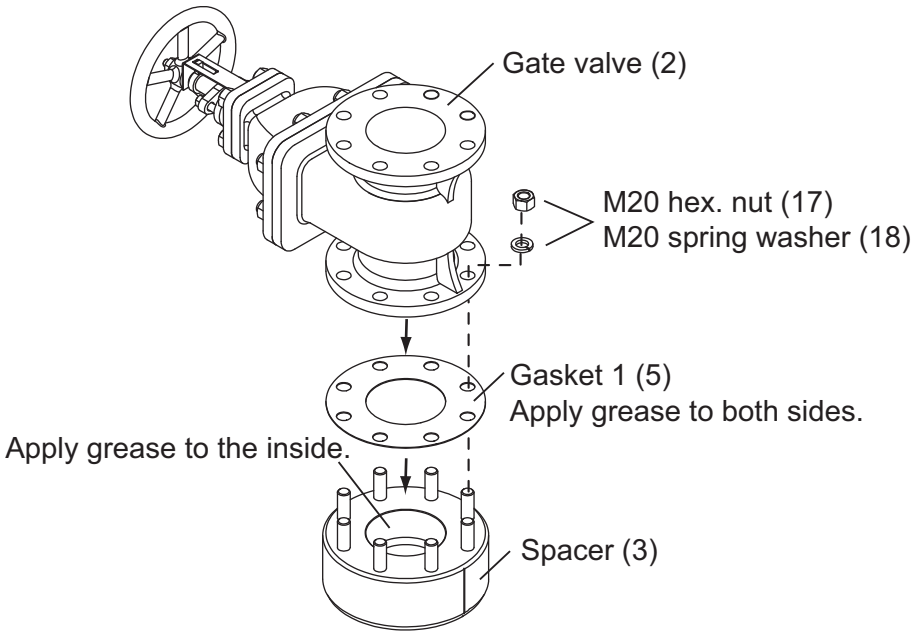


5. Paint the gate valve (2), spacer (3) and seachest cap (4) the same color as ship's body. Paint only gray-colored areas; for other part, seal with a masking tape.
6. Pass the cable from the transducer (1) through the shaft (6) from the bottom.
7. Apply adhesive (supplied) on the top of the transducer (1).
8. Use hex. bolt (26) and seal washer (27) to fasten the transducer (1) to the shaft (6).
9. Pass the gasket (8), flat washer (7) and fixing gland (11) through the transducer cable.

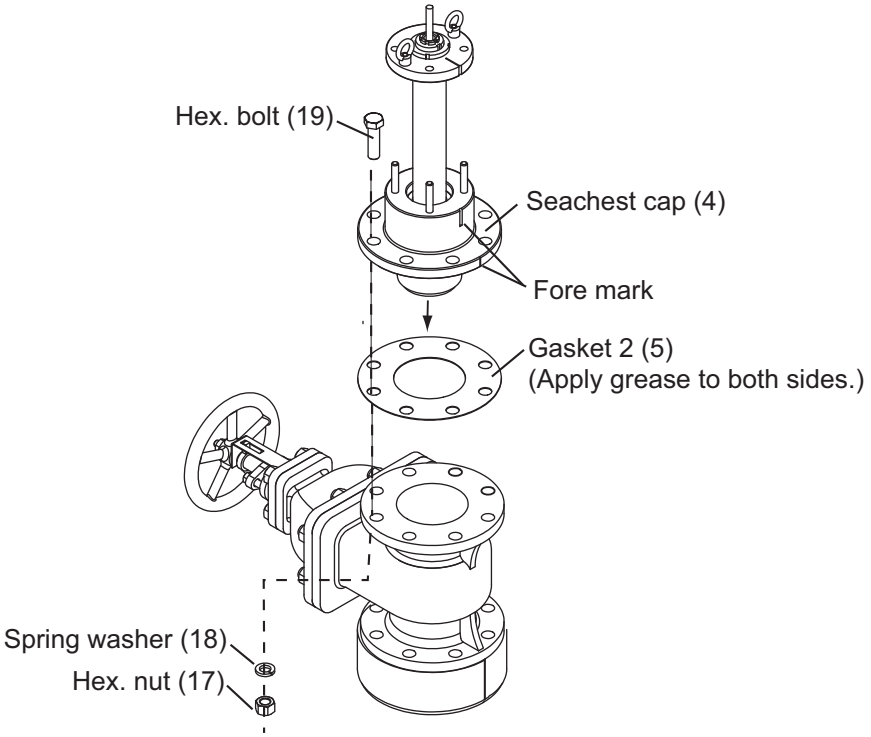


10. Fasten the fixing gland (11) to the top of the shaft (6).
    The height between the top of the fixing gland (11) and the top of the shaft (6) must be less than 7 mm.

11. Apply grease (supplied) to both sides of the gasket 1 (5), and set it on the spacer (3).
12. Apply grease (supplied) to the inside of the spacer (3).
13. Clean the top and bottom of the gate valve (2), and mount it on the gasket 1 (5) mounted on the spacer (3) at step 11.
14. Fasten M20 hex. nut (17) and spring washer (18) loosely to the stud bolt of the spacer (3).

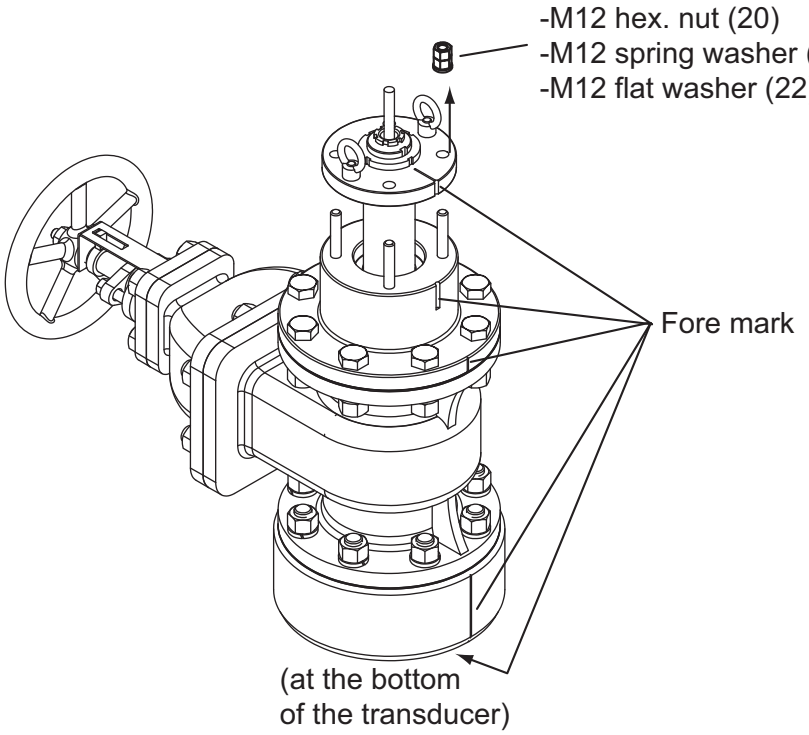


15. Apply grease (supplied) to both sides of the gasket 2 (5), and set it on the gate valve (2).
16. Use hex. nut (17), spring washer (18) and hex. bolt (19) to mount the seachest cap (4) of the shaft (6) on the gate valve (2).

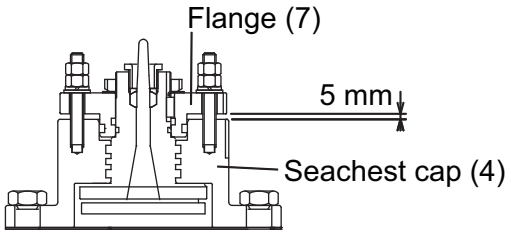


17. Move the shaft (6) upward and downward by hands to check if it moves smoothly.

18. Check that fore marks are aligned, and fasten hex. nut (17), spring washer (18) and hex. bolt (19) tightly.
19. Fasten hex. nut (20), spring washer (21) and flat washers (22) removed at step 4 to stud bolt on the seachest cap.

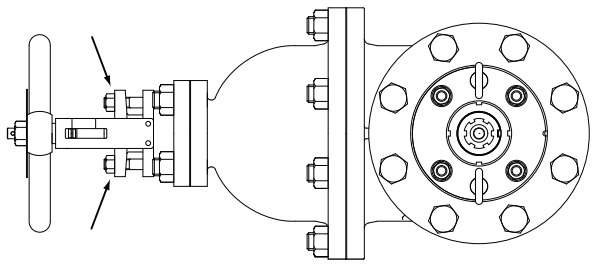


The distance between the seachest cap (4) and flange (7) must be 5 mm.



How to open the gate valve

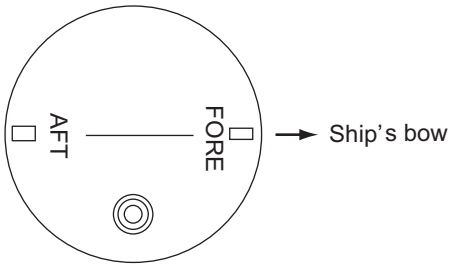
When you open or close the gate valve, unfasten two nuts shown below to rotate the handle. Then, fasten nuts to fix the handle.



1.4.4 Installation using the transducer tank DS-660A

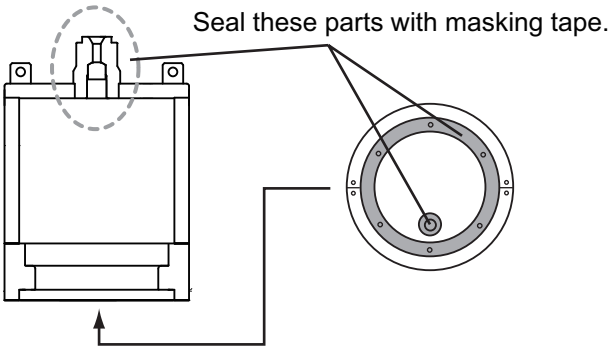
For the sectional view, see page 1-7.

1. Remove fixing gland (6), washer (7) and gasket (8) from the tank.
2. Set the tank to the place which was selected at paragraph 1.4.1.
   The “FORE-AFT” line on the tank must be parallel with the line between ship’s fore and aft (error: within 3°).
   For horizontal direction, the bottom of the tank (2) must be parallel to the draft.



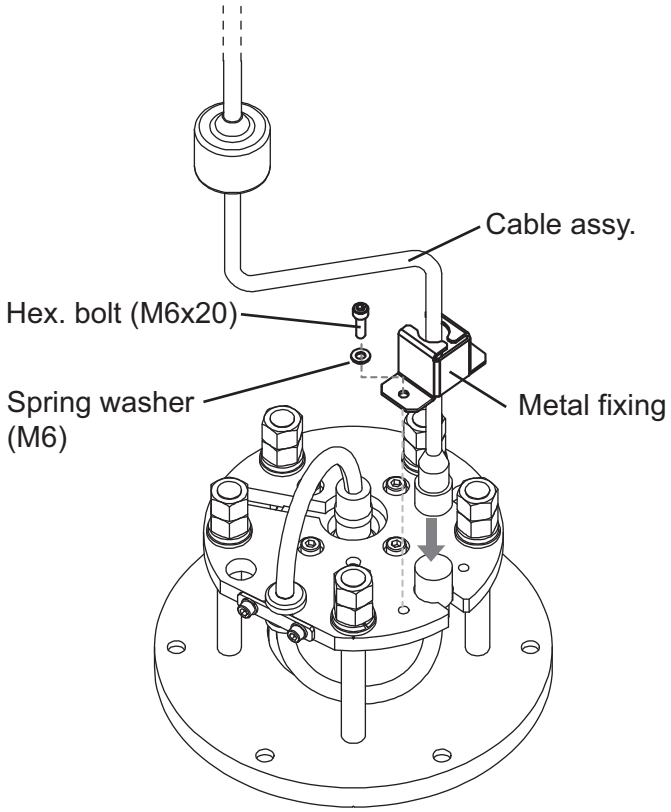
DS-660A Tank, top view

3. Weld the tank (2) to the ship’s hull. The doubling and welding methods are left up to the shipyard.
4. Paint the tank (2), flange (4) and fixing plate (5) the same color as the ship’s body.
   - The tank (2) is pre-painted with zinc rich primer.
   - The flange (4) and fixing plate (5) are pre-painted with zinc rich primer and anti-corrosion coat (BAN-NOH 500). If necessary, re-move it with the sand-blast, then paint the flange (4) and fix-ing plate (5) the same color as the shipÅfs body.

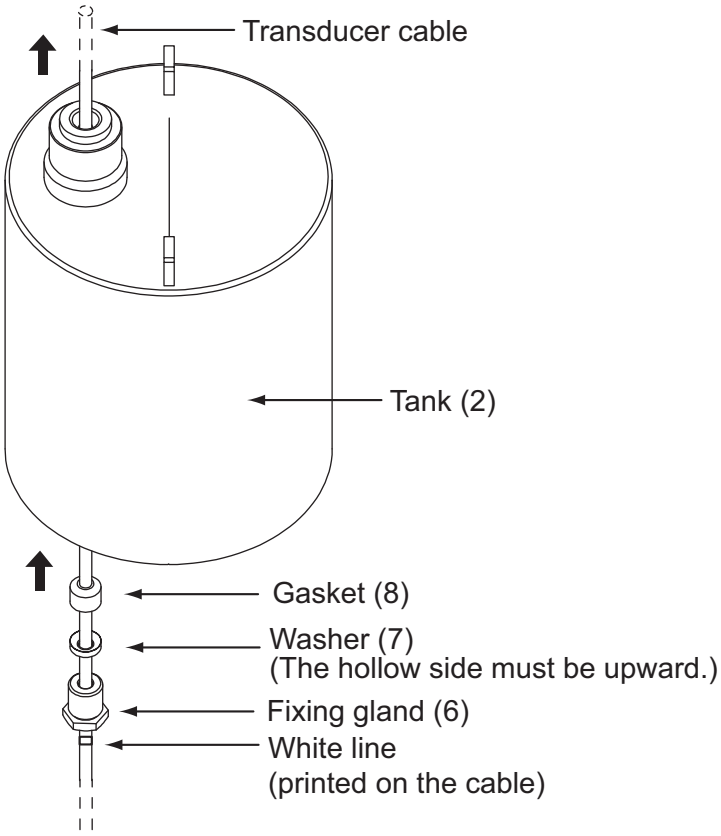


5. For the transducer DS-631A, do the following steps:
   1) Unfasten two bolts M6×20 and spring washers M6 to remove the metal fixing.
   2) Connect the cable assy. (supplied) to the connector from the transducer. Clean the connector faces and pins before the connection.

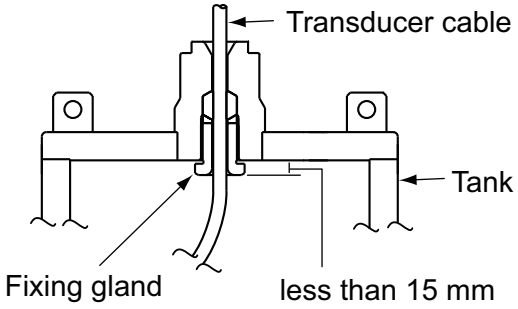
3) Attach the metal fixing (supplied) to the connector, and use two bolts M6×20 and spring washers M6 unfastened at step 1) to fix them.



6. Pass the fixing gland (6), washer (7) and gasket (8) through the transducer cable (DS-631A: cable assy), and slide them to the white line on the cable.
7. Pass the cable through the hole at the top of the tank (2).

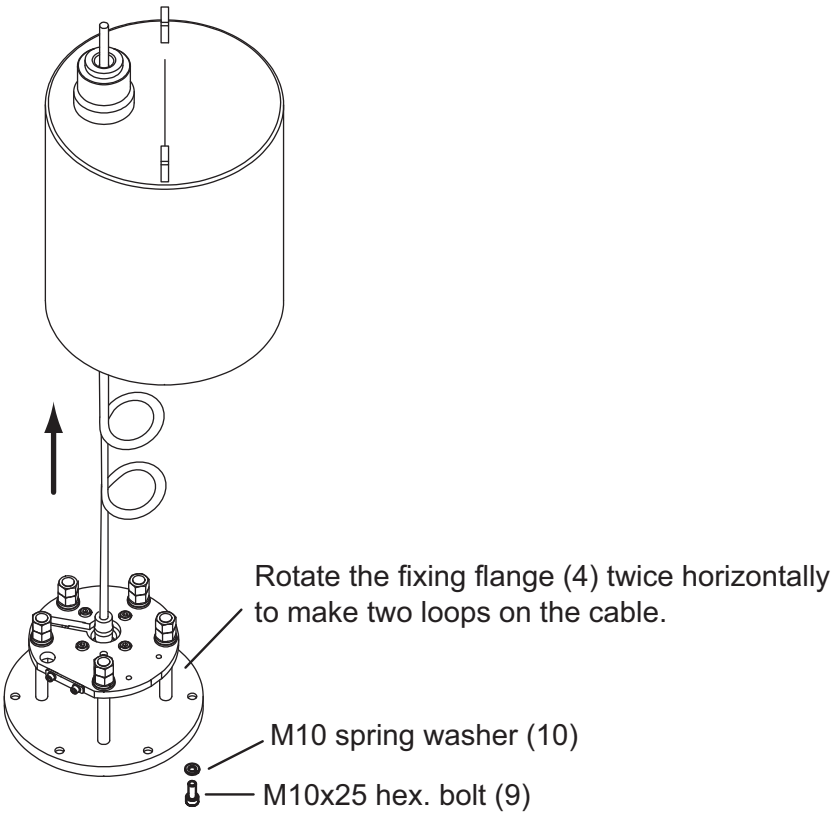


8. Use the tightening handle (option) to fasten the fixing gland (6) from the inside of the tank (2).
   The distance between the bottom of the fixing gland (6) and tank must be less than 15 mm.



Transducer tank, sectional view

9. Rotate the fixing flange (4) twice horizontally to make two loops.
   These loops make it easy to put the cable in the tank.
10. Use the bolt M10x25 (9) and spring washer M10 (10) to fasten the fixing flange (4) to the tank (2).



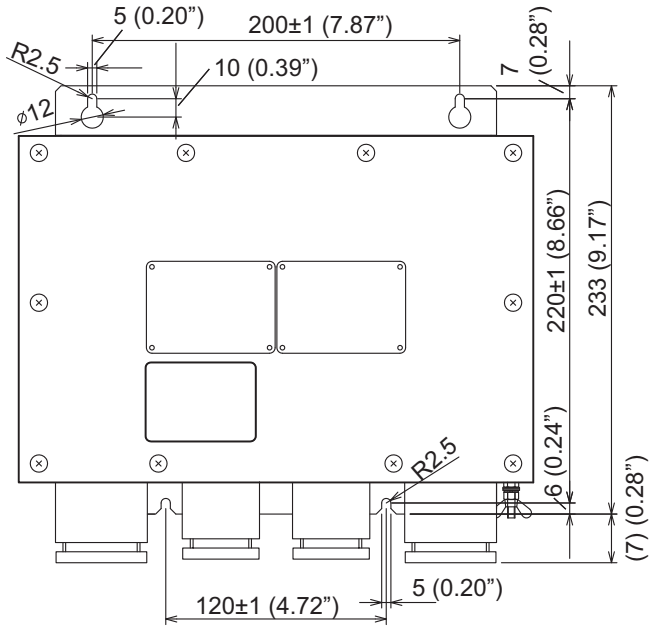
1.5 Junction Box DS-640, DS-645A/B (option)

Installation considerations

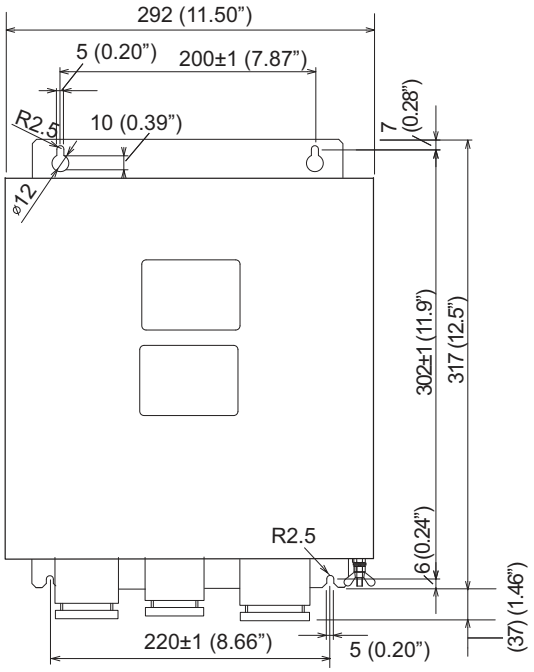
The junction box forms a joint between the distributor and the transceiver unit, and extends the distance between them to max. 500 m. Install it as below:

- Keep the junction box away from noise-emitting electrical machinery, for example, electric gen-erator, radio transmitter and TV.
- Do not install the junction box in place of high temperature and humidity.

See the outline drawing at the back of this manual.



Dimensions for DS-640



Dimensions for DS-645A/B

1.6 Installation of Display Unit with DS-605 (Water-Proof Box, option)

For installation of the display unit on the wings of the bridge, use the optional water proof box DS-605. Fix the DS-605 on the bulkhead and set the display unit therein.

Installation materials for DS-605 (Type: CP66-01731, Code No.: 001-082-660-00)

Name	Type	Code No.	Qty	Comments
Seal Washer	03-001-3002-0 ROHS	300-130-020-10	4	
Gasket (2)	26-003-1605	100-355-310-10	1	
Washer (2)	26-003-1607	100-355-320-10	2	
Cable Gland Washer	JIS F8801 25C	000-172-238-10	2	
Cable Grand Inner gasket	JIS F8801 25C	000-171-892-10	1	
Silicon Rubber	S-8400W 50G	000-158-483-10	1	
Binding Head Screw	M5x12 SUS304	000-171-999-10	4	Not included if the flush mount sponge is not attached on the DS-605.

Mounting considerations

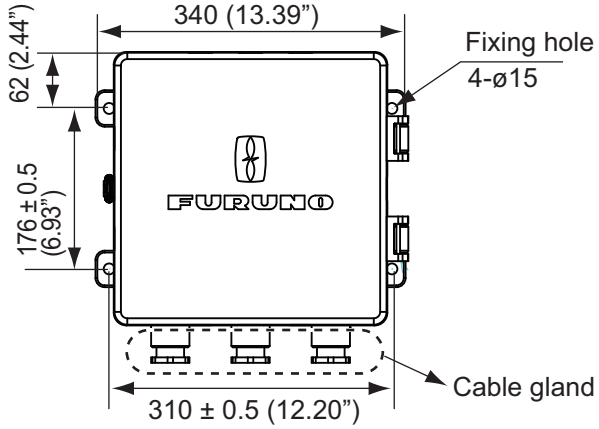
The DS-605 has waterproofing protection of IP56. When you select a mounting location for the waterproof box, keep in mind the following points.

- Keep the unit away from electromagnetic field-generating equipment like motors and generators.
- For maintenance and checking purposes, leave enough space at the sides of the unit and leave slack in cables. See the outline drawing at the back of this manual.
- A magnetic compass will be affected if the waterproof box is too close to the magnetic com-pass. Observe the compass safe distances (see page i) to prevent interference to a magnetic compass.

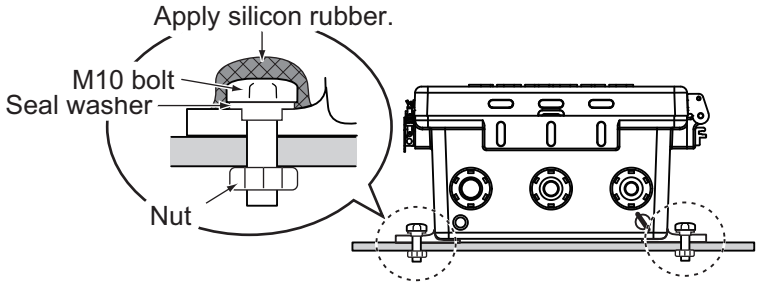
Mounting procedure

Note: Mount the DS-605 on the bulkhead so the cable glands and the drain hole are down.

1. Fix the DS-605 on the wings of the bridge.
   1) Insert the seal washer (03-001-3002-0 ROHS) to four fixing holes.
   2) Fix the DS-605 with four M10 bolts (dockyard supply).
      Note: Mount the unit so the cable glands are down.

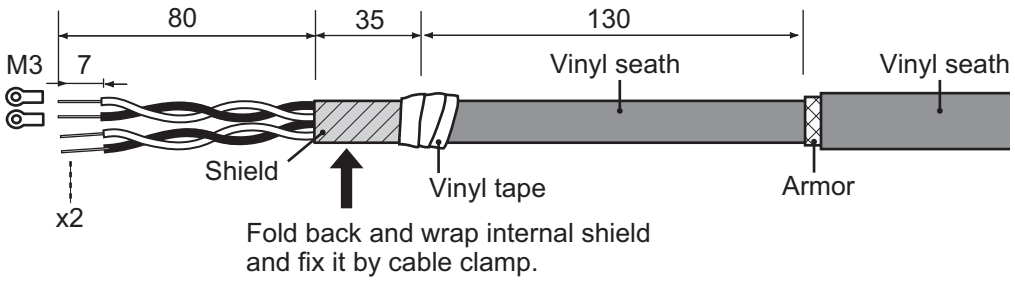


3) Apply silicon rubber to M10 bolts as shown below.

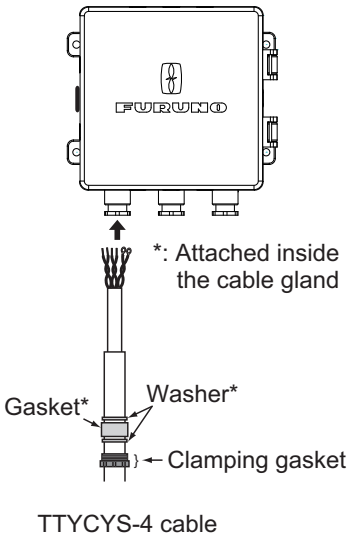


2. Connect the TTYCS-4 cable to the DS-600 through the cable glands for the DS-605.
   1) Fabricate the cable as shown below.

TTYCYS-4



   2) Pass the clamping gland, washer (26-003-1607), gasket (26-003-1605) and washer (supplied as installation materials) onto the cable, in that order.
   3) Pass the cable through the cable gland as shown below.
   4) Open the front cover of the DS-605 and connect the ground wire attached inside the DS-605 to the ground terminal on the rear of the DS-600.
   5) Connect the cables to the DS-600. Refer to chapter 2.



TTYCYS-4 cable

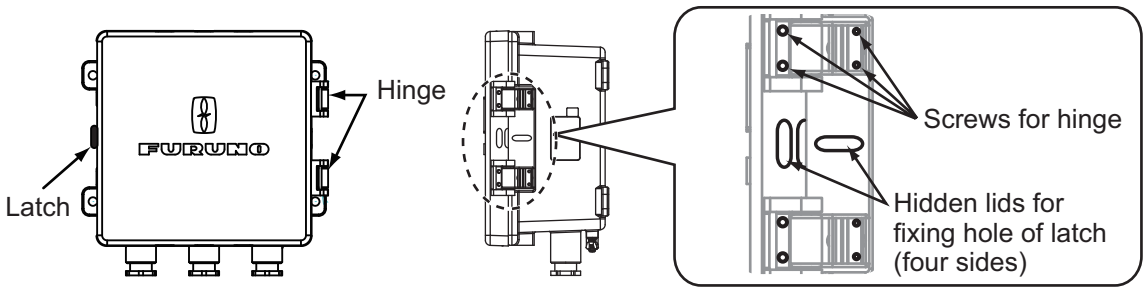
3. Remove each binding head screw from four corners of the DS-605 and set the DS-600 to the DS-605. These screws can be discarded.
4. Apply silicon grease to the binding head screws included in CP66-01731 and fix the DS-600 to the DS-605 with four binding head screws.
5. Tighten the clamping glands to fix the cables.
6. Apply putty to the cable glands for waterproofing.
7. Connect the ground terminal for the DS-605 to the ground terminal on the hull with the IV-1.25 sq. wire.

How to change orientation of the front cover of DS-605

The front cover of the DS-605 can be oriented up, down, right or left. To change the orientation of the front cover, do the following.

Note: Set the front cover so the FURUNO logo on the cover is right side up. The drain hole must be down.

1. Remove eight screws from two hinges.
2. Remove two screws from the latch.
3. Remove the hinges and the hidden lids for fixing hole of latch in consideration of the opening direction.The hidden lids for fixing hole of latch are taped on each side.
4. Orient the front cover as desired and fix the hinges and latch.

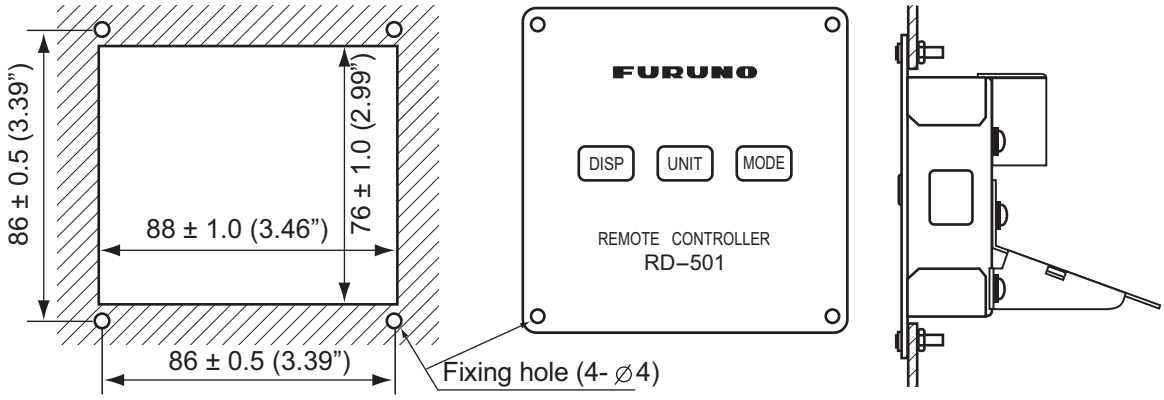


1.7 Remote Controller RD-501/Dimmer Controller RD-502 (option)

The optional remote controller RD-501 and dimmer controller RD-502 can be flush mounted in a panel. The size and the mounting procedure are shared by RD-501 and RD-502. For the mounting location, refer to the mounting considerations for the display unit in section 1.2.

Note: Before you fasten the display unit to the cutout, first connect the cables referring to chapter 2.

1. Make a cutout in the mounting location (88 mm (width) x 76 mm (height)).
2. Make four holes of 4 mm diameter in the locations indicated in the illustration below.
3. Set the remote controller or dimmer controller to the cutout. Insert four binding head screws (M3x12) from the front side then fasten the unit with four sets of flat washers, spring washers and hexagonal nuts from the rear side.



1.8 Rate-of-Turn Gyro DS-670 (option)

The rate-of-turn gyro must be installed, in a location with minimal vibration, so that the sensor in-side the unit is level to within 1 degree. (There is no designation for orientation of the unit.) Select the location considering that the cable for connection with the distributor is 5 m.

Note: When installing the rate-of-turn gyro, wear the earth strap to prevent the electrification.

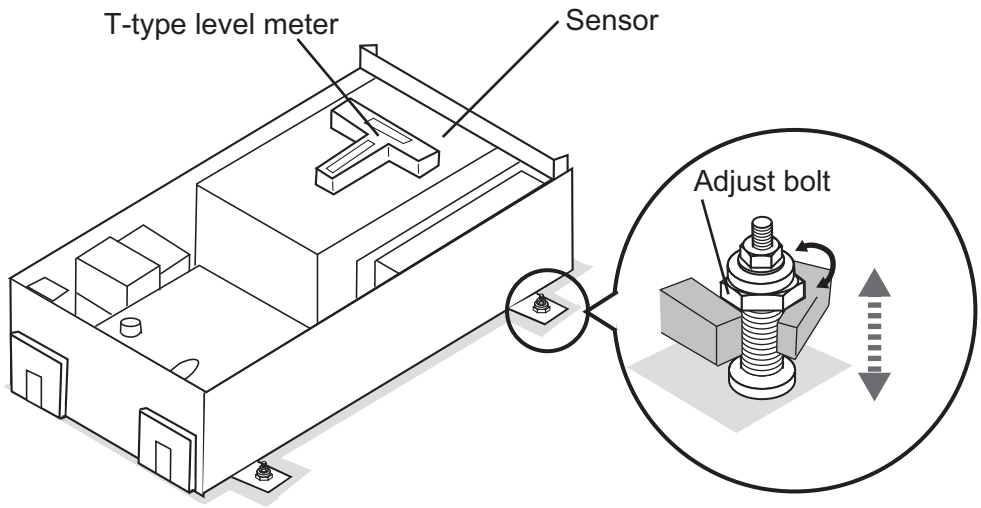
Use the four stud bolts, flat washers, spring washers and eight adjust nuts to fix the unit. See the outline drawing at the back of this manual.

Use the XH connector (supplied with DS-670) to connect cables.

Leveling adjustment

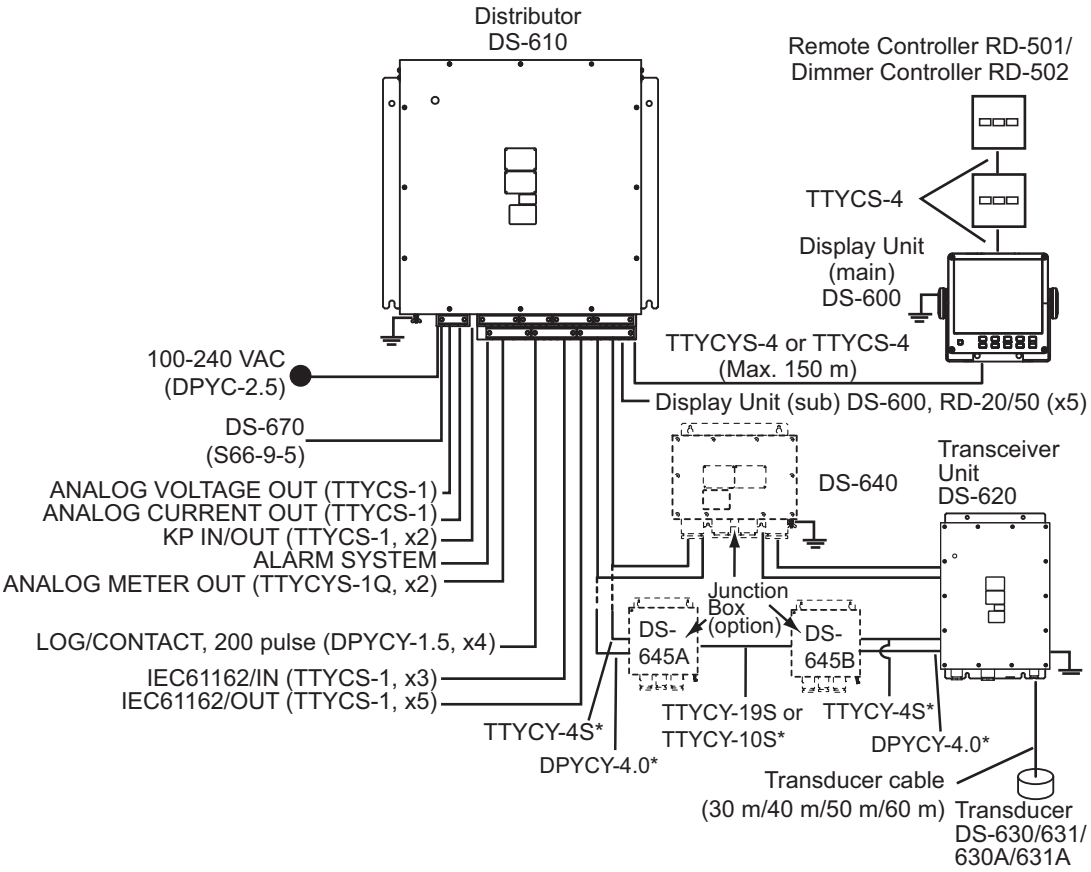
This adjustment must be performed while the ship is in dry-dock where it has no heeling and trimming inclinations.

Place a T-type level meter on top of the sensor to measure longitudinal and transverse inclination. To level the sensor, turn the adjust bolts.



2. WIRING

Refer to the interconnection diagram at the back of this manual to connect cables.



*The cable length between DS-620 and DS-610 must be less than 500 m.

Note: For details of JIS (Japan Industrial Standard) cables, see "JIS CABLE GUIDE" on page AP-4.

Precautions for cable installation

Observe the following guidelines to prevent noise, interference problem.

- The transducer cable carries very weak signals (amplitude less than 0.1 μV), which are easily interfered by noise. The need for a good ground cannot be overemphasized. Pass the transducer cable through dedicated conduit. Fill the conduit with vibration absorbing material (sand, etc.) to prevent vibration. The part of the cable extending from the conduit should be as short as possible. Separate the transducer cable at least 40 cm from other cables.
- Locate DS-60 cables away from the transmission antenna cable or radio equipment.
- Locate the DS-60 cables away from the power cables mentioned below. Also, separate cables at least 40 cm when the cables are run parallel with power cables.
  - Cable carrying more than a few kilowatts power to fluctuating loads
  - Cable carrying switching waves generated by thyristor, etc.

- If the cables run through conduit or duct behind a non-metallic bulkhead, use a sheathless armored cable and ground the cable to the ship's hull every 50 cm.

Grounding

Connect the units and cables to the ground to prevent interference to the system and other equipment, referring to the following points:

- Keep all the units of the DS-60 as far away as possible from other radio equipment.
- Do not put the cables close to the cables of other radio equipment.
- All cables should be as short as possible.
- Gound the units of the DS-60 with suitable grounding wire (local supply).

⚠ CAUTION

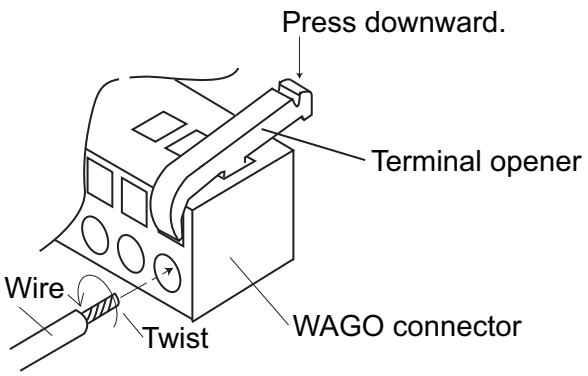
Ground the equipment.

Ungrounded equipment can give off or receive electromagnetic interference or cause electrical shock.

Connection of WAGO connector

Remove the WAGO connector from each unit and connect each cable core to the WAGO connector. See the interconnection diagram at the back of this manual. The terminal opener is attached inside each unit.

How to connect wires to WAGO connector

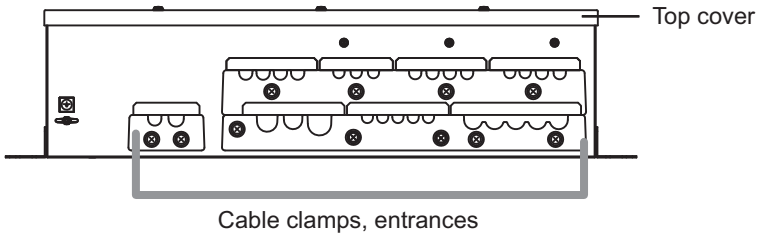


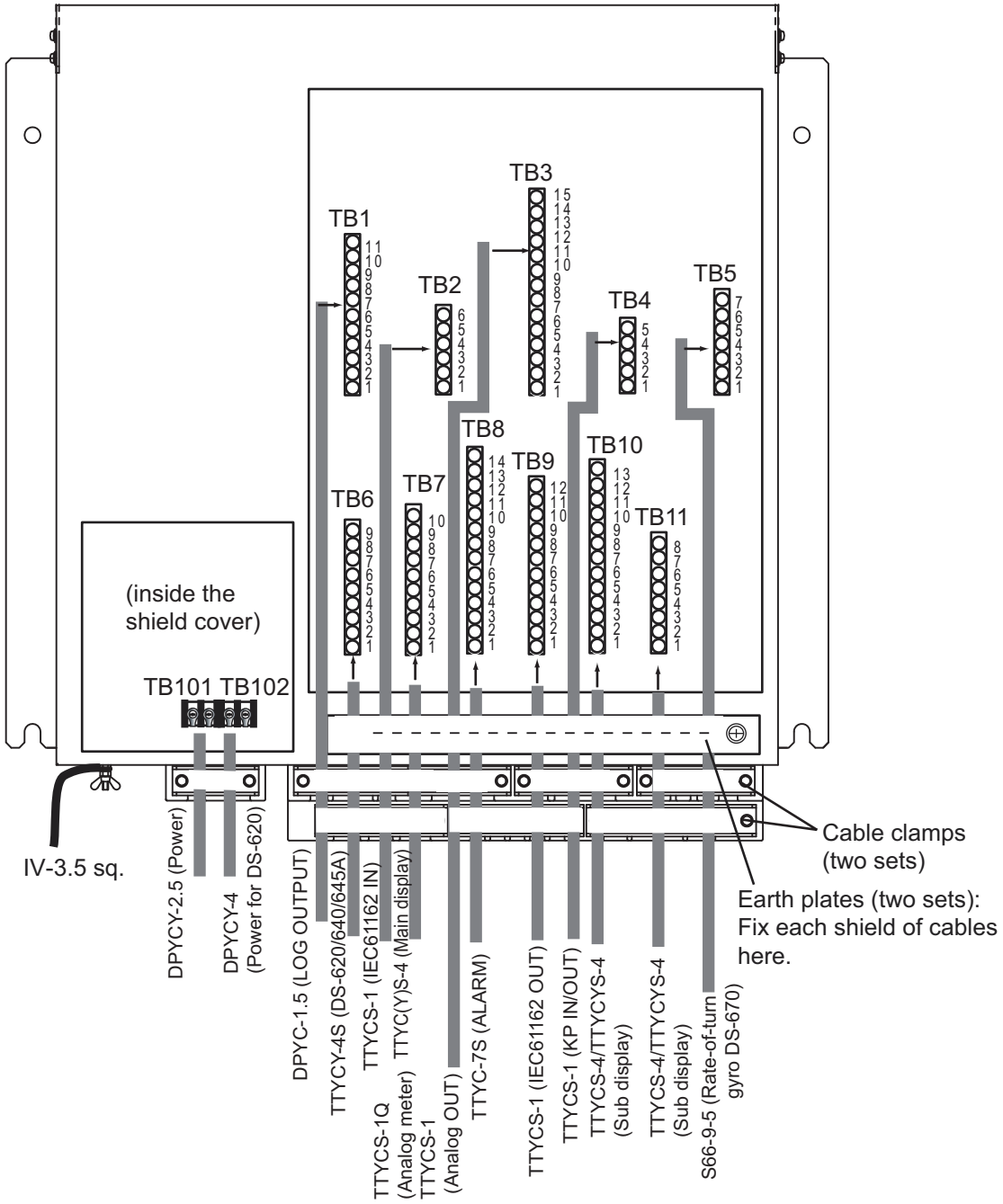
Procedure
1. Twist the cores.
2. Set and press the terminal opener downward.
3. Insert the wire to hole.
4. Remove the terminal opener.
5. Pull the wire to confirm that it is secure.

2.1 Distributor Unit DS-610

The Distributor Unit DS-610 has two lines of cable clamps, and there are 13 cable entrances in total. The cables and corresponding cable entrances are shown on the reverse side of the top cover of the DS-610. Fabricate cables referring to page 2-4. Pass

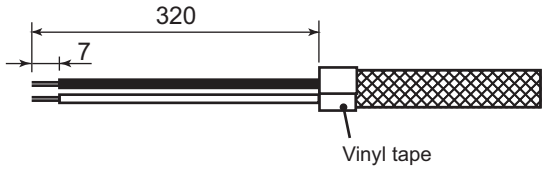
the cables through their respective cable entrances and connect them to WAGO connectors.



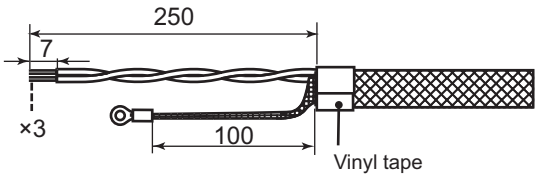


DS-610 Distributor Unit

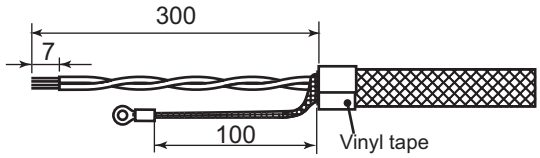
TB1 (LOG OUT), DPYC-1.5



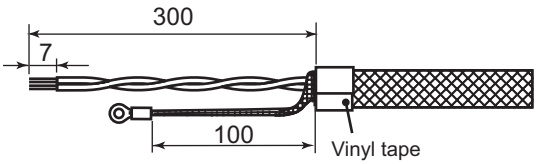
TB2 (IEC61162 IN), TTYCS-1



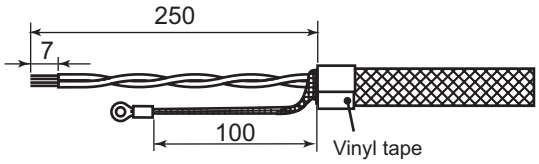
TB3 (Analog meter), TTYCS-1Q



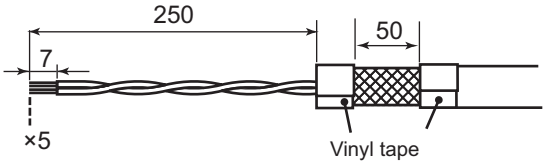
TB3 (Analog current/voltage), TTYCS-1



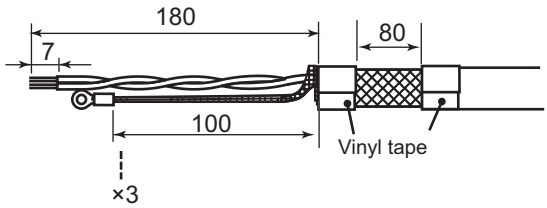
TB4 (KP IN/OUT), TTYCS-1



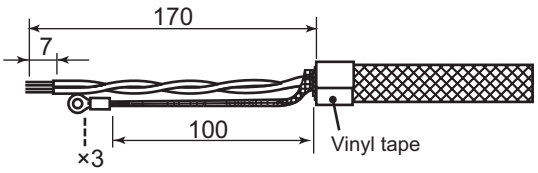
TB5 (DS670), S66-9-5



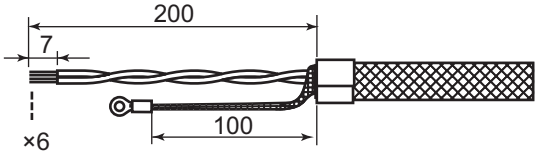
TB6 (DS620/640), TTYCY-4S



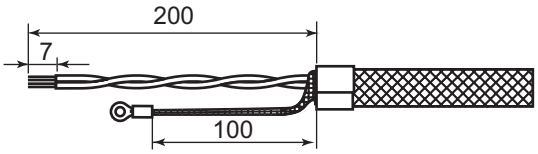
TB7 (DS600), TTYCS-4



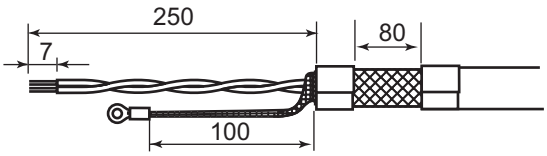
TB8 (ALARM), TTYC-7S



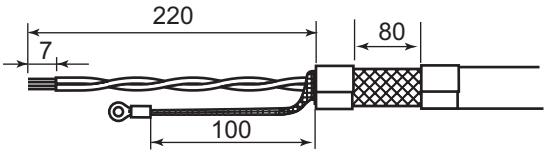
TB9 (IEC61162 OUT), TTYCS-1



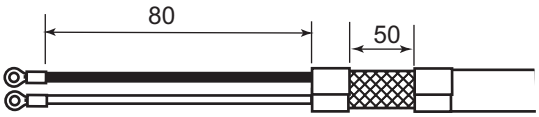
TB10 (Sub display), TTYCS-4/TTYCYS-4 (for DS-605)



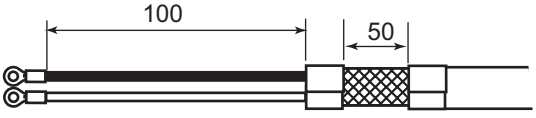
TB11 (Sub display), TTYCS-4/TTYCYS-4 (for DS-605)



TB101 Power (main), DPYCY-2.5



TB102 Power (for DS-620), DPYCY-4



2.2 DIPSW S3 Settings

DIPSW S3 is on the MAIN Board (66P3950) inside the Distribution Unit DS-610.

S3-#1,2

When the analog indicator is connected to the DS-610 Distributor Unit (TB3 #1,2 and #5,6), set the output voltage range according to the speed scale and range. The table below shows the corresponding settings.

DIPSW	Setting		
S3-#1	OFF (Factory default)	ON	
S3-#2	ON	OFF (Factory default)	
Output voltage range (mA)	-5.0 to 10	-3.3 to 10	-2.5 to 10
Analog indicator speed scale range (kn)	-10 to 20	-10 to 30	-10 to 40

Note: These settings do not affect the analog output ports (TB3 #9 through #12).

S3-#4 to #8

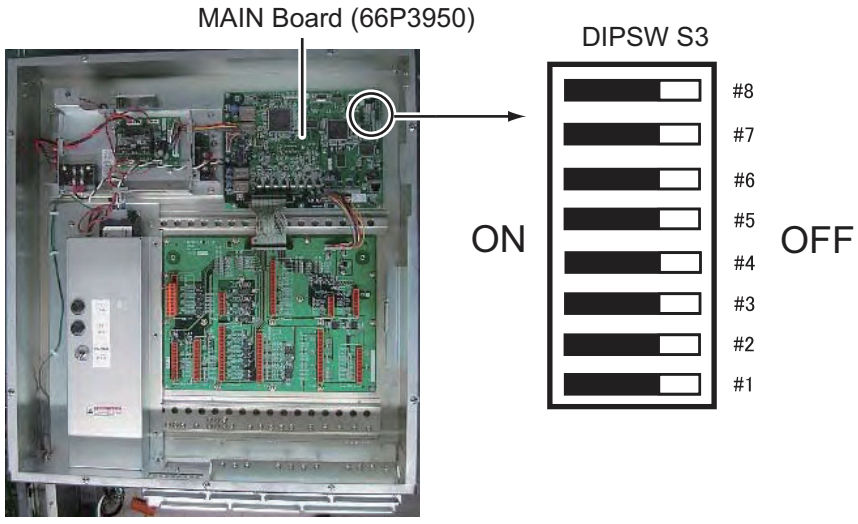
Alarm contact input/output settings by the DIPSW S3 are shown below.

	OFF (Default settings)	ON
S3-#4 REMOTE ACK	Contact input For ACK, close input	Contact input For ACK, open input
S3-#5 LOCAL ACK	Contact output For ACK, close output	Contact output For ACK, open output
S3-#6 ECHO FAIL	Contact output Normal open output	Contact output Normal close output
S3-#7 SPEED LIMIT	Contact output Normal open output	Contact output Normal close output
S3-#8 SYSTEM FAIL	Contact output Normal open output	Contact output Normal close output

Note 1: S3-#3 should remain OFF, the default setting.

Note 2: [POWER FAIL] is normal close output regardless of the settings of DIPSW.

When the power is off, all contact outputs are open output.



Distribution Unit DS-610, cover removed

2.3 How to Adjust the Analog Indicator

If it is necessary to adjust the offset or gain of the analog indicator or analog output, output dummy speed from the demo mode then adjust the applicable potentiometer on the MAIN board in the DS-610.

1) ANA_DISP1 offset adjustment: R180 (Rotate clockwise to offset in the AST direction)

2) ANA_DISP1 gain adjustment: R181 (Rotate clockwise to decrease the gain)

3) ANA_DISP2 offset adjustment: R169 (Rotate clockwise to offset in the AST direction)

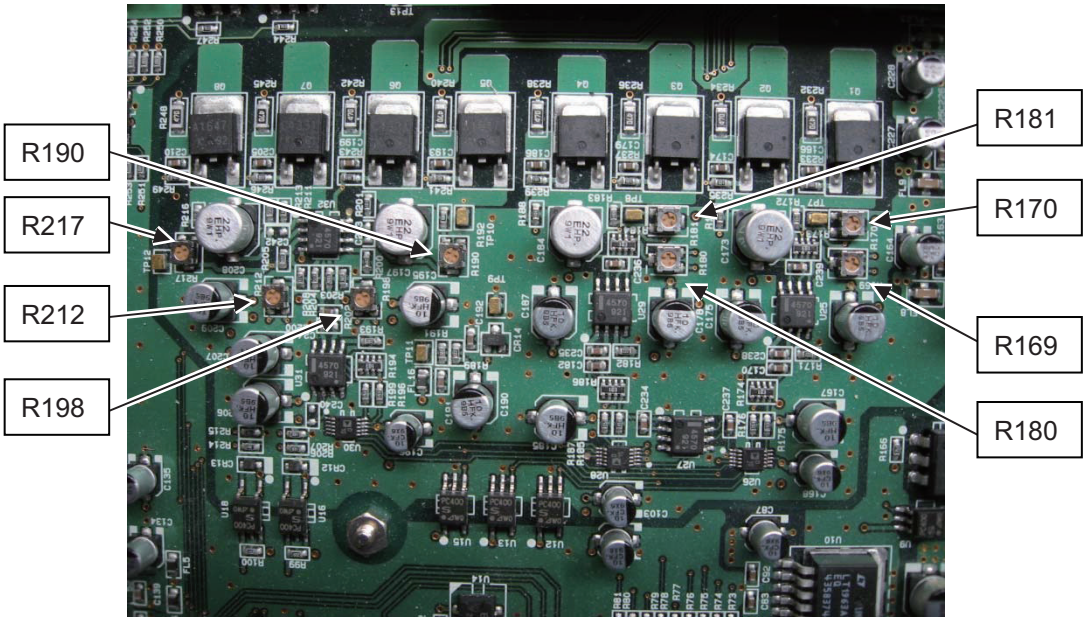
4) ANA_DISP2 gain adjustment: R181 (Rotate clockwise to decrease the gain)

5) ANA_V offset adjustment: R198 (Rotate clockwise to increase the offset value)

6) ANA_V gain adjustment: R190 (Rotate clockwise to increase the gain)

7) ANA_C offset adjustment: R212 (Rotate clockwise to increase the offset value)

8) ANA_C gain adjustment: R217 (Rotate clockwise to increase the gain



How to adjust the analog indicator

1. Set 0 kn for test speed in the demo mode, then adjust the offset of the analog indicator.
2. Set 15 kn or 20 kn for test speed in the demo mode, then adjust the gain of the analog indicator.

Note: Do the test for the gain adjustment with the ship's cruising speed.

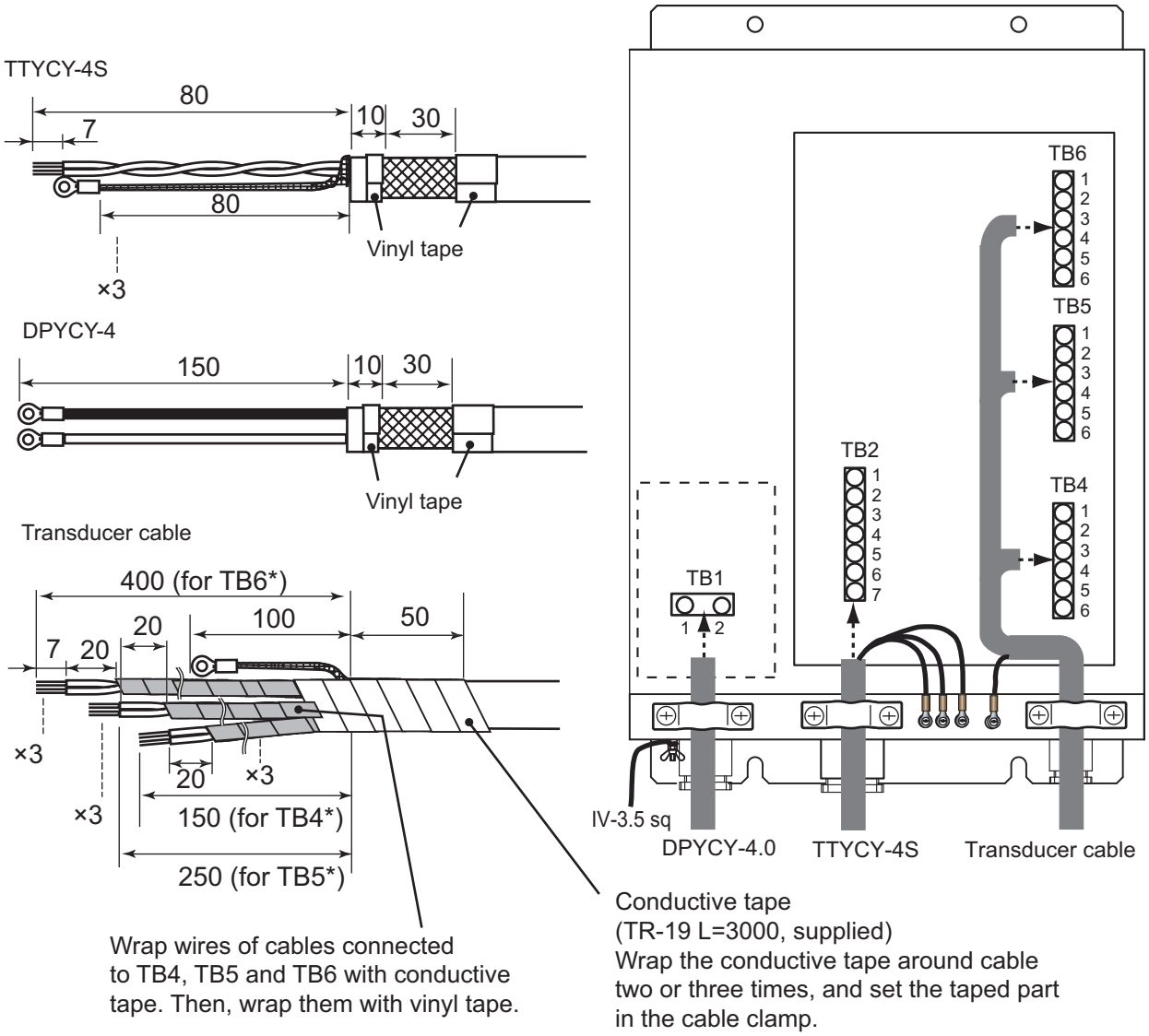
The specifications of voltage and current for analog indicator

Voltage output	-10 to 30 kn: -3.33 to 10.0 V
Current output	-10 to 30 kn: 4.0 to 20.0 mA (0 kn: 8.0 mA)

2.4 Transceiver Unit DS-620

Cables TTYCY-4S, DPYCY-4 and the transducer cable are connected to the DS-620. Fabricate and pass them through their respective the cable clamps at the bottom.

DS-620 Transceiver unit



Wrap wires of cables connected to TB4, TB5 and TB6 with conductive tape. Then, wrap them with vinyl tape.

Conductive tape
(TR-19 L=3000, supplied)
Wrap the conductive tape around cable two or three times, and set the taped part in the cable clamp.

Note: The transducer cable has nine twisted-pairs of signal lines (w/polarity). Be careful to connect them to the correct connectors in the transceiver unit.

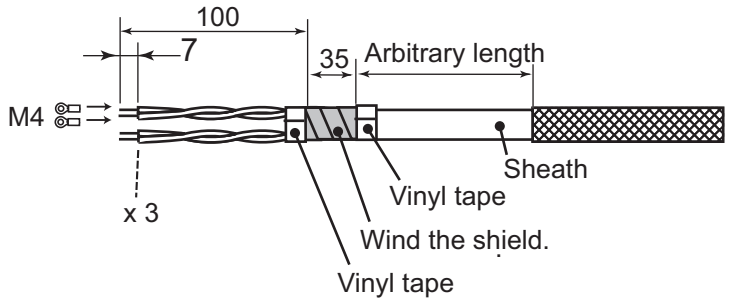
2.5 Display Unit DS-600, Remote Controller RD-501/ Dimmer Controller RD-502 (option)

Use the TTYCS-4 cable to connect the display unit DS-600 to the distributor.

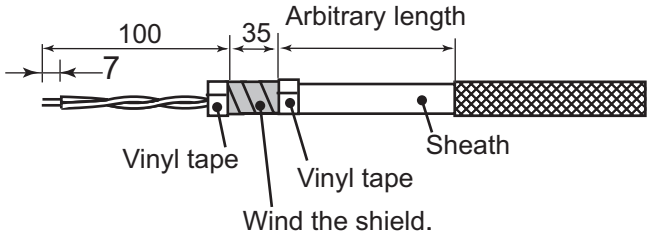
Note: The cable length must be less than 150 m.

DS-600 Display unit

TTYCS-4 (TB1/2, for distributor)
(TB3, for RD-501/502 (option))

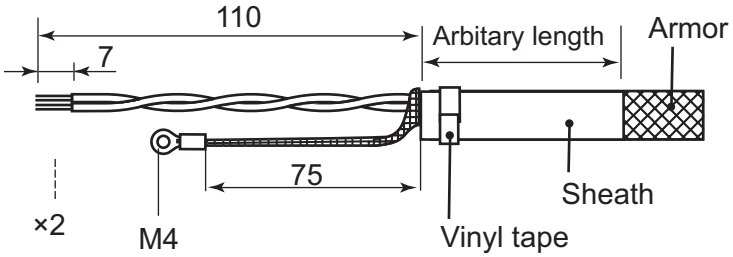


TTYCS-1 (TB4, for RD-20/50 (option))



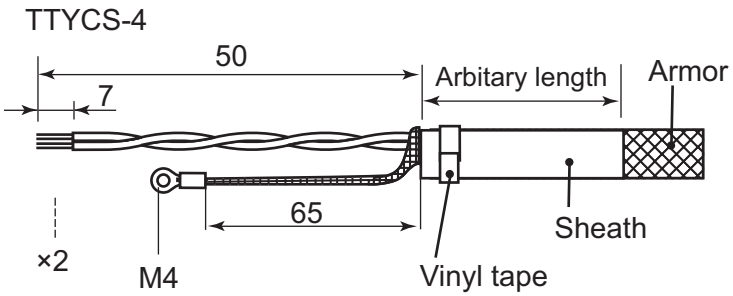
RD-501 (end of RD-501)

TTYCS-4

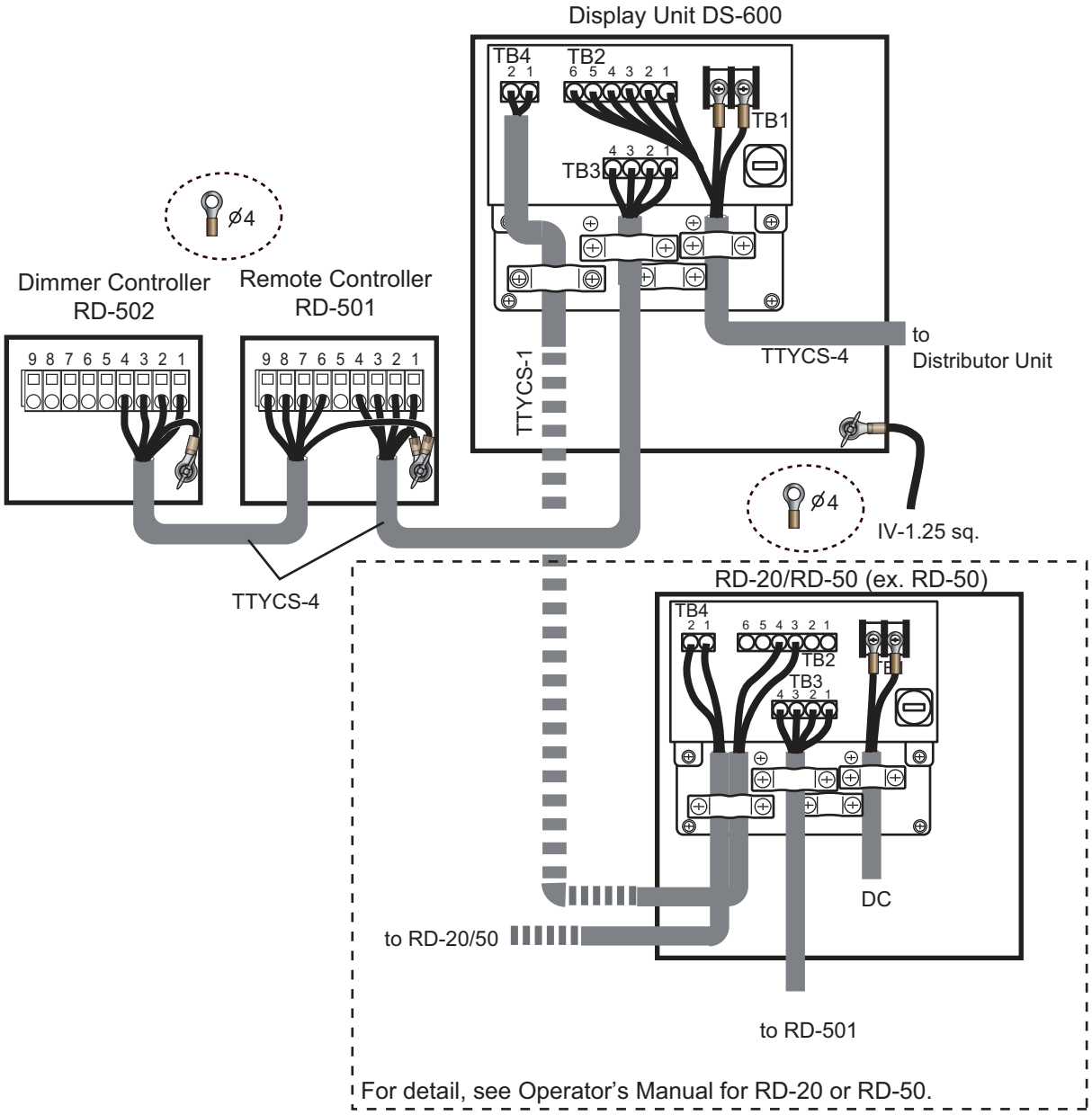


RD-502 (end of RD-502)

TTYCS-4



Connect cables fabricated on the previous page to terminals on the back of the unit, and fix them with clamps.



DS-600, example of connection

When using the optional water proof box DS-605, TTYCYS-4 cable is necessary.

2.6 Junction Box (option)

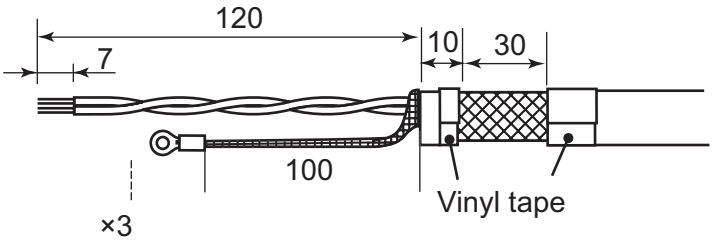
The optional Junction Box DS-640 permits extension of the cable connected between the Junction Box and the Transceiver Unit up to maximum of 500 m.

2.6.1 DS-640

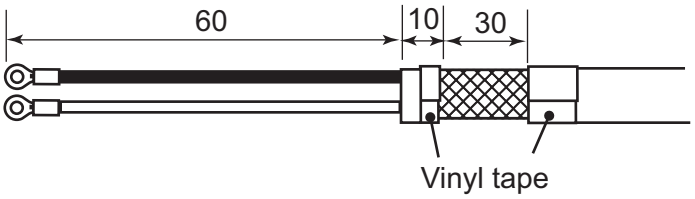
Fabricate two TTYCY-4S and DPYCY-4 cables as shown below.

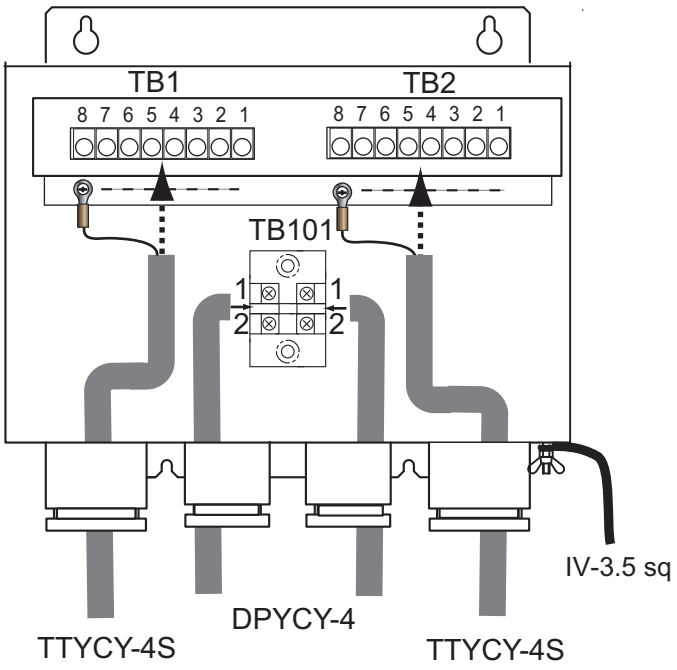
DS-640 Junction Box

TB1/TB2, TTYCY-4S



TB101, DPYCY-4.0



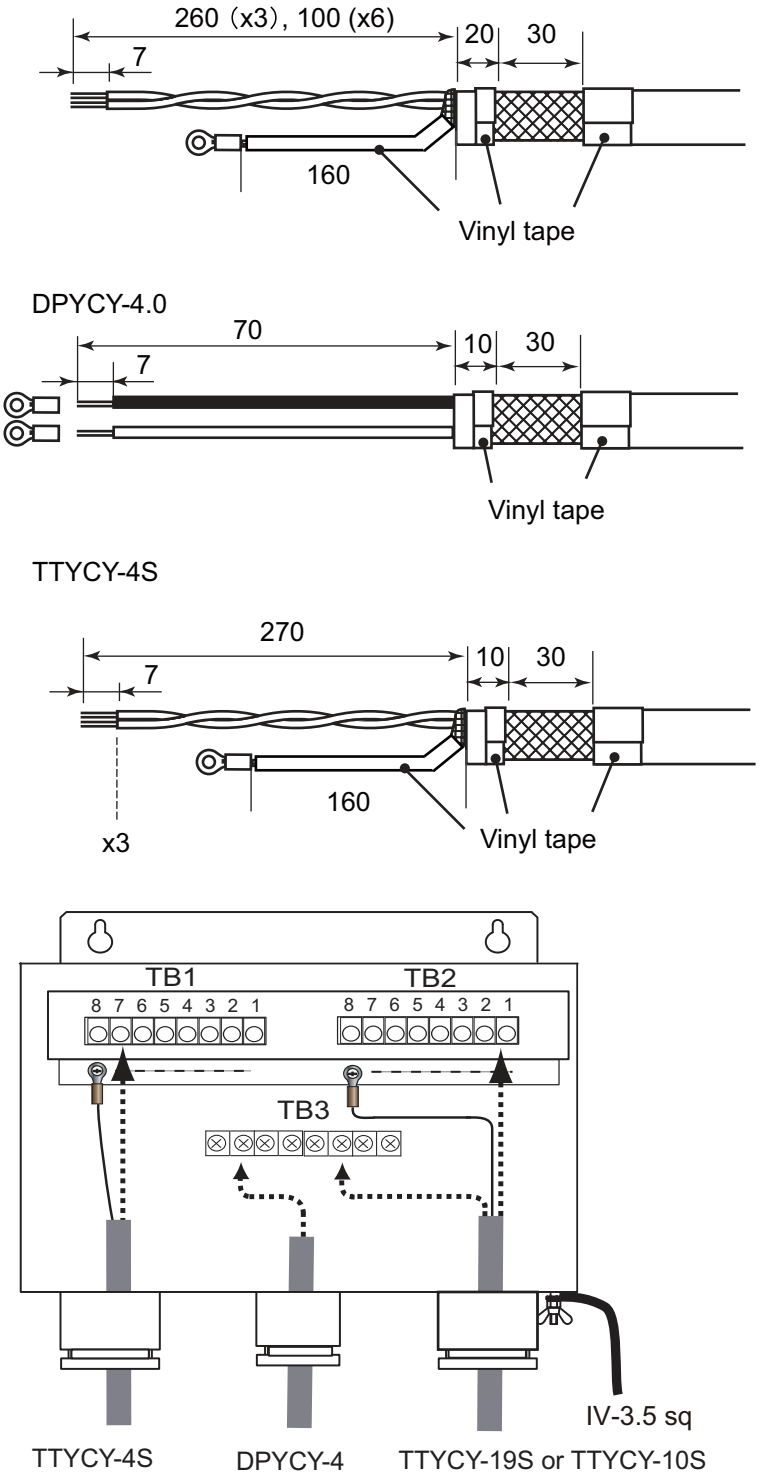


DS-640, internal view

2.6.2 DS-645A/645B

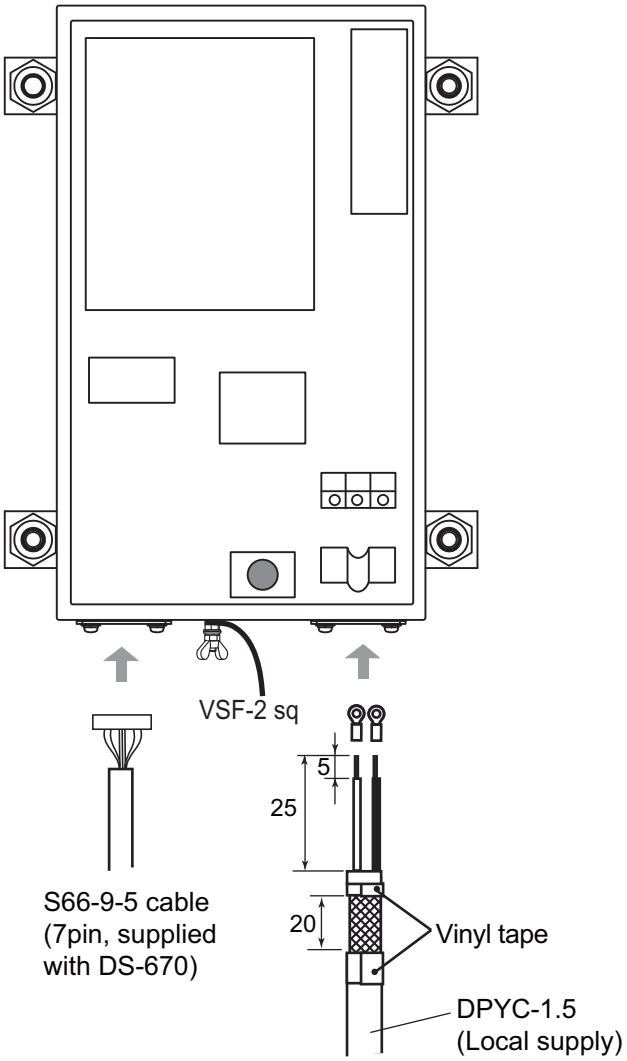
When using the JIS cable TTYCY-19S or TTYCY-10S between the distributor and the transceiver unit, select the optional DS-645A and B. These units are supplied with one pair, and you should take care to install them correctly; DS-645A: connected to the distributor unit, DS-645B: connected to the transceiver unit.

DS-645A/B Junction Box



2.7 Rate-of-Turn Gyro DS-670 (option)

Connect the signal cable S66-9-5 (7P, supplied with DS-670) and DPYC-1.5 cable (local supply) as described on the reverse side of the top cover.

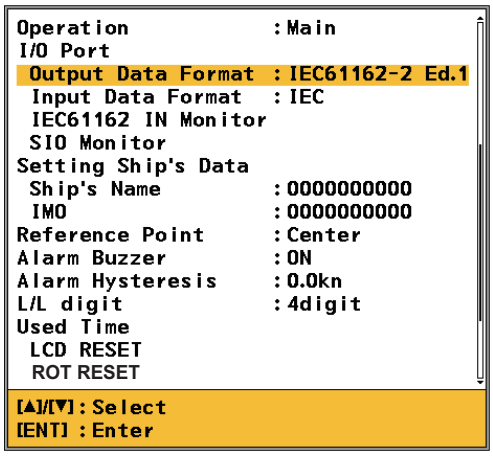


3. MENU SETTINGS

After the installation is completed, set up the system from the [Service] and [System] menus.

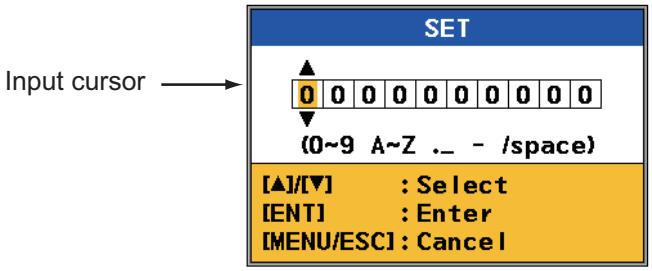
3.1 How to Use the [Service] Menu

1. With the power off, press and hold the **DISP** key, then press the **PWR** key to show the [Service] menu.
   Note: Do not release the **DISP** key until the system releases a audible beep.



[Service] menu

2. Press ▲ or ▼ to select a menu item, and press the **ENT** key to show the setting window.
3. Press ▲ or ▼ to change the setting, and press the **ENT** key. To return to the menu, press the **MENU/ESC** key.
   To enter alphanumeric data; for example, [Ship's Name], do the following:
   1) A character input box appears, with the input cursor at the far-left position.



   2) Press ▲ or ▼ to select character.
   3) Press the **ENT** key to confirm selection.
   4) Repeat step 2) and step 3) to complete the item.
      You can move the input cursor with the **ENT** and **MENU/ESC** keys.
      ENT: Move right.
      MENU/ESC: Move left.
4. Repeat step 2 and step 3 to complete the setting.
   For items to be set at the installation, see the table on next page.
5. Press the **PWR** key to turn the power off.

Menu item			Meaning	Option (default in boldface)
[Operation]			Select [Main], [Sub] or [Satellite] to use. For display units connected to TB7 in the DS-610, select [Main]. For sub display units connected to a GS-100 and DS-60 (dual input), select [Satellite].	[**Main**], [Sub], [Satellite]
[Alarm Mode]			Select the alarm mode. (Select [Alert I/F1] or [Alert I/F2] when connected to AMS.)	[Legacy], [**Alert I/F1**], [Alert I/F2]
[Buzzer Stop]			Select the signal to input to TB8 #11 and #12 of DS-610 (main display only). **Note:** This item is grayed out (inoperative) when [Alarm Mode] is [Alert I/F1]or [Alert I/F2]. [Enable]: Stop the audible alarm at the external equipment. To "ACK" the alarm, press the **ALARM ACK** key. [Disable]: Stop the audible alarm and "ACK" the alarm at the external equipment.	[Enable], **[Disable]**
[Output Data Format]			Select the version of IEC61162 data to output from DS-610.	[IEC61162-1 Ed.2] **[IEC61162-1 Ed.3]** [IEC61162-2 Ed.1] [IEC61162-1 Ed.4]
[Input Data Format]	[IEC]	[61162_IN_1]	Select IEC data format input to the channel 1 of the IN port, TB2-#1, 2 in DS-610. (main display only)	[IEC61162-1 Ed.2] [**IEC61162-1 Ed.3**] [IEC61162-2 Ed.1] [IEC61162-1 Ed.4]
		[61162_IN_2]	Select IEC data format to input to the channel 2 of the IN port, TB2-#3, 4 in DS-610. (main display only)	
		[61162_IN_3]	Select IEC data format to input to the channel 3 of the IN port, TB2-#5, 6 in DS-610. (main display only)	
	[NMEA]	[61162_IN_1]	Select NMEA data baud rate to input to the channel 1 of the IN port, TB2-#1, 2 in DS-610. (main display only)	[**4800**] [38400]
		[61162_IN_2]	Select NMEA data baud rate to input to the channel 2 of the IN port, TB2-#3, 4 in DS-610. (main display only)	
		[61162_IN_3]	Select NMEA data baud rate to input to the channel 3 of the IN port, TB2-#5, 6 in DS-610. (main display only)	
	[IEC61162 IN Monitor]		Monitor the IEC input signal described above. (main display only)	
	[SIO Monitor]		Monitor the serial signal input to the display units. (main and sub)	

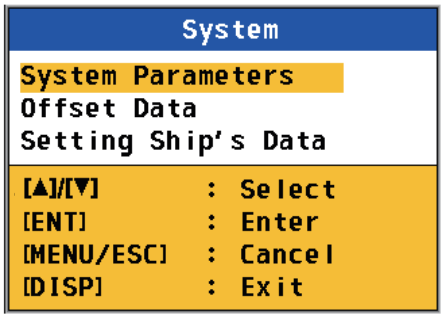
Menu item	Meaning	Option (default in boldface)
[Reference Point]	Select the reference position to use to calculate ship's speed. (main display only)	[Bow] [**Transducer**] [Center]
[Alarm Buzzer]	Select [ON] to get the audio alarm when an alarm is violated. (main display only)	[**ON**], [OFF]
[Alarm Hysteresis]	Set the amount of tolerance to apply to the Speed Limit alarm (main display only). For example, if you set "1 kn" here and "30 kn" for the Speed Limit alarm, that alarm is cancelled when ship's speed drops to 29 kn from 30 kn.	[0 to 5 kn] (Default: **0 kn**)
[L/L digit]	Set the number of digits to show for the minutes indication in latitude and longitude position.	[3 digit], [**4 digit**]
[Others]	For the serviceman. These are not used at the installation.	

3.2 How to Set the [System] Menu

Set the items on the [System] menu after completing those on the [System] menu.

3.2.1 How to show the [System] menu

1. Press the **PWR** key to turn the power on.
2. Press the **MENU/ESC** key to show the main menu.
3. Press ▼ to select [System], and press the **ENT** key.

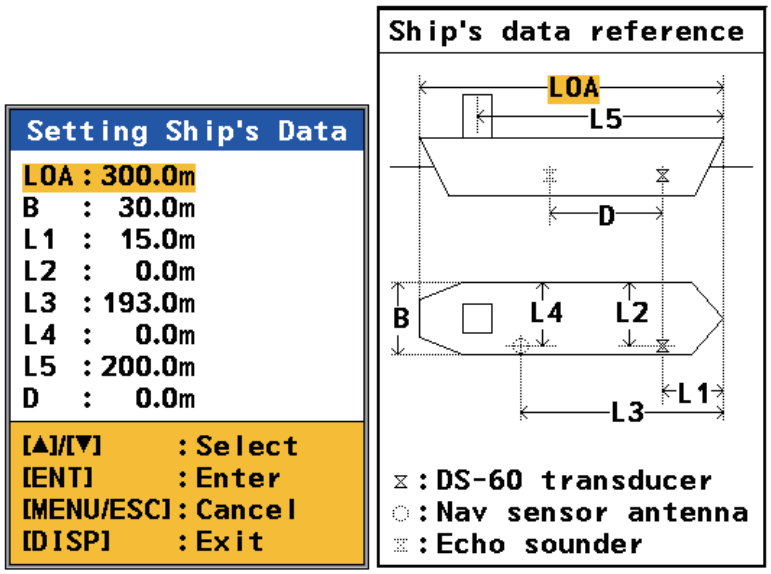


[System] menu

3.2.2 How to set ship's data

Enter the dimensions of your ship's on the [Setting Ships Data] menu.

1. Press ▼ to select [Setting Ship's Data], and press the **ENT** key to show the Setting Ships Data menu.



[Setting Ship's Data] menu

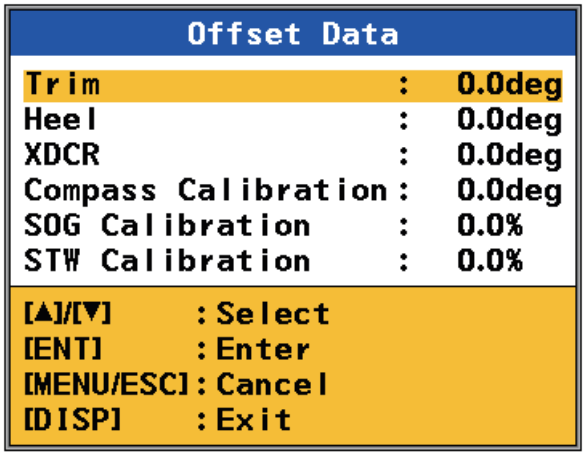
2. Select an item, and press the **ENT** key to show the setting window. Refer to the table in below to enter the dimensions.

Item	Meaning	Setting range
[LOA]	Ship's length	50.0 to 400.0 m
[B]	Ship's width	5.0 to 100.0 m
[L1]	Horizontal distance from the ship's bow to transducer	0.0 m to the setting value for [LOA]
[L2]	Horizontal distance from port to transducer	0.0 m to the setting value for [B]
[L3]	Horizontal distance from ship's bow to GPS antenna	0.0 m to the setting value for [LOA]
[L4]	Horizontal distance from port to GPS antenna	0.0 m to setting value for [B]
[L5]	Horizontal distance from ship's bow and CCRP (bridge)	0.0 m to setting value for [LOA]
[D]	Horizontal distance between transducers for DS-60 and echo sounder.	0.0 m to ([LOA]-[L1])

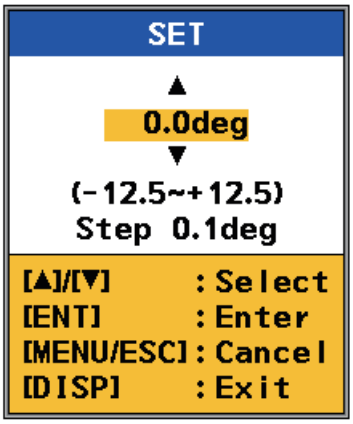
3. Press the **MENU/ESC** key to close the menu.

3.2.3 How to enter offset values

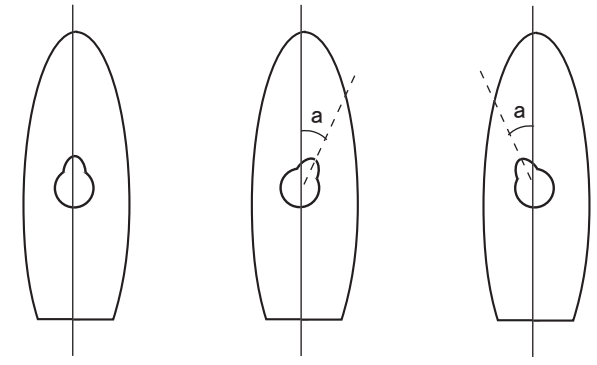
1. Press ▲ to select [Offset Data], and **ENT** key to show the [Offset Data] menu.



2. Select [Trim], and press the **ENT** key.



3. Enter the offset value for inclined angle, and press the **ENT** key (setting range: -12.5 to +12.5°, +: rise at bow).
4. Press ▼ to select [Heel], and press the **ENT** key.
5. Enter the offset value for the heel, and press the **ENT** key (setting range: -12.5 to +12.5°, +: rise at port).
6. Press ▼ to select [XDCR], and press the **ENT** key.
7. Enter the offset value if transducer is not installed perfectly with ship's fore-aft line (setting range: -60.0 to +60.0°). Measure the difference between ship's fore-aft line and the line on the transducer, and enter it.



Offset: ±0 Offset: +a Offset: -a

3.2.4 How to correct the ship's speed

Correct the speed error using the test sheet at the back of this manual.

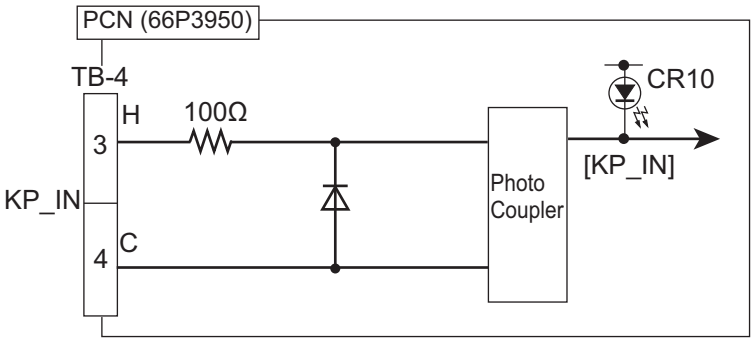
1. Press ▼ to select [SOG Calibration], and press the **ENT** key.
2. Enter the offset value for the speed over ground, and press the **ENT** key (setting range: -12.5 to +12.5%).
3. Press ▼ to select [STW Calibration], and press the **ENT** key.
4. Enter the offset value for the speed through water, and press the **ENT** key (setting range: -12.5 to +12.5%).
5. Press the **MENU/ESC** key several times to close the menu.

3.2.5 Interference rejection

Interference rejection (Input)

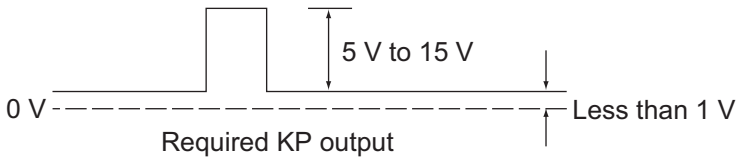
Interference can be detected during a noise test, and the interference may affect the speed log measurements and readings. To reject the interference, you can use the interference rejection circuit inside the transceiver unit.

The circuit uses the keying pulse (KP) from the external equipment to reject interference. External equipment should be connected to the KP_IN terminal.

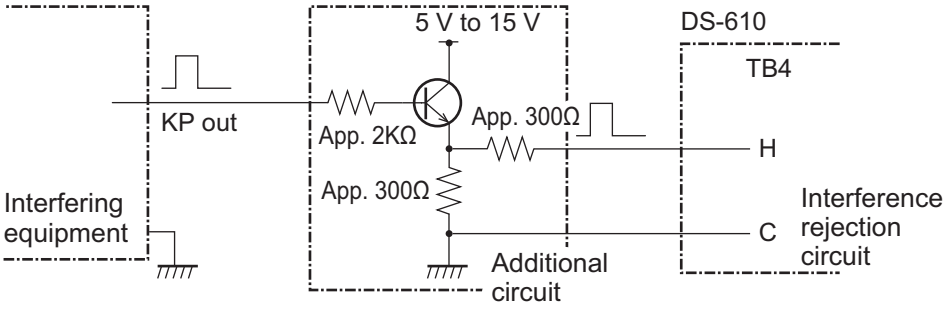


Required KP output

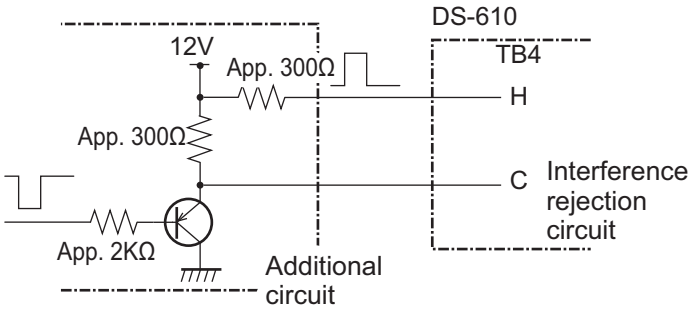
The interference rejection circuit requires the following KP output. If the interfering equipment has KP output outside this range, take the measure shown in "How to buffer the KP" on the following page.



How to buffer the KP



The following method can also be used:



Menu settings

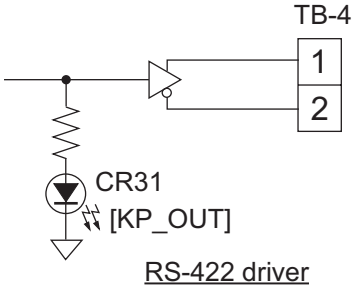
Where external equipment is connected to the KP_IN terminal, the following procedure must also be completed.

1. Press the **MENU/ESC** key to show the main menu.
2. Press ▲ or ▼ to select [System], then press the **ENT** key.
3. Press ▼ to select [System Parameters], then press the **ENT** key.
4. Press ▼ to select [IR], then press the **ENT** key.
5. Press ▲ to select [ON], then press the **ENT** key.

Note: The DS-60 does not have a mode to allow synchronization with external equipment's KP.

Interference rejection (Output)

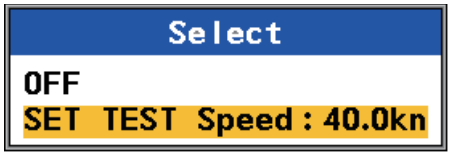
When outputting KP from the DS-60 for the purpose of suppressing interference to other ultrasound equipment, remove the TX trigger pulse from the TB4 (KP_OUT) terminal.



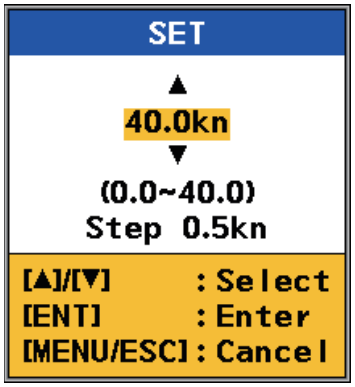
3.3 Demo Mode

The demonstration mode displays and outputs internally generated speed data and requires external input of navigational data. This mode can be used for demonstration and to check output to external equipment. “SIM” appears on the screen when the demonstration mode is active.

1. While pressing the **DISP** key, press the **PWR** key to turn on the power. The [Service] menu appears.
2. Press ▲ or ▼ to select [SIM], and press the **ENT** key.



3. Press to select [SET TEST Speed], and press the **ENT** key. The window for setting of the test speed appears.



4. Press ▲ or ▼ to select the appropriate spped, and press the **ENT** key.
5. Press the **PWR** key to turn off the power.
6. Press the **PWR** key again to turn on the power. The simulation mode starts.
7. To stop the simulation mode, press the **PWR** key to turn off the power. Do step 1 to re-apply the power. Whenever you open the [Service] menu, the [SIM] menu is set to [OFF].
8. Press the **PWR** key to turn off the power.

APPENDIX 1 CALIBRATION

For an accurate display of speed, a test to find the difference between your actual speed and the speed calculated by the equipment is necessary. The offset values are calculated from the speed test by comparing the DGPS measurements, or by conducting a milepost run.

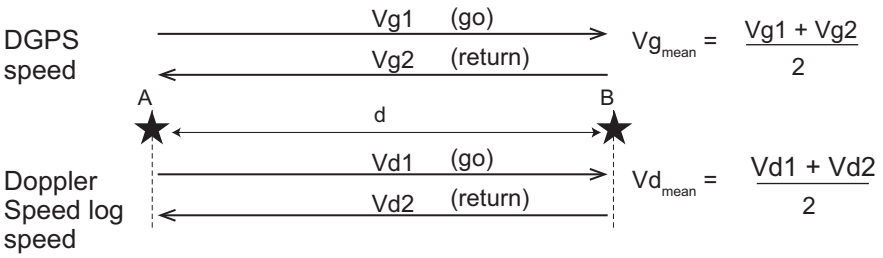
Note: To obtain accurate offset values, it is recommended to conduct the test using similar conditions and speeds to a regular voyage.

Doppler speed test

The doppler speed log can be compared with the speed measurement of your DGPS. The test should be done in an area with a depth of 40 m or more.

Note: If a depth of 40 m or more is not available, the SOG-based VBW data can be used in COG mode to obtain the measurement.

Steer the ship at a steady speed for 10 minutes or longer on the test course (EG: A to B in the following figure). The ship's speed data is collected as NMEA output data. Calcurate the offset values for the average of the difference between the DGPS measurement. The calibration value is set based on the difference.



Where;
d: distance run(NM), Vg1, Vg2: GPS measured speed (kn), Vd1, Vd2: doppler speed log measured speed (kn).

By conducting the same test using different speed conditions, you can obtain varied sampling data. Use the average values to calculate a calibration value and allow a 2% margin of error.

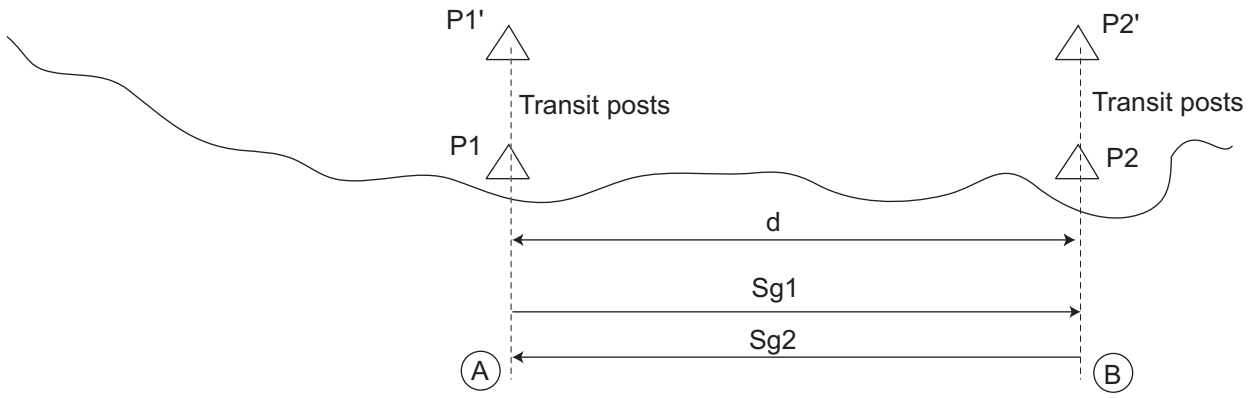
Note: The procedure for setting the calibration value in the menu is covered at the end of this appendix.

Milepost run

It is common practice to check a new ship's performance at an official trial run. Take this opportunity to calibrate the DS-60. In practice, the ship speed is evaluated as follows.

1. Calculation with transit posts

Steer the ship at a steady speed on the test course, e.g. A→B in the illustration. Speed is obtained from the following equations. Note that Sg1 and Sg2 are both speeds over the ground (SOG); however the DS-60 provides the speed through the water. To find the speed through the water, a return trip is necessary.



Sg1 = d/t1 x 3600 (kn)... (1)
Sg2 = d/t2 x 3600 (kn)... (2)
Sw + St = Sg1 (kn)... (3)
Sw - St = Sg2 (kn)... (4)
Adding (4) and (3), we get;
2Sw = Sg1 + Sg2 (kn)

Therefore, Sw = (Sg1 + Sg2)/2 (kn)... (5)
where,
d = distance run (NM),

t1 = time taken to run 1 (s),
t2 = time taken to run 2 (s). (Note: Runs 1 and 2 are in opposite direction.)
Sw = Speed through the water (kn),
St = Speed of tide current (kn),
Sg1 = SOG for run 1 (kn),
Sg2 = SOG for run 2 (kn).
Thus we can find a speed through the water by making a round tip.

2. Calculation with DS-60

To measure the distance run between points A and B by DS-60, do the following:

1. Reset the distance run figure of DS-60 to zero by selecting [Reset] on the [Trip DIST] menu at the moment the ship passes point A.
2. Run the ship from A to B at full speed, timing with a stopwatch.
3. Read the distance run (nm) and time taken to run (second) exactly at the moment the ship-shape point B.
4. Run the ship from B to A at full speed rehearing to step 1 through step 3.

Where,
n1 (NM) = distance run from A to B measured by DS-60
n2 (NM) = distance run from B or A measured by DS-60

Therefore, the average run from A to B measured by DS-60
Therefore, the average ship speeds of run 1 and run 2 are calculated as follows.

Slog1 (kn) = n1/t1 x 3600
Slog2 (kn) = n2/t1 x 3600

The average ship speed of round trip is Slog (kn) = (Slog1 + Slog2)/2 ...(6)

3. Speed error

From (5) and (6),
Error = (Sw - Slog)/Slog X 100 (%)... (7)

Caliblation Setting

The speed error can be corrected at [OFFSET DATA] on the [System] menu as follows:

1. Press the **MENU/ESC** key.
2. Select [System] and press the **ENT** key.
3. Select [OFFSET DATA] and press the **ENT** key.
4. Select [STW CALIBRATION] and press the **ENT** key.
5. Enter the value of caliblation.

Repeat the above procedure several times to satisfy the speed accuracy specification.

FURUNO

TEST SHEET FOR DOPPLER SPEED LOG

Type: ____________ Serial No.: ____________

Date: ____________ Place: ____________ Ship's length: ________ m Draft: Fore: ________ m

Ship's Name: ____________ Hull No.: ____________ Shipyard: ____________ Aft: ________ m

RUN No.	Engine		DGPS	Doppler Speed Log				Shipyard Data				Note
	Load (%)	Rev. (rpm)	Speed (kn)	Tracking Mode	Speed (kn)	*1 Error (%)	Calibration (%)	Depth (m)	Course (deg)	Wind (m/s)	Sea condition	
-												
-												
Mean												
-												
-												
Mean												
-												
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$$\text{*1 Error} = \frac{\text{DS Speed (NM)} - \text{DGPS (NM)}}{\text{DGPS (NM)}} \times 100\ (\%)$$

Owner's Signeture: ____________

Company name: ____________

Engineer's Signeture: ____________

FURUNO

Calibratioin sheet for Doppler Speed log (milepost test)

Type: ______ Serial No. ______ DRAFT

Date: ______ Place: ______ Ship's length ______ m Fore: ______ m Calibration (%)

Ship's Name ______ Ship's No. ______ Shipyard ______ Aft: ______ m [ ]

Run No.	Engine		Milepost			Doppler speed log			Shipyard data				REMARKS
	Out (%)	rpm	Ship's speed *2 Time (s)	Ship's speed *2 Speed (kn)	Mesure mode	Distance run Time (s)	Distance run Speed (kn)	*3 Error (%)	Depth (m)	Course (deg)	Wind (m/s)	Sea state	
-													
-													
Mean													
-													
-													
Mean													
-													
-													
Mean													
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Mean													
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-													
Mean													

*1 Distance for milepost [ ] NM

*2 Average ship speed = (Distance run (NM)/Measured time(s)) x 3600 (kn)

$$\text{*3 Error} = \frac{\text{DS speed (NM) - Measured speed (NM)}}{\text{Measured speed (NM)}} \times 100\ (\%)$$

Owner's Signeture: ______

Company name: ______

Engineer's Signeture ______

APPENDIX 2 JIS CABLE GUIDE

Cables listed in the manual are usually shown as Japanese Industrial Standard (JIS). Use the following guide to locate an equivalent cable locally.

JIS cable names may have up to 6 alphabetical characters, followed by a dash and a numerical value (example: DPYC-2.5).
For core types D and T, the numerical designation indicates the *cross-sectional Area (mm^2)* of the core wire(s) in the cable.
For core types M and TT, the numerical designation indicates the *number of core wires* in the cable.

1. Core Type

D: Double core power line
T: Triple core power line
M: Multi core
TT: Twisted pair communications (1Q=quad cable)

2. Insulation Type

P: Ethylene Propylene Rubber

3. Sheath Type

Y: PVC (Vinyl)

4. Armor Type

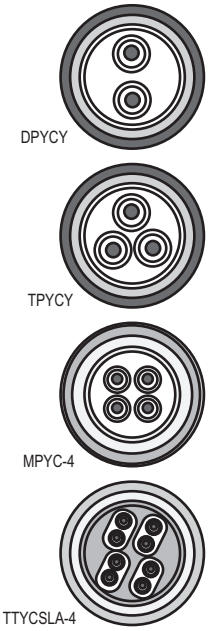
C: Steel

5. Sheath Type

Y: Anticorrosive vinyl sheath

6. Shielding Type

S: All cores in one sheath
-S: Indivisually sheathed cores
SLA: All cores in one shield, plastic tape w/aluminum tape
-SLA: Individually shielded cores, plastic tape w/aluminum tape



1 2 3 4 5 6
EX: TTYCYSLA - 4
Designation type ┘ Core Area (mm^2) ┘

1 2 3 4
MPYC - 4
Designation type ┘ # of cores ┘

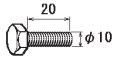
The following reference table lists gives the measurements of JIS cables commonly used with Furuno products:

Type	Core Area	Core Diameter	Cable Diameter	Type	Core Area	Core Diameter	Cable Diameter
DPYC-1.5	1.5mm^2	1.56mm	11.7mm	TTYCS-1	0.75mm^2	1.11mm	10.1mm
DPYC-2.5	2.5mm^2	2.01mm	12.8mm	TTYCS-1T	0.75mm^2	1.11mm	10.6mm
DPYC-4	4.0mm^2	2.55mm	13.9mm	TTYCS-1Q	0.75mm^2	1.11mm	11.3mm
DPYC-6	6.0mm^2	3.12mm	15.2mm	TTYCS-4	0.75mm^2	1.11mm	16.3mm
DPYC-10	10.0mm^2	4.05mm	17.1mm	TTYCSLA-1	0.75mm^2	1.11mm	9.4mm
DPYCY-1.5	1.5mm^2	1.56mm	13.7mm	TTYCSLA-1T	0.75mm^2	1.11mm	10.1mm
DPYCY-2.5	2.5mm^2	2.01mm	14.8mm	TTYCSLA-1Q	0.75mm^2	1.11mm	10.8mm
DPYCY-4	4.0mm^2	2.55mm	15.9mm	TTYCSLA-4	0.75mm^2	1.11mm	15.7mm
MPYC-2	1.0mm^2	1.29mm	10.0mm	TTYCY-1	0.75mm^2	1.11mm	11.0mm
MPYC-4	1.0mm^2	1.29mm	11.2mm	TTYCY-1T	0.75mm^2	1.11mm	11.7mm
MPYC-7	1.0mm^2	1.29mm	13.2mm	TTYCY-1Q	0.75mm^2	1.11mm	12.6mm
MPYC-12	1.0mm^2	1.29mm	16.8mm	TTYCY-4	0.75mm^2	1.11mm	17.7mm
TPYC-1.5	1.5mm^2	1.56mm	12.5mm	TTYCY-4S	0.75mm^2	1.11mm	21.1mm
TPYC-2.5	2.5mm^2	2.01mm	13.5mm	TTYCY-4SLA	0.75mm^2	1.11mm	19.5mm
TPYC-4	4.0mm^2	2.55mm	14.7mm	TTYCYS-1	0.75mm^2	1.11mm	12.1mm
TPYCY-1.5	1.5mm^2	1.56mm	14.5mm	TTYCYS-4	0.75mm^2	1.11mm	18.5mm
TPYCY-2.5	2.5mm^2	2.01mm	15.5mm	TTYCYSLA-1	0.75mm^2	1.11mm	11.2mm
TPYCY-4	4.0mm^2	2.55mm	16.9mm	TTYCYSLA-4	0.75mm^2	1.11mm	17.9mm

FURUNO

CODE NO.	001-082-190-00	66AT-X-9405 -0
TYPE	CP66-01701	1/1

工事材料表
INSTALLATION MATERIALS

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	六角ﾎﾞﾙﾄ HEX.BOLT		M10X20 SUS304 CODE NO. 000-162-779-10	4	

型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。　なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT.
QUALITY IS THE SAME.
（略図の寸法は、参考値です。　DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO ELECTRIC CO ., LTD.

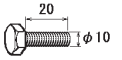
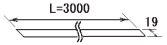
C7264-M05-A

FURUNO

CODE NO.	001-082-290-00	66AT-X-9411 -0
TYPE	CP66-01702	1/1

工事材料表
INSTALLATION MATERIALS

DS-620

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	六角ﾎﾞﾙﾄ HEX.BOLT		M10X20 SUS304 CODE NO. 000-162-779-10	4	
2	導電布ﾃｰﾌﾟ SHIELDING TAPE		TR-19 L=3000 CODE NO. 000-173-067-10	1	

型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。　なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT.
QUALITY IS THE SAME.
（略図の寸法は、参考値です。　DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO ELECTRIC CO ., LTD.

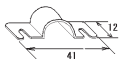
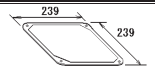
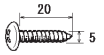
C7264-M11-A

FURUNO

CODE NO.	001-081-900-00	26AC-X-9403 -3
TYPE	CP26-01501	1/1

工事材料表

INSTALLATION MATERIALS

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	ｹｰﾌﾞﾙｸﾗﾝﾌﾟ(2) CABLE CLAMP(2)		26-003-1528-0 CODE NO. 100-355-110-10	1	
2	Fﾏｳﾝﾄﾖｳｽﾎﾟﾝｼﾞ FLUSH MOUNTING SPONGE		26-003-1532-2 CODE NO. 100-355-202-10	1	
3	+ﾊﾞｲﾝﾄﾞﾀｯﾋﾟﾝ1ｼｭ TAPPING SCREW		5X20 SUS304 CODE NO. 000-171-997-10	4	

型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。　なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT.
QUALITY IS THE SAME.

（略図の寸法は、参考値です。　DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

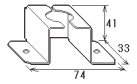
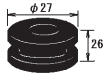
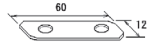
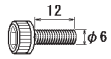
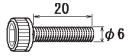
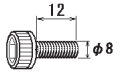
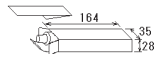
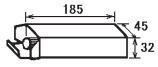
FURUNO

CODE NO.	001-496-120-00	66AT-X-9407 -4
TYPE	CP66-01704	1/1

工事材料表

INSTALLATION MATERIALS

DS-631

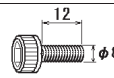
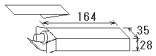
番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	ｺﾈｸﾀ固定金具 METAL FIXING FOR CONNECTOR		66-027-6019-0 CODE NO. 100-354-690-10	1	
2	ｸﾞﾛﾒｯﾄ GROMET		66-027-6021-0 CODE NO. 100-354-700-10	1	
3	ｹｰﾌﾞﾙ押え板 CABLE FIXING PLATE		66-027-6022-0 CODE NO. 100-354-710-10	1	
4	ﾊﾞﾈｻﾞｶﾞﾈ SPRING WASHER		M6 SUS316L CODE NO. 000-167-409-10	4	
5	六角穴付ﾎﾞﾙﾄ HEXAGONAL HEAD BOLT		M6X12 SUS316L CODE NO. 000-172-253-10	2	
6	六角穴付ﾎﾞﾙﾄ HEXAGONAL HEAD BOLT		M6X20 SUS316L CODE NO. 000-162-745-10	2	
7	六角穴付ﾎﾞﾙﾄ HEXAGONAL HEAD BOLT		M8X12 SUS316L CODE NO. 000-172-255-10	4	
8	ｼｰﾙﾜｯｼｬｰ SEAL WASHER		SUS W8 CODE NO. 000-167-584-10	4	
9	接着剤袋詰 ADHESIVE		TB5211 50G CODE NO. 001-477-870-00	1	
10	ｼﾘｺﾝｸﾞﾘｽ GREASE		G-30M-100 CODE NO. 000-169-306-10	1	

（略図の寸法は、参考値です。　DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO

CODE NO.	001-496-110-00	66AT-X-9406 -3
TYPE	CP66-01703	1/1

工事材料表
INSTALLATION MATERIALS

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	六角穴付ﾎﾞﾙﾄ HEXAGONAL HEAD BOLT		M8X12 SUS316L CODE NO. 000-172-255-10	4	
2	ｼｰﾙﾜｯｼｬｰ SEAL WASHER		SUS W8 CODE NO. 000-167-584-10	4	
3	接着剤袋詰 ADHESIVE		TB5211 50G CODE NO. 001-477-870-00	1	

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO ELECTRIC CO ., LTD.

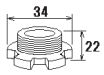
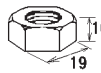
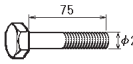
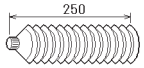
C7264-M06-D

FURUNO

CODE NO.	001-082-800-00	66AT-X-9409 -1
TYPE	CP66-01711	1/1

工事材料表
INSTALLATION MATERIALS

DS-661

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	防水座金 WATERPROOF WASHER		66-027-7206-1 CODE NO. 100-354-071-10	1	
2	防水ﾊﾟｯｷﾝ WATERPROOF GASKET		66-027-7207-1 CODE NO. 100-354-081-10	1	
3	ｸﾞﾗﾝﾄﾞ用締付 CABLE GLAND NIPPLE		JIS F8801 20ﾖｳ CODE NO. 000-171-874-10	1	
4	六角ﾅｯﾄ 1ｼｭ HEXAGONAL NUT		M12 SUS316L CODE NO. 000-167-494-10	8	
5	平座金 FLAT WASHER		M12 SUS316L CODE NO. 000-167-417-10	4	
6	ﾊﾞﾈ座金 SPRING WASHER		M12 SUS316L CODE NO. 000-167-396-10	4	
7	六角ﾅｯﾄ 1ｼｭ HEXAGONAL NUT		M20 SUS316L CODE NO. 000-167-495-10	16	
8	ﾊﾞﾈ座金 SPRING WASHER		M20 SUS316L CODE NO. 000-167-402-10	16	
9	六角ﾎﾞﾙﾄ HEXAGONAL HEAD BOLT		M20X75 SUS316L CODE NO. 000-172-024-10	8	
10	ｺｽﾓｸﾞﾘｽﾀﾞｲﾅﾏｯｸｽ GREASE		No.1 400G ｼﾞｬﾊﾞﾗﾁｭｰﾌﾞ CODE NO. 000-165-774-10	1	

型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。 なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO ELECTRIC CO ., LTD.

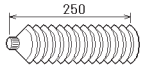
C7264-M09-B

FURUNO

CODE NO.	001-082-830-00	66AT-X-9408 -0
TYPE	CP66-01710	1/1

工事材料表
INSTALLATION MATERIALS

DS-661

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	ｺｽﾓｸﾞﾘｽﾀﾞｲﾅﾏｯｸｽ GREASE		No.1 400G ｼﾞｬﾊﾞﾗﾁｭｰﾌﾞ CODE NO. 000-165-774-10	1	

型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。 なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT.
QUALITY IS THE SAME.
（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO ELECTRIC CO ., LTD.

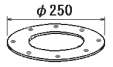
C7264-M08-A

FURUNO

CODE NO.	001-082-820-00	66AT-X-9410 -0
TYPE	CP66-01712	1/1

工事材料表
INSTALLATION MATERIALS

DS-661

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	ｶﾞｽｹｯﾄ GASKET		66-027-7203-0 CODE NO. 100-354-040-10	2	

型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。 なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT.
QUALITY IS THE SAME.
（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

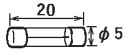
FURUNO ELECTRIC CO ., LTD.

C7264-M10-A

FURUNO

CODE NO.	001-076-450-00	26AB-X-9301-4 1/1
TYPE	SP26-00101	BOX NO. P

SHIP NO.	SPARE PARTS LIST FOR	U S E	SETS PER VESSEL
	REMOTE DISPLAY RD-20/RD-50, DS-600		

ITEM NO.	NAME OF PART	OUTLINE	DWG. NO. OR TYPE NO.	QUANTITY WORKING PER SET	QUANTITY WORKING PER VES	QUANTITY SPARE	REMARKS/CODE NO.
1	ﾋｭｰｽﾞ GLASS TUBE FUSE		FGMB-A 125V 2A PBF	1	1	2	000-157-479-10

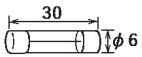
MFR'S NAME	FURUNO ELECTRIC CO.,LTD.	DWG NO.	C4454-P01-E KR	1/1

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO

CODE NO.	001-082-200-00	66AT-X-9301-2 1/1
TYPE	SP66-00901	BOX NO. P

SHIP NO.	SPARE PARTS LIST FOR	U S E	SETS PER VESSEL
	DS-610		

ITEM NO.	NAME OF PART	OUTLINE	DWG. NO. OR TYPE NO.	QUANTITY WORKING PER SET	QUANTITY WORKING PER VES	QUANTITY SPARE	REMARKS/CODE NO.
1	ﾋｭｰｽﾞ GLASS TUBE FUSE		FGBO-A 250V 5A PBF	2	2	6	000-155-840-10

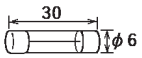
MFR'S NAME	FURUNO ELECTRIC CO.,LTD.	DWG NO.	C7264-P01-C	1/1

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO

CODE NO.	001-082-520-00	66AT-X-9302-2 1/1
TYPE	SP66-00902	BOX NO. P

SHIP NO.	SPARE PARTS LIST FOR	U S E	SETS PER VESSEL
	DS-620		

ITEM NO.	NAME OF PART	OUTLINE	DWG. NO. OR TYPE NO.	QUANTITY WORKING PER SET	QUANTITY WORKING PER VES	QUANTITY SPARE	REMARKS/CODE NO.
1	ﾋｭｰｽﾞ GLASS TUBE FUSE		FGBO-A 250V 3A PBF	2	2	6	000-155-841-10

MFR'S NAME	FURUNO ELECTRIC CO.,LTD.	DWG NO.	C7264-P02-C	1/1

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

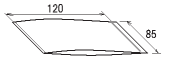
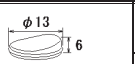
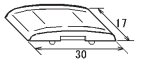
FURUNO

CODE NO.	001-082-140-00	66AT-X-9501 -1
TYPE	FP66-00701	1/1

付属品表

ACCESSORIES

DS-600-S/HK, DS-600-S/HK-V

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	ﾌｨﾙﾀｰｸﾘｰﾅｰ LCD CLEANING CLOTH		02-155-1082-2 CODE NO. 100-332-652-10	1	
2	ﾈｼﾞｷｬｯﾌﾟ CAP		26-003-1508-1 CODE NO. 100-356-091-10	4	
3	ALARMﾌﾀ組品 ALARM LID ASSY.		FP66-00702 CODE NO. 001-091-070-00	1	

型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。 なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO ELECTRIC CO ., LTD.

FURUNO

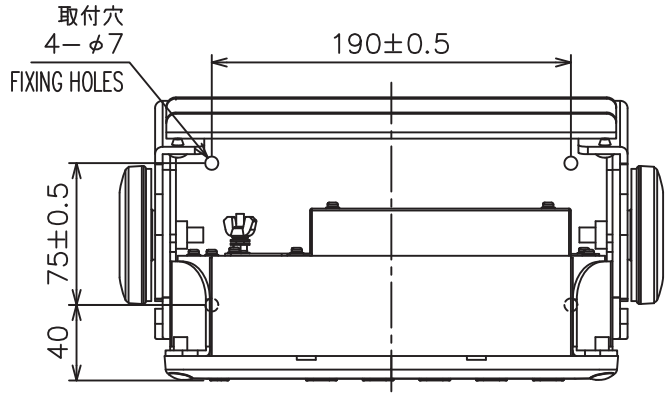
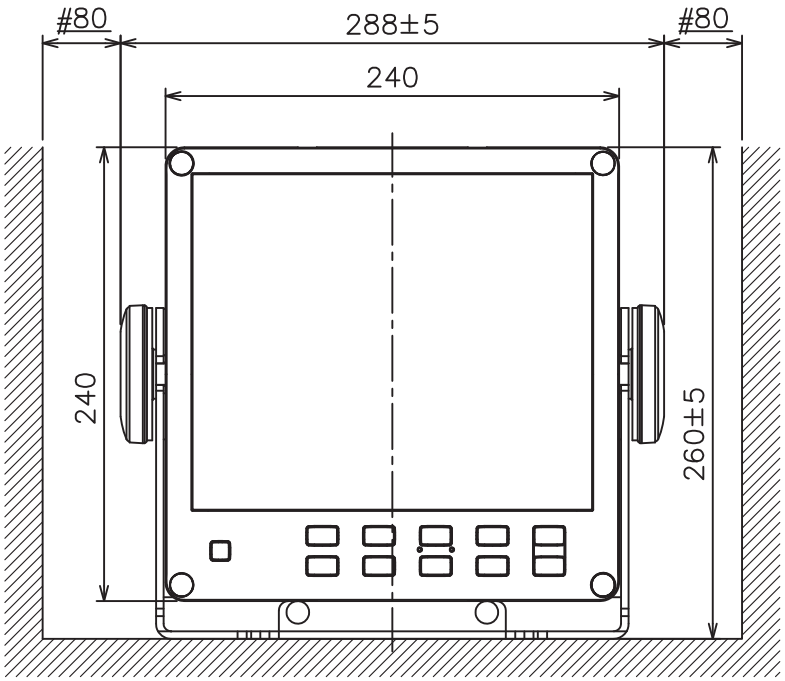
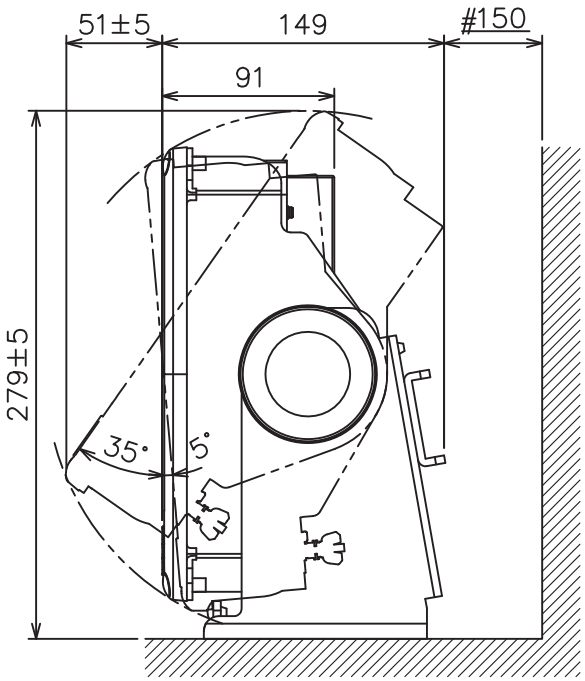
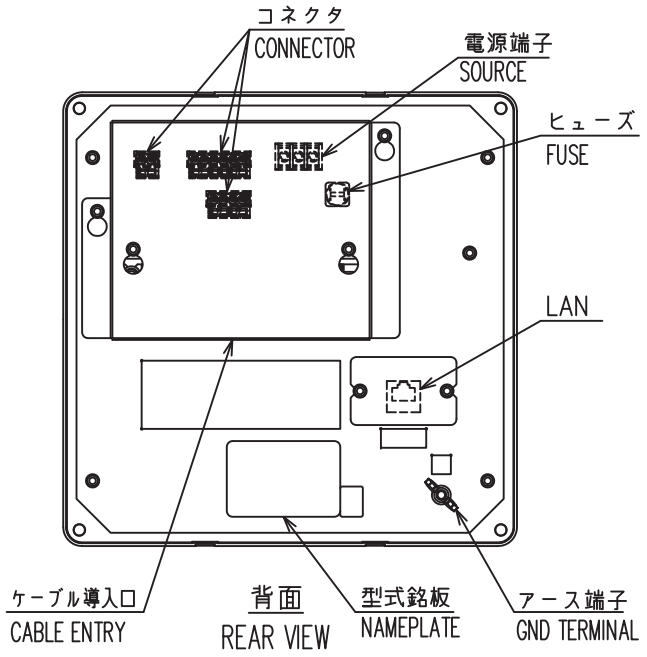


表1　TABLE 1

寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3







注記　1）　指定外の寸法公差は表１による。
　　2）　#印寸法は最小サービス空間寸法とする。
　　3）　取付用ネジはバインドタッピンネジ呼び径５×２０を使用のこと。

NOTE　1.　TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
　　2.　#: MINIMUM SERVICE CLEARANCE.
　　3.　USE BIND TAPPING SCREWS ø5x20 FOR FIXING THE UNIT.

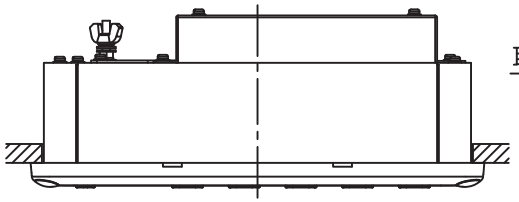
DRAWN 5/Mar/2010 T.YAMASAKI		TITLE	DS-600
CHECKED 5/Mar/2010 T.TAKAHASHI		名称	指示器（卓上装備）
APPROVED 8/Mar/2010 Y.NISHIYAMA	DS-60		外寸図
SCALE 1/4 MASS 3.3 ±10% kg		NAME	DISPLAY UNIT (TABLETOP MOUNT)
DWG.No. C7264-G01- C	REF.No. 66-027-101G-5		OUTLINE DRAWING

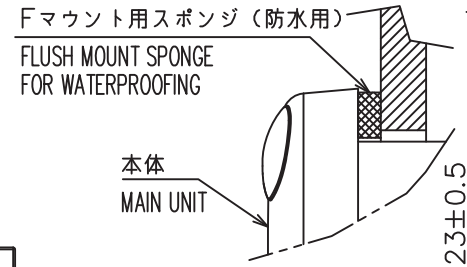
FURUNO ELECTRIC CO., LTD.

FURUNO

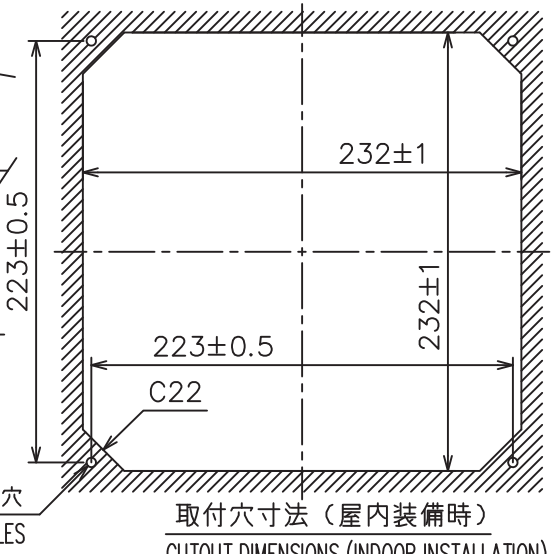
表1 TABLE 1

寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

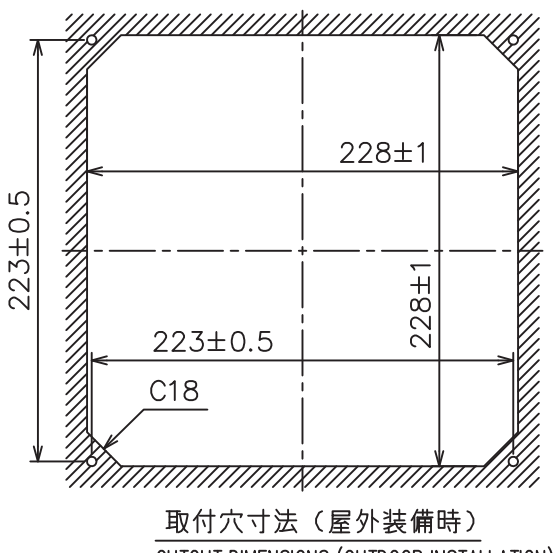




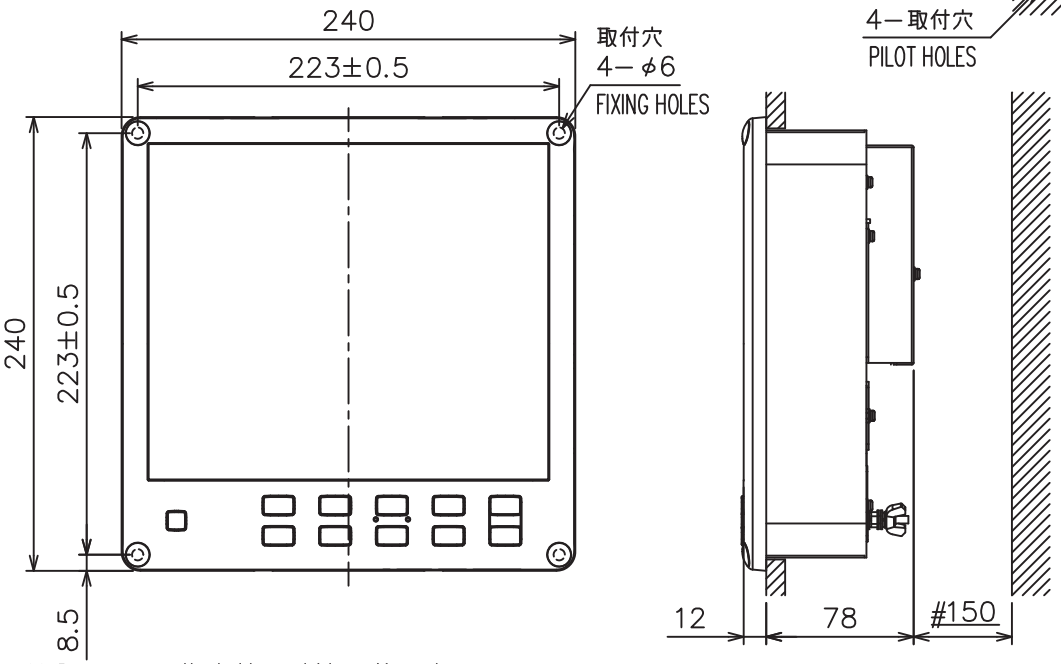
取付部断面（尺度：1／1）
SLICE OF FIXING (SCALE: 1/1)

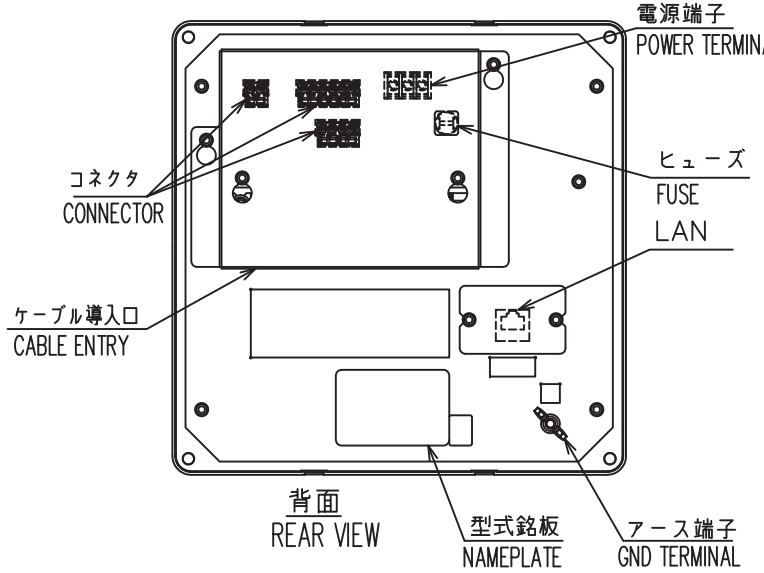


取付穴寸法（屋内装備時）
CUTOUT DIMENSIONS (INDOOR INSTALLATION)



取付穴寸法（屋外装備時）
CUTOUT DIMENSIONS (OUTDOOR INSTALLATION)





注記 1） 指定外の寸法公差は表1による。
2） #印寸法は最小サービス空間寸法とする。
3） 取付用ネジはバインドタッピンネジ呼び径5×20を使用のこと。

NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE BIND TAPPING SCREWS ø5x20 FOR FIXING THE UNIT.

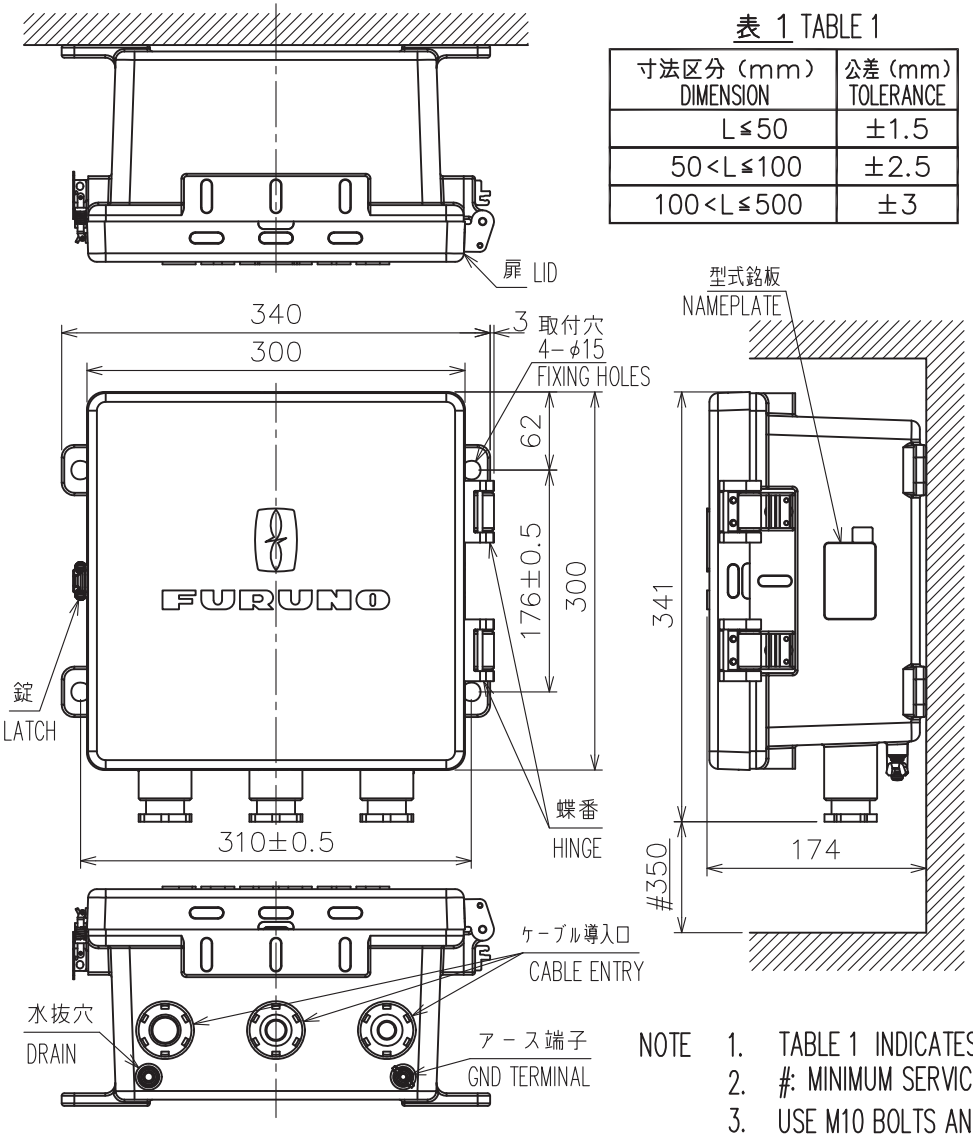
DRAWN 17/Dec/2012 T.YAMASAKI		TITLE	DS-600
CHECKED 17/Dec/2012 H.MAKI		名称	指示器（埋込装備）
APPROVED 18/Dec/2012 Y.NISHIYAMA	DS-60		外寸図
SCALE 1/4 MASS 2.1 ±10% kg		NAME	DISPLAY UNIT (FLUSH MOUNT)
DWG.No. C7264-G02- D	REF.No. 66-027-102G-6		OUTLINE DRAWING

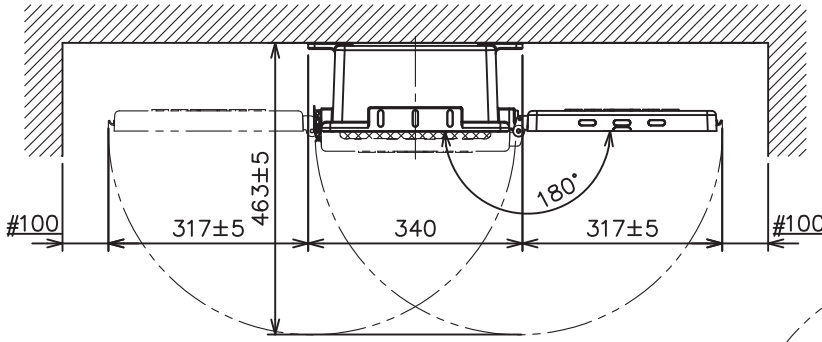
FURUNO ELECTRIC CO., LTD.

FURUNO

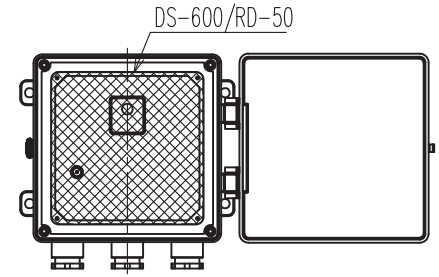
表 1 TABLE 1

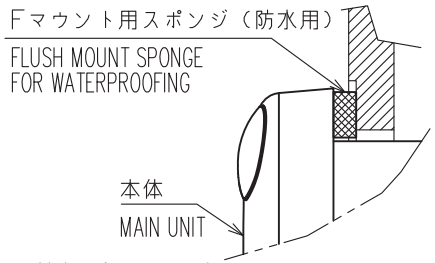
寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3



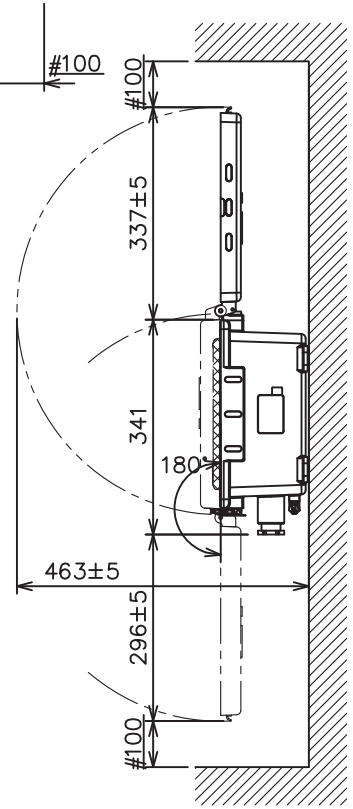


扉 右（左）開閉図（尺度：1/12）
OPENING THE LID LEFT/RIGHT (SCALE:1/12)





取付部断面（尺度：1／1）
SLICE OF FIXING (SCALE: 1/1)



扉 上（下）開閉図（尺度：1/12）
OPENING THE LID UP/DOWN (SCALE:1/12)

NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE M10 BOLTS AND SEAL WASHERS (03-001-3002) FOR FIXING THE UNIT.
4. EXCHANGE THE POSITION OF LATCH/HINGE TO CHANGE THE LID DIRECTION.

注 記
1） 指定外の寸法公差は表1による。
2） #印寸法は最小サービス空間寸法とする。
3） 取付ネジはM10ボルト、シールワッシャー（03-001-3002）を使用のこと。
4） 錠と蝶番の取付位置を入れ替えて、扉の開閉方向を変更出来ます。

DRAWN 17/Dec/2012 T.YAMASAKI			TITLE DS-605
CHECKED 17/Dec/2012 H.MAKI			名称 防水箱
APPROVED 18/Dec/2012 Y.NISHIYAMA		DS-60, RD-50	外寸図
SCALE 1/6	MASS 7.0 ±10% kg	質量は指示器本体を含まず。 MASS W/O DISPLAY UNIT	NAME WATERPROOF BOX
DWG.No. C7264-G05- F		REF.No. 66-027-104G-3	OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

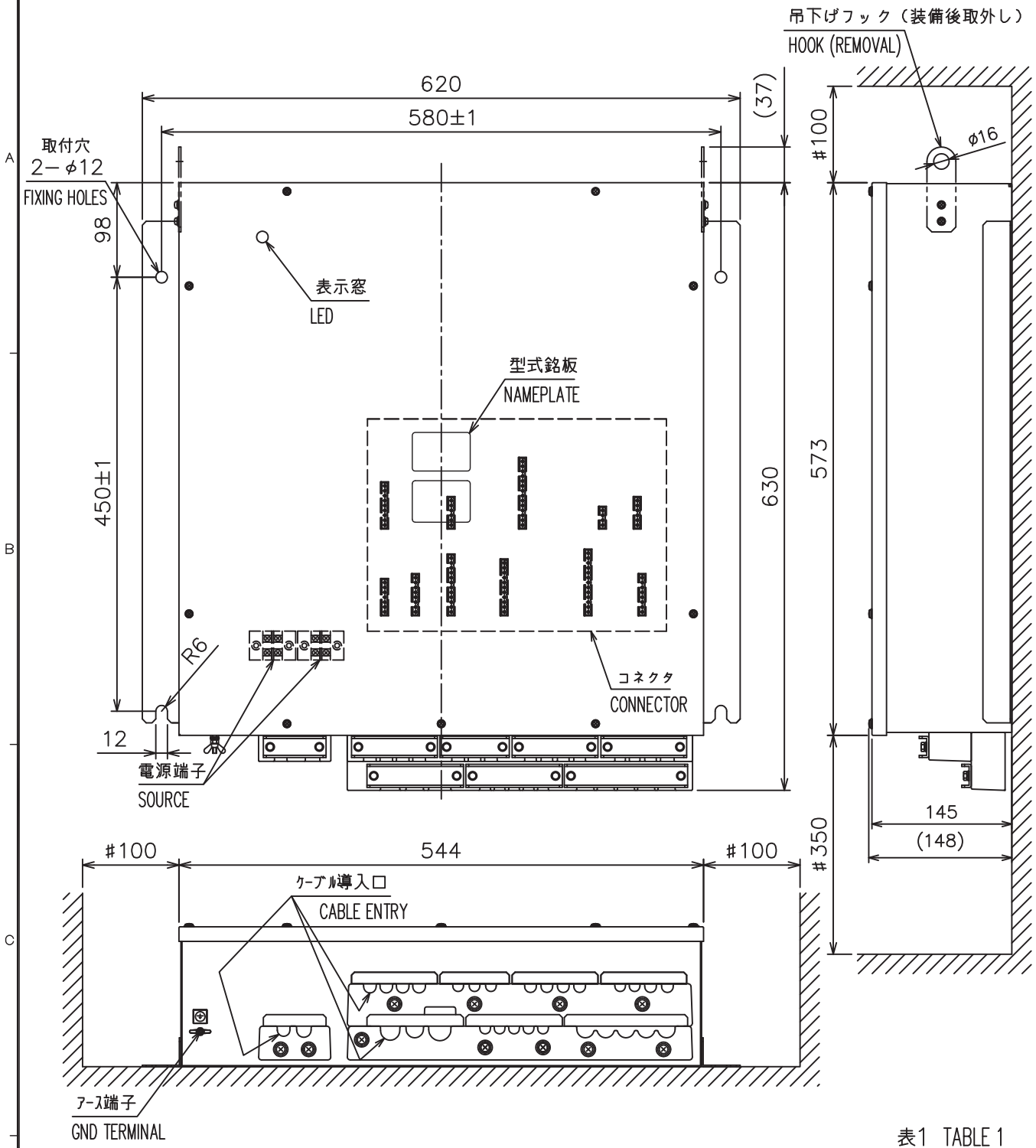


表1 TABLE 1

寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3
500<L≦1000	±4

注記 1） 指定外の寸法公差は表1による。
2） #印寸法は最小サービス空間寸法とする。
3） 取付用ネジはM10ボルトを使用のこと。

NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE M10 BOLTS FOR FIXING THE UNIT.

DRAWN 30/Jun/2015 T.YAMASAKI		TITLE	DS-610
CHECKED 30/Jun/2015 H.MAKI		名称	分配器
APPROVED 30/Jun/2015 H.MAKI	DS-60		外寸図
SCALE 1/6 MASS 20 ±10% kg		NAME	DISTRIBUTOR
DWG. No. C7264-G03- B	REF. No. 66-027-200G-1		OUTLINE DRAWING

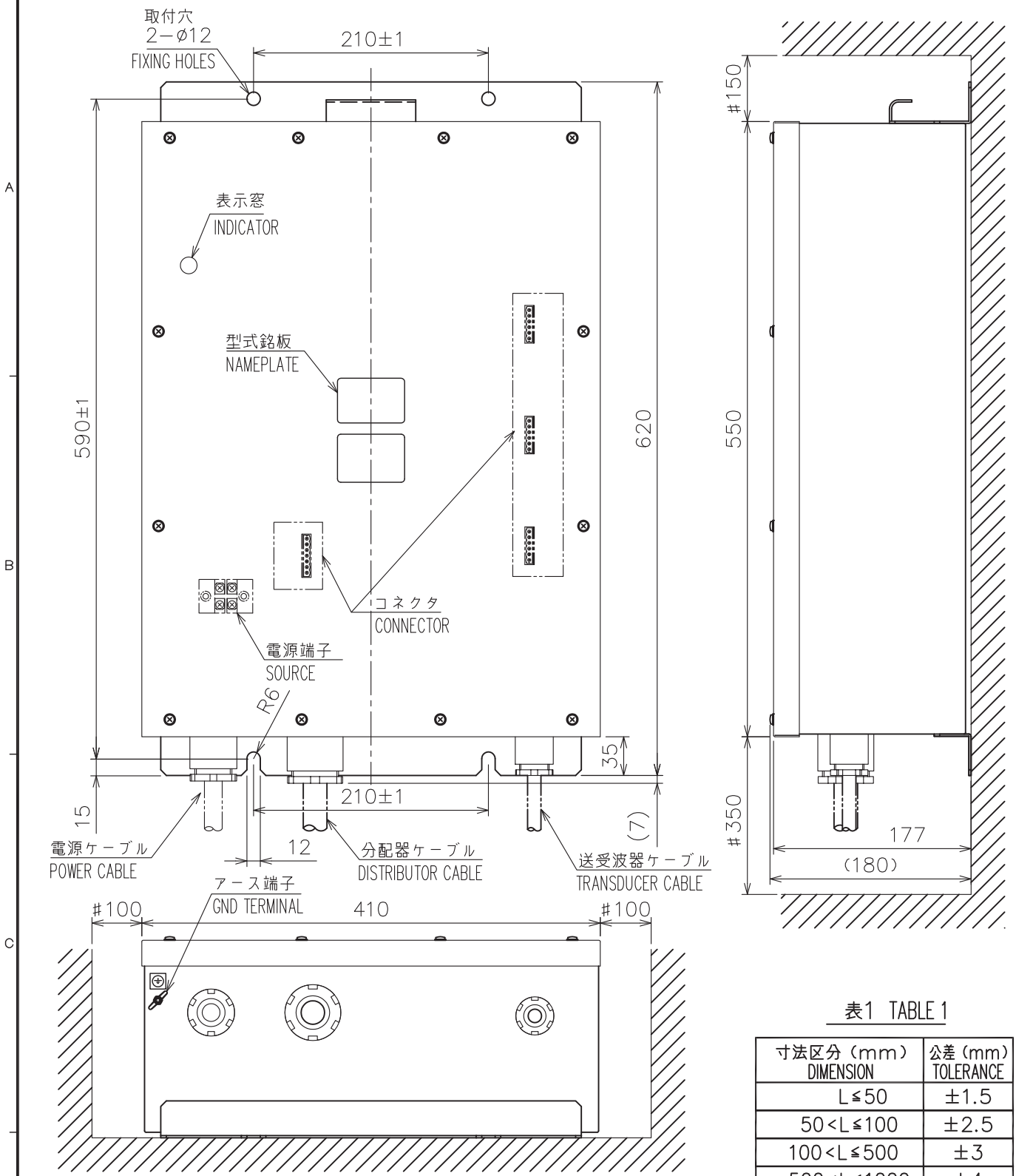


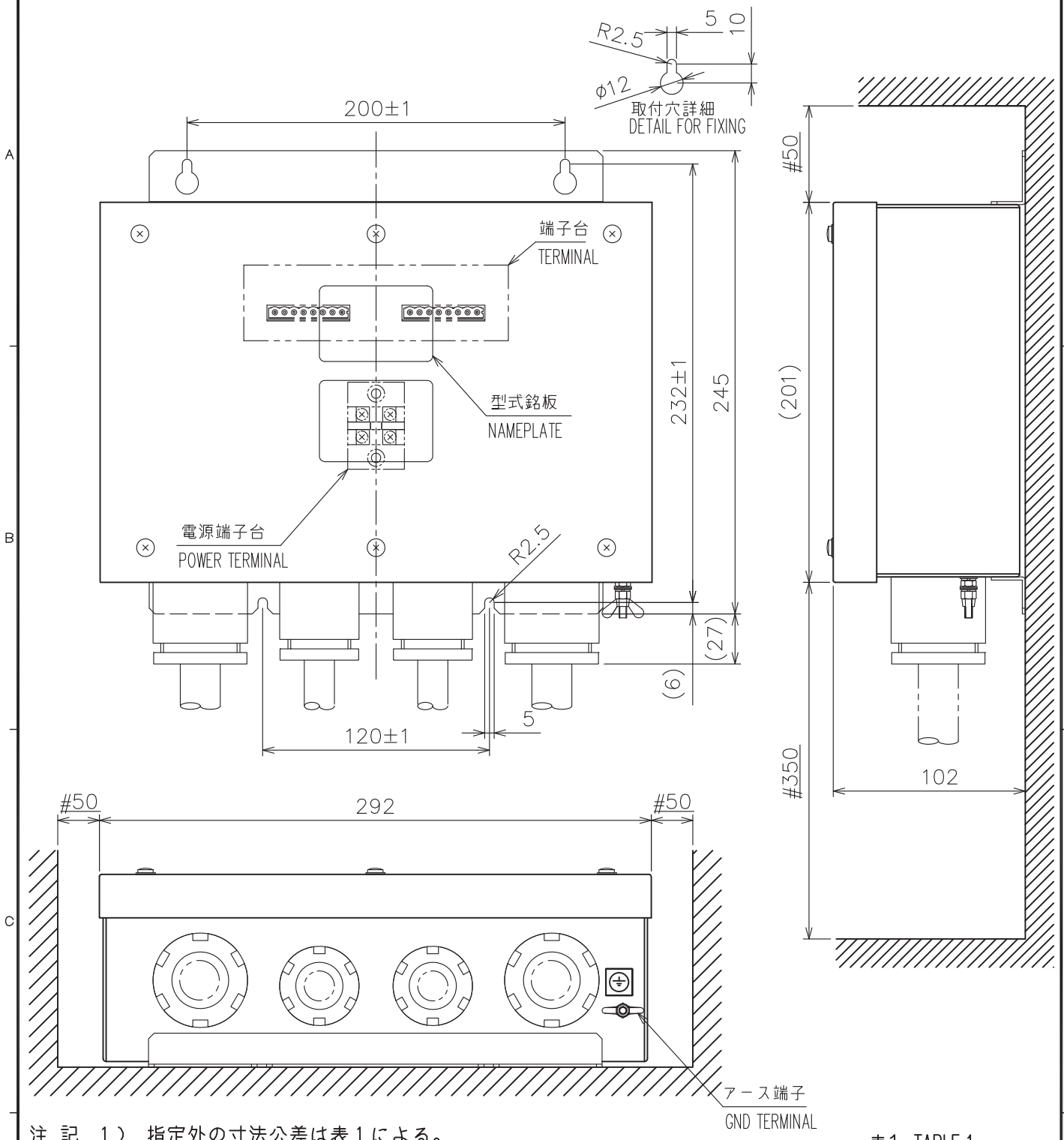
表1 TABLE 1

寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3
500<L≦1000	±4

注記 1） ＃印寸法は最小サービス空間寸法とする。
2） 指定外の寸法公差は表1による。
3） 取付用ネジはM10ボルトを使用のこと。

NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE M10 BOLTS FOR FIXING THE UNIT.

DRAWN 30/Jun/2015 T.YAMASAKI		TITLE	DS-620
CHECKED 30/Jun/2015 H.MAKI		名称	送受信部
APPROVED 30/Jun/2015 H.MAKI	DS-60		外寸図
SCALE 1/5 MASS 19 ±10% kg		NAME	TRANSCEIVER UNIT
DWG. No. C7264-G04- C	REF. No. 66-027-300G-1		OUTLINE DRAWING



注 記 1） 指定外の寸法公差は表１による。
2） ＃印寸法は最小サービス空間寸法とする。
3） 取付用ネジはトラスタッピンネジ呼び径４Ｘ２０を使用のこと。

NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS ø4x20 FOR FIXING THE UNIT.

表1 TABLE 1

寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

DRAWN 1/Jul/2011 T.YAMASAKI		TITLE	DS-640
CHECKED 1/Jul/2011 H.MAKI		名称	接続箱
APPROVED 1/Jul/2011 Y.NISHIYAMA	DS-60		外寸図
SCALE 1/3 MASS 5.0 ±10% kg		NAME	JUNCTION BOX
DWG. No. C7264-G06- B	REF. No. 66-027-400G-1		OUTLINE DRAWING

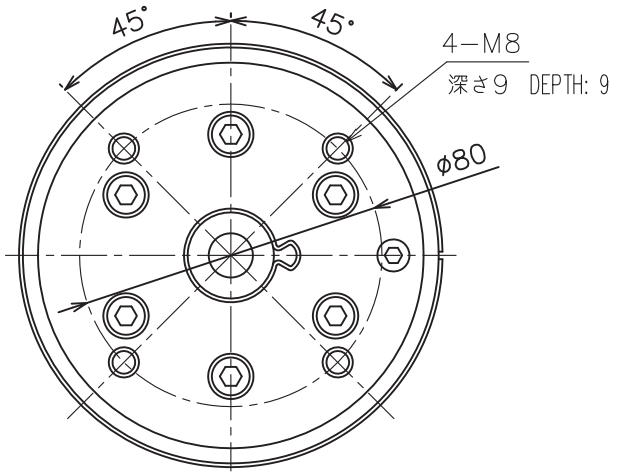
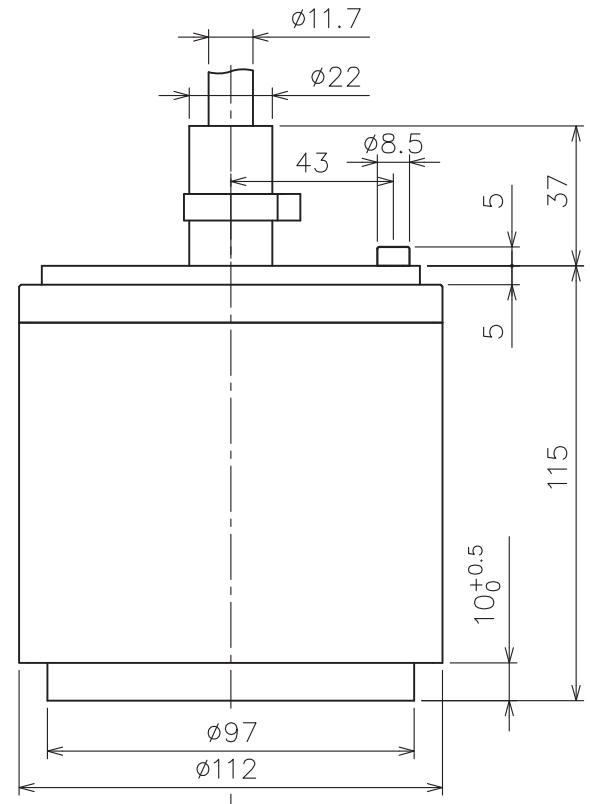


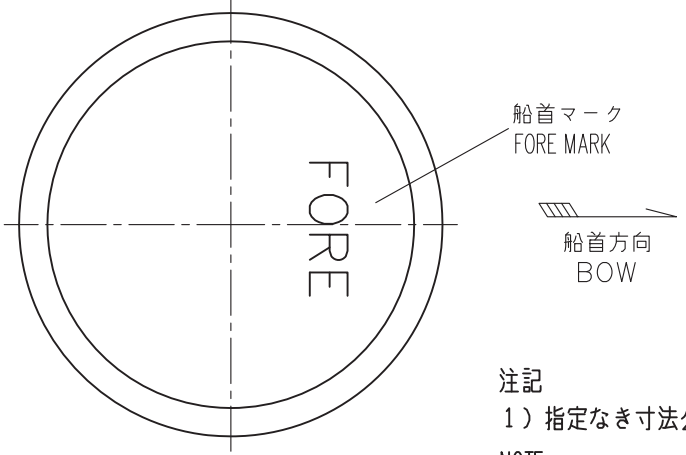
表 1 TABLE 1

寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

表 2 TABLE 2

ケーブル長（m） CABLE LENGTH +5% −0%	質量（kg±10%） MASS
31	9
41	11
51	13
61	14





注記

1）指定なき寸法公差は表1による。

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.

DRAWN 29/Mar/2011 T.YAMASAKI		TITLE	DS-630
CHECKED 29/Mar/2011 H.MAKI		名称	送受波器
APPROVED 29/Mar/2011 Y.NISHIYAMA	DS-60		外寸図
SCALE 1/2 MASS 表2参照 SEE TABLE 2		NAME	TRANSDUCER
DWG. No. C7264-G07- B	REF. No. 66-027-600G-1		OUTLINE DRAWING

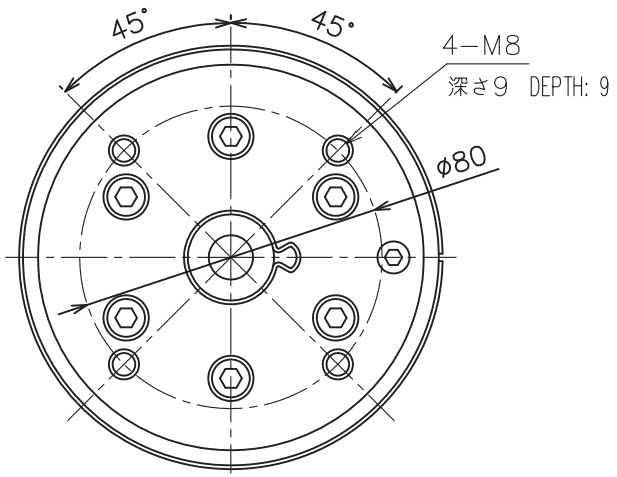
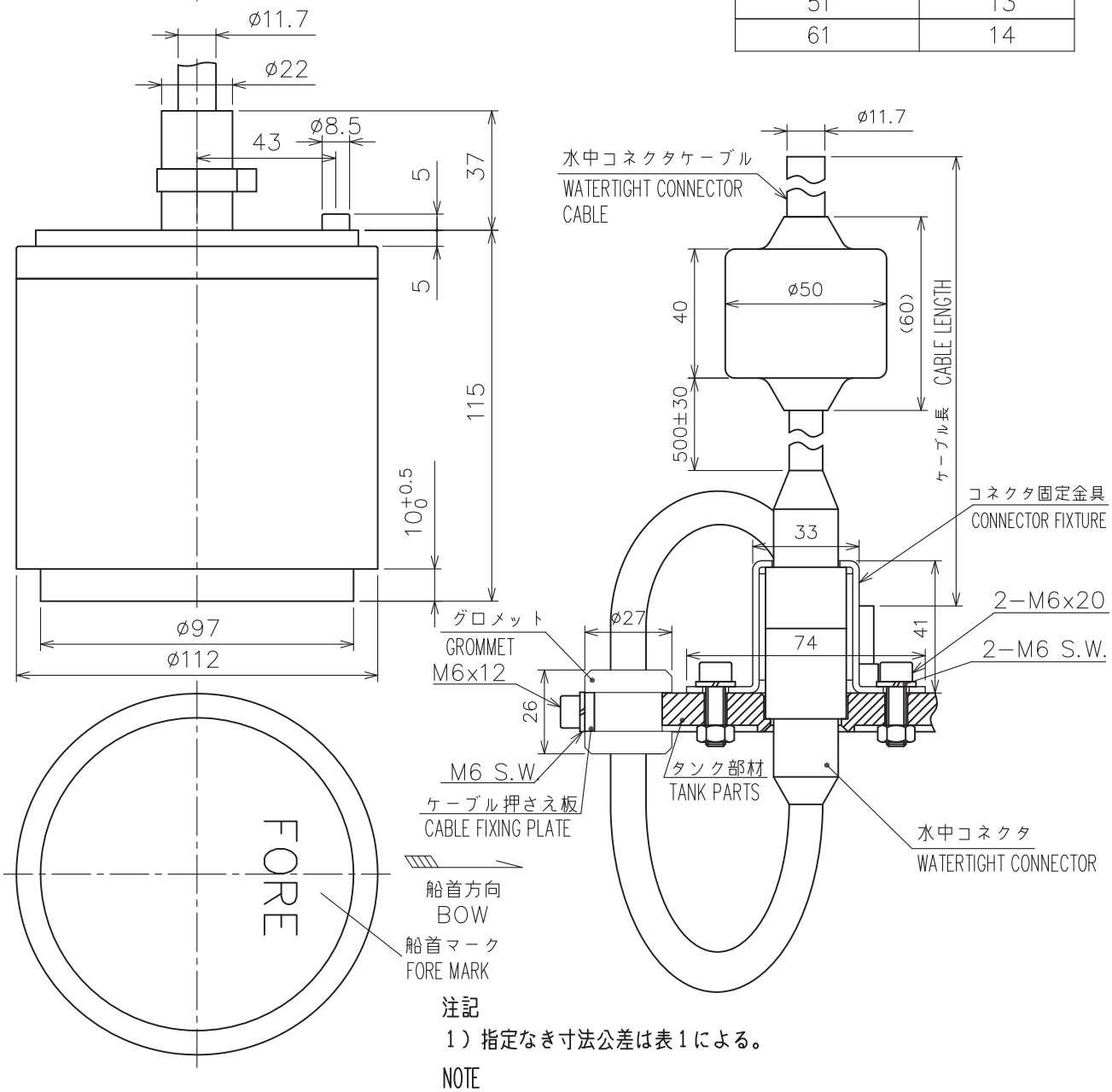


表 1 TABLE 1

寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

表 2 TABLE 2

ケーブル長（m） $^{+5\%}_{-0\%}$ CABLE LENGTH	質量（kg±10%） MASS
31	9
41	11
51	13
61	14



注記

1）指定なき寸法公差は表1による。

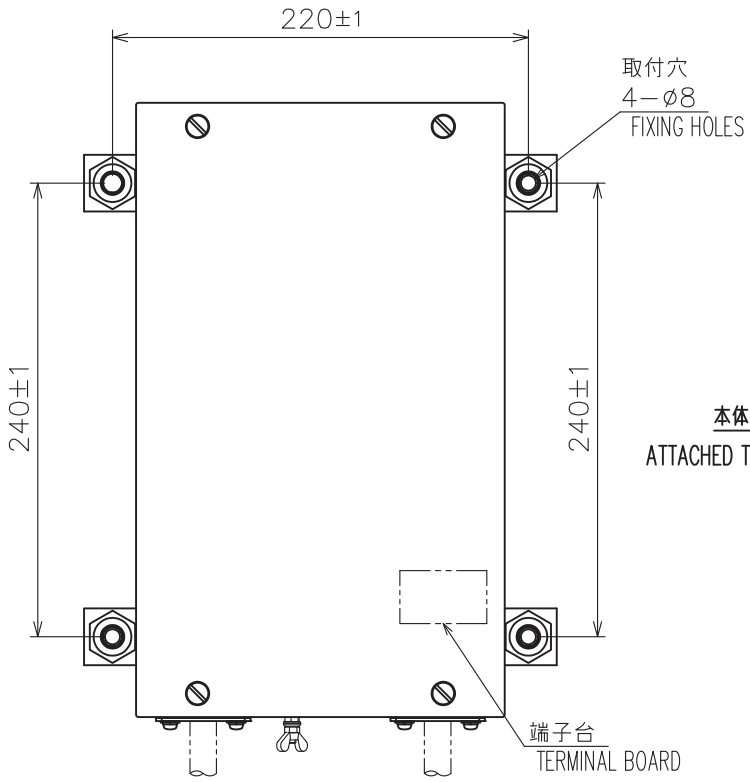
NOTE

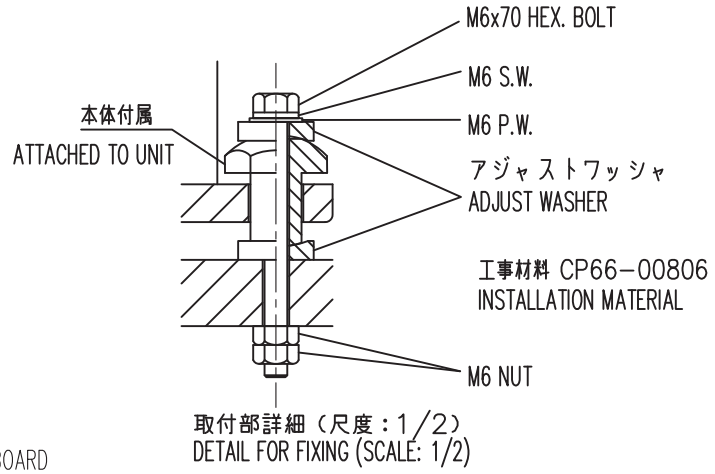
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.

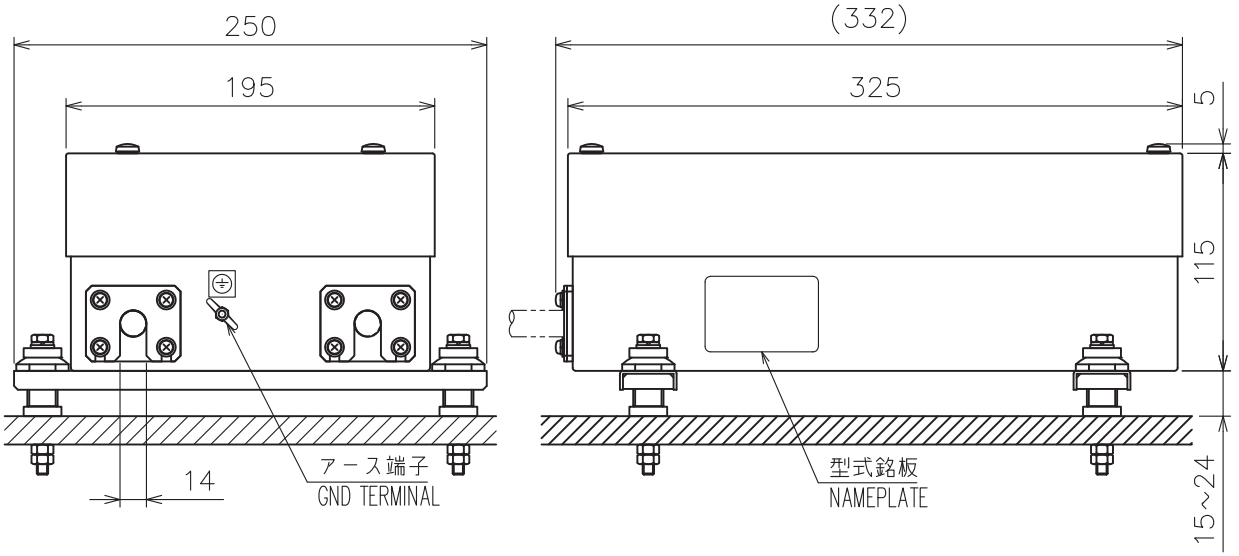
DRAWN 29/Mar/2011 T.YAMASAKI		TITLE	DS-631
CHECKED 29/Mar/2011 H.MAKI		名称	送受波器
APPROVED 29/Mar/2011 Y.NISHIYAMA	DS-60		外寸図
SCALE 1/2 MASS 表2参照 SEE TABLE 2		NAME	TRANSDUCER
DWG. No. C7264-G08- B	REF. No. 66-027-610G-1		OUTLINE DRAWING

表1　TABLE 1

寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3







注　記

1）　指定外の寸法公差は表１による。
2）　取付用ネジは六角ボルト呼び径６×７０を使用のこと。
3）　本装置は水平（±1°）となるように設置すること。

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. USE HEX. BOLTS ø6x70 FOR FIXING THE UNIT.
3. INSTALL THE UNIT HORIZONTAL LEVEL WITHIN ±1°.

DRAWN 30/Jun/2015 T.YAMASAKI		TITLE	DS-670
CHECKED 30/Jun/2015 H.MAKI		名称	レートジャイロ変換器（卓上装備）
APPROVED 30/Jun/2015 H.MAKI	DS-60		外寸図
SCALE 1/4 MASS 6.0 ±10% kg		NAME	RATE-OF-TURN GYRO CONVERTER (TABLETOP MOUNT)
DWG. No. C7264-G10- B	REF. No. 66-019-600G-2		OUTLINE DRAWING

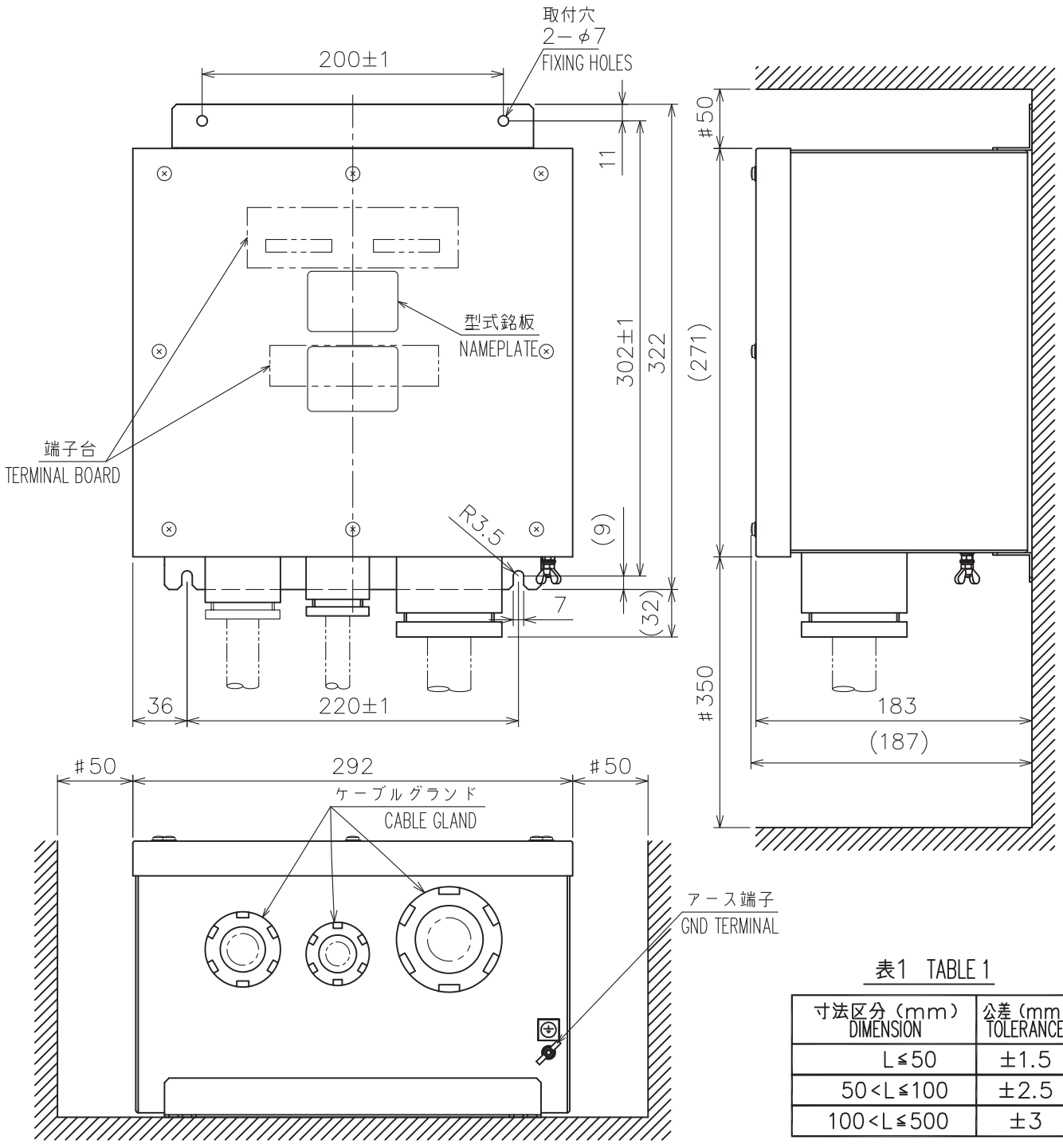


表1 TABLE 1

寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

表2 TABLE 2

型式 MODEL	質量 MASS (kg±10%)
DS-645A	11.0
DS-645B	8.0

注　記

1）　指定外の寸法公差は表１による。

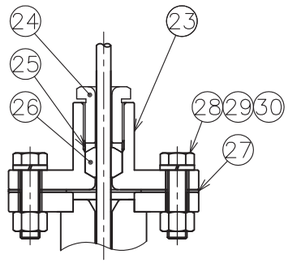
2）　＃印寸法は最小サービス空間寸法とする。

3）　取付用ネジはトラスタッピンネジ呼び径５Ｘ２０を使用のこと。

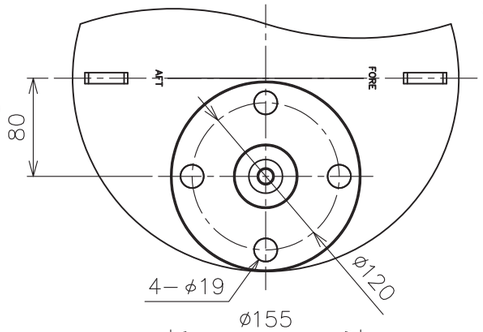
NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS ø5x20 FOR FIXING THE UNIT.

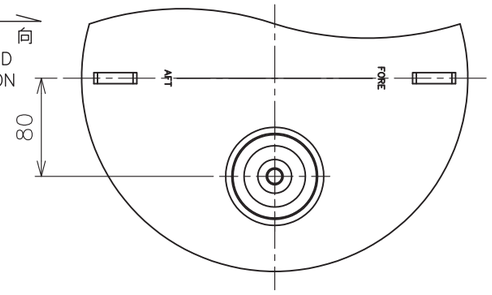
DRAWN 30/Jun/2015 T.YAMASAKI		TITLE	DS-645A/B
CHECKED 30/Jun/2015 H.MAKI		名称	接続箱
APPROVED 30/Jun/2015 H.MAKI	DS-60		外寸図
SCALE 1/4 MASS 表2参照 SEE TABLE 2		NAME	JUNCTION BOX
DWG. No. C7264-G09- B	REF. No. 66-027-411G-3		OUTLINE DRAWING

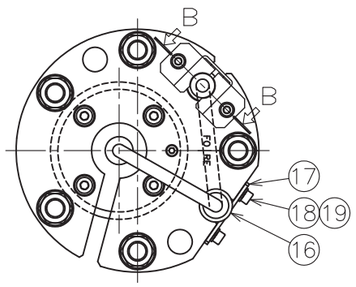


3）オプション
3) OPTION



船首方向
FORWARD DIRECTION

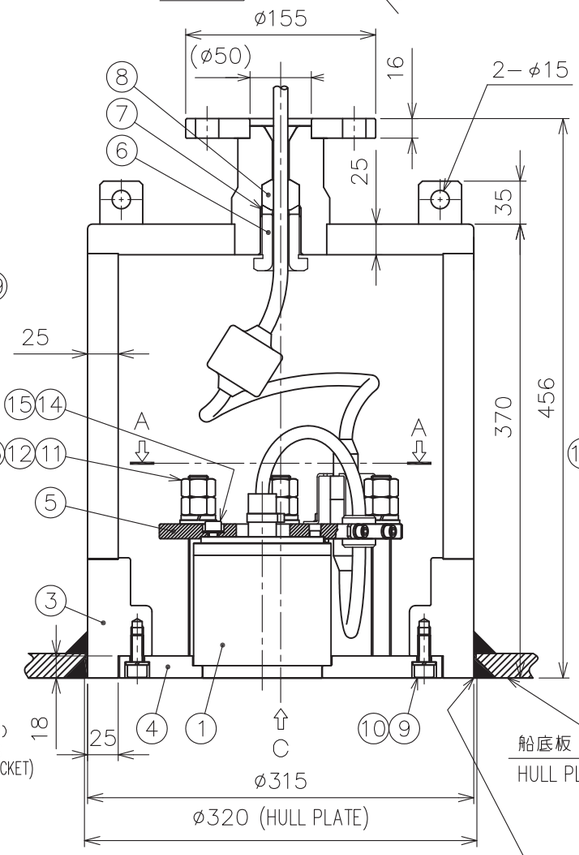




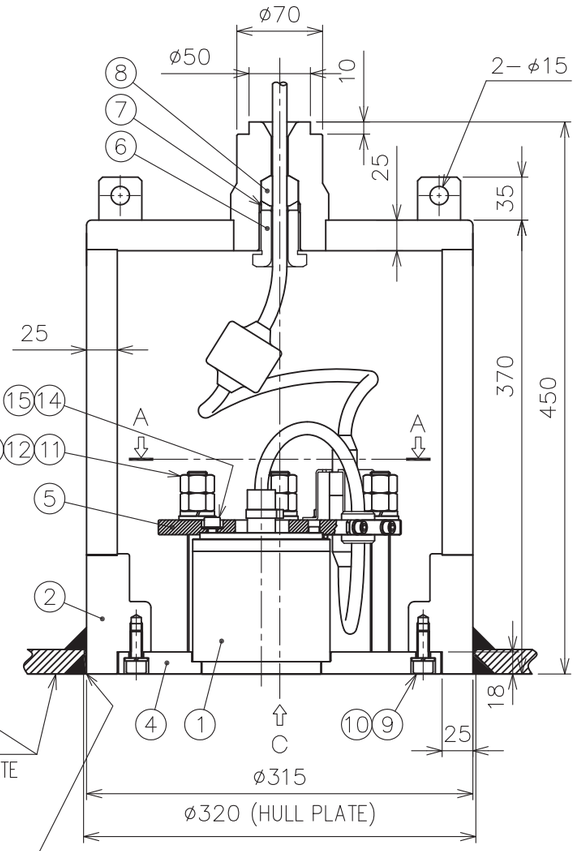
矢示A
VIEW A

断面B－B
SECTION B-B

文字・ラインの位置を合わせる
（ピン・ソケットの位置を確認）
ADJUST THE CHARACTERS AND LINES
(CONFIRM THE LOCATIONS OF PIN/SOCKET)



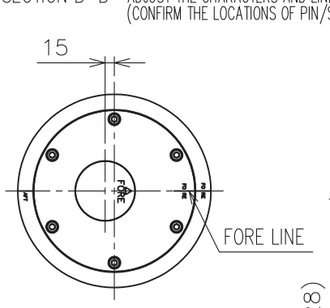
2）フランジ使用の場合
2) INSTALLATION USING A FLANGE



1）フランジを使用しない場合
1) INSTALLATION W/O FLANGE

船底板
HULL PLATE

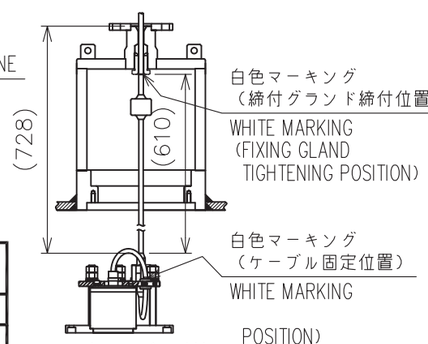
ダブリング及び溶接方法については造船所一任
DOUBLING PLATE AND WELDING PREPARED BY SHIPYARD.



矢示C（尺度 1:10）
VIEW C (SCALE 1:10)

表1 (TABLE1)

寸法区分（mm） Dimension	公差（mm） Tolerance
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3



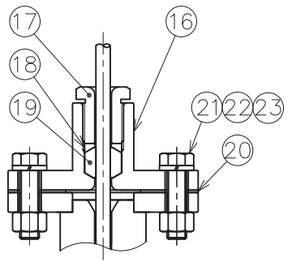
タンク内ケーブル寸法
CABLE LENGTH IN TANK

NOTE
1. ORIENT FORE-AFT LINE OF THE CASING ②③ IN PARALLEL WITH SHIP'S FORE-AFT LINE AND THE TOP OF THE CASING IN PARALLEL WITH WATER-LINE TO AN ACCURACY OF 3 DEGREE OR BETTER. THE TRANSDUCER TANK SHOULD BE WELDED FLUSH WITH SHIP'S HULL PLATE.
2. TO AVOID DISTORTION BY HEAT, PUT FIXING FLANGE ④ WITHOUT TRANSDUCER ONTO CASING WHILE WELDING.
3. CABLE GLAND ⑥ CAN BE TIGHTENED WITH THE OPTIONAL TOOL.
4. ORIENT FORE LINE OF FIXING FLANGE ④ TOWARD FORE DIRECTION TO INSTALL.
5. THE TRANSDUCER FACE IS COATED WITH SEATENDER20, DO NOT APPLY OTHER TYPE OF PAINT.
6. CLEAN, RE-PAINT THE TANK AT DOCKING.
7. MATERIAL OF TANK MEETS NK (NIPPON KAIJI KYOUKAI) STANDARD KSTPT38&KA.
8. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
9. FILL THE SPACES AROUND BOLT HEAD AND THE GAP ON TRANSDUCER FACE WITH SILICONE SEALANT.

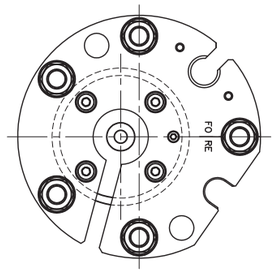
注　記
1. タンクを船底に溶接する際、タンク本体 ②③ のFORE－AFT LINEを船体の船首船尾方向に合わせて下さい。船首船尾の方向の据付の誤差は±3°以内として下さい。
また、水平方向の取付けはタンクのフランジが吃水線と±3°以内の誤差で平行になるようにして下さい。
タンク下面は船底板と面一とし、船底板より凹まないように装備して下さい。
2. タンク溶接の際は、歪防止のため送受波器を取外した状態の取付フランジ④を取付けて溶接して下さい。
3. ケーブルグランド⑥はオプションの工具で締付けて下さい。
4. 装備時は、取付フランジ④のFORE LINEを船首方向に合わせて下さい。
5. 送受波器面はシーテンダー20（ブラウン）を塗布しています。その他の船底塗料を塗布しないで下さい。
6. 定期ドック時、タンクのメンテナンス（清掃／再塗装）を行って下さい。
7. タンクの材質はNK（日本海事協会）規格のKSTPT38及びKA材です。
8. 指定外の寸法公差は表1の通りです。
9. 送受波器面のボルト周りの空間や隙間はシール剤で埋めてください。

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.No.	摘要 REMARKS
30	六角ナット HEX. NUT	SUS316L	(4)	M16	オプション OPTION
29	バネ座金 SPRING WASHER	SUS316L	(4)	M16	オプション OPTION
28	六角ボルト HEX. BOLT	SUS316L	(4)	M16X60	オプション OPTION
27	シートガスケット SHEET GASKET	NON-ASBESTOS JOINT SHEET	(1)	10K-50A	オプション OPTION
26	ガスケット GASKET	CR	(1)	66-027-7007	オプション OPTION
25	座金 WASHER	SUS316L	(1)	66-027-7006	オプション OPTION
24	締付グランド FIXING GLAND	SUS316L	(1)	66-027-7005	オプション OPTION
23	フランジ FLANGE ZINC RICH PRIMER	SS400	(1)	66-027-7011	オプション OPTION
22	バネ座金 SPRING WASHER	SUS316L	2	M6	
21	六角穴付ボルト HEX.S.H.C.BOLT	SUS316L	2	M6X20	
20	コネクタ固定金具 CONNECTOR FIXING PLATE	SUS316L	1	66-027-6019	
19	バネ座金 SPRING WASHER	SUS316L	2	M6	
18	六角穴付ボルト HEX.S.H.C.BOLT	SUS316L	2	M6X12	
17	ケーブル押え板 CABLE FIXING PLATE	SUS316L	1	66-027-6022	
16	グロメット GROMMET	CR	1	66-027-6021	
15	シールワッシャー SEAL WASHER	SUS304	4	W8	
14	六角穴付ボルト HEX.S.H.C.BOLT	SUS316L	4	M8X12	
13	平座金 FLAT WASHER	SUS316L	5	M16	
12	バネ座金 SPRING WASHER	SUS316L	5	M16	
11	六角ナット HEX. NUT	SUS316L	10	M16	
10	バネ座金 SPRING WASHER	SUS316L	6	M10	
9	六角穴付ボルト HEX.S.H.C.BOLT	SUS316L	6	M10X25	
8	ガスケット GASKET	CR	1	66-027-7007	
7	座金 WASHER	SUS316L	1	66-027-7006	
6	締付グランド FIXING GLAND	SUS316L	1	66-027-7005	
5	押え板 FIXING PLATE ZINC RICH PRIMER/BANNOH500	SS400	1	66-027-7004	
4	取付フランジ FIXING FLANGE ZINC RICH PRIMER/BANNOH500	SS400	1	66-027-7003	
3	フランジ付きタンク本体 CASING WITH FRANGE ZINC RICH PRIMER	KA/KSTPT38	1	66-027-7002	船級認定材 CLASSIFICATION SOCIETY APPROVED MATERIAL
2	タンク本体 CASING ZINC RICH PRIMER	KA/KSTPT38	1	66-027-7001	船級認定材 CLASSIFICATION SOCIETY APPROVED MATERIAL
1	送受波器 TRANSDUCER		1	DS-631	

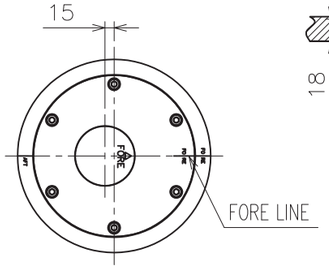
DRAWN 14/Apr/2016 T.YAMASAKI		TITLE	DS-660
CHECKED 15/Apr/2016 H.MAKI		名称	船底タンク（水中コネクタ付）
APPROVED 15/Apr/2016 H.MAKI	DS-60		送受波器装備図
SCALE 1/5	MASS 1) 96 ±10% 2) 100 kg	質量は、送受波器とオプションを除く MASS W/O TRANSDUCER AND OPTION	NAME TRANSDUCER TANK (W/ WATERTIGHT CONNECTOR)
DWG. No. C7264-T01- H	REF. No. 66-027-700G-6		TRANSDUCER INSTALLATION



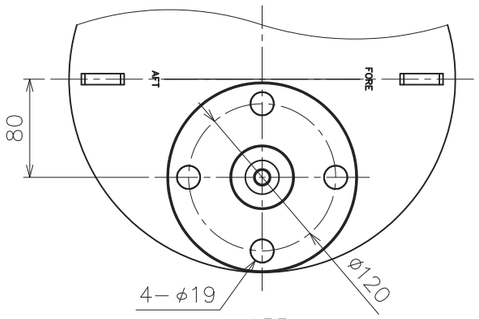
3) オプション
3) OPTION



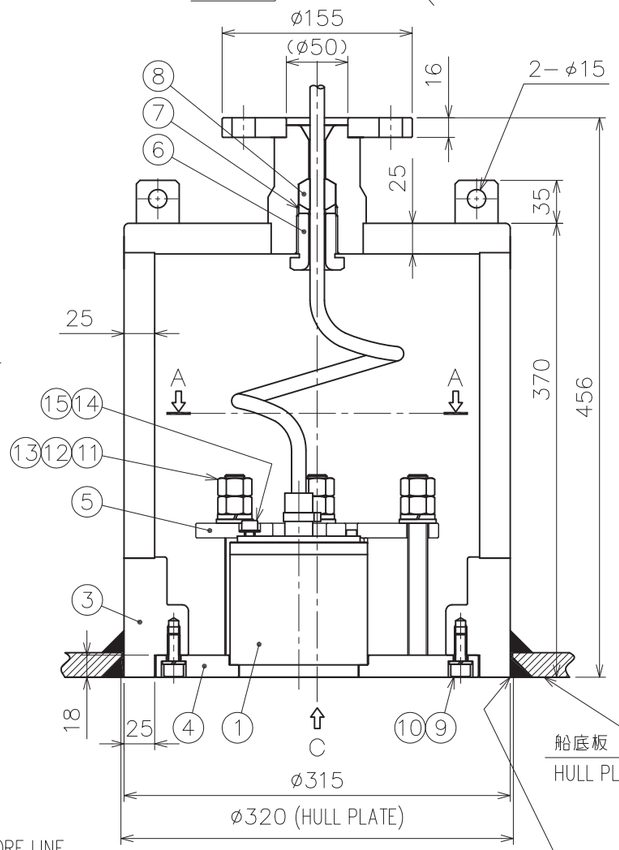
矢視 A
VIEW A



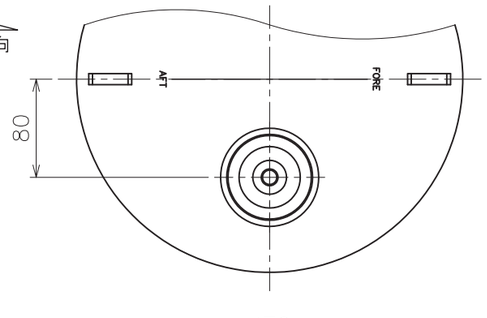
矢視 C（尺度 1:10）
VIEW C (SCALE 1:10)

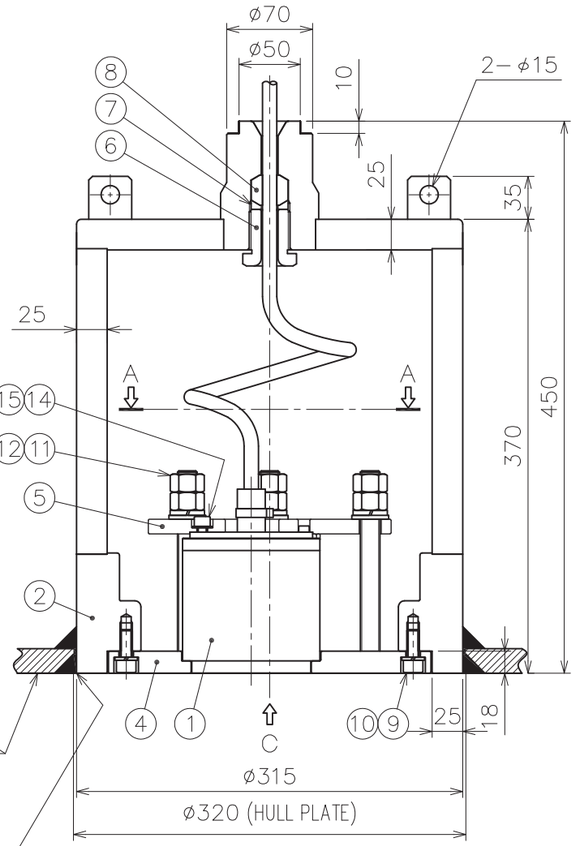


船首方向
FORWARD DIRECTION



2）フランジ使用の場合
2) INSTALLATION USING A FLANGE

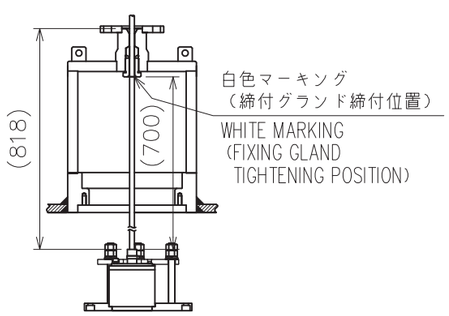




1）フランジを使用しない場合
1) INSTALLATION W/O FLANGE

船底板
HULL PLATE

ダブリング及び溶接方法については造船所一任
DOUBLING PLATE AND WELDING PREPARED BY SHIPYARD.



タンク内ケーブル寸法
CABLE LENGTH IN TANK

表1 (TABLE1)

寸法区分 (mm) Dimension	公差 (mm) Tolerance
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

注　記
1. タンクを船底に溶接する際、タンク本体 ②③ のＦＯＲＥ−ＡＦＴ ＬＩＮＥを船体の船首船尾方向に合わせて下さい。船首船尾の方向の据付の誤差は±３°以内として下さい。
   また、水平方向の取付けはタンクのフランジが吃水線と±３°以内の誤差で平行になるようにして下さい。
   タンク下面は船底板と面一とし、船底板より凹まないように装備して下さい。
2. タンク溶接の際は、歪防止のため送受波器を取外した状態の取付フランジ④を取付けて溶接して下さい。
3. ケーブルグランド⑥はオプションの工具で締付けて下さい。
4. 装備時は、取付フランジ④のＦＯＲＥ ＬＩＮＥを船首方向に合わせて下さい。
5. 送受波器面はシーテンダー２０（ブラウン）を塗布しています。その他の船底塗料を塗布しないで下さい。
6. 定期ドック時、タンクのメンテナンス（清掃／再塗装）を行って下さい。
7. 船底タンクの材質はＮＫ（日本海事協会）規格のＫＳＴＰＧ３７０及びＫＡ材です。
8. 指定外の寸法公差は表１の通りです。
9. 送受波器面のボルト周りの空間や隙間はシール剤で埋めてください。

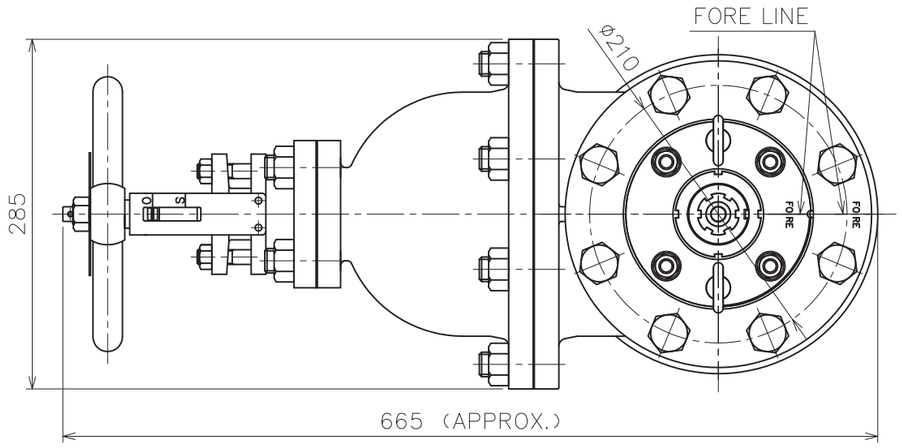
NOTE
1. ORIENT FORE-AFT LINE OF THE CASING ②③ IN PARALLEL WITH SHIP'S FORE-AFT LINE AND THE TOP OF THE CASING IN PARALLEL WITH WATER-LINE TO AN ACCURACY OF 3 DEGREE OR BETTER. THE TRANSDUCER TANK SHOULD BE WELDED FLUSH WITH SHIP'S HULL PLATE.
2. TO AVOID DISTORTION BY HEAT, PUT FIXING FLANGE ④ WITHOUT TRANSDUCER ONTO CASING WHILE WELDING.
3. CABLE GLAND ⑥ CAN BE TIGHTENED WITH THE OPTIONAL TOOL.
4. ORIENT FORE LINE OF FIXING FLANGE ④ TOWARD FORE DIRECTION TO INSTALL.
5. THE TRANSDUCER FACE IS COATED WITH SEATENDER20, DO NOT APPLY OTHER TYPE OF PAINT.
6. CLEAN, RE-PAINT THE TANK AT DOCKING.
7. MATERIAL OF TANK MEETS NK (NIPPON KAIJI KYOUKAI) STANDARD KSTPG370&KA.
8. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
9. FILL THE SPACES AROUND BOLT HEAD AND THE GAP ON TRANSDUCER FACE WITH SILICONE SEALANT.

ITEM	NAME	MATERIAL	Q'TY	DWG.No.	REMARKS
23	六角ナット HEX. NUT	SUS316L	(4)	M16	オプション OPTION
22	バネ座金 SPRING WASHER	SUS316L	(4)	M16	オプション OPTION
21	六角ボルト HEX. BOLT	SUS316L	(4)	M16X60	オプション OPTION
20	シートガスケット SHEET GASKET	NON-ASBESTOS JOINT SHEET	(1)	10K-50A	オプション OPTION
19	ガスケット GASKET	CR	(1)	66-027-7007	オプション OPTION
18	座金 WASHER	SUS316L	(1)	66-027-7006	オプション OPTION
17	締付グランド FIXING GLAND	SUS316L	(1)	66-027-7005	オプション OPTION
16	フランジ FLANGE ZINC RICH PRIMER	SS400	(1)	66-027-7011	オプション OPTION
15	シールワッシャー SEAL WASHER	SUS304	4	W8	
14	六角穴付ボルト HEX.S.H.C.BOLT	SUS316L	4	M8X12	
13	平座金 FLAT WASHER	SUS316L	5	M16	
12	バネ座金 SPRING WASHER	SUS316L	5	M16	
11	六角ナット HEX. NUT	SUS316L	10	M16	
10	バネ座金 SPRING WASHER	SUS316L	6	M10	
9	六角穴付ボルト HEX.S.H.C.BOLT	SUS316L	6	M10X25	
8	ガスケット GASKET	CR	1	66-027-7007	
7	座金 WASHER	SUS316L	1	66-027-7006	
6	締付グランド FIXING GLAND	SUS316L	1	66-027-7005	
5	押え板 FIXING PLATE ZINC RICH PRIMER/BANNOH500	SS400	1	66-027-7004	
4	取付フランジ FIXING FLANGE ZINC RICH PRIMER/BANNOH500	SS400	1	66-027-7003	
3	フランジ付きタンク本体 CASING WITH FRANGE ZINC RICH PRIMER	KA/KSTPG370	1	66-027-7002	船級認定材 CLASSIFICATION SOCIETY APPROVED MATERIAL
2	タンク本体 CASING ZINC RICH PRIMER	KA/KSTPG370	1	66-027-7001	船級認定材 CLASSIFICATION SOCIETY APPROVED MATERIAL
1	送受波器 TRANSDUCER		1	DS-630	

DRAWN	14/Apr/2016 T.YAMASAKI	TITLE	DS-660
CHECKED	15/Apr/2016 H.MAKI	名称	船底タンク（水中コネクタなし）
APPROVED	15/Apr/2016 H.MAKI		送受波器装備図
SCALE	1/5	MASS	1) 96 ±10% 2) 100 kg
DWG. No.	C7264-T02- G	REF. No.	66-027-710G-6
	DS-60	NAME	TRANSDUCER TANK (W/O WATERTIGHT CONNECTOR) TRANSDUCER INSTALLATION

質量は、送受波器とオプションを除く
MASS W/O TRANSDUCER AND OPTION

FURUNO ELECTRIC CO., LTD.

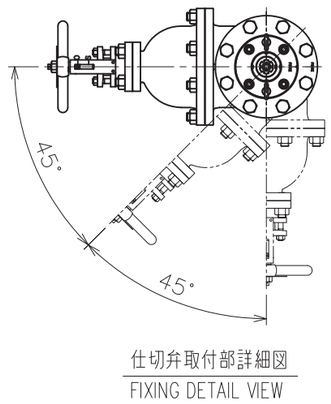


注 記

1. 船底スペーサ③を船底に溶接する際、FORE－AFT LINEを船体の船首船尾方向に合わせて下さい。船首船尾の方向の据付の誤差は±3°以内として下さい。また、水平方向の取付けは吃水線と±3°以内の誤差で平行になるようにして下さい。船底スペーサ下面は船底板と面一とし、船底板より凹まないように装備して下さい。
2. 装備時は、船底スペーサ③、シーチェストキャップ④およびフランジ⑦のFORE LINEを船首方向に合わせて下さい。
3. ゲートバルブ②を取付ける際はナット⑰の回り止め対策として、ボルト⑲、寸切りボルト(③に付属)およびナット⑰を脱脂後、ロックタイト#271を塗布して完全に締めて下さい。
4. ゲートバルブ②は45°ピッチで任意の方向に取付け可能です。
5. シートガスケット⑤には標準支給のグリースを全面に均一塗布して下さい。
6. 送受波器面はシーテンダー２０（ブラウン）を塗布しています。その他の船底塗料を塗布しないで下さい。
7. 定期ドック時、ゲートバルブのメンテナンス（清掃/再塗装）を行って下さい。
8. ゲートバルブ部以外の部分は０．５ＭＰａの水圧試験がされています。
9. 指定外の寸法公差は表1の通りです。
10. #印寸法は最小サービス空間寸法とする。

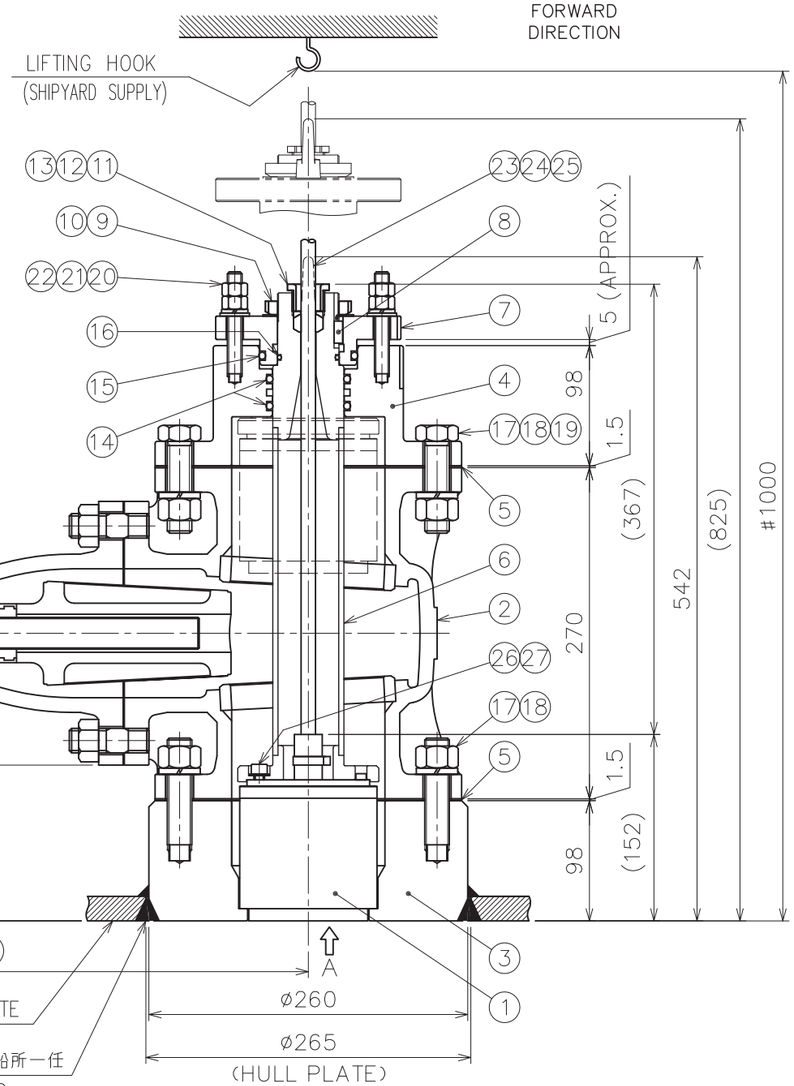
NOTE

1. ORIENT FORE-AFT LINE OF THE SPACER ③IN PARALLEL WITH SHIP'S FORE-AFT LINE AND THE TOP OF THE SPACER IN PARALLEL WITH WATER-LINE TO AN ACCURACY OF 3 DEGREE OR BETTER. THE SPACER SHOULD BE WELDED FLUSH WITH SHIP'S HULL PLATE.
2. ORIENT FORE LINES OF SPACER ③ AND SEACHEST CAP ④ AND FLANGE ⑦ TOWARD FORE DIRECTION TO INSTALL.
3. CLEAN NUTS ⑰ AND BOLTS WITH SOLVENT, COAT THEIR THREADS WITH ADHESIVE/SEALANT (LOCTITE#271) AND THEN TIGHTEN THEM SECURELY WHEN MOUNTING GATE VALVE ②.
4. GATE VALVE ② CAN BE ATTACHED IN ANY DIRECTION IN INCREMENT OF 45°.
5. COAT THE SHEET GASKET ⑤WITH THE SUPPLIED GREASE UNIFORMLY.
6. THE TRANSDUCER FACE IS COATED WITH SEATENDER20, DO NOT APPLY OTHER TYPE OF PAINT.
7. CLEAN, RE-PAINT THE GATE VALVE AT DOCKING.
8. SEACHEST EXCEPT GATE VALVE IS TESTED UNDER 0.5MPa WATER PRESSURE.
9. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
10. #:MINIMUM SERVICE CLEARANCE.

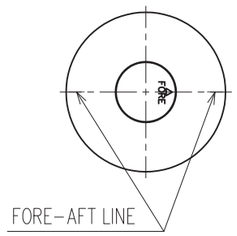


仕切弁取付部詳細図
FIXING DETAIL VIEW

船 首 方 向
FORWARD DIRECTION



ダブリング及び溶接方法については造船所一任
DOUBLING PLATE AND WELDING PREPARED BY SHIPYARD.



矢視A（尺度1：10）
VIEW A (SCALE 1:10)

表1 (TABLE1)

寸法区分（mm） Dimension	公差（mm） Tolerance
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3
500<L≦1000	±4

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.No.	摘要 REMARKS
27	シールワッシャー SEAL WASHER	SUS304	4	W8	送受波器付属品 TRANSDUCER ACCESSORY
26	六角穴付ボルト HEX.S.H.C.BOLT	SUS316L	4	M8X12	送受波器付属品 TRANSDUCER ACCESSORY
25	アイナット EYE NUT	SUS304	2	M10	
24	バネ座金 SPRING WASHER	SUS316L	2	M10	
23	六角穴付ボルト HEX.S.H.C.BOLT	SUS316L	2	M10X25	
22	平座金 FLAT WASHER	SUS316L	4	M12	
21	バネ座金 SPRING WASHER	SUS316L	4	M12	
20	六角ナット HEX. NUT	SUS316L	8	M12	
19	六角ボルト HEX. BOLT	SUS316L	8	M20X75	
18	バネ座金 SPRING WASHER	SUS316L	16	M20	
17	六角ナット HEX. NUT	SUS316L	16	M20	
16	Oリング O-RING	NBR	1	JIS B 2401 P44	
15	Oリング O-RING	NBR	1	JIS B 2401 P70	
14	Oリング O-RING	NBR	2	JIS B 2401 P58	
13	ガスケット GASKET	CR	1	66-027-7207	
12	座金 WASHER	SUS316L	1	66-027-7206	
11	締付グランド FIXING GLAND	C3604B	1	JIS F 8801 20 1a	
10	座金 WASHER	SPCC	1	AW10	
9	ナット NUT	SS400	1	AN10	
8	キー TURNING STOPPER	SUS304	1	JIS B 1301 P-B 8X7X18	
7	フランジ FLANGE ZINC RICH PRIMER	SS400	1	66-027-7205	
6	シャフト SHAFT	SUS316L	1	66-027-7204	
5	シートガスケット SHEET GASKET	NON-ASBESTOS JOINT SHEET	2	66-027-7203	
4	シーチェストキャップ SEACHEST CAP ZINC RICH PRIMER	KA	1	66-027-7202	船級認定材 CLASSIFICATION SOCIETY APPROVED MATERIAL
3	船底スペーサ SPACER ZINC RICH PRIMER	KA	1	66-027-7201	船級認定材 CLASSIFICATION SOCIETY APPROVED MATERIAL
2	船用鋳鋼仕切弁 GATE VALVE ZINC RICH PRIMER	SC480	1	66-027-7211 (JIS F 7366-125S)	船級認定品 CLASSIFICATION SOCIETY APPROVED
1	送受波器 TRANSDUCER		1	DS-630	

DRAWN	15/Apr/2016 T.YAMASAKI		TITLE	DS-661
CHECKED	15/Apr/2016 H.MAKI		名称	ゲートバルブ 送受波器装備図
APPROVED	15/Apr/2016 H.MAKI	DS-60		
SCALE	1/5	MASS 128 ±10% kg	NAME	GATE VALVE TRANSDUCER INSTALLATION
DWG. No.	C7264-T03- C	質量は送受波器を含まず MASS DOES NOT INCLUDE TRANSDUCER		
		REF. No. 66-027-720G-1		

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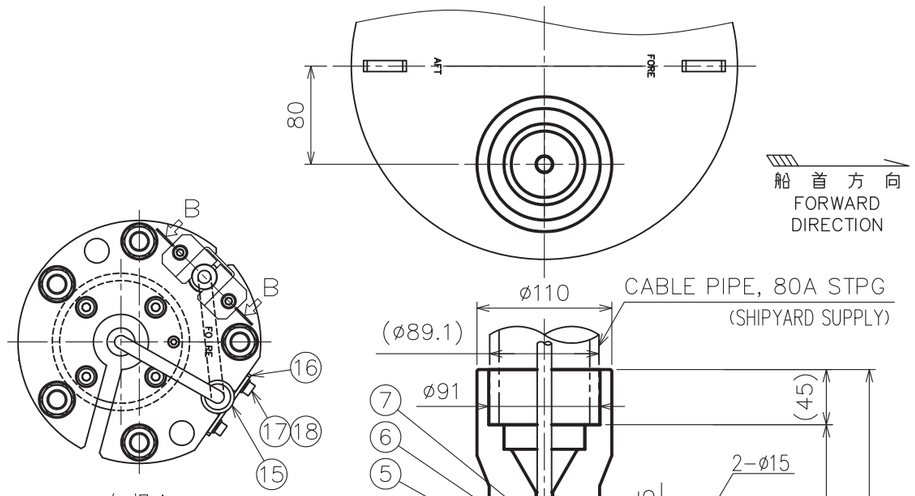
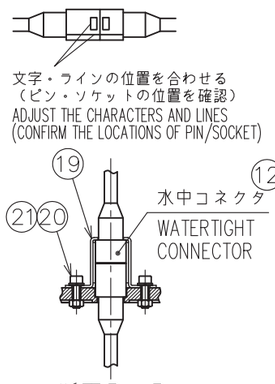
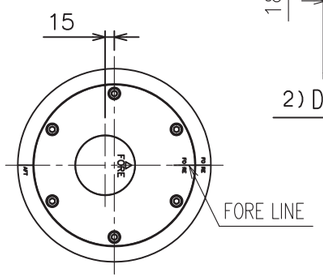


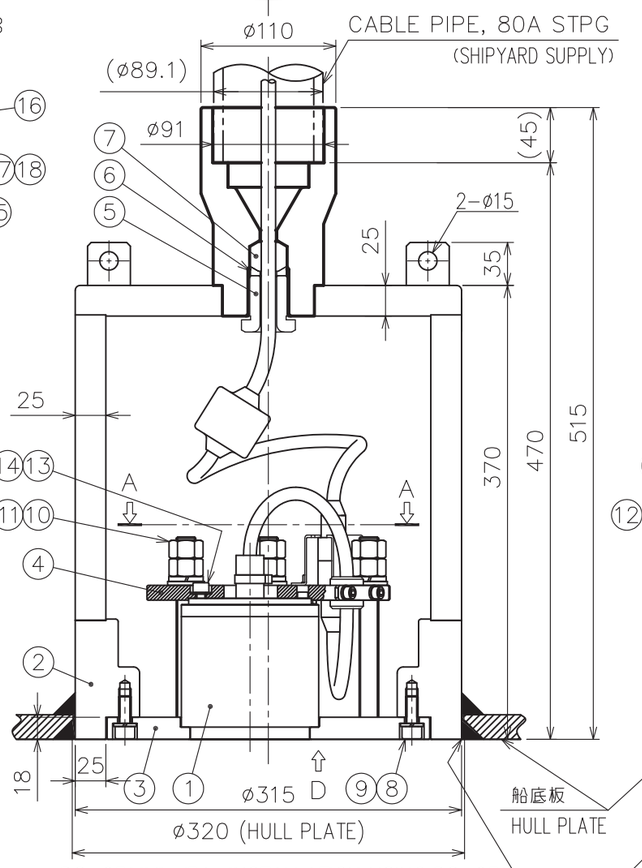


断面 B－B
SECTION B-B

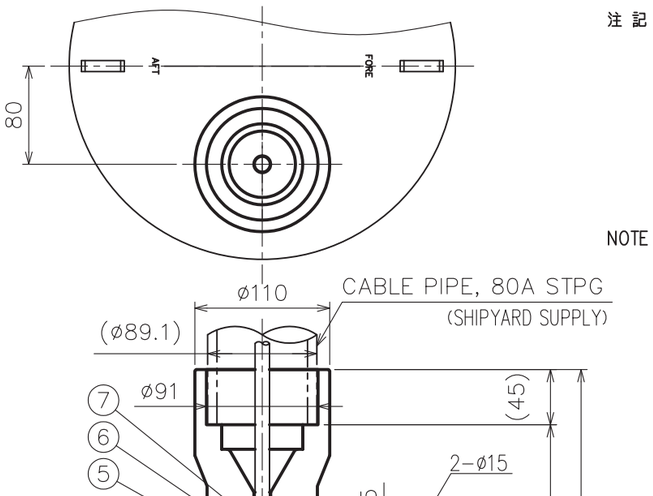


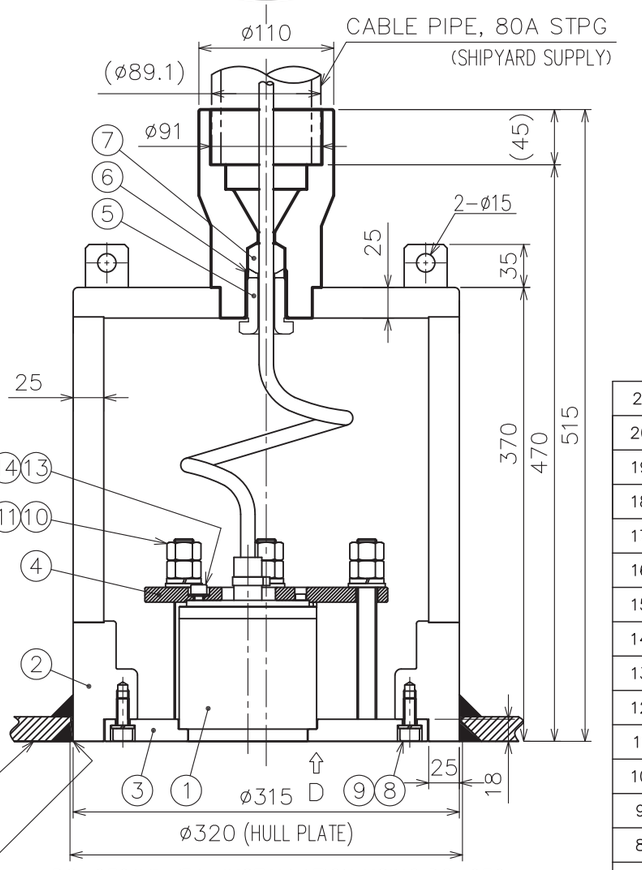
矢視D （尺度 1:10）
VIEW D (SCALE 1:10)

船 首 方 向
FORWARD
DIRECTION



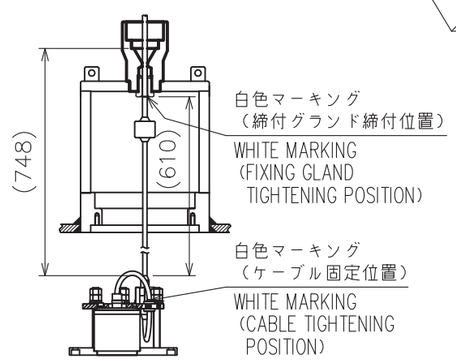
2）DS-631装備の場合 INSTALLATION USING DS-631



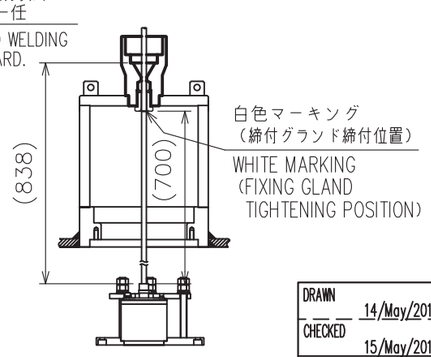


1）DS-630装備の場合 INSTALLATION USING DS-630

ダブリング及び溶接方法
については造船所一任
DOUBLING PLATE AND WELDING
PREPARED BY SHIPYARD.



タンク内ケーブル寸法（DS-631）
CABLE LENGTH IN TANK (DS-631)



タンク内ケーブル寸法（DS-630）
CABLE LENGTH IN TANK (DS-630)

表1 (TABLE1)

寸法区分（mm） Dimension	公差（mm） Tolerance
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

注 記
1. タンクを船底に溶接する際、タンク本体 ② のＦＯＲＥ－ＡＦＴ ＬＩＮＥを船体の船首船尾方向に合わせて下さい。船首船尾の方向の据付の誤差は±３°以内として下さい。
また、水平方向の取付けはタンクのフランジが吃水線と±３°以内の誤差で平行になるようにして下さい。
タンク下面は船底板と面一とし、船底板より凹まないように装備して下さい。
2. ケーブルグランド⑤ はオプションの工具で締付けて下さい。
3. 装備時は、取付フランジ③ のＦＯＲＥ ＬＩＮＥを船首方向に合わせて下さい。
4. 送受波器面はマリンスター２０を塗布しています。その他の船底塗料を塗布しないで下さい。
5. 定期ドック時、タンクのメンテナンス（清掃/再塗装）を行って下さい。
6. タンクの材質はＮＫ（日本海事協会）規格のＫＳＴＰＴ３８及びＫＡ材です。
7. 指定外の寸法公差は表１の通りです。

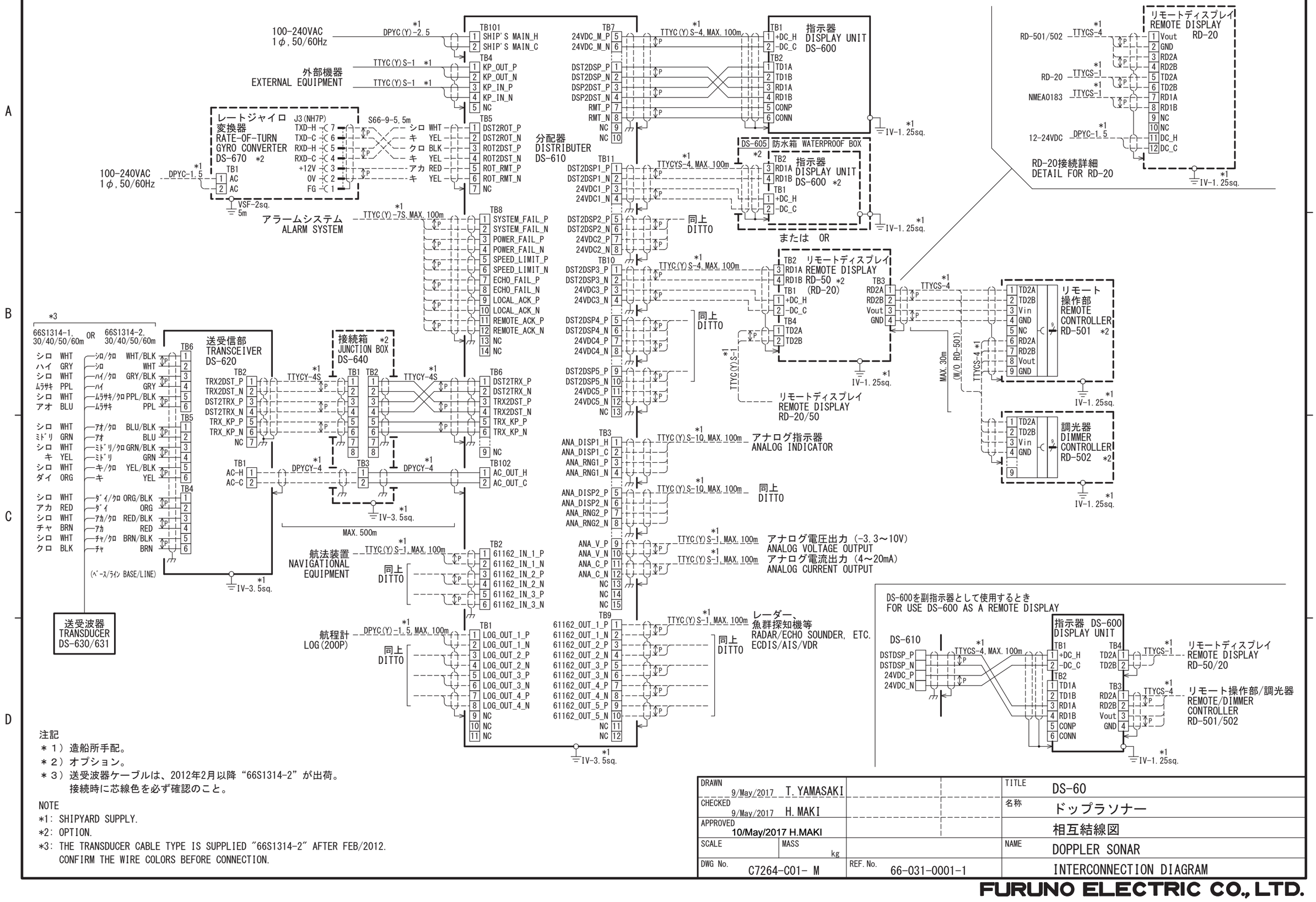
NOTE
1. ORIENT FORE-AFT LINE OF THE CASING ② IN PARALLEL WITH SHIP'S FORE-AFT LINE AND THE TOP OF THE CASING IN PARALLEL WITH WATER-LINE. ALIGNMENTS TO AN ACCURACY OF 3 DEGREE OR BETTER. THE TRANSDUCER TANK MUST BE WELDED FLUSH WITH SHIP'S HULL PLATE.
2. CABLE GLAND ⑤ CAN BE TIGHTENED WITH THE OPTIONAL TOOL.
3. ORIENT FORE LINE OF FIXING FLANGE ③ TOWARD FORE DIRECTION TO INSTALL.
4. THE TRANSDUCER FACE IS COATED WITH MARINESTAR20. DO NOT APPLY OTHER TYPE OF PAINT.
5. CLEAN, RE-PAINT THE TANK AT DOCKING.
6. MATERIAL OF TANK MEETS NK (NIPPON KAIJI KYOUKAI) STANDARD KSTPT38&KA.
7. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS
21	バネ座金 SPRING WASHER	SUS316L	2	M6	DS-631装備時のみ DS-631 ONLY
20	六角穴付ボルト HEX.S.H.C.BOLT	SUS316L	2	M6X20	DS-631装備時のみ DS-631 ONLY
19	コネクタ固定金具 CONNECTOR FIXING PLATE	SUS316L	1	66-027-6019	DS-631装備時のみ DS-631 ONLY
18	バネ座金 SPRING WASHER	SUS316L	2	M6	DS-631装備時のみ DS-631 ONLY
17	六角穴付ボルト HEX.S.H.C.BOLT	SUS316L	2	M6X12	DS-631装備時のみ DS-631 ONLY
16	ケーブル押え板 CABLE FIXING PLATE	SUS316L	1	66-027-6022	DS-631装備時のみ DS-631 ONLY
15	グロメット GROMMET	CR	1	66-027-6021	DS-631装備時のみ DS-631 ONLY
14	シールワッシャー SEAL WASHER	SUS304	4	W8	
13	六角穴付ボルト HEX.S.H.C.BOLT	SUS316L	4	M8X12	
12	平座金 FLAT WASHER	SUS316L	5	M16	
11	バネ座金 SPRING WASHER	SUS316L	5	M16	
10	六角ナット HEX. NUT	SUS316L	10	M16	
9	バネ座金 SPRING WASHER	SUS316L	6	M10	
8	六角穴付ボルト HEX.S.H.C.BOLT	SUS316L	6	M10X25	
7	ガスケット GASKET	CR	1	66-027-7007	
6	座金 WASHER	SUS316L	1	66-027-7006	
5	締付グランド FIXING GLAND	SUS316L	1	66-027-7005	
4	押え板 FIXING PLATE ZINC RICH PRIMER/BANNOH500	SS400	1	66-027-7004	
3	取付フランジ FIXING FLANGE ZINC RICH PRIMER/BANNOH500	SS400	1	66-027-7003	
2	タンク本体 CASING ZINC RICH PRIMER	KA/KSTPT38	1	66-027-7301	船級認定材 CLASSIFICATION SOCIETY APPROVED MATERIAL
1	送受波器 TRANSDUCER		1	DS-630/631	

DRAWN	14/May/2015 T.YAMASAKI	TITLE	DS-660
CHECKED	15/May/2015 H.MAKI	名称	船底タンク（スリーブ付）
APPROVED	15/May/2015 H.MAKI	DS-60	送受波器装備図
SCALE	1/5	MASS 100 ±10% kg	質量は、送受波器とオプションを除く MASS W/O TRANSDUCER AND OPTION
NAME	TRANSDUCER TANK (W/ SLEEVE)		
DWG. No.	C7264-T04- C	REF. No.	66-027-730C-3
	TRANSDUCER INSTALLATION		

FURUNO

S-1



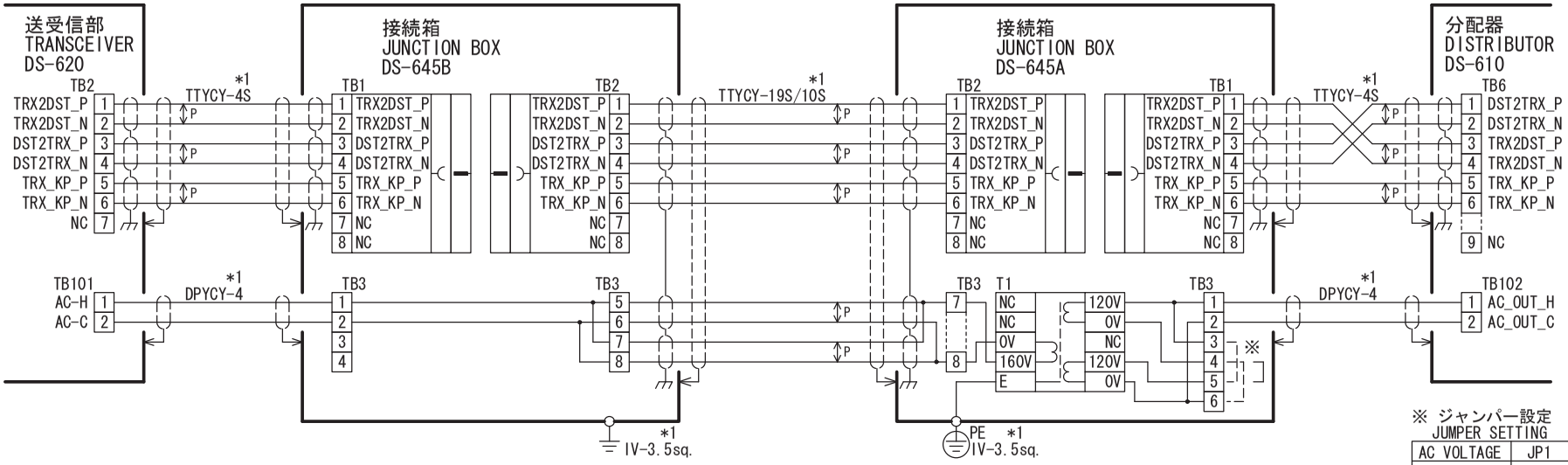
注記
＊1）造船所手配。
＊2）オプション。
＊3）送受波器ケーブルは、2012年2月以降“66S1314-2”が出荷。
接続時に芯線色を必ず確認のこと。

NOTE
*1: SHIPYARD SUPPLY.
*2: OPTION.
*3: THE TRANSDUCER CABLE TYPE IS SUPPLIED "66S1314-2" AFTER FEB/2012.
CONFIRM THE WIRE COLORS BEFORE CONNECTION.

DRAWN 9/May/2017 T. YAMASAKI		TITLE	DS-60
CHECKED 9/May/2017 H. MAKI		名称	ドップラソナー
APPROVED 10/May/2017 H.MAKI			相互結線図
SCALE	MASS kg	NAME	DOPPLER SONAR
DWG No. C7264-C01- M	REF. No. 66-031-0001-1		INTERCONNECTION DIAGRAM

FURUNO ELECTRIC CO., LTD.

FURUNO



※ ジャンパー設定
JUMPER SETTING

AC VOLTAGE	JP1	JP2
100-120V	#3-#5	#4-#6
200-240V	#4-#5	

注記
＊１）造船所手配。

NOTE
*1: SHIPYARD SUPPLY.

DRAWN 19/Apr/2012 T. YAMASAKI			TITLE DS-645A/B
CHECKED 19/Apr/2012 H. MAKI			名 称 接続箱
APPROVED 27/Apr/2012 Y.NISHIYAMA	DS-60		相互結線図
SCALE	MASS kg		NAME JUNCTION BOX
DWG. No. C7264-C02- C	REF. No. 66-031-4501-0		INTERCONNECTION DIAGRAM

FURUNO ELECTRIC CO., LTD.