

# FURUNO®

Revolutionary heading sensor

## SATELLITE COMPASS

Model SC-110



The future today with FURUNO's electronics technology.

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Catalogue No. N-858

TRADE MARK REGISTERED  
MARCA REGISTRADA

# Furuno's high-grade satellite compass with its superior heading accuracy for AIS, ECDIS, RADAR



Compass Rose Mode

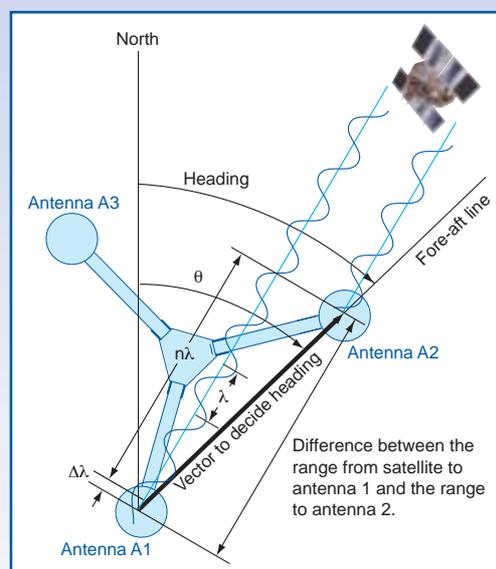
- Heading information for ARPA, AIS, ECDIS, Scanning Sonar, Autopilot
- Heading accuracy  $\pm 0.6^\circ$  exceeding IMO MSC.116(73) as a THD (Transmitting Heading Device)
- SOG, COG, ROT, pitch and roll
- Excellent follow-up rate of  $45^\circ/\text{s}$  exceeding requirements of high speed craft ( $20^\circ/\text{s}$ )
- High speed heading data output in IEC 61162-2 format
- Clear 4.5" silver bright LCD showing mimic compass rose with digital readouts
- Analog and digital data output for pitch and roll for ship's motion correction

## Principle

With the SC-50, a ship's heading is determined by decoding the phase data in the GPS carrier frequency. In principle, a pair of antennas A1(ref) and A2(fores), each connected with an associated GPS engine and processor, are installed along the ship's fore-aft line. The GPS systems at A1 and A2 calculate the range and azimuth to the satellite.

The difference in range between A1 and A2 is  $\Delta\lambda + n\lambda$  where  $\lambda$  is 19 cm and  $n^*$  is automatically found during the initialization stage. A fraction of a carrier wavelength,  $\Delta\lambda$ , is processed by Furuno's advanced kinematic technology in geographical survey, thus determining a vector (range and orientation) A1 to A2, i.e., heading of ship relative to north.

In reality, the third antenna is added to reduce the influence of pitch, roll and yaw, and five satellites are used to process 3D data (by 3rd sat), to reduce clock derived error (by 4th sat), and to calculate  $n$  in initial stage (by 5th sat).



If GPS signal is blocked by a tall building or under a bridge, the 3-axis vibrating-gyro rate sensors in the processor unit take the place of the satellite until all five satellites are in view. The rate sensors also contribute to regulating the heading data against pitch, roll and yaw together with the third antenna (A3 in the illustration).

\*Ambiguity " $n$ " is resolved by LAMBDA algorithm developed by Prof. Teussen, Delft University of Technology, The Netherlands.

The SC-110 is an enhanced GPS-based compass designed for onboard equipment requiring a heading signal, such as ARPA, AIS, ECDIS, Scanning Sonar, Autopilot, etc. This equipment also provides all the necessary functions the latest GPS navigators do. Fallback arrangement by 3-axis vibrating-gyro rate sensor provides accurate and constant heading information even when the satellite signals are blocked under bridges or reduced by tall buildings. The SC-110 also regulates the compass function when the ship is subject to pitching, rolling and yawing. The performance is not affected by ships' speed, latitude, geomagnetism, etc. Settling time is almost instant and follow-up performance is excellent, achieving 45°/s (SOLAS HSC Code requires 20°/s as a minimum).

In addition to the heading information and positional data, SOG (speed over ground), COG (course over ground) and ROT (rate of turn) are displayed. SOG is remarkably accurate by decoding the Doppler shift in the received satellite signals. The interface delivers true heading and course/speed over ground, rate of turn as well as GPS fix through up to 11 ports. The heading

information is put out in IEC 61162-2 format at a high update rate of 25ms to satisfy the high speed data-output required in the special applications.

The roll and pitch angle is also output both in analog and digital formats to the equipment, such as sonar, sounders etc. It is useful in offering the stable echo pictures by compensating the transmitted/received beams even in the rough seas. Thus, the SC-110 can be used as a highly accurate motion sensor.

The SC-110 has a unique Set and Drift mode. When connected with a water-tracking speed-log, such as DS-80, it calculates set and drift (tide direction and speed) in the mode. The display helps a radar operator to manually enter set and drift for accurate sea stabilization pictures.

The SC-110 consists of 3 antennas on a solid precision support, a processor unit, and a display unit. The tri-antenna system helps reduce the influence of ships' motions. There are no mechanical parts such as gimbals and rotating meters, thus the compass is free from regular maintenance.

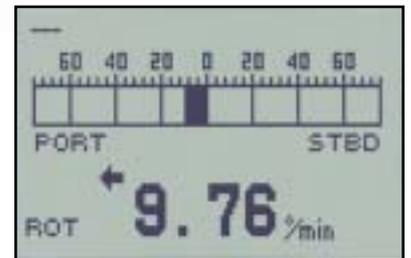
Heading Mode



NAV Data Mode



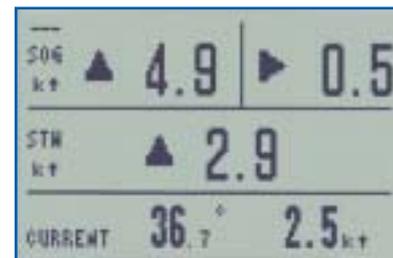
ROT Mode



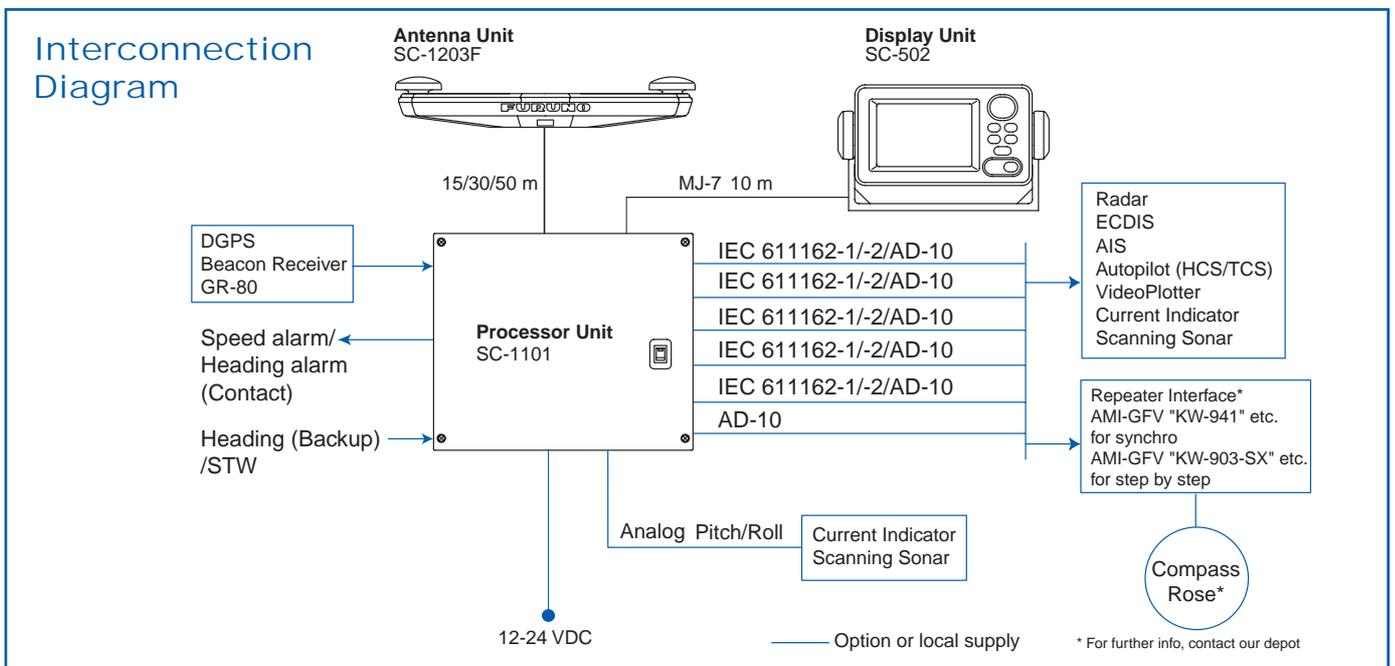
Steering Mode



Set & Drift Mode



(Current (Set and Drift) and Distance Run is selectable.)



# SPECIFICATIONS OF SC-110

## 1. Accuracy

Heading:  $\pm 0.6^\circ$  (95 % static accuracy)  
(IMO THD MSC.116(73) static accuracy:  $\pm 1.0^\circ \times \sec \text{Lat.}$ )

GPS: 10 m (95 %)

DGPS: 5 m (95 %)

## 2. Follow-up

25°/s rate-of-turn

## 3. Settling time

4 min

## 4. Interface

Number of ports

10 ports\*

5 ports in AD-10 or

10 ports in IEC 61162-1/-2

\* Number of ports is changed by system configuration.

1 port

AD-10 only

Serial data sentence

25/100/200 ms, 1s data rate:

HDT, HDM(Heading), Patt(Pitch, Roll and Yaw), ROT(Rate of turn)  
VHW(Heading), VTG, VBW(SOG), GGA, GLL, GNS(L/L), ZDA(UTC), GSA, GSV

1/2 s data rate:

Log Output

1 port: 200/400 p/nm (closure)

Alarm Output

1 port: Alarm signal (closure signal)

Heading Input

1 port: Backup Heading  
(AD-10/IEC 61162-1/-2)

DGPS Input

HDT, HDG, HDM, VBW, VHW, VLW  
1 port: RTCM SC-104 format

## 5. Receiver Type

Twelve discrete channels.  
C/A code, all-in-view

## 6. Receive Freq

L1 (1575.42 MHz)

## 7. Display Unit

4.5" diagonal 95 (W) x 60 (H)mm,  
120 x 64 pixels

## 8. Display Mode

Steering, Nav Data, Set and Drift,  
Compass Rose, ROT, Heading

## POWER SUPPLY

12-24 VDC, 15 W

## ENVIRONMENTAL

IEC 60945 for EMC, Vibration, Temperature

## EQUIPMENT LIST

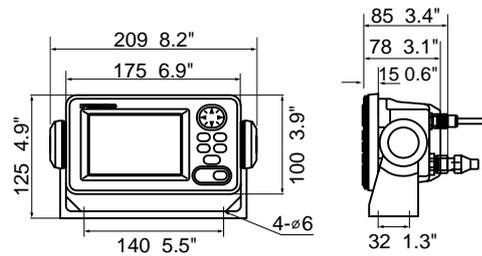
### Standard

- |   |        |
|---|--------|
| 1. Display Unit SC-502                          | 1 unit |
| 2. Antenna Unit with 15 m cable SC-1203F        | 1 unit |
| 3. Processor Unit SC-1101                       | 1 unit |
| 4. Standard Spare Parts, Installation Materials | 1 set  |

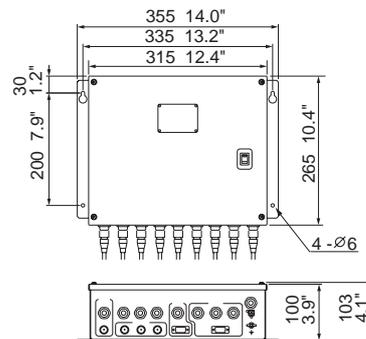
### Optional

- Antenna Cable, 15 m 20S0336-1, 30 m CP20-01700, 50 m CP20-01710
- Flush Mount Kit S type CP20-17, F type CP20-29
- Repeater Interface for synchro or step by step

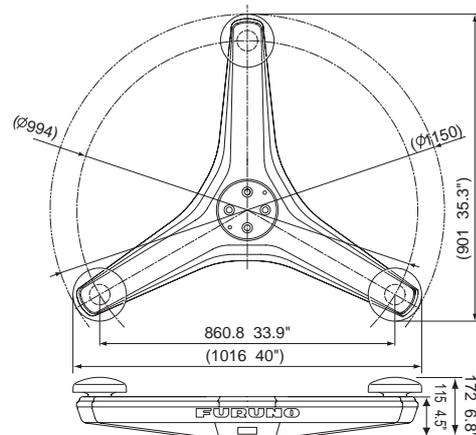
## Display Unit 0.6 kg 1.3 lb



## Processor Unit 3.6 kg 7.9 lb



## Antenna Unit 6.8 kg 15.0 lb



SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

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