FURUNO®

Revolutionary heading sensor, Radome type
SATELLITE COMPASS
Model SC-60

UKAS
QUALITY
MANAGEMENT
001

True heading for AIS, ECDIS, RAD...

- **Heading information for radar, AIS, Scanning Sonar, VideoPlotter**
- **Tri-antenna system reduces effect of pitching, rolling and yawing**
- **Heading accuracy ±1.0° complying with IMO MSC.116(73) as a THD (Transmitting Heading Device)**
- **Excellent follow-up rate of 25°/s exceeding requirements of high speed craft (20°/s)**

- **Data in IEC 61162-1; heading output in AD-10 format for high speed rate applications**
- **Accurate SOG, COG, ROT, and L/L**
- **Clear 4.5" backlit monochrome LCD**
- **Six display modes: Heading, Nav Data, Steering, Compass Rose, Set & Drift and ROT mode**
- **Free from routine maintenance**
- **Provides GPS Positioning**
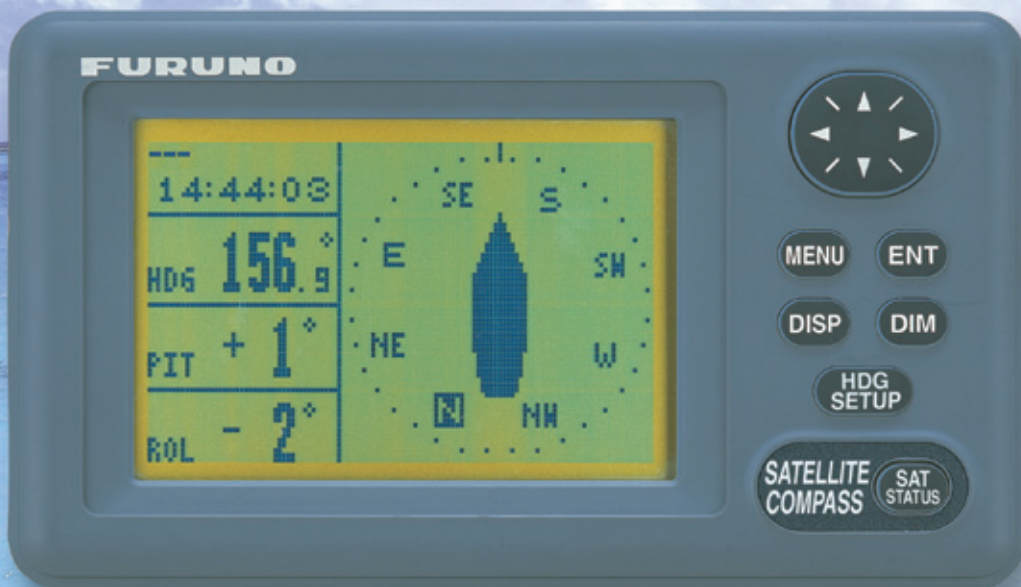
Compass Rose Mode

The SC-60 is a new satellite compass that uses Furuno's advanced GPS technology. This compass offers a wide range of applications for any type of vessel. Radar/ARPA, AIS, ECDIS, Scanning Sonar, and VideoPlotter can utilize the functions of this compass.

The SC-60 consists of Radome Antenna, Display Unit and Processor Unit. The low-profile radome accommodates three GPS antenna/receiver units. The tri-antenna system helps reduce the influence of ship's motion.

The performance is not affected by ship's speed, latitude, geomagnetism, etc. Settling time is almost instant and follow-up performance is excellent to 25°/s (SOLAS HSC Code requires 20°/s as minimum).

This unit also provides GPS positioning. SOG

(speed over ground), COG (course over ground) and ROT (rate of turn) are also displayed as well as the heading information and positional data. SOG is remarkably accurate by decoding the Doppler shift in the received satellite signals.

The display modes include Heading, Nav Data, Steering, Compass Rose, Set & Drift and ROT modes. The unit delivers true heading, course/speed over ground and rate of turn, as well as GPS fix, through four ports. The heading information can be taken out in AD-10 format at a high update of 25 ms to satisfy high speed data requirements in special applications. When a water-tracking speed log, such as DS-80, is connected, the SC-60 calculates set and drift (tide direction and speed) in the Set and Drift mode. The display helps radar operator to manually enter set and drift for accurate sea stabilization picture.
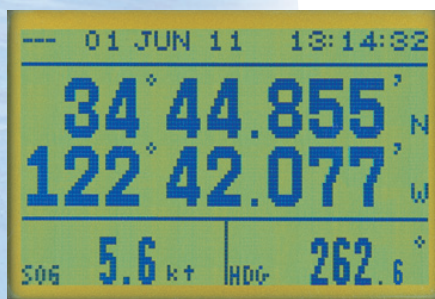
AR/ARPA.
All functions of GPS navigator.
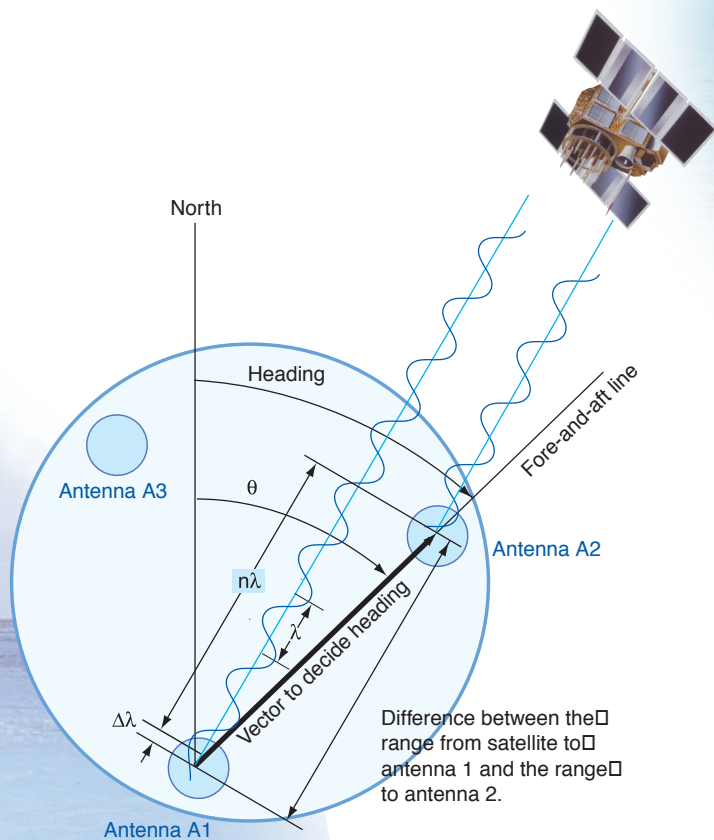
Own ship's heading is determined by decoding the phase data in the GPS carrier frequency. In principle, a pair of antennas A1(ref) and A2(fore), each connected with an associated GPS engine and processor, are installed along the ship's fore-aft line. The GPS systems at A1 and A2 calculate the range and azimuth to the satellite.

The difference in range between A1 and A2 is $\Delta\lambda + n\lambda$ where λ 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 own ship relative to north.
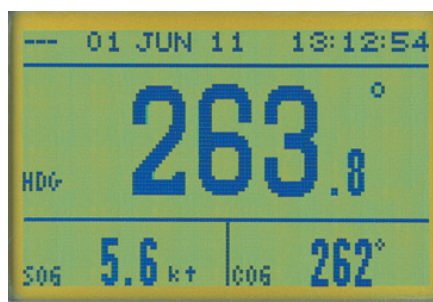
In reality, a third antenna is added to reduce the influence of pitch, roll and yaw, and five satellites are used to process 3D data (by 3rd sat), to reduce clock derived error (by 4th sat), and to calculate n in initial stage (by 5th sat).

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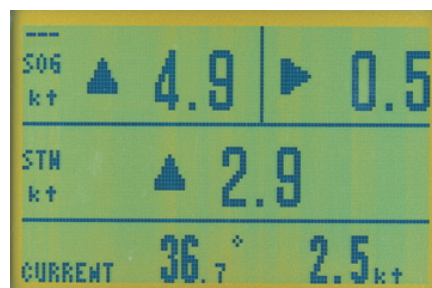
*Ambiguity "n" is resolved by LAMBDA algorithm developed by Prof. Teussen, Delft University of Technology, The Netherlands.
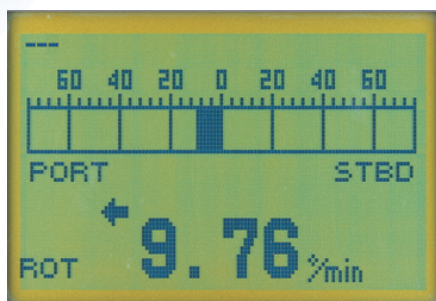
North

Heading

Antenna A3
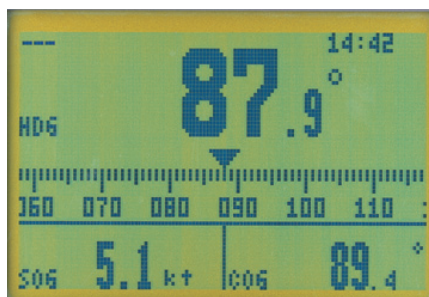
θ

nλ

λ

Δλ

Vector to decide heading

Antenna A2

Fore-and-aft line

Antenna A1

Difference between the range from satellite to antenna 1 and the range to antenna 2.

--- 01 JUN 11   13:14:32

34° 44.855' N
122° 42.077' W

SOG 5.6 kt   HDG 262.6°

NAV Data Mode

--- 01 JUN 11   13:12:54

263.8°

HDG

SOG 5.6 kt   COG 262°

Heading Mode

SOG kt ▲ 4.9   ▶ 0.5

STW kt ▲ 2.9

CURRENT 36.7°   2.5 kt

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

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60 40 20 0 20 40 60

PORT   STBD

◀ 9.76 °/min

ROT

ROT Mode

87.9°

14:42

HDG

060 070 080 090 100 110

SOG 5.1 kt   COG 89.4°

Steering Mode

SPECIFICATIONS OF SC-60

1. Accuracy

Heading	±1.0° (95 % static accuracy) (IMO THD MSC.116(73) static accuracy: ±1.0° x secant Lat.)
GPS Fix	10 m (95 %)
DGPS Fix	5 m (95 %)

2. Follow-up
25°/s rate-of-turn

3. Settling time
3 min

4. Interface

Heading Output	3 ports: AD-10 or IEC 61162-1 1 port: NMEA 0183 (Ver 1.5/2.0) in RS-232C level HDT, HDM, VTG, ZDA, GGA AD-10 format: 25 ms data rate
COG, SOG, L/L Output	1 port: IEC 61162-1 1 port: NMEA 0183 in RS-232C VTG, GGA, ZDA, GLL, ROT, PFECatt including pitch, roll and yaw data PFECGPatt (NMEA 0183 V 1.5/2.0)
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) HDT, HDG, HDM, VBW, VHW, VLM for tide direction and speed
DGPS	1 port: RTCM SC-104 format in RS-232C: MSK, GGA

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

6. Receive Freq
L1 (1575.42 MHz)

7. Display Unit
4.5-inch LCD (4 gray tones), 120 (V) x 64 (H) pixels

8. Display Mode
Steering, Nav Data, Compass Rose, ROT, Heading and Set and Drift modes

POWER SUPPLY
12-24 VDC, 15 W

EQUIPMENT LIST

Standard

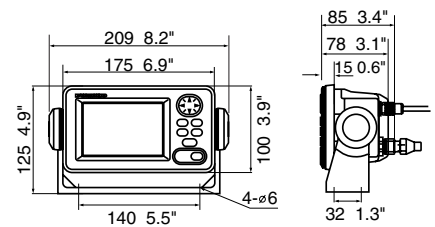|		
1. Display Unit	SC-602	1 unit
2. Antenna Unit with 15 m cable	SC-303	1 unit
3. Processor Unit	SC-601	1 unit
4. Standard Spare Parts, Installation Materials		1 set

Optional

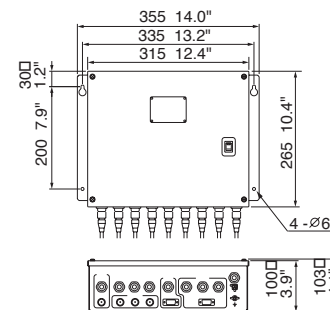|		
1. Beacon Receiver Kit	GR-7001-K	
2. Whip Antenna for Beacon Receiver Kit		
	1.2 m (FAW-1.2)	
	2.6 m (04S4176)	
2. Data Cable for AD-10	5 m (MJ-A6SPF0003-050)	
	10 m (MJ-A6SPF0007-100)	
3. Interface Cable	10 m (MJ-A6SPF0012-100)	
4. Antenna Cable	30 m (CP20-01700),	
	50 m (CP20-01710)	
5. Flush Mount Kit for Display S type (OP20-17)		
	F type (OP20-18/29)	

ENVIRONMENTAL
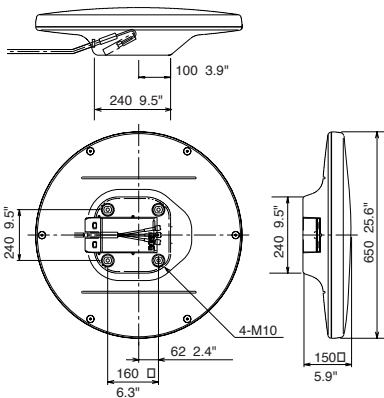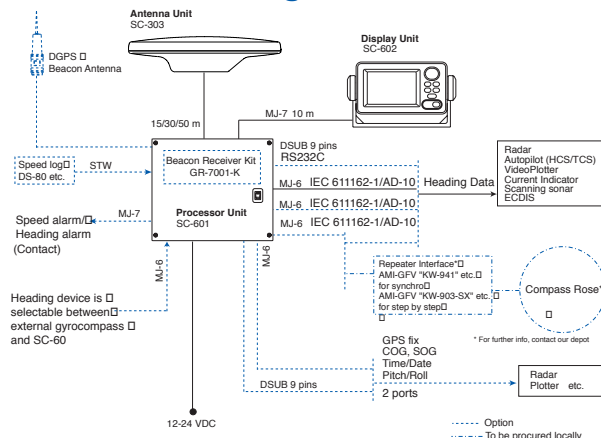IEC 60945 for EMC, Vibration, Temperature

Display Unit
0.6 kg 1.3 lb

209 8.2"
175 6.9"
125 4.9"
100 3.9"
140 5.5"
4-ø6
85 3.4"
78 3.1"
15 0.6"
32 1.3"

Processor Unit
3.8 kg 8.4 lb

355 14.0"
335 13.2"
315 12.4"
30 1.2"
200 7.9"
265 10.4"
4 - Ø6
100 3.9"
103 4.1"

Antenna Unit   3.5 kg 7.7 lb

100 3.9"
240 9.5"
240 9.5"
240 9.5"
650 25.6"
4-M10
62 2.4"
160 6.3"
150 5.9"

Interconnection Diagram

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE