FURUNO

OPERATOR'S MANUAL

SATELLITE COMPASS

MODEL **SC-30**

FURUNO ELECTRIC CO., LTD.

www.furuno.co.jp

IMPORTANT NOTICES

- This manual is intended for use by readers with a solid knowledge of English.
- No part of this manual may be copied or reproduced without written permission.
- If this manual is lost or worn, contact your dealer about replacement.
- The contents of this manual and equipment specifications are subject to change without notice.
- Store this manual in a convenient place for future reference.
- FURUNO will assume no responsibility for the damage caused by improper use or modification of the equipment (including software) by an unauthorized agent or a third party.
- When it is time to discard this product it must be done according to local regulations for disposal of industrial waste. For disposal in the USA, refer to the Electronics Industries Alliance (http://www.eiae.org/).

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⚠ SAFETY INSTRUCTIONS

The operator and installer must read the applicable safety instructions before attempting to install or operate the equipment.

⚠ 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, can result in minor or moderate injury.

⚠ Warning, Caution Prohibitive Action Mandatory Action

Safety instructions for the operator

⚠ WARNING

Do not open the equipment.

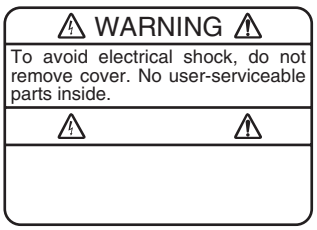
Only qualified personnel should work inside the equipment.

Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.

Warning Label

A warning label is attached to the equipment. Do not remove the label. If the label is missing or illegible, contact a FURUNO agent or dealer about replacement.



Name: Warning Label(1)
Type: 86-003-1011-1
Code No.: 100-236-231

Safety instructions for the installer

⚠ WARNING

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

Fire or electrical shock can result if the power is left on.

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

Connecting an incompatible power supply can cause fire or damage the equipment. The voltage rating appears on the inlet of power.

⚠ CAUTION

Observe the following compass safe distances to prevent interference to a magnetic compass:

	Standard compass	Steering compass
SC-30	0.40 m	0.30 m

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FOREWORD

A Word to the Owner of the SC-30

Congratulations on your choice of the FURUNO SC-30 Satellite Compass. We are confident you will see why the FURUNO name has become synonymous with quality and reliability.

For 60 years FURUNO Electric Company has enjoyed an enviable reputation for quality marine electronics equipment. This dedication to excellence is furthered by our extensive global network of agents and dealers.

This equipment is designed and constructed to meet the rigorous demands of the marine environment. However, no machine can perform its intended function unless installed properly. Please carefully read and follow the recommended procedures for installation.

Thank you for considering and purchasing FURUNO equipment.

Features

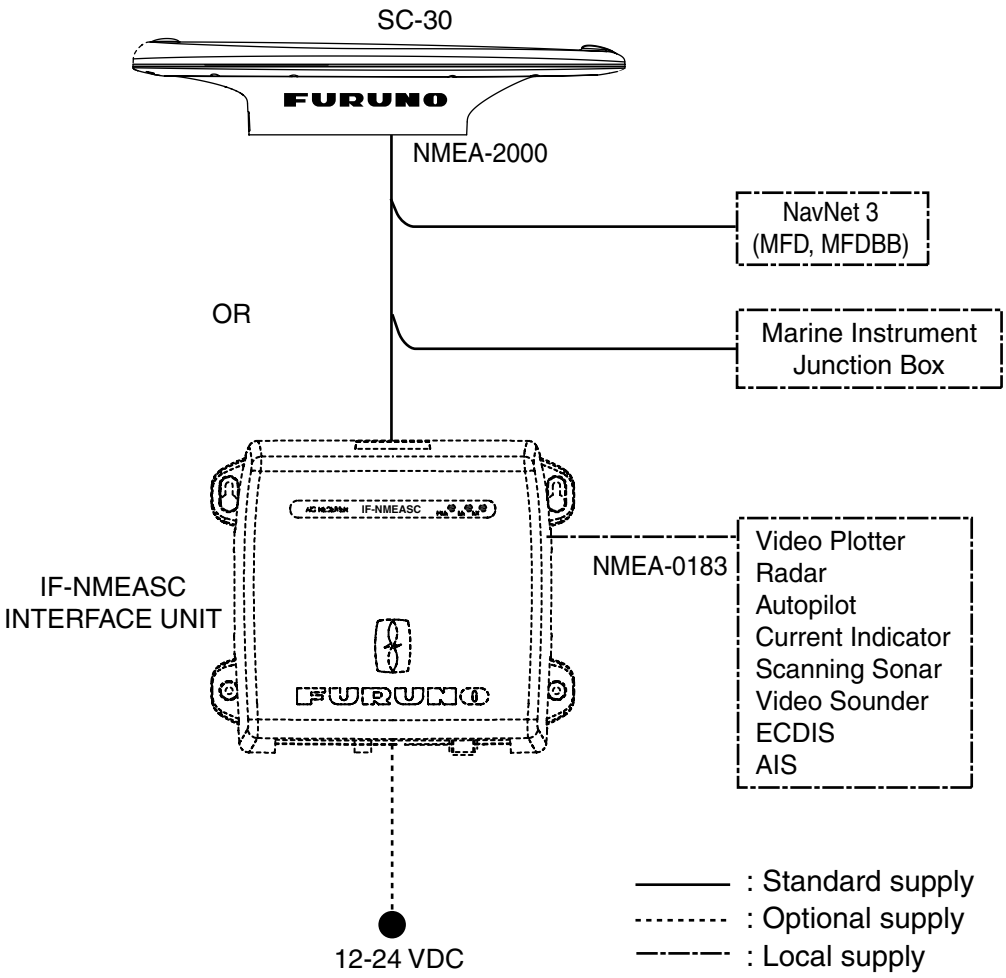
The SC-30 Satellite Compass outputs highly accurate heading, GPS position data and speed and motion data for AIS, ECDIS, ARPA radar, autopilots, etc. Data is output in NMEA 2000®* format, and with connection of the optional interface unit the data can be converted to NMEA 0183 format. Settling time is within three minutes and the follow-up performance is an excellent 45°/s.

- Heading accuracy of ±1.0°
- Perfect heading sensor for radar/ARPA, AIS, scanning sonar, etc.
- Outputs accurate heading, position, time, speed, course.
- Pitch and roll output in digital and analog format for ship's motion correction
- Dual antenna system with three axis rate gyro and acceleration sensors
- Data can be output in NMEA 2000 format
- Free from regular maintenance
- Aesthetically pleasing antenna fits nicely on recreational boats

*NMEA 2000 is a registered trademark of the National Marine Electronics Association USA.

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SYSTEM CONFIGURATION



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1. MOUNTING

1.1 Equipment Lists

Standard supply

Name	Type	Code No.	Qty	Remarks
Sensor	SC-30	-	1	
Installation Materials	CP20-02900	000-011-455	1 (Select one)	With cable MJ-A10SPF0016-060C (6 m) and Installation materials CP20-02901*
	CP20-02910	000-011-459		With cable MJ-A10SPF0017-150C (15 m) and Installation materials CP20-02901*
	CP20-02920	000-011-461		With cable MJ-A10SPF0015-150C (15 m) and Installation materials CP20-02901*
Spare Parts	SP20-01201	001-019-740	1	Fuse FGBO 125V 1A, 3 pcs., (for use w/MJ-A10SPF0017-150C)

* See packing list at back of manual for details.

Optional supply

Name	Type	Code No.	Qty	Remarks
Interface Unit	IF-NMEASC	-	1	See OME-72651, issued separately
Bird-Repel-lent Fixture	OP20-36	004-380-830	4	
Cable Assy.	MJ-A10SPF0017-300C	000-166-890-10	1	30 m, ϕ8
	MJ-A10SPF0015-300C	000-166-892-10		30 m, ϕ10
	MJ-A10SPF0016-060C	000-166-887-10		6 m, ϕ8
	MJ-A10SPF0017-150C	000-166-889-10		15 m, ϕ8
	MJ-A10SPF0015-150C	000-166-891-10		30 m, ϕ10

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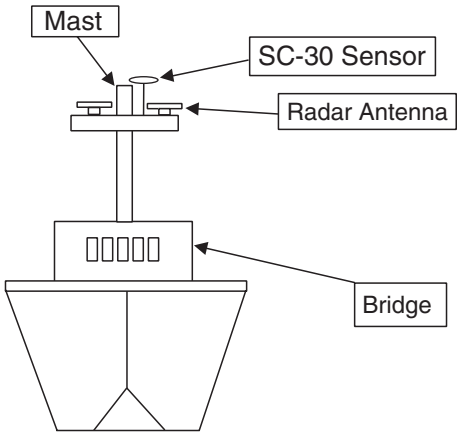
1.2 Mounting Considerations

In addition to the considerations described in this section, keep the length of the sensor cable in mind when selecting a mounting location.

General considerations

Mount the sensor above radar mast

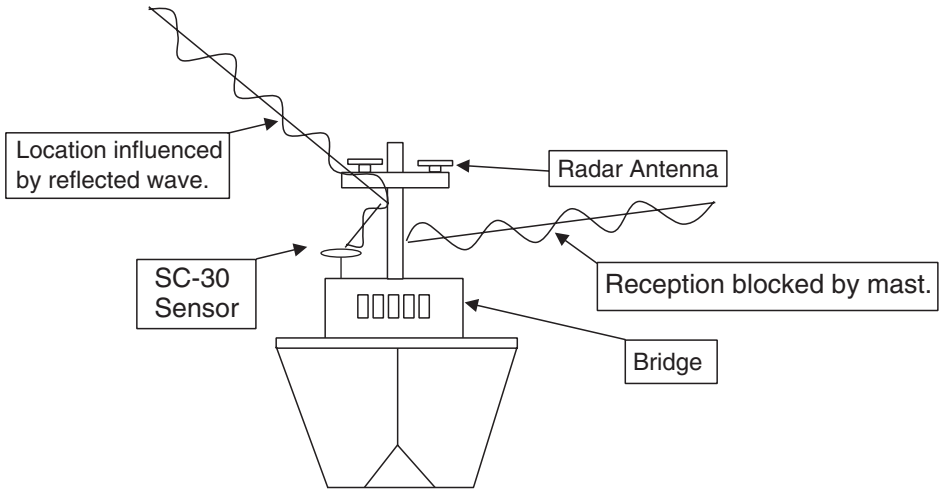
Like in the figure below, mount the SC-30 sensor above a radar mast. This provides an unobstructed path between the sensor and the satellite, regardless of vessel heading. Follow the procedure on the next page to choose an installation site.



Sensor mounted above antennas and structures

If sensor cannot be installed above radar mast

If absolutely impossible to do otherwise, the sensor may be installed below a radar mast. However, certain guidelines must be followed to prevent the shading and multipath problems which occur as shown in the figure below. Follow the procedure on the next page to choose an installation site.



Problems associated with mounting sensor below a radar mast

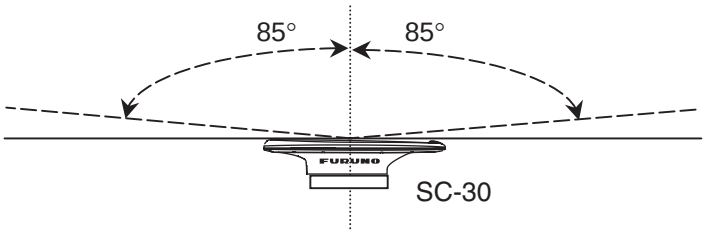
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Selecting the installation site

The installation site must satisfy the four conditions described in this section. After choosing the site, determine installation height, following the procedure in the next section.

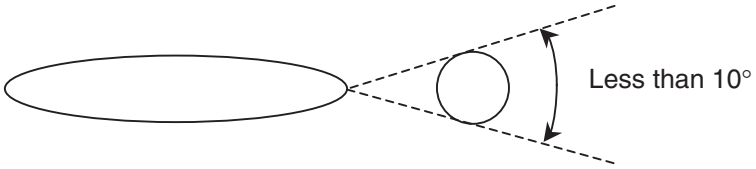
CONDITION 1: Locate the SC-30 away from masts that might prevent reception of the GPS signal

- Install the sensor where the field of view against zenith is at least ±85°. The installation site should be as high as possible, above masts, etc. which might interfere with reception.



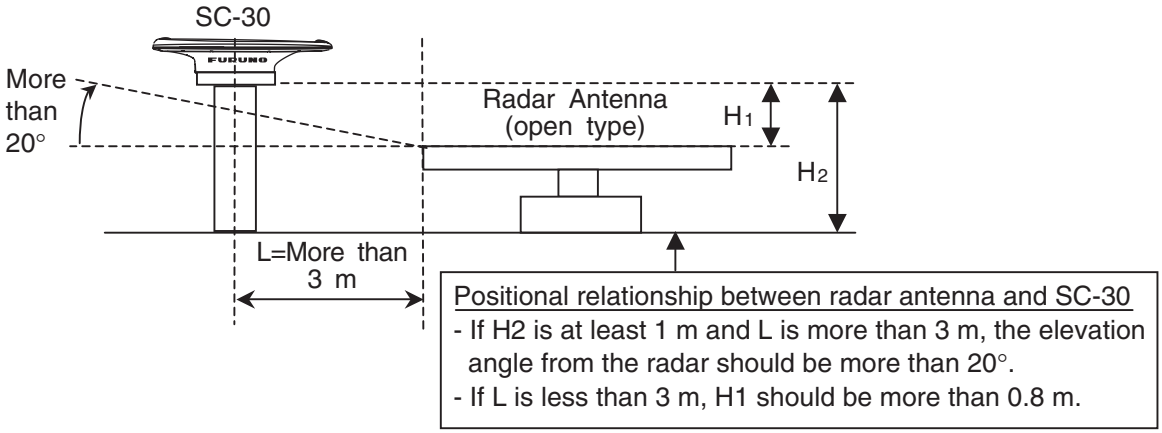
- If the above condition cannot be satisfied, separate the sensor so that the horizontal angle to the interfering object is less than 10°. Refer to the table below to determine minimum separation distance.

Mast diameter	Min. separation distance
10 cm	1.5 m
30 cm	3 m



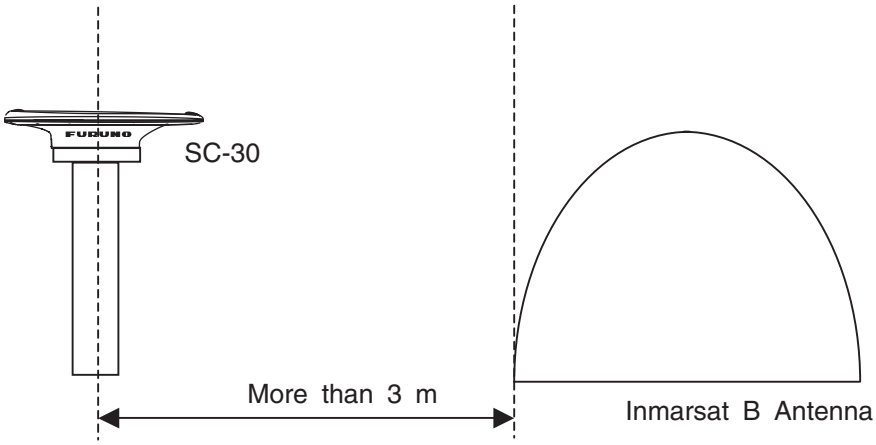
CONDITION 2: Locate the SC-30 out of Inmarsat and radar beams

- Locate the SC-30 more than 20° above the top of a radar antenna.
- Separate the SC-30 at least three meters from an open-type radar antenna.
- If the SC-30 absolutely cannot be separated at least three meters from an open-type radar antenna, install it at least 80 cm above the top of the radar antenna.
- Separate an Inmarsat B antenna from the SC-30 at least three meters.



Separation distances from radar antenna

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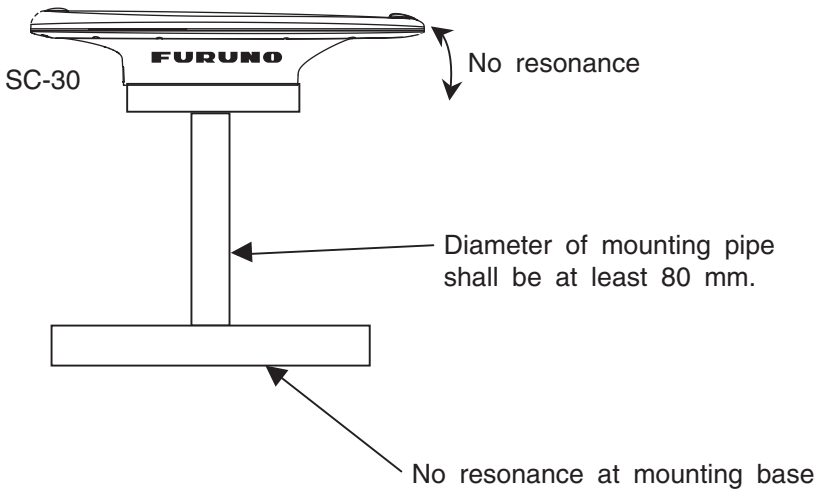
Separation distance from Inmarsat B antenna

CONDITION 3: Locate the SC-30 away from communication (VHF, etc.) antennas

Separate the SC-30 as far as possible from communication antennas.

CONDITION 4: Select a stable location, no resonance location by engine or waves

Install the SC-30 in a stable location. The SC-30 contains highly sensitive GPS and angular speed sensors. Therefore, install it where shock, vibration, etc. are minimal.



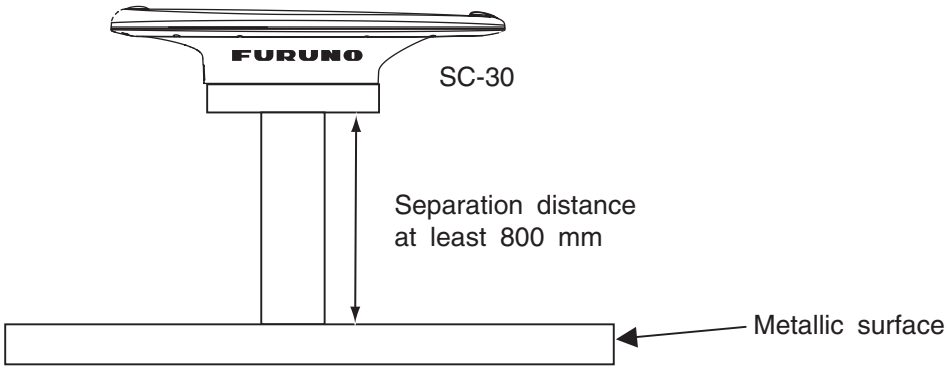
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Installation height

After choosing the installation site, determine the installation height, considering composition of the deck and surrounding area.

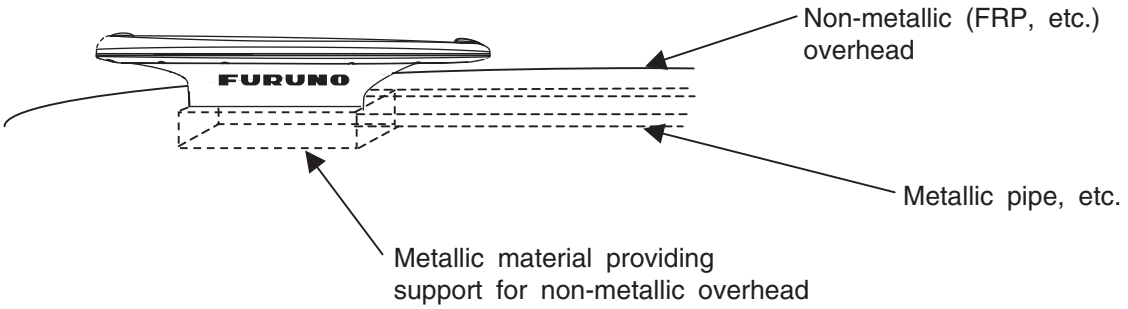
The deck is flat and metallic, or the area around the installation site is metallic

- If metallic surface is wider than the area of the top view of the SC-30, install the SC-30 at least 800 mm above the deck.



The deck is non-metallic (FRP, etc.) and there are no metallic objects around the installation site

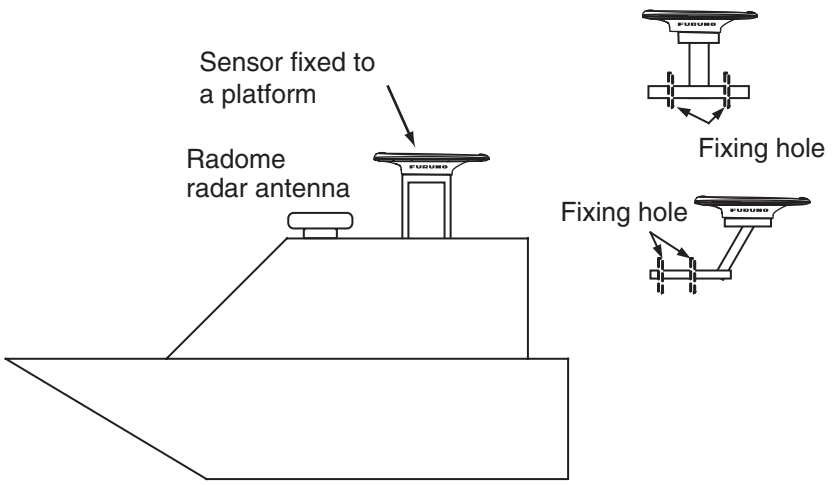
- If mounting surface is non-metallic and there is no radar or Inmarsat antenna in the vicinity, mount the SC-30 directly on the non-metallic surface. This can be done provided the metallic material support is smaller than the SC-30. If the SC-30 is to be fixed to a mounting pipe, choose a site where there is less vibration.



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Installation examples for a pleasure boat

No tuna tower

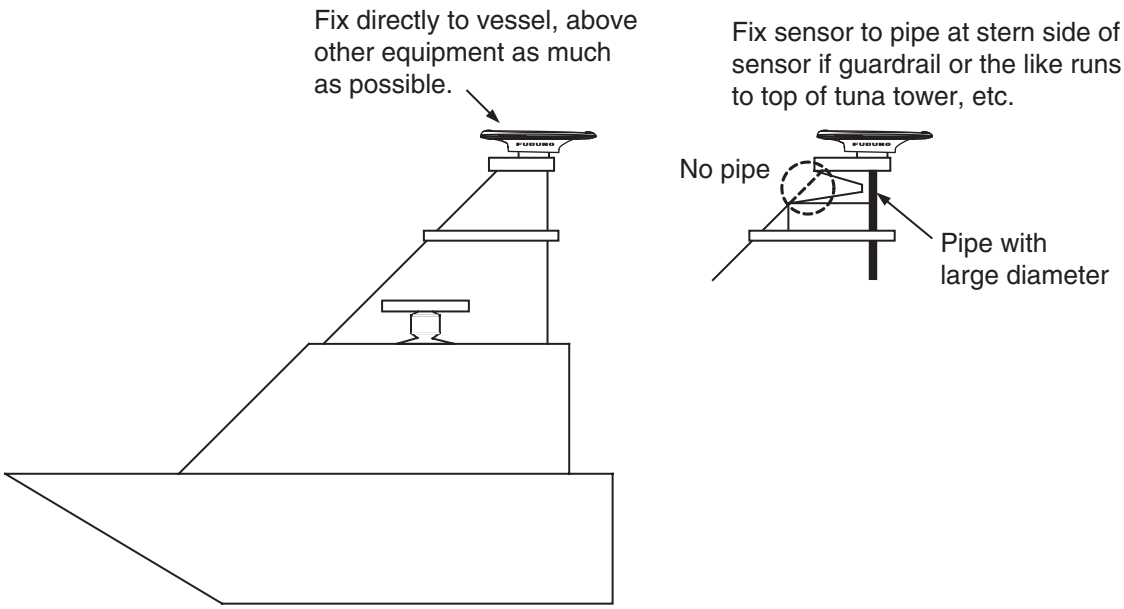


Fixing holes should "surround" the sensor. Further, fix the mounting pole at a right angle. The recommended dimensions for the pole are

Diameter: more than ϕ80 mm
Length: less than 500 mm

Do not mount the sensor like this.
Vibration can damage the sensor.

With tuna tower

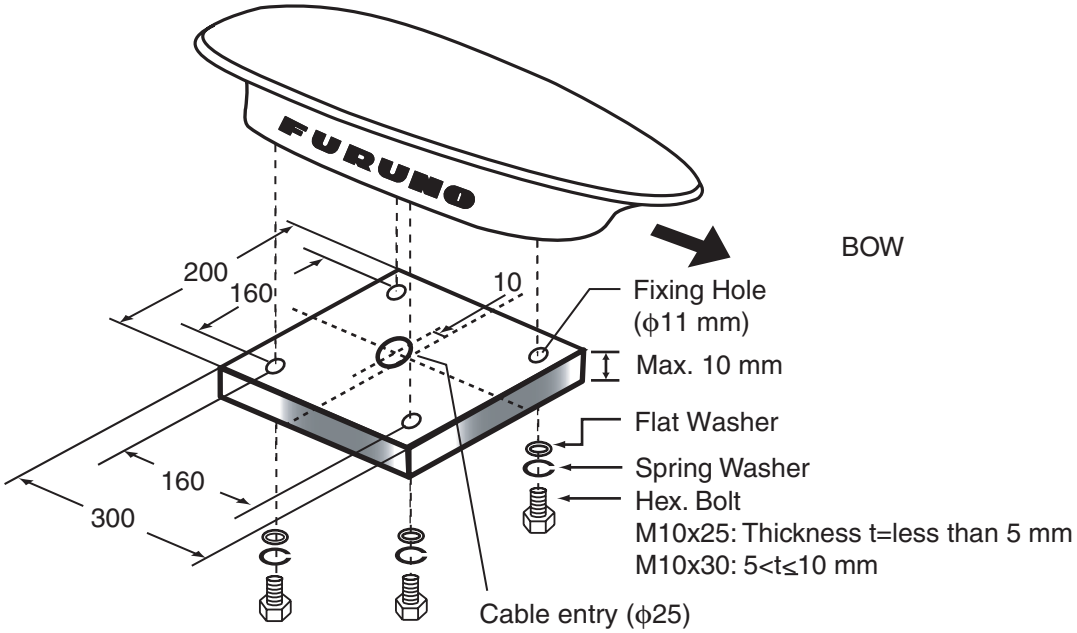


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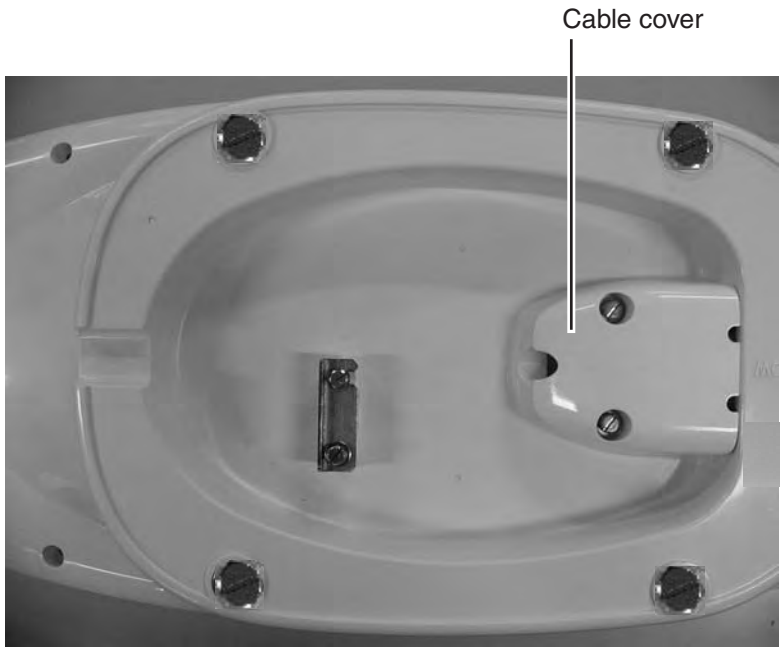
1.3 Mounting Procedure

"Bird-repellent fixtures" (option) can be attached to the sensor cover to prevent birds from alighting on the cover. If it is more convenient to attach them before mounting the sensor, do step 7 first.

1. As shown in the figure below, weld a platform (local supply) for which to mount the sensor. The thickness of the platform should be max. 10 mm.

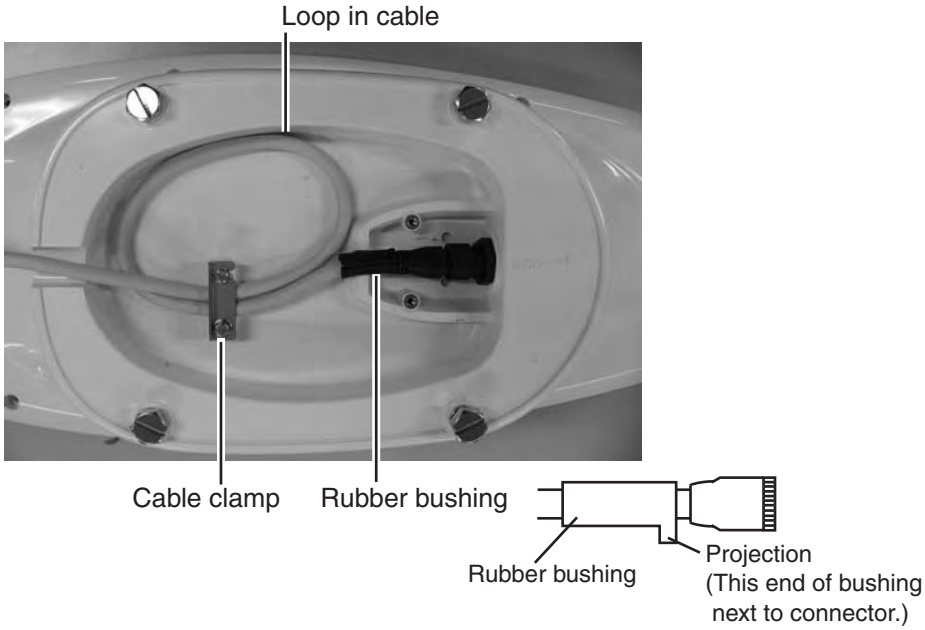


2. Open the cable cover on the underside of the sensor.

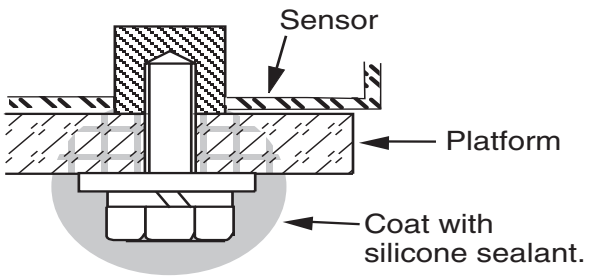


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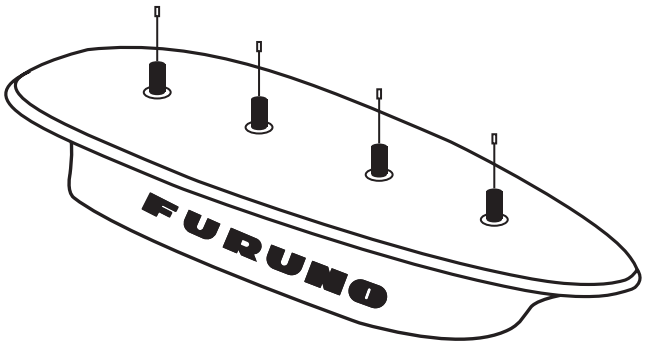
3. Slip the rubber bushing (supplied) onto the sensor cable at the location shown below. Attach the cable to the connector. Make a loop in the cable to prevent cable fatigue.



4. Tighten the cable clamp and close the cable cover.
5. Orient the sensor so the bow mark (on the underside of the narrower end) on its underside is facing the bow. Fasten the sensor to the platform with hex. bolts, spring washers and flat washers. Use M10x25 bolts if the thickness of the platform is less than 5 mm. For greater thickness use M10x30 bolts. The torque for the hex. bolts should be 20±2Nm.
   Note: For the sensor cable passed through the mounting pipe, fill the gap between the pipe and the cable with silicone sealant, for waterproofing.
6. Coat exposed parts of bolts and washers with silicone sealant.
7. If you have the optional "bird-repellent fixtures", attach them to the sensor similar to as shown in the figure below. (You may change the pattern as desired.)



8. Fix the sensor cable to the pipe at suitable intervals with the cable ties (supplied).



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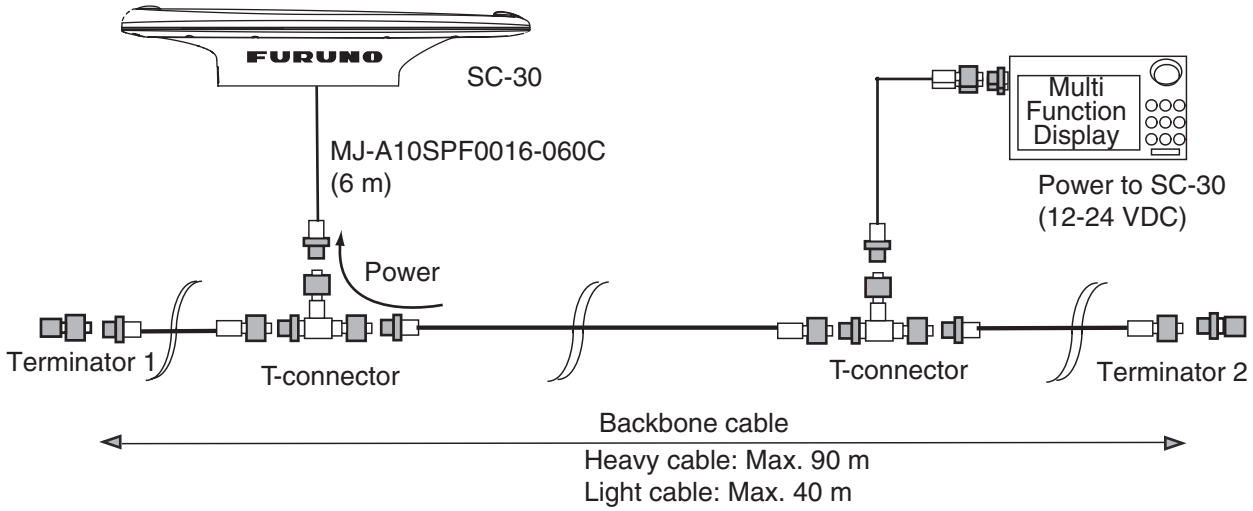
2. WIRING

2.1 NMEA 2000 Network Connection

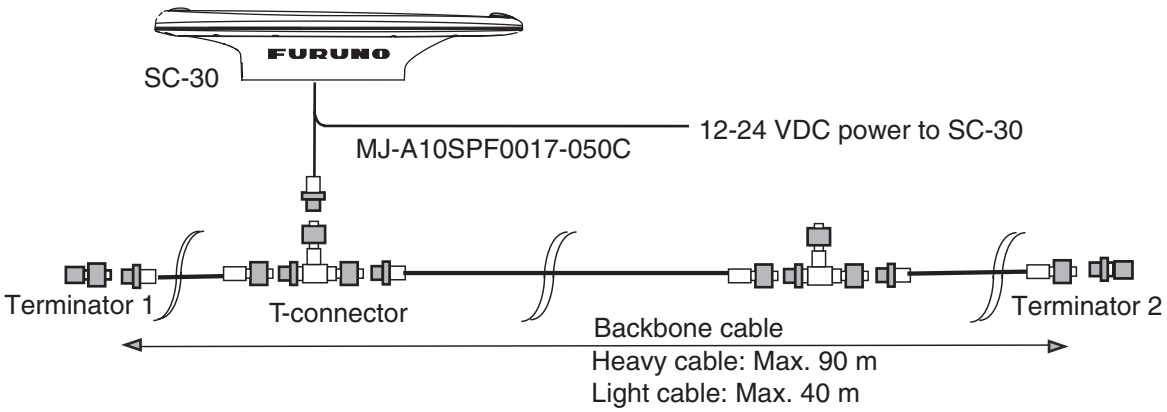
The SC-30 connects to the devices in an NMEA 2000 network with a drop cable, which is connected to a backbone cable w/T-type connectors. The backbone cable can be light or heavy type. Attach a terminator at both ends of the backbone cable. Use a Micro-C connector to connect to the devices. We recommended that power from the NMEA 2000 network be input at the center of the backbone cable. For connection to the IF-NMEA SC Interface Unit, see its operator's manual.

Use DeviceNet MIcro-C type T-connector (5 pin), cable and terminator.

Power to SC-30 supplied from NMEA 2000 network



Power to SC-30 not supplied from NMEA 2000 network



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3. NMEA 2000 I/O DATA

The SC-30 handles the NMEA 2000 I/O data sentences listed below.

3.1 Input Data

<table>
<tr><th>Name</th><th>PGN (Parameter Group No.)</th><th colspan="4">Remarks</th></tr>
<tr><td>ISO Acknowledge-ment</td><td>059392</td><td colspan="4"></td></tr>
<tr><td>ISO Request</td><td>059904</td><td colspan="4">Request for one-time transmission of asterisk-marked PGN in the output data table on the next page.</td></tr>
<tr><td>ISO Address Claim</td><td>060928</td><td colspan="4"></td></tr>
<tr><td>NMEA-Request Group Function</td><td rowspan="13">126208</td><td colspan="4">Request for transmission of transmitting interval and one-time transmission of asterisk-marked PGN in the output data table on the next page.</td></tr>
<tr><td>NMEA-Command Group Function</td><td colspan="4">Standard PGN sentences and their changeable fields</td></tr>
<tr><td></td><td>Name</td><td>PGN</td><td>Field</td><td>Remarks</td></tr>
<tr><td></td><td>Vessel Heading</td><td>127250</td><td>#5</td><td rowspan="2">0 or 1 (default 0)
0: true bearing
1: magnetic bearing.
Setting is mutually changed.</td></tr>
<tr><td></td><td>COG & SOG, Rapid Update</td><td>129026</td><td>#2</td></tr>
<tr><td></td><td>GNSS Control Group Function</td><td>129538</td><td>#6</td><td>0 or 1 (default 1)
0: WAAS off
1: WAAS on</td></tr>
<tr><td></td><td colspan="4">The PNGs below are FURUNO proprietary PNG, and various settings can be adjusted by them.</td></tr>
<tr><td></td><td colspan="3">Name</td><td>PGN</td></tr>
<tr><td></td><td colspan="3">FURUNO GNSS Control Status</td><td>130817</td></tr>
<tr><td></td><td colspan="3">Heading and Attitude Sensor Control Status</td><td>130818</td></tr>
<tr><td></td><td colspan="3">Motion Sensor Control Status</td><td>130819</td></tr>
</table>

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3.2 Output Data

Name	PGN (Parameter Group No.)	Output Interval	Remarks
ISO Acknowledgement	059392	*	
ISO Address Claim	060928	*	
Heave	065280	100 ms	FURUNO proprietary sentence
NMEA-Acknowledge Group Function	126208	*	
PGN List	126464	*	
System Time	126992	1 s	
Product Information	126996	*	
Vessel Heading	127250	100 ms	
Rate of Turn	127251	100 ms	
Attitude	127257	100 ms	This PGN does not follow standard transmission interval (1s).
Magnetic Variation	127258	1 s	
Position, Rapid Update	129025	100 ms	
COG & SOG Rapid Update	129026	250 ms	
GNSS Position Data	129029	1 s	
Time & Date	129033	*	
GNSS Sats In View	129540	1 s	
Motion Sensor Status	130820	1 s	FURUNO proprietary sentence
Multi Sats in View	130826	1 s	FURUNO proprietary sentence

*PNG transmitted once only when requested.

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4. MAINTENANCE, TROUBLE-SHOOTING

This chapter provides the information for keeping your unit in good working order.

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.

4.1 Preventive Maintenance

Regular maintenance is important for good performance. Following the procedures in the table below will help maintain performance.

Preventive maintenance

Item	Check point	Remedy
Cabling	• Visually check cabling for signs of wear and damage. • Check that connector is firmly fastened.	• Replace damaged cables. • Reconnect cable if it has loosened.
Cover	Cleanliness of cover	Dust can be removed with a soft cloth. Do not use chemical based cleaners to clean the cover, as they can remove paint and markings and deform the cover.

4.2 Fuse Replacement

Two 1A fuses are contained in the fuse holder in the power cable MJ-A10SPF0017-xxx, which is used when supplying power to the SC-30 directly from the power source. If heading data is not being output, first check the SC-30's breaker at the power source and the check if a fuse in the power cable has blown. If it has blown, find out the cause before replacing the fuse. If it blows again after replacement, request service.

Item	Type	Code No.
Fuse	FGBO-A, 125A, 1A, PBF	000-157-847-10

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4.3 Troubleshooting

Heading is not output

Check installation site:

- Check for interfering objects near the antenna.
- Check the installation site and mounting base for vibration.
- Check for antenna of radar, radio equipment, etc. near the installation site.

Check connections:

1. NMEA-2000 bus connection
   - Check that the connector on the SC-30 is tightly connected.
   - Check that no stress is applied to the cable and that a loop has been made with the cable to prevent cable stress.
   - Check that terminators (120 ohm) are attached at each end of the NMEA 2000 network.
   - Check that the input voltage to the SC-30 is 12-24 VDC.
   - Check that all devices connected to the NMEA 2000 bus are within the current capacity of the bus.
   - Check that the cable (MJ-A10SPF0016-060C (6m)) is used. (If power is fed through a trunk line, the feeder cable shall be no longer than 6 m).
   - If power to the SC-30 is fed directly from the ship's mains, check breaker switch on mains switchboard and fuse in power cable.
2. IF-NMEASC interface unit connection:
   See the IF-NMEASC's operator's manual.

Heading output stops often. Position and GPS-related items are output but heading is not.

- Check for interfering object near the SC-30.
- Check installation site for vibration.
- Check if antenna of radar, radio equipment, etc. is near the installation site.

Equipment in NMEA 2000 network malfunctions when SC-30 is connected

- Check that terminators (120 ohm) are attached at each end of the NMEA 2000 network.
- Check that the input voltage to the SC-30 is 12-24 VDC.
- Check that all devices connected to the NMEA 2000 bus are within the current capacity of the bus.
- Check that the cable (MJ-A10SPF0016-060C (6m)) is used. (If power is fed through a trunk line, the feeder cable shall be no longer than 6 m).

Heading is output normally in fine wather but is not output in bad weather

- Check the installation site for vibration.

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Autopilot jerks suddenly

- Check for interfering objects near the SC-30.
- Check the installation site and mounting base for vibration.
- Check if antenna of radar, radio equipment, etc. is near the installation site.
- Check operation at the autopilot:
  - Confirm that the ruddle angle can be recognized by the operator when heading output is stopped.
    Minimally, the buzzer should sound.
  - Confirm that rudder does not jerk violently when heading output is resumed. For example, check that setting for rudder angle limit is suitable.

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SPECIFICATIONS OF SATELLITE COMPASS
SC-30

1 GENERAL

1.1	Frequency	L1 1575.42MHz
1.2	Heading accuracy	0.5° rms
1.3	Heading resolution	0.1°
1.4	Follow-up	45°/sec rate-of turn
1.5	Heave accuracy	30cm
1.6	Settling time	3 minutes approx.
1.7	Position accuracy	10m, WAAS adjusted: 3m
1.8	I/O port	NMEA2000

2 INTERFACE UNIT

2.1	I/O port	
	NMEA2000	Input: time, position, speed, heading, heave, others
		Output: offset heading
	USB	for maintenance program
2.2	Output port	
	AD-10	1 port
	IEC61162-1	2 port
	Analog	1 port
2.3	Output interval	
	Heading, Heave	25ms, 100ms, 200ms, 1sec, 2sec
	Speed, Position, Time	1sec, 2sec

3 POWER SUPPLY

3.1	Satellite compass	12-24 VDC: 0.4-0.23 A
3.2	Interface unit	12-24 VDC: 1.0-0.6 A

4 ENVIRONMENTAL CONDITIONS

4.1	Ambient temperature	
	Satellite compass	-25°C to +70°C
	Interface unit	-15°C to +55°C
4.2	Relative humidity	95% at 40°C
4.3	Degree of protection	
	Satellite compass	IP56
	Interface unit	IP20
4.4	Bearing vibration	IEC 60945

5 COATING COLOR

5.1	Satellite compass	N9.5
5.2	Interface unit	N2.5

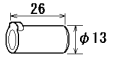
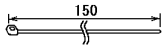
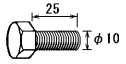
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FURUNO

CODE NO.	001-019-690-00	20BA-X-9401 -1
TYPE	CP20-02901	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	ｹｰﾌﾞﾙﾌﾞｯｼｭ CABLE RUBBER BUSH		20-030-1105-2 CODE NO. 100-340-192-10	1	
2	ｺﾝﾍﾞｯｸｽ CONVEX		CV-150N CODE NO. 000-162-186-10	3	
3	平座金 FLAT WASHER		M10 SUS316L M10 SUS316L CODE NO. 000-167-416-10 000-147-299-00	4	
4	ﾊﾞﾈ座金 SPRING WASHER		M10 SUS316L M10 SUS316L CODE NO. 000-167-389-10 000-147-303-00	4	
5	六角ﾎﾞﾙﾄ HEXAGONAL HEAD BOLT		M10X25 SUS316L CODE NO. 000-162-959-10	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。

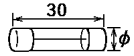
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

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

FURUNO

CODE NO.	001-019-740-00	20BA-X-9301 -0 1/1
TYPE	SP20-01201	BOX NO. P

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

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 FUSE		FGBO-A 125V 1A PBF			3	000-155-847-10

MFR'S NAME	FURUNO ELECTRIC CO.,LTD.	DWG NO.	20BA-X-9301	1/1

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

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。

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FURUNO

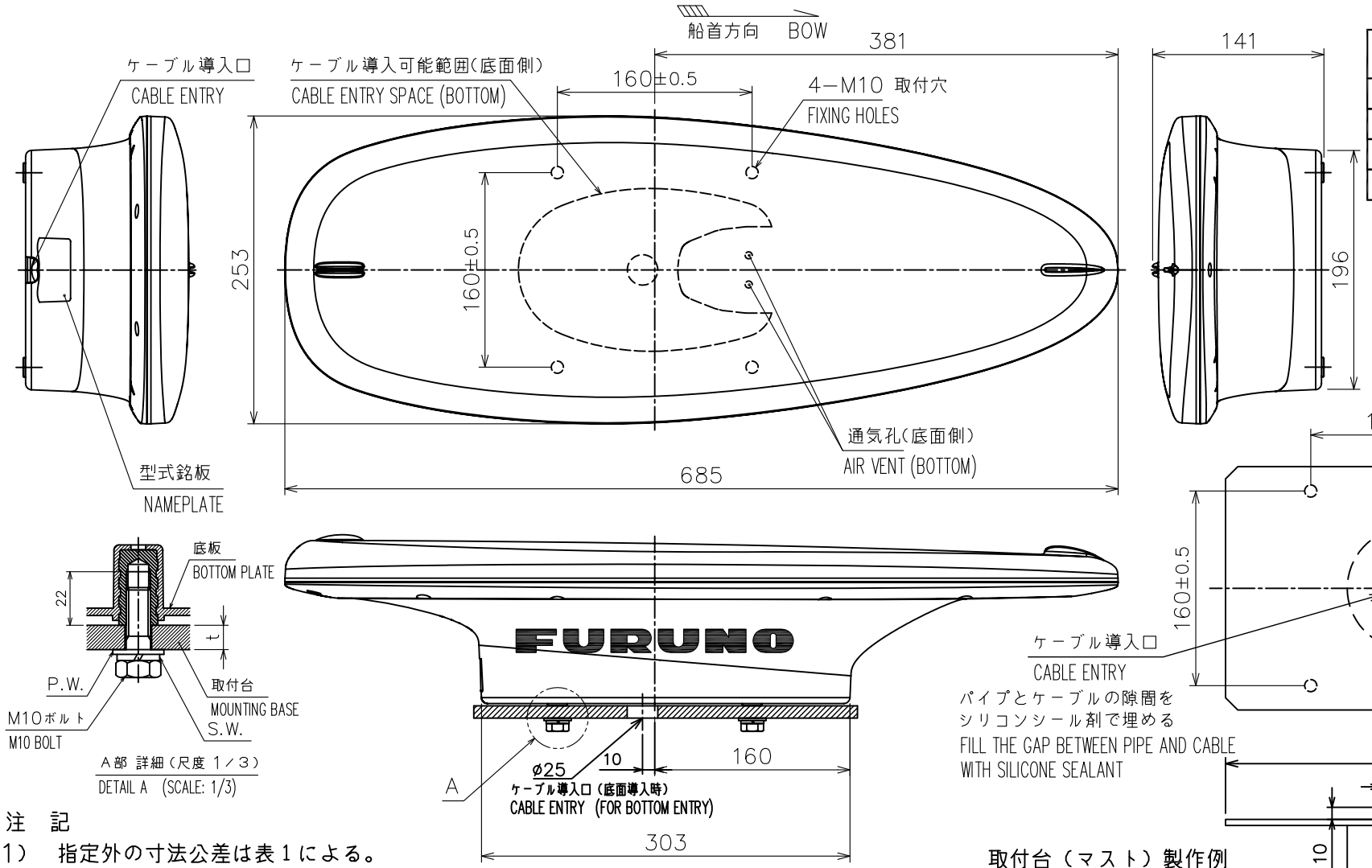


表1 TABLE 1

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

取付台(マスト)製作例
EXAMPLE OF MOUNTING BASE (MAST)

注 記

1) 指定外の寸法公差は表1による。
2) 取付用ネジはM10ボルトを使用のこと。
ネジ長さは板厚tに応じて、25(t≦5)または30(5<t≦10)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: 25 (t≦5) OR 30 (5<t≦10). t: THICKNESS OF MOUNTING BASE.

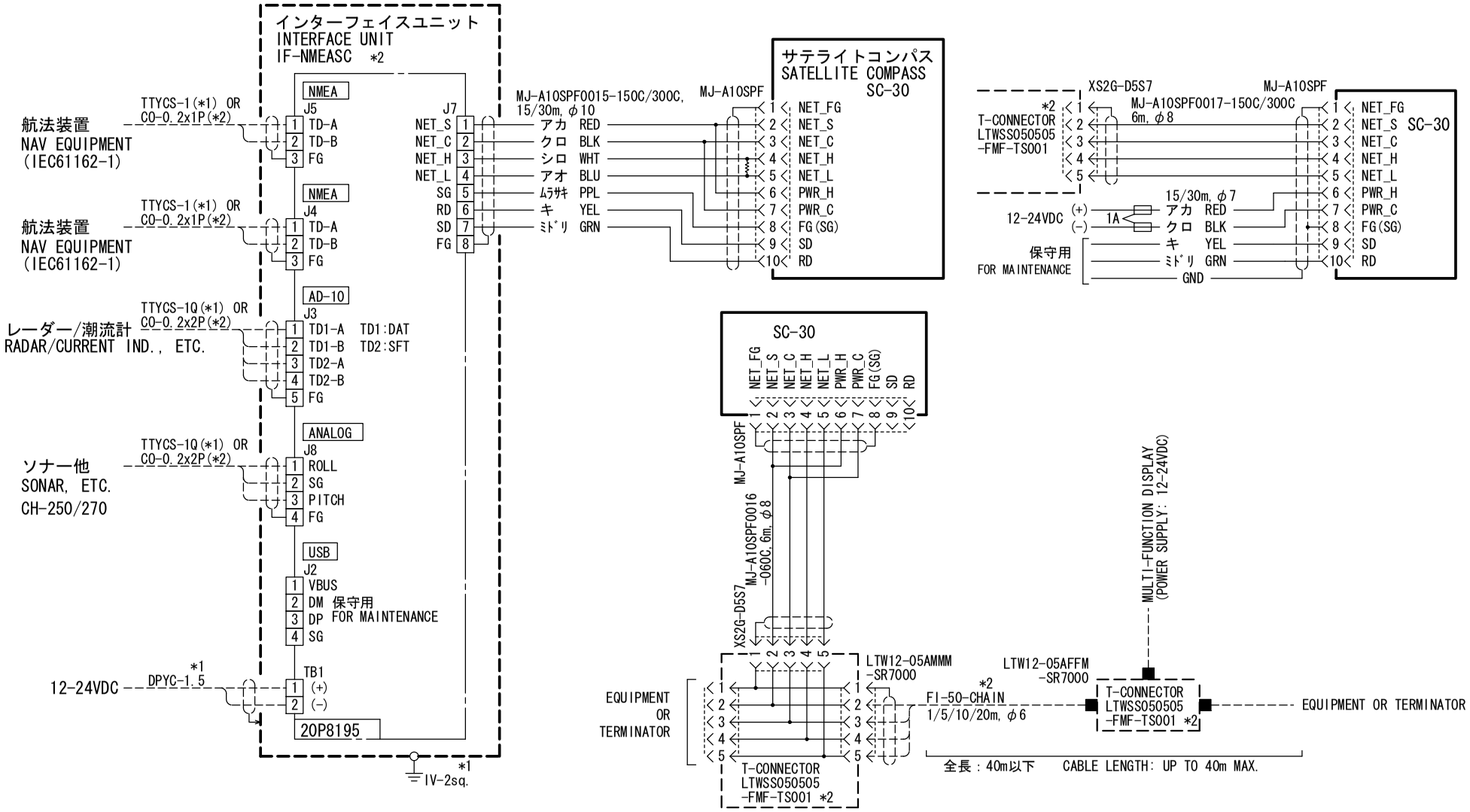
DRAWN	Jul. 20 '07 T.YAMASAKI	TITLE	SC-30
CHECKED	Jul. 20 '07 T.TAKENO	名称	サテライトコンパス
APPROVED	Jul.23'07 R.Esumi		外寸図
SCALE	1/5	MASS	2.5 kg ±10% 質量はケーブルを含まず。 MASS W/O CABLE.
NAME	SATELLITE COMPASS		
DWG.No.	C7265-G01- A	REF.No.	20-030-100G-2
	OUTLINE DRAWING		

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FURUNO



注記
＊1）造船所手配。
＊2）オプション。

NOTE
*1. SHIPYARD SUPPLY.
*2. OPTION.

CO-0.2x1P: CO-SPEVV-SB-C 0.2x1P, φ8.5
CO-0.2x2P: CO-SPEVV-SB-C 0.2x2P, φ10.5

DRAWN Jan. 16 '08 T.YAMASAKI		TITLE	SC-30
CHECKED Jan. 16 '08 T.TAKENO		名称	サテライトコンパス
APPROVED Jan.18'08 R.Esumi			相互結線図
SCALE / MASS kg		NAME	SATELLITE COMPASS
DWG. No. C7265-C01- C	REF. No. 20-030-5000-1		INTERCONNECTION DIAGRAM

FURUNO ELECTRIC CO., LTD.

S-1

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