

Installation Manual

RADAR SENSOR

Model DRS4D X-Class

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SAFETY INFORMATION

Read these safety instructions before you operate or install the equipment.



WARNING

Indicates a condition that can cause death or serious injury if not avoided.



CAUTION

Indicates a condition that can cause minor or moderate injury if not avoided.



Warning, Caution



Prohibitive Action



Mandatory Action



WARNING

Radio Frequency Radiation Hazard

The radar antenna sends the electromagnetic radio frequency (RF) energy. This energy can be dangerous to you, especially your eyes. Do not look at the radiator or near the antenna when the antenna is rotating.

The distances at which RF radiation levels of 100 W/m², 50 W/m² and 10 W/m² exist are shown in the table below.

Note: If the antenna unit is installed at a close distance in front of the wheel house, prevent the transmission in that area to protect passengers and crew from microwave radiation. See Sector Blanking in chapter 2.

Distance to 100 W/m ² point	Distance to 50 W/m ² point	Distance to 10 W/m ² point
N/A	0.53 m	1.7 m



Do not open the equipment.

The equipment uses high voltage that can cause electrical shock. Refer any repair work to a qualified technician.



Wear a safety belt and hard hat when working on the antenna unit.

Serious injury or death can result if someone falls from the radar mast.



WARNING



Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.



To prevent falls when working at heights, secure a service scaffolding or landing at the installation location of the antenna.



For the power supply, use a voltage suitable for the rated voltage of the device.

Using a voltage outside the rated voltage may cause a fire or equipment failure.



Turn off the power at the switchboard before beginning the installation.

If the work is done with the power turned on, there is a risk of electric shock or fire.



If the equipment is giving off smoke or fire, immediately turn off the power at the switchboard.

Fire or electrical shock can result.









Use the specified connection cables and fuses.





Use of other cables or fuses may cause a serious accident or fire.





If water leaks into the equipment turn off the power at the switchboard.


Fire, electrical may result.

 CAUTION	
	Install the antenna where only technicians can access it, such as the radar mast.
	To turn the power of this unit on or off, connect it to the onboard power supply via a disconnection device such as a breaker.
	Ground the equipment. Poor grounding can cause interference from other equipment or interfere with other equipment.
	Follow the instructions in this manual to ensure that the equipment is properly installed and that all related equipment is properly connected.
	In some countries a radio license is required to install a radar. For details, contact a FURUNO agent or dealer.

 CAUTION							
	The data presented by this equipment is intended as a source of navigation information. The prudent navigator never relies exclusively on any one source of navigation information, for safety of vessel and crew.						
	Observe the following compass safe distances to prevent interference to a magnetic compass. <table border="1" data-bbox="906 616 1388 739"> <thead> <tr> <th>Unit</th> <th>Standard Compass</th> <th>Steering Compass</th> </tr> </thead> <tbody> <tr> <td>Antenna unit</td> <td>1.70 m</td> <td>1.05 m</td> </tr> </tbody> </table>	Unit	Standard Compass	Steering Compass	Antenna unit	1.70 m	1.05 m
Unit	Standard Compass	Steering Compass					
Antenna unit	1.70 m	1.05 m					
	Do not use high-pressure cleaners to clean this equipment. This equipment has the waterproof rating outlined in the equipment specifications. However, the use of high-pressure cleaning equipment can cause water ingress, resulting in damage to, or failure of, the equipment.						





Target Tracking (TT) safety information

 WARNING	
	The TT function is a valuable aid to navigation. However, the navigator must check all aids available to avoid collision. <ul style="list-style-type: none"> - The TT automatically tracks an automatically or manually acquired radar target and calculates its course and speed, indicating them with a vector. Since the data generated by the TT depends on the selected radar targets, the radar must be optimally tuned for use with the TT, to ensure required targets will not be lost or unnecessary targets, like sea returns and noise, will not be acquired and tracked. - A target is not always a landmass, reef, ship, but can also be returns from the sea surface and from clutter. As the level of clutter changes with the environment, the operator must correctly adjust the sea and rain clutter controls and the gain control so that the target echoes do not disappear from the radar screen.

 CAUTION	
The plotting accuracy and response of this TT meets IMO standards. Tracking accuracy is affected by the following: <ul style="list-style-type: none"> • Tracking accuracy is affected by course change. One to two minutes is required to restore vectors to full accuracy after an abrupt course change. (The actual amount depends on gyrocompass specifications.) • The amount of tracking delay is inversely proportional to the relative speed of the target. Delay is approx. 15-30 seconds for the higher relative speed; approx. 30-60 seconds for the lower relative speed. The following factors can affect accuracy: <ul style="list-style-type: none"> - Echo intensity - Radar transmission pulse length - Radar bearing error - Heading sensor error - Course change (own ship and targets) 	

Warning Label(s)

Warning label(s) is(are) attached to the equipment. Do not remove the label(s).
If a label is missing or damaged, contact a FURUNO agent or dealer about replacement.

 WARNING 	 警告 
To avoid electrical shock, do not remove cover. No user-serviceable parts inside.	感電の恐れあり。 サービスマン以外の方はカバーを開け ないで下さい。内部には高電圧部分が 数多くあり、万一さわると危険です。

Name: Warning Label (2)
Type: 03-129-1001-3
Code No.: 100-236-743

Importer in Europe

The following concern acts as our importer in Europe, as defined in
DECISION No 768/2008/EC.

- Name: FURUNO EUROPE B.V.
- Address: Ridderhaven 19B, 2984 BT Ridderkerk, The Netherlands

Importer in UK

The following concern acts as our importer in UK, as defined in SI 2016/1025
as amended SI 2019/470.

- Name: FURUNO (UK) LTD.
- Address: West Building Penner Road Havant Hampshire PO9 1QY, U.K.

Program No.

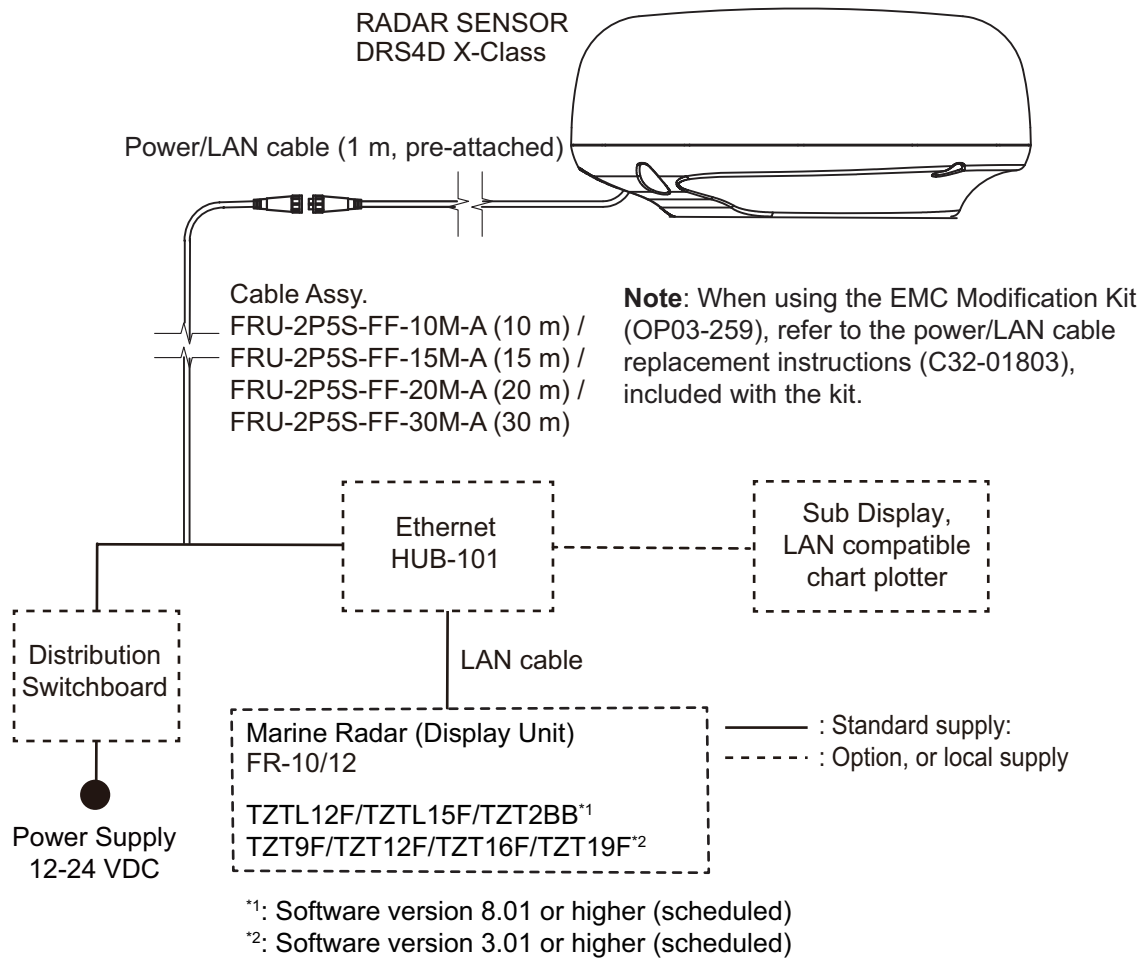
- 0359517-01.**

** Denotes minor modifications.

CE declarations

With regard to CE declarations, please refer to our website (www.furuno.com),
for further information about RoHS conformity declarations.

SYSTEM CONFIGURATION



EQUIPMENT LISTS

Standard supply

Name	Type	Code No.	Qty	Remarks
Radar Sensor	RSB-143-128	-	1	
Installation Materials	CP03-37001	001-552-170	1	
	CP03-38500	000-035-186	Select one	Power/LAN cable 10 m
	CP03-38510	000-035-187		Power/LAN cable 15 m
	CP03-38520	000-035-188		Power/LAN cable 20 m
	CP03-38530	000-035-189		Power/LAN cable 30 m
Spare Parts	SP03-19401	001-552-160	1	Fuses (FRU-60C-FU-5A)
Installation Guide	J32-02105-A	000-199-071	1	
Template	C32-00702-*	000-167-458	1	

Optional supply

Name	Type	Code No.	Remarks
Joint Box Note: After connecting, wrap with self-bonding tape and vinyl tape to protect the connector joints from water ingress.	TL-CAT-012	000-167-140	For LAN cable extension
LAN Cable	MOD-Z072-020+	000-167-880	2 m
	MOD-Z072-050+	000-167-890	5 m
	MOD-Z072-100+	000-167-900	10 m
EMC Modification Kit	OP03-259-1	001-524-010	w/10 m cable
	OP03-259-2	001-524-020	w/15 m cable
	OP03-259-3	001-524-030	w/20 m cable
	OP03-259-4	001-524-040	w/30 m cable
Radome Mount	OP03-208	001-078-340	
Retractable Mast Waterproofing Kit			

1. INSTALLATION

1.1 Installation Considerations

NOTICE

Do not use paint, anti-corrosion products, contact spray or other items containing organic solvents on the equipment.

Organic solvents can harm paint and plastic, particularly the connectors.

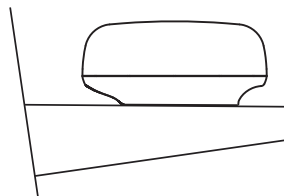
- To ensure proper emission of radar waves, do not paint the radome.
- Install the unit on a common mast, radar mast, etc.
- Make sure the mounting location does not allow water to accumulate on the mounting platform.
- Do not cut the power/LAN cable.

Distribution switchboard

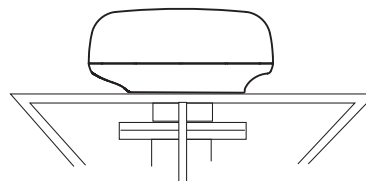
This antenna unit does not have a power switch. Connect to the onboard power supply via a distribution switchboard so that the power to the antenna unit can be turned on/off.

Mounting position

- The antenna unit is mounted on a radar arch, a common mast or radar mast, a dedicated mounting base, etc.



(a) Common mast



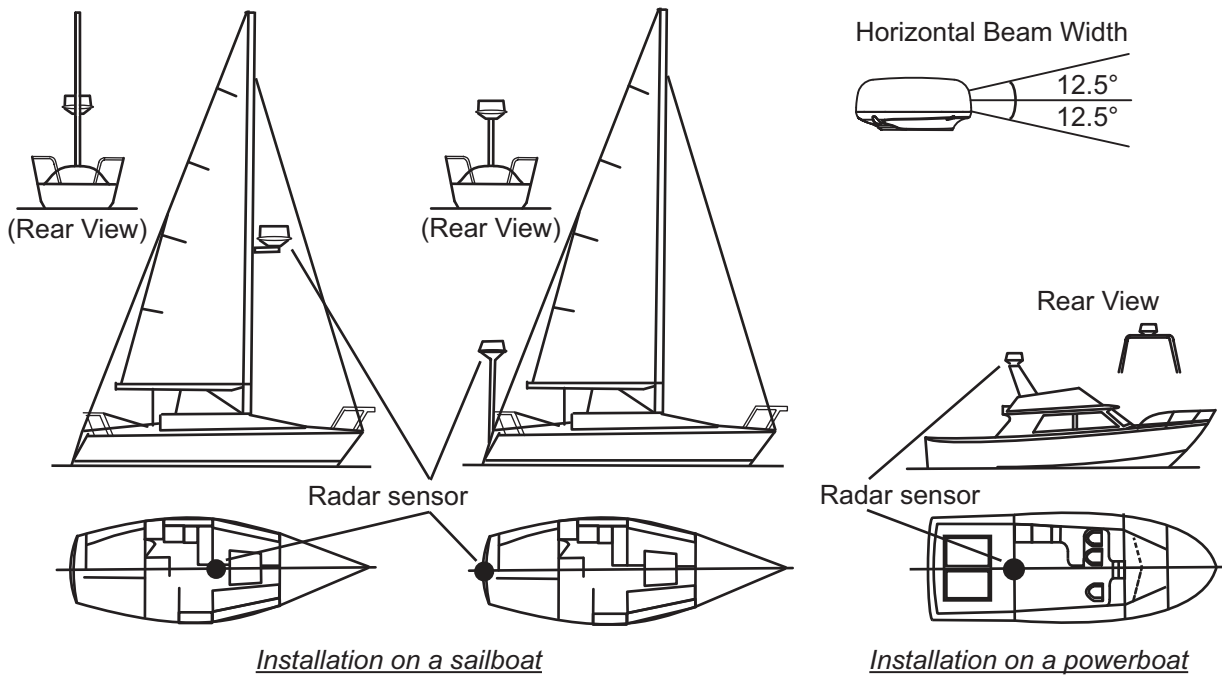
(b) Radar mast

For installation on a sailboat, use the optional radome mount.

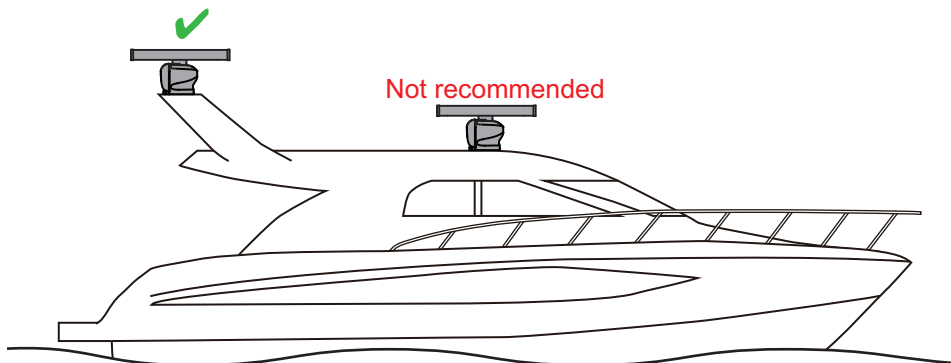
- Install the antenna unit in a place with a good view as much as possible and no obstruction around the unit. Select a place where there is no chimney or mast in the bow direction. If there are obstacles, a blind spot for radio waves will occur and no images will appear on the display in that area. In addition, the performance of the antenna unit (beam width and side lobe level) may be reduced, and false images may appear. A mast with a diameter smaller than the radiation width of the antenna unit will produce a small blind spot, but if there is a horizontal plane at the same height as the antenna unit, a large blind spot will result. Choose a position that is well above the horizontal plane.
- Select a location near the radar (within 1 m in diameter) where there are no large structures such as masts.

1. INSTALLATION

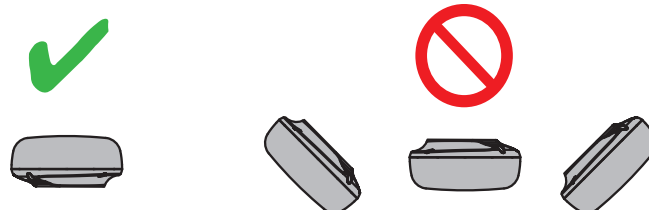
- It is almost impossible to install the antenna unit in a place where there are no obstacles all around. When checking the operation, check if there is a blind spot. if there is a blind spot, note the direction.



- Avoid mounting directly above the cabin where crew (occupants) are present, as the motor drive noise of the antenna may echo inside the cabin.



- Observe the compass safe distances mentioned in the safety instructions, to prevent interference to a magnetic compass.
- Referring to the outline drawings at the back of this manual, allow space for maintenance and service.
- The antenna unit should not be operated or stored in any position other than the proper operational position (upright).



- Use the optional waterproof kit when using a retractable mast.

Installation with radio equipment

- Install the antenna unit away from radio antennas (SSB, VHF, Inmarsat) and GPS antenna.
- Install the antenna unit away from radio receivers to prevent electromagnetic interference to the radio.

Cabling

- To prevent noise, do not lay the cables of this unit near or in parallel with the power cables of other electronic devices.
- When laying the cable of the antenna unit in parallel with the cables of radio equipment, use the cable supplied with the EMC Modification Kit and separate all cables at least 1.5 m from one another.
- Be sure that the power/LAN cable and cable assembly are not run parallel to each other. Also, locate those cables well away from other signal cables and antennas.

Installation on large vessels

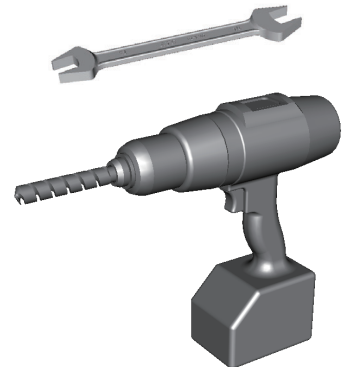
- The antenna unit cable comes in lengths of 10, 15 and 20 m (30 m optionally available). Consider the length of the cable when selecting a mounting location.
- Keep the unit away from smoke and exhaust stacks. Hot air affects antenna performance. Hot air can also damage the unit. The temperature at the mounting location should not exceed 55°C (131°F).

1.2 Necessary Tools and Materials

The following tools are necessary to complete the installation.

Name	Usage
Electric drill	Drill holes for mounting. Drill bit: $\phi 11$ mm
Hexagonal wrench	For fastening bolts (M10).
Self-bonding tape*	For waterproofing connector junction.
Vinyl tape*	
Cable tie	For securing cable.

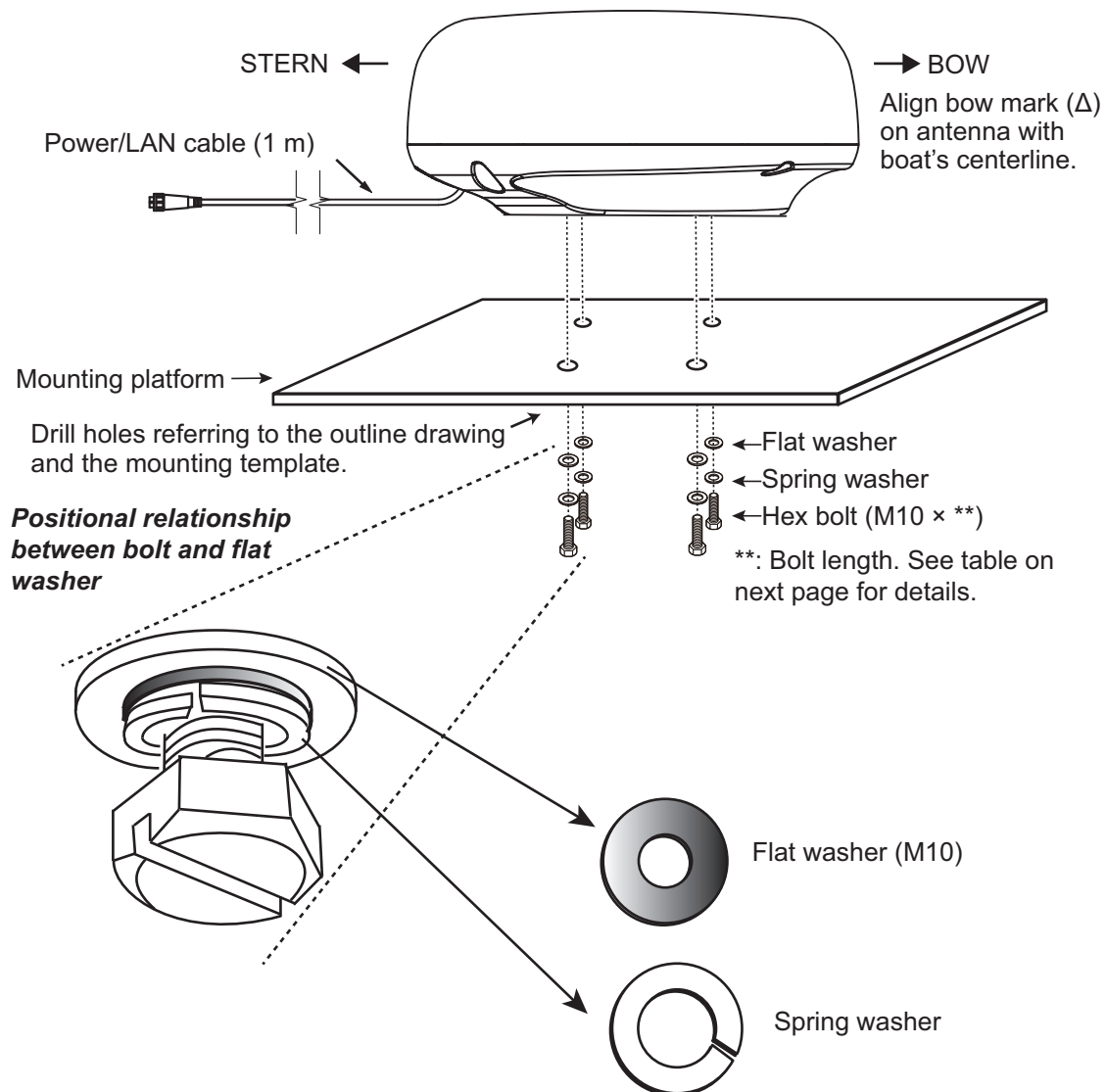
*: For aesthetic reasons, it is recommended to use the same color (black) tape as the cable.



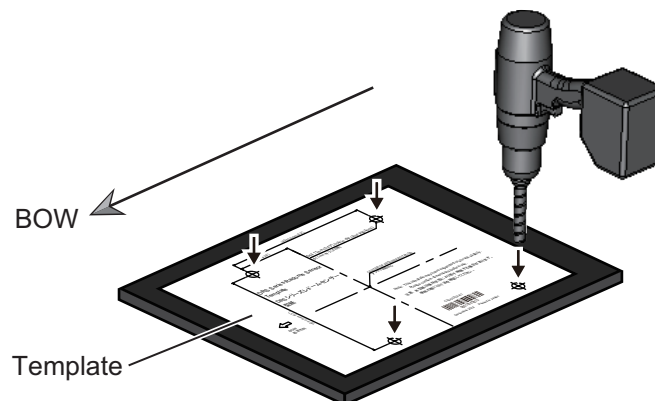
1.3 Installation of the Antenna Unit (Radar Sensor)

How to fasten the antenna unit to the mounting platform

Referring to the figure below, fasten the antenna unit to the mounting platform.



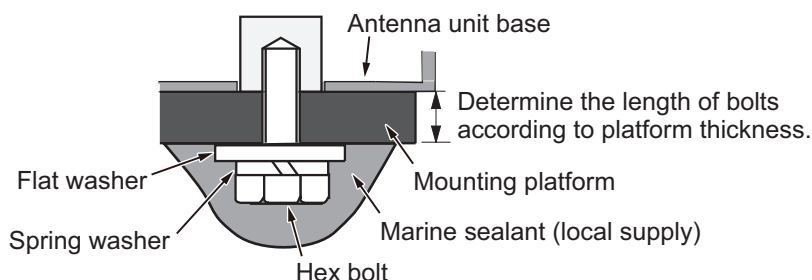
1. Use the mounting template (supplied) to mark the location of fixing holes in the mounting platform. Be sure to drill the holes parallel with the bow.



2. Lay the antenna unit on the mounting platform with the bow mark (Δ) on the antenna unit facing the bow.

3. Use the installation materials (CP03-37001), consisting of hex bolts*, flat washers and spring washers), to fasten the antenna unit to the platform. The torque for the bolts must be 19.6 to 24.5 Nm. Apply marine sealant (local supply) to the hex bolts, flat washers and spring washers as shown below.

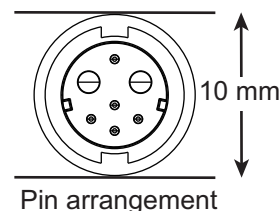
*: See the table below to determine the bolt length to use.



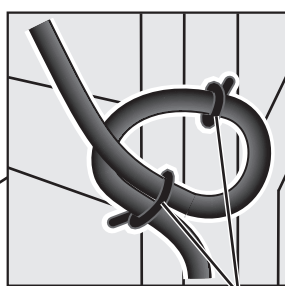
Platform thickness and bolt to use

Platform thickness	Size of bolts to use
6 to 10 mm	M10×25 (Supplied as installation material)
Over 10 mm	Supply locally.

4. Connect the power/LAN cable from the antenna unit. The connector pin arrangement is as shown to the right. Observe the below guidelines for laying the power/LAN cable.



- Do not fasten the cable to the hull.
- If radar noise is interfering with VHF radio equipment, use the cable supplied with the EMC Modification Kit in place of the LAN/power cable, and separate the cable at least 1.5 m from the radio cable.
- Make sure the cable connector does not strike the hull because of wind, etc.
- If the cable is passed through a mast on a sailboat, be sure the cable does not touch ropes (sheet, halyard, etc.).
- The cable must be secured so no tension is applied to its connectors. As shown in the figure below, create a loop in the cable close to the unit and secure the loop with cable ties.

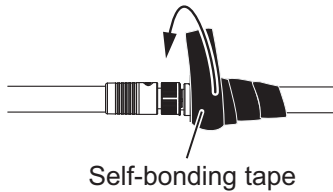


Loop cable and secure loop with cable ties.
The minimum bend radius is 242 mm.

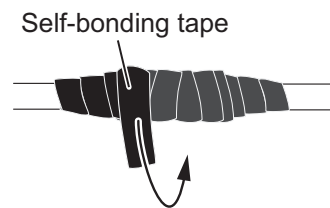
1. INSTALLATION

- For waterproofing, wrap the junction of the connectors with self-bonding tape and vinyl tape.

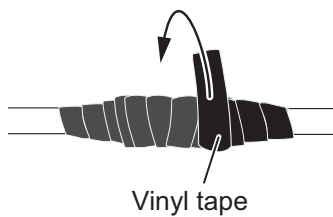
1) Wind one layer of the self-bonding tape around the connector joint.



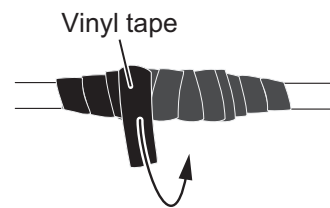
2) Change the winding direction and wind one layer of the self-bonding tape again.



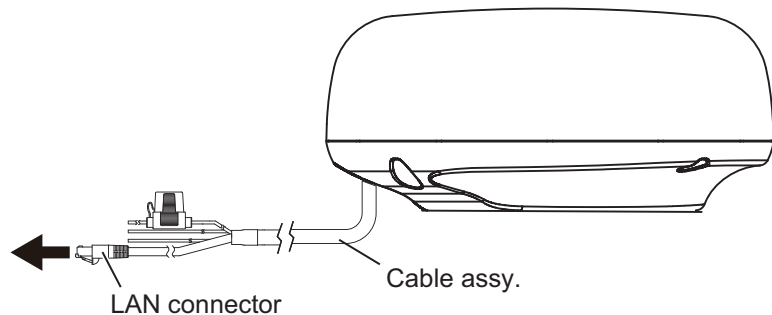
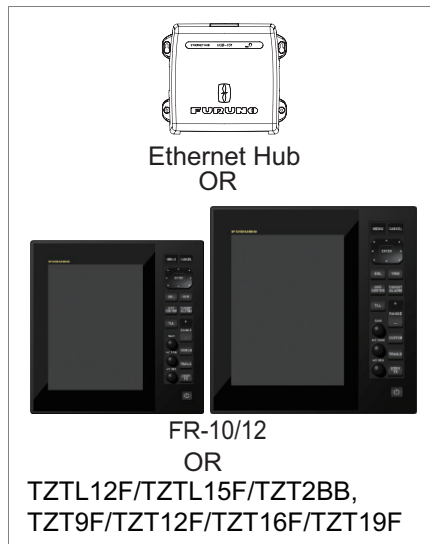
3) Wind one layer of the vinyl tape over the self-bonding tape.



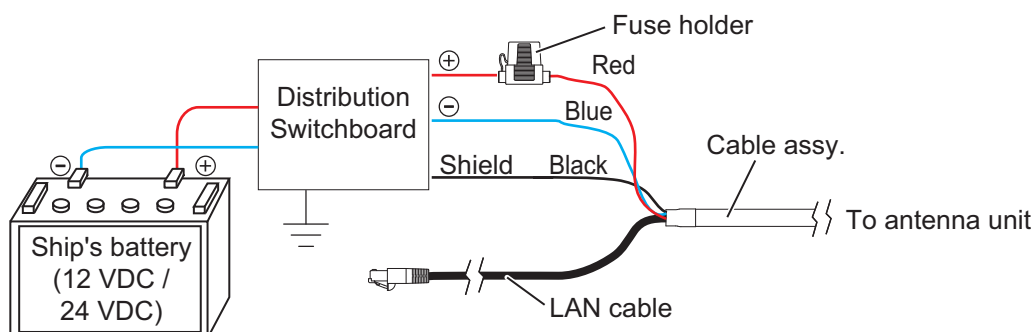
4) Change the winding direction and wind one layer of vinyl tape again.



- Insert a fuse in the fuse holder on the cable, referring to the instructions "HOW TO ATTACH THE FUSE" (C32-01604-**), supplied with the cable. Attach the supplied fuse rating label (5A) on the fuse holder cover.
- Connect the LAN connector of the cable to the LAN port of FR-10/12, TZTL12F/TZTL15F/TZT2BB, TZT9F/TZT12F/TZT16F/TZT19F, or the Ethernet Hub. Do not connect to the onboard LAN.



7. Connect the power wires to the ship's battery (12 VDC or 24 VDC).
- **Red wire:** Connect to the positive (+) terminal. The red wire has the fuse holder.
 - **Blue wire:** Connect to the negative (–) terminal.
 - **Black wire:** The black wire is a shielding wire for grounding.



Note 1: There is no power switch on the antenna unit. Connect to the onboard power supply via a distribution switchboard so that you can power the antenna unit on and off. Even when the power to the display unit (FR-10/12, TZTL12F/TZ-TL15F/TZT2BB, TZT9F/12F/16F/19F) is turned off, standby power (13W) is generated because the power is supplied to the antenna unit. Be sure to turn off the breaker if you do not use the radar when powering from the battery.

Note 2: The antenna unit cannot accept input voltage of more than 24 VDC.

Radome mount

The optional radome mount is for installing the antenna unit on a mast on a sailboat.

Name, Type: Radome Mount, OP03-208

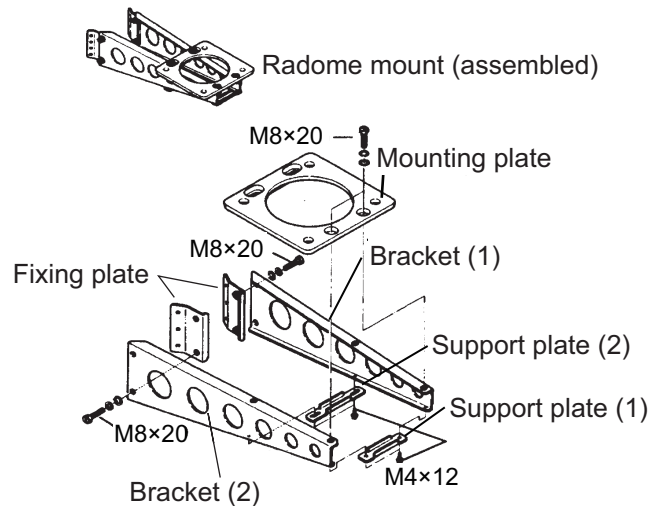
Code No.: 001-078-340

Name	Type	Code No.	Qty
Mounting Plate	03-018-9001-0	100-206-740	1
Bracket (1)	03-018-9005-0	100-206-780	1
Bracket (2)	03-018-9006-0	100-206-790	1
Support Plate (1)	03-028-9002-3	100-206-753	1
Support Plate (2)	03-028-9003-3	100-206-763	1
Fixing Plate	03-028-9004-3	100-206-773	2
Hex Bolt B	M8×20 SUS304	000-162-955	10
Hex Bolt B	M4×12 SUS304	000-162-956	4

1. INSTALLATION

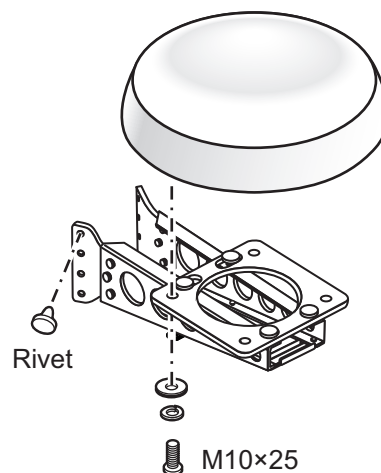
How to assemble the bracket:

1. Fasten the fixing plates to brackets (1) and (2) with four M8×20 hex bolts.
2. Using four M4×12 hex bolts, loosely fasten support plates (1) and (2) to brackets (1) and (2), so that the gap between the brackets can be adjusted later.
3. Place the mounting plate on the brackets and loosely fasten it with four M8×20 hex bolts.



How to fasten the radome mount to the mast:

1. Drill eight holes of 6.5 mm diameter in the mast. Fasten the bracket to the mast with eight stainless steel rivets (local supply) whose diameter is 6.4 mm.
2. Tighten the bolts on the bracket.
3. Fasten the antenna unit to the bracket with four sets of flat washers, split washers, and bolts (M10×25).



2. INITIAL SETUP

2.1 Connections

2.1.1 Power requirements

The antenna unit requires either 12 VDC or 24 VDC power. Connect the red cable of the cable assembly to the positive terminal of the distribution switchboard and the blue wire to the negative terminal of the distribution switchboard. The black wire is a shielded wire; connect it to the hull ground.

2.1.2 LAN cable connection

Connect the LAN cable to the display unit (FR-10/12, TZTL12F/TZTL15F/TZT2BB, TZT9F/12F/16F/19F) or the Ethernet Hub HUB-101.

2.2 Checks After Installation

Do the following before using the equipment.

- Perform a mechanical inspection.
- Power the unit and make the initial settings.

Mechanical inspection

Check the following before powering the equipment.

- All flat washers are in the correct position and tightly fastened.
- All connection points are correctly connected.
- All cables are connected.
- The LAN cable is connected to the display unit (FR-10/12, TZTL12F/TZTL15F/TZT2BB, TZT9F/12F/16F/19F).

Initial setup

Refer to the information described in this manual and the manual of the display unit (FR-10/12, TZTL12F/TZTL15F/TZT2BB, TZT9F/12F/16F/19F) to do the initial setup.

1. Power the radar sensor and the display unit. Warm up of the magnetron begins.
2. If communication between the display unit and this unit is established, a count-down or "preparation" appears on the display. If not displayed, check that the radar sensor is connected to the display unit and that the settings on the display unit are correct (see the operator's manual for the display unit).
3. Transmit and confirm that radar echoes appear on the display.
 - If the FR-10/12 is connected as a display unit, set the following items. For other display units, confirm and set the antenna rotation speed, align the heading, suppress the main bang, set sector blanking area(s), set the tuning mode, and tune the radar manually. See the display unit's installation manual for the procedure.

([Installation Setup] menu)

Menu item	Description
[Antenna Rotation]	Set the antenna rotation speed (Settings: Auto, 24 rpm).
[Antenna Heading Align]	See "How to align the antenna heading." <ul style="list-style-type: none"> • Make sure the heading line is displayed in the correct direction. Check that targets are displayed in the correct direction with respect to the bow.
[Sweep Timing]	Adjust the sweep timing (Setting range: -10 to 10).
[Main Bang Suppression]	If main bang appears at the screen center, slide the circle icon, while watching the radar echo on the left-side of the display, until the main bang disappears.

Note: The items on the [Installation Setup] menu come into effect after completing the following settings.

- 1) Press the [MENU] key to open the menu.
- 2) While pressing and holding down the [ESC/HL OFF] key, press the [MENU] key five times.

([Sector Blanking] menu)

Menu item	Description
[Enable Sector Blanking 1], [Enable Sector Blanking 2]	Up to two sectors may be set for blanking (no transmission). Select [ON] to enable this feature. Set the start and end angles (0° to 359°).

([Tuning/TX Channel] menu)

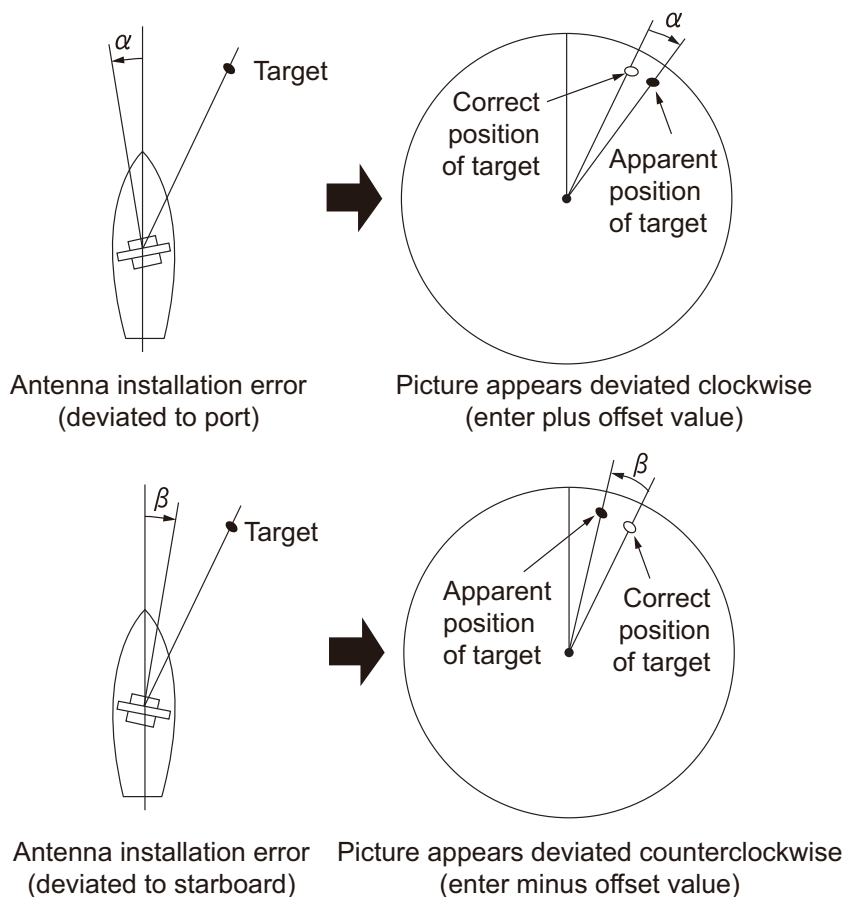
Menu item	Description
[Tuning Mode]	Set the tuning mode, automatic or manual, for the connected radar
[Manual Tuning]	Manually tune the radar. Not available when [Tuning Mode] is [Auto].
[Tuning Initialization]	If the radar cannot be tuned, initialize tuning.

2. INITIAL SETUP

How to align the antenna heading

You have mounted the antenna unit facing straight ahead in the direction of the bow. Therefore, a small but conspicuous target dead ahead visually should appear on the heading line (zero degrees).




You may observe a minor bearing error on the display. This is due to the difficulty in orienting the antenna unit accurately. The following adjustment will compensate for the error.



1. Select a range between 0.125 and 0.25 NM and set the mode to "head up".
2. Turn the vessel's bow toward a target.
3. Press the [MENU] key to open the menu.
4. While pressing and holding down the [ESC/HL OFF] key, press the [MENU] key five times.
5. Open the [Installation Setup] menu.
6. Select [Antenna Heading Align].
7. Key in an offset value so that the target is at the very top of the screen (setting range: 0.0° to 359°) then press the [ENT] key. Enter a plus value if the deviation is clockwise; minus value if the deviation is counterclockwise.
8. Confirm that the target echo is displayed at correct bearing on the screen.

3. MAINTENANCE, TROUBLESHOOTING

This chapter describes the maintenance and troubleshooting procedures which the user can follow to maintain the performance of the equipment and restore normal operation. Before performing any maintenance or inspection, review the information below and the safety instructions at the beginning of this manual. If normal operation cannot be restored, do not attempt to check inside the equipment. Contact a FURUNO agent or dealer for service.

 WARNING	NOTICE
 DO NOT OPEN THE SENSOR. Electrical shock hazard There are no user-serviceable parts inside. Only qualified personnel are allowed to work inside the equipment.	<p>Do not use paint, anti-corrosion products, contact spray or other items containing organic solvents on the equipment.</p> Organic solvents can harm paint and plastic, particularly the connectors.
 Wear a safety belt and hard hat when working on the sensor. Serious injury or death can result if someone falls from the radar mast.	

3.1 Maintenance

Regular maintenance is important for good performance. Check the points mentioned below every 3 to 6 months to keep the sensor in good working order. Observe the safety instructions at the front of this manual when working on the mast.

Check	Checkpoint	Action
Cabling	Confirm that all cabling is tightly connected and is not damaged.	<ul style="list-style-type: none"> Confirm that all cables are firmly connected. If a cable is damaged, replace it.
Nuts and bolts of antenna unit	Nuts and bolts are exposed to sea breeze and wind and rain, and corrode over time. Check for corrosion and looseness.	<ul style="list-style-type: none"> Replace corroded bolts. Tighten loosened bolts. Coat new bolts and nuts with marine sealant.
Ground terminal of antenna unit	Confirm that the ground terminal is not loose or rusted, and that the ground wire is securely fastened.	<ul style="list-style-type: none"> Tighten loosened ground wire. If rust is present, remove it.

3.2 Troubleshooting


The table below provides simple troubleshooting procedures which the user can follow to restore normal operation. If you cannot restore normal operation, contact your dealer for advice.


Trouble	Remedy
The display shows "No radar" and radar does not go into stand-by.	<ul style="list-style-type: none"> • Check if power is being supplied to the antenna unit. • Check if the power supply is the rated voltage of the device (12/24 VDC) • Check if the fuse (in the cable assy.) has blown. • Check all cables for damage. • Check that the software version of the display unit is compatible with the antenna unit.
The equipment goes into stand-by after start up. However, no radar echoes appear after transmitting. Then, radar echoes disappear and the message "No radar" appears.	<ul style="list-style-type: none"> • Check the power supply voltage and capacity. • Check that all cables are securely connected. • Check all cables for damage.
In TX state, no echoes appear or echoes are faint.	Check that tuning, gain, sea clutter, and rain clutter are properly adjusted.
Echoes are faint even if the tuning is adjusted or the sensitivity is increased.	The magnetron in the antenna unit may have deteriorated. Contact a FURUNO agent or dealer about replacement of the magnetron.
Echoes appear only in some areas and are faint.	<ul style="list-style-type: none"> • Check the sector blank settings. • Check for obstructions around the antenna.
Echoes are displayed where there is no targets.	False images can occur due to various factors. Adjust the sensitivity, sea clutter, etc. appropriately.

3.3 Replacement of Fuse

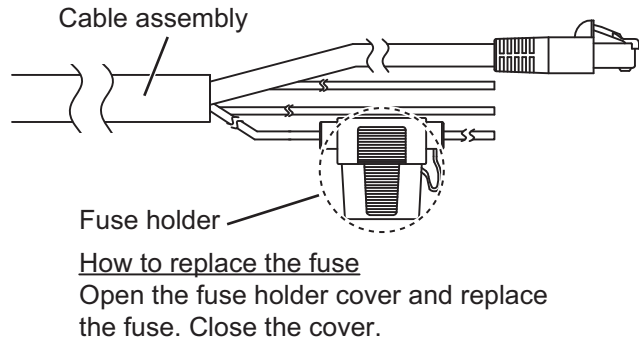
The fuse in the supplied cable assembly protects the equipment from overcurrent and equipment fault. If the fuse blows, find the cause before replacing the fuse. Use the correct fuse. A wrong fuse can cause fire, injury, or damage the equipment. If the fuse blows again, contact your dealer for advice.

Name	Type	Code No.
Fuse	FRU-60V-FU-5A	000-194-913


WARNING



Use the proper fuse.
Use of a wrong fuse can cause fire, injury, or damage the equipment.



3.4 Replacement of Parts

Magnetron

When the life of the magnetron is reached, targets are faint and eventually no targets appear on the display. If this occurs, contact a FURUNO agent or dealer about replacement of the magnetron.

Name	Type	Code No.	Estimated life
Magnetron	M1653	000-199-065	Approx. 5,000 hours

Antenna motor

When the antenna motor reaches the end of its life, the antenna may stop rotating or emit abnormal noise. If you experience any of those symptoms, contact a FURUNO agent or dealer about replacement of the antenna motor.

Name	Type	Code No.	Estimated life
Motor	RM-00376	000-198-794	Approx. 5,000 hours

APPENDIX 1 RADIO REGULATORY INFORMATION

USA-Federal Communications Commission (FCC)

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation. Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Caution: Exposure to Radio Frequency Radiation

- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET65.
- This equipment should be installed and operated keeping the radiator at least 170 cm or more away from person's body.
- This device must not be co-located or operating in conjunction with any other antenna or transmitter.

Innovation, Science and Economic Development Canada (ISED)

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil contient un ou plusieurs émetteurs / récepteurs exempts de licence qui sont conformes à la norme « exempts de licence RSS (s) » Canadienne d'Innovation, Sciences et Développement économique. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage.
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Caution: Exposure to Radio Frequency Radiation

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment and meets RSS-102 of the ISED radio frequency (RF) Exposure rules. This equipment should be installed and operated keeping the radiator at least 170 cm or more away from person's body.

Cet équipement est conforme aux limites d'exposition aux rayonnements énoncées pour un environnement non contrôlé et respecte les règles d'exposition aux fréquences radioélectriques (RF) CNR-102 de l'ISED. Cet équipement doit être installé et utilisé en gardant une distance de 170 cm ou plus entre le dispositif rayonnant et le corps.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication.

SPECIFICATIONS OF RADAR SENSOR DRS4D X-Class

1 GENERAL

- 1.1 Antenna type Patch array antenna
- 1.2 Antenna length 24-inch
- 1.3 Horizontal beam width 4.0° typical
- 1.4 Vertical beam width 25° typical
- 1.5 Sidelobe attenuation -24 dB (within 20° of main-lobe)
- 1.6 Rotation 24/36/48 rpm coupled with range or 24 rpm fixed (select)

2 RADAR FUNCTION

- 2.1 Tx frequency 9410 ±30 MHz (P0N)
- 2.2 Output power 4 kW nominal
- 2.3 Range, Pulse Length (PL) and Pulse Repetition Rate (PRR)

Range (NM)	PL	PRR (Hz approx.)
0.0625 to 1	S1	3000
0.5 to 2	S2	3000
1 to 3	M1	1500
2 to 6	M2	1000
3 to 12	M3	600
6 to 48	L	600

- 2.4 Minimum range 25 m
- 2.5 Range resolution 25 m
- 2.6 Bearing accuracy ±4°
- 2.7 Warm-up time 90 s approx.

3 INTERFACE

- 3.1 Number of port LAN: 1 port, Ethernet, 100Base-TX, RJ45

4 POWER SUPPLY

12-24 VDC (10.8-31.2 V): 2.3-1.1 A, ST-BY: 1.1-0.5 A

5 ENVIRONMENTAL CONDITIONS

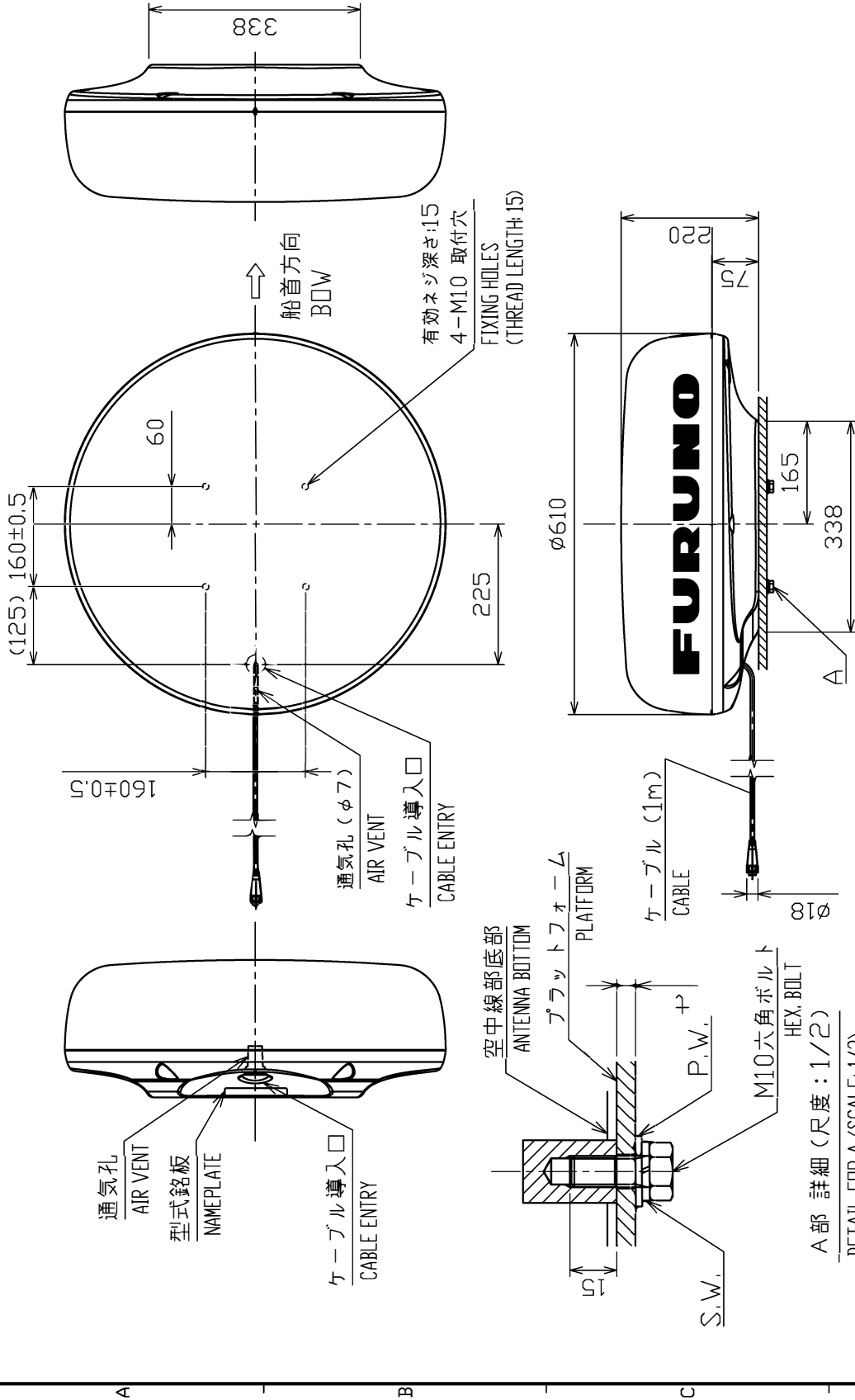
- 5.1 Ambient temperature -25°C to +55°C (storage: -30°C to +70°C)
- 5.2 Relative humidity 93% or less at +40°C
- 5.3 Degree of protection IP26
- 5.4 Vibration IEC 60945 Ed.4

6 UNIT COLOR

N9.5

表1 TABLE 1

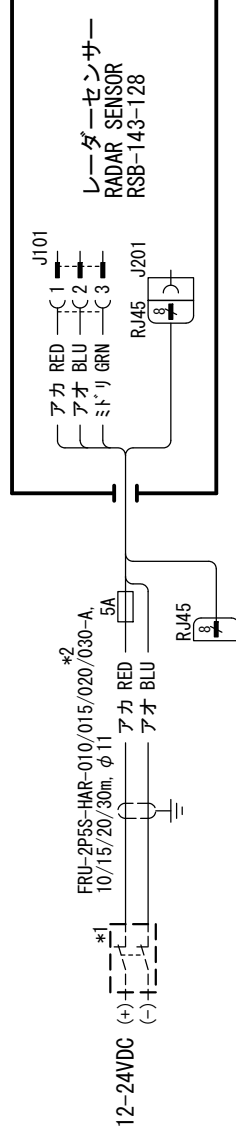
寸法区分 (mm) DIMENSION	公差 (mm) TOLERANCE
L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3



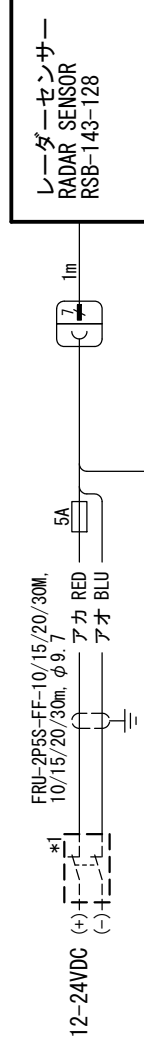
- 注記 1) 指定外の寸法公差は表 1 による。
 2) 取付ネジは M10 ボルトを使用のこと。ネジ長さは、板厚 t に応じて 25 (5 < t ≤ 10) または 30 (10 < t ≤ 15) とする。

- NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
 2. USE M10 BOLTS FOR FIXING THE UNIT. SCREW LENGTH SHOULD BE 25 (5 < t ≤ 10) OR 30 (10 < t ≤ 15). t: THICKNESS OF PLATFORM.

DRAWN	27/AUG/2021	T. YAMASAKI	TITLE	DRS4D X-CLASS
CHECKED	27/AUG/2021	H. MAKI	名称	レーダーセンサー
APPROVED			外図	
SCALE	1/10	WSS 7.2	WAVE	RADAR SENSOR
INCHES	C3689-G01-A	REF. NO.	03-203-3005-1	OUTLINE DRAWING



OR
または



または OR

マルチファンクションディスプレイ
MULTI FUNCTION DISPLAY
TZTL12F/15F, TZ12BB
TZ19F/12F/16F/19F

船舶用レーダー
MARINE RADAR
FR-10/12

品類

- * 1) 現地手配。
- * 2) オプシヨh。

NOTE

- *1: LOCAL SUPPLY.
*2: OPTION.

DRAWN	12/Oct/2021	T. YAMASAKI				TITLE
CHECKED	12/Oct/2021	H. MAKI				名称
APPROVED						
SCALE		MASS	kg			相互結線図
DWG No.						NAME
						RADAR SENSOR
						INTERCONNECTION DIAGRAM

Declaration of Conformity

[DRS4D X-Class]

Bulgarian (BG)	С настоящото Furuno Electric Co., Ltd. декларира, че гореспоменат тип радиосъоръжение е в съответствие с Директива 2014/53/ЕС, СИ 2017/1206. Цялостният текст на ЕС/УК декларацията за съответствие може да се намери на следния интернет адрес:
Spanish (ES)	Por la presente, Furuno Electric Co., Ltd. declara que el tipo de equipo radioeléctrico arriba mencionado es conforme con la Directiva 2014/53/UE, SI 2017/1206. El texto completo de la declaración de conformidad de la EU/UK está disponible en la siguiente dirección Internet:
Czech (CS)	Tímto Furuno Electric Co., Ltd. prohlašuje, že výše zmíněné typ rádiového zařízení je v souladu se směrnicí 2014/53/EU, SI 2017/1206. Úplné znění EU/SK prohlášení o shodě je k dispozici na této internetové adrese:
Danish (DA)	Hermed erklærer Furuno Electric Co., Ltd., at ovennævnte radioudstyr er i overensstemmelse med direktiv 2014/53/EU, SI 2017/1206. EU/UK-overensstemmelseserklæringens fulde tekst kan findes på følgende internetadresse:
German (DE)	Hiermit erklärt die Furuno Electric Co., Ltd., dass der oben genannte Funkanlagentyp der Richtlinie 2014/53/EU, SI 2017/1206 entspricht. Der vollständige Text der EU/UK-Konformitätserklärung ist unter der folgenden Internetadresse verfügbar:
Estonian (ET)	Käesolevaga deklareerib Furuno Electric Co., Ltd., et ülalmainitud raadioseadme tüüp vastab direktiivi 2014/53/EL, SI 2017/1206 nõuetele. EL/GB vastavusdeklaratsiooni täielik tekst on kättesaadav järgmisel internetiaadressil:
Greek (EL)	Με την παρούσα η Furuno Electric Co., Ltd., δηλώνει ότι ο προαναφερθέντας ραδιοεξοπλισμός πληροί την οδηγία 2014/53/ΕΕ, SI 2017/1206. Το πλήρες κείμενο της δήλωσης συμμόρφωσης ΕΕ/ΥΚ διατίθεται στην ακόλουθη ιστοσελίδα στο διαδίκτυο:
English (EN)	Hereby, Furuno Electric Co., Ltd. declares that the above-mentioned radio equipment type is in compliance with Directive 2014/53/EU, SI 2017/1206. The full text of the EU/UK declaration of conformity is available at the following internet address:
French (FR)	Le soussigné, Furuno Electric Co., Ltd., déclare que l'équipement radioélectrique du type mentionné ci-dessus est conforme à la directive 2014/53/UE, SI 2017/1206. Le texte complet de la déclaration UE/RU de conformité est disponible à l'adresse internet suivante:
Croatian (HR)	Furuno Electric Co., Ltd. ovime izjavljuje da je gore rečeno radijska oprema tipa u skladu s Direktivom 2014/53/EU, SI 2017/1206. Cjeloviti tekst EU/UK izjave o sukladnosti dostupan je na sljedećoj internetskoj adresi:
Italian (IT)	Il fabbricante, Furuno Electric Co., Ltd., dichiara che il tipo di apparecchiatura radio menzionato sopra è conforme alla direttiva 2014/53/UE, SI 2017/1206. Il testo completo della dichiarazione di conformità UE/RU è disponibile al seguente indirizzo Internet:
Latvian (LV)	Ar šo Furuno Electric Co., Ltd. deklarē, ka augstāk minēts radioiekārta atbilst Direktīvai 2014/53/ES, SI 2017/1206. Pilns ES/AK atbilstības deklarācijas teksts ir pieejams šādā interneta vietnē:

Lithuanian (LT)	Aš, Furuno Electric Co., Ltd., patvirtinu, kad pirmiau minėta radijo įrenginių tipas atitinka Direktyvą 2014/53/ES, SI 2017/1206. Visas ES/JK atitikties deklaracijos tekstas prieinamas šiuo interneto adresu:
Hungarian (HU)	Furuno Electric Co., Ltd. igazolja, hogy fent említett típusú rádióberendezés megfelel a 2014/53/EU, SI 2017/1206 irányelvnek. Az EU/EK-megfelelőségi nyilatkozat teljes szövege elérhető a következő internetes címen:
Maltese (MT)	B'dan, Furuno Electric Co., Ltd., niddikjara li msemmija hawn fuq-tip ta' tagħmir tar-radju huwa konformi mad-Direttiva 2014/53/UE, SI 2017/1206. It-test kollu tad-dikjarazzjoni ta' konformità tal-UE/RU huwa disponibbli f'dan l-indirizz tal-Internet li ġej:
Dutch (NL)	Hierbij verklaar ik, Furuno Electric Co., Ltd., dat het hierboven genoemde type radioapparaat conform is met Richtlijn 2014/53/EU, SI 2017/1206. De volledige tekst van de EU/VK-conformiteitsverklaring kan worden geraadpleegd op het volgende internetadres:
Polish (PL)	Furuno Electric Co., Ltd. niniejszym oświadcza, że wyżej wymieniony typ urządzenia radiowego jest zgodny z dyrektywą 2014/53/UE, SI 2017/1206. Pełny tekst deklaracji zgodności UE/UK jest dostępny pod następującym adresem internetowym:
Portuguese (PT)	O(a) abaixo assinado(a) Furuno Electric Co., Ltd. declara que o mencionado acima tipo de equipamento de rádio está em conformidade com a Diretiva 2014/53/UE, SI 2017/1206. O texto integral da declaração de conformidade da EU/UK está disponível no seguinte endereço de Internet:
Romanian (RO)	Prin prezenta, Furuno Electric Co., Ltd. declară că echipamentul radio menționat mai sus este în conformitate cu Directiva 2014/53/UE, SI 2017/1206. Textul integral al declarației de conformitate UE/RU este disponibil la următoarea adresă internet:
Slovak (SK)	Furuno Electric Co., Ltd. týmto vyhlasuje, že vyššie spomínané rádiové zariadenie typu je v súlade so smernicou 2014/53/EÚ, SI 2017/1206. Úplné EÚ/SK vyhlásenie o zhode je k dispozícii na tejto internetovej adrese:
Slovenian (SL)	Furuno Electric Co., Ltd. potrjuje, da je zgoraj omenjeno tip radijske opreme skladen z Direktivo 2014/53/EU, SI 2017/1206. Celotno besedilo izjave EU/ZK o skladnosti je na voljo na naslednjem spletnem naslovu:
Finnish (FI)	Furuno Electric Co., Ltd. vakuuttaa, että yllä mainittu radiolaitetyyppi on direktiivin 2014/53/EU, SI 2017/1206 mukainen. EU/UK-vaatimustenmukaisuusvakuutuksen täysimittainen teksti on saatavilla seuraavassa internetosoitteessa:
Swedish (SV)	Härmed försäkrar Furuno Electric Co., Ltd. att ovan nämnda typ av radioutrustning överensstämmer med direktiv 2014/53/EU, SI 2017/1206. Den fullständiga texten till EU/Storbritanniens försäkran om överensstämmelse finns på följande webbadress:

Online Resource

http://www.furuno.com/en/support/red_doc

Notice for radiated immunity

The test for the radiated immunity is performed up to 2.7 GHz only without the special condition of spot frequency being applied. There would be chance where the equipment may be interfered with allocated services in the frequency range of 2.7 GHz to 6 GHz near the harbor, the river, bank of the lake, etc.