FURUNO DEEPSEA WORLD

FURUNO®

Meeting New IMO requirements

MARINE GPS NAVIGATOR

Model GP-90

- Fully meets new IMO Resolution MSC.112(73) and IEC 61108-1 Ed.2 for SOLAS carriage requirements on and after 1 July 2003
- Ideal sensor of SOG and COG for AIS, radars, and other navigational aids
- Augmentation to enhance accuracy by standard fitted WAAS and optional DGPS
- Display modes: VideoPlotter, 3-D Highway, Text, etc.
- Memory: 2,000 points for ship's past positions and marks (incl. 99 event marks max.); 999 waypoints; 30 routes each containing up to 30 waypoints

GPS/WAAS Antenna:
GPA-017S
(standard)

DGPS Antenna:
GPA-019S
(option)

Advanced Electronic Position-Fixing System (EPFS) to meet New IMO Performance Requirements and IEC Testing Standards.

The future today with FURUNO's electronics technology.

FURUNO ELECTRIC CO., LTD.
9-52 Ashihara-cho, Nishinomiya City, Japan Phone: +81 (0)798 65-2111
Fax: +81 (0)798 65-4200, 66-4622 URL: www.furuno.co.jp

Catalogue No. N-856

An outstanding solution to SOLAS carriage requirements as a standalone positioning device and as a sensor for AIS, Radar, VDR, etc.

The FURUNO GP-90 is a new GPS navigator designed for SOLAS ships complying with the new GPS performance standard IMO Res MSC.112(73) and associated IEC standards required on and after 1 July 2003. It is a highly reliable standalone EPFS (Electronic Position-Fixing System) providing a navigation solution to the AIS, radars, VDRs, etc.

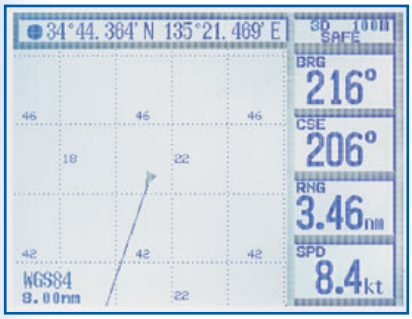
Receiver dependability is improved by fault detection using five satellites, i.e., Receiver Autonomous Integrity Monitoring (RAIM). The GP-90 indicates the integrity status in Safe, Caution, or Unsafe label. These indications are given with respect to user selected accuracy level, 10 m or 100 m. RAIM also works on DGPS signals.

A choice of display mode is available from VideoPlotter, Text, Highway, etc. In the highway mode, you can intuitively see how to steer and where the next waypoint is located relative to your ship. It is useful when you are following a series of waypoints along a planned route.

WAAS is standard fitted to improve the position accuracy and DGPS is optionally available with an internal or external differential receiver.

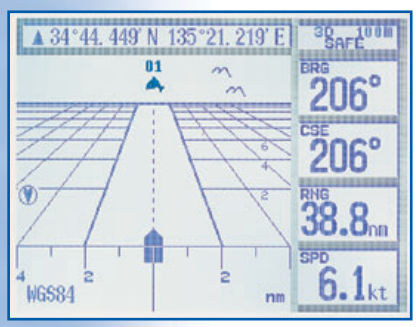
The GP-90 consists of an antenna unit and display unit. The display unit is a 6" silver bright LCD offering optimum viewing under the direct sunlight. Dual configuration with a second system provides a backup or remote operation to ensure system availability.

VideoPlotter mode

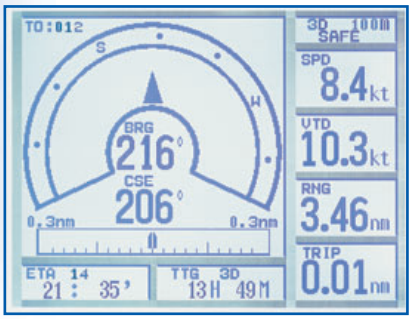


Text mode

Highway mode



Steering mode

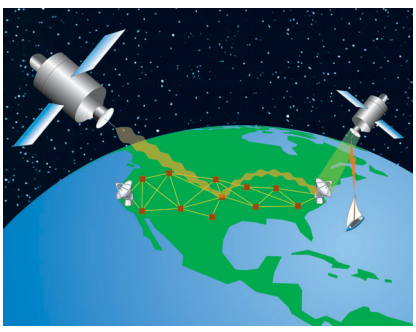


Augmentation

The GPS accuracy can be enhanced by a proper augmentation system. The following two methods, WAAS and DGPS are basically the same in that a reference station monitors the signal quality and transmits correction data to the users.

WAAS

WAAS is a GPS navigation system with differential correction by means of geostationary satellites. The US FAA has been testing this system and expects more field tests in 2003. Similar systems, using Satellite-Based Augmentation Systems (SBAS), are under development in Japan (MSAS: MSAT Satellite-based Augmentation System) and Europe (EGNOS: European Geostationary Navigation Overlay System). They are said to be fully interoperable and compatible. MSAS and EGNOS are expected to become fully operational in 2004 or after.



Increases the navigation efficiency and safety by feeding accurate positional data to AIS, Radars, INS, and many other nav aids.

IMO performance standard MSC.112(73) and associated IEC standards are an epoch-making milestone in the radionavigation history.

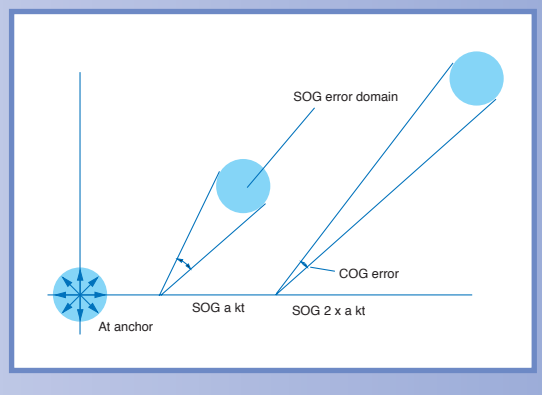
The SOLAS Chapter V as amended prohibits new installation of current GPS receivers which are disigned to IMO A.819 after 1 July 2003*. With the comparison below, you will see why we say the new IMO equipment is epoch making.* Some Administrations may give a grace period for the current GPS receivers.

Major functionality	MSC.112(73), IEC 61108-1 ed.2	A.819(19), IEC 61108-1 ed.1
Accuracy	13 m (95%)	100 m (95%)
SOG (speed over ground)	Required to accuracy of SDME	SOG prohibited, no testing standard
COG (course over ground)	Required to accuracy of ±1° (>17 kt), ±3° (<17 kt)	COG prohibited, no testing standard
UTC	Required to output	Data is limited to only L/L
RAIM (Receiver autonomous integrity monitoring)	Required to indicate integrity indication of Safe, Caution, Unsafe at confidence level of 10 m and 100 m	No
Display update rate	1 s at latest	every 2 s

How SOG and COG are measured?

As locations of GPS satellites in view are known, analyzing Doppler shifts from them produces the latitudinal and longitudinal components of velocities of respective moving satellites relative to a GPS receiver. Vector sum of these components provides a speed over ground (SOG). Course over ground (COG) is at the same time found as an angle of the SOG vector relative to the north.

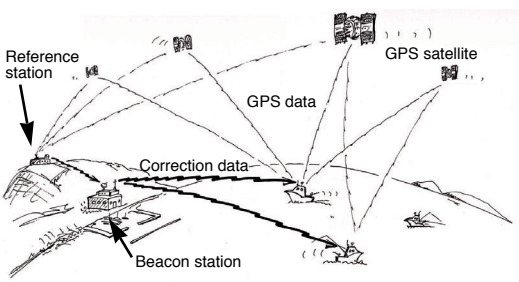
Note COG is not a course made good (CMG) that is found by striking a segment between two locations (past and present). Accuracy of SOG is free from the moving speeds of the ship but that of COG is subject to the ship speed. The faster ship speed provides a longer vector; thus, the error of COG gets smaller. Suppose your ship is at anchor; the COG vector can be anywhere within a SOG error domain. Errors mostly results from ionospheric refraction of the GPS signals.



As the WAAS utilizes the same frequency as the GPS, a single antenna can receive GPS and WAAS signals. Currently two Inmarsat GEO satellites are available for receiving the WAAS signal: AOR-W and POR. Major contributors of an error in a single frequency GPS system are receiver clock drift and signal delays by refraction. The WAAS reference stations on the earth monitor the GPS constellation and route GPS error data to the satellites via the master earth station. The Inmarsat or communication satellite broadcasts the differential corrections to marine and aviation users.

DGPS

Differential operation of the GPS consists of several essential elements. In a word, a reference receiver is placed at a known point (usually at radio beacon stations). It compares the known location with that predicted by the GPS reference receiver producing correction data. This data is broadcast in MSK modulated signals within the beacon band. The differential beacon receiver on ship receives and demodulates the signals, applying the correction data to the GPS receiver.



SPECIFICATIONS OF GP-90

GPS

Receiver	12 discrete channels all-in-view, C/A code
RX Frequency	L1 (1575.42 MHz)
Time to First Fix	12 s (Warm start)
Tracking Velocity	900 kt
Geodetic System	WGS-84 (NAD-27 or others selectable)
Update Rate	1 s

Positioning Augmentation

DGPS

Reference Station: Automatic or manual selection
Frequency Range: 283.5 - 325.0 kHz (all ITU regions)
Format: RTCM SC-104 Ver 2.0 Type1, 7, 9, 16

WAAS

Standard fitted in display unit

Accuracy
GPS: 10 m (95%)
DGPS: 5 m (95%)
WAAS: 3 m (95%), limited coverage
SOG: ±0.001 kt (calm sea)
COG: ±3° (SOG 1-17 kt), ±1° (SOG > 17 kt)

Display
6" LCD (120 W, 91 H mm),
320 (H) x 240 (V) pixels,
L/L resolution: 0.001 min

Display Modes
VideoPlotter, Highway, Text, Steering

VideoPlotter
Scale: 0.02 to 320.0 nm,
Plot Interval: 1 s - 60 min or 0.01-99.99 nm

Memory Capacity
2,000 points for ship's track and marks, 999 waypoints with comments, 30 routes (containing 30 waypoints/route)

Alarms
Arrival, anchor watch, XTE, speed, time, water depth, trip, DGPS, WAAS

Integrity indication
Safe, Caution, Unsafe at accuracy level of 10 m or 100 m

Interface (IEC 61162-1 Ed 2, NMEA 0183):
Output: GBS (satellite fault), GLL (L/L), VTG (SOG, COG), ZDA(UTC), WPL (WPT location), etc.
Input: DBT (Depth), HDT (Compass), MTW (Water temperature), TLL (TGT L/L), VBW (Dual grd/wat spd), etc.

ENVIRONMENT (IEC 60945 test method)

Temperature	Display Unit: -15°C to +55°C Antenna Unit: -25°C to +70°C
Waterproofing	Display Unit: IPX5 (IEC 60529), CFR46 (USCG) Antenna Unit: IPX6 (IEC 60529)
EMC	IEC 60945 Ed. 4 (up to 2 GHz)

POWER SUPPLY

12-24 VDC, 0.8-0.4 A

EQUIPMENT LIST

Standard

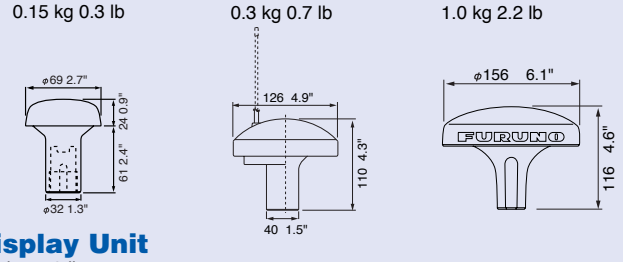
1. Display Unit (Specify single or dual)	1 unit
2. Antenna Unit GPA-017S	1 unit
3. Antenna Cable	15 m
4. Interface Cable	5 m x 2 pcs
5. Installation Materials and Spare Parts	1 set

Option

1. DGPS Receiver Kit OP20-32-1/20-33
2. Whip Antenna FAW-1.2 for GPA-018S
3. Antenna Cable, 30/50 m
4. Interface Cable, 5/10 m
5. Antenna Base
   CP20-01111 (Pipe mount), No.13-QA300 (Deck mount)
   No.13-QA310 (Offset bracket), No.13-RC5160 (Handrail mount)
6. Flush Mount Kit OP20-24/20-25
7. Interface Unit IF-2500
8. External DGPS Receiver GR-80
9. Rectifier PR-62

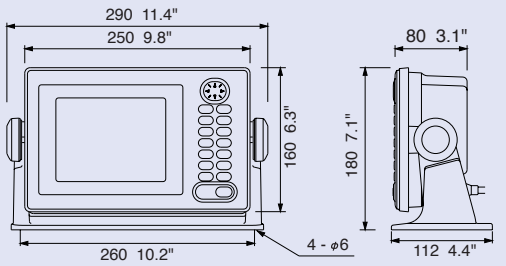
Antenna Unit

GPA-017S 0.15 kg 0.3 lb
GPA-018S 0.3 kg 0.7 lb
GPA-019S 1.0 kg 2.2 lb

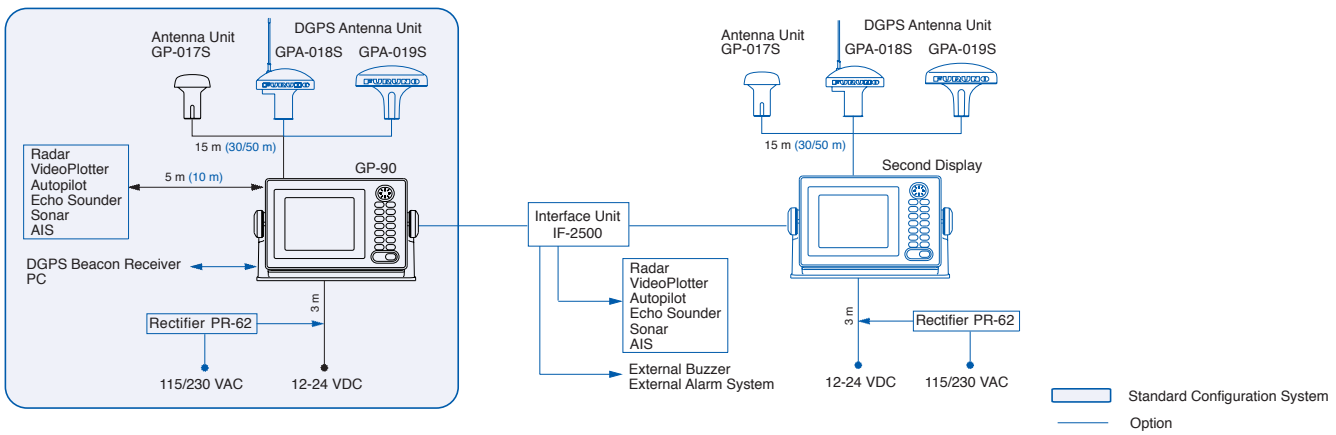


Display Unit

2.2 kg 4.9 lb



Interconnection Diagram



SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

03085N Printed in Japan

FURUNO U.S.A., INC.
Camas, Washington, U.S.A.
Phone: +1 360-834-9300 Telefax: +1 360-834-9400

FURUNO (UK) LIMITED
Denmead, Hampshire, U.K.
Phone: +44 2392-230303 Telefax: +44 2392-230101

FURUNO FRANCE S.A.
Bordeaux-Mérignac, France
Phone: +33 5 56 13 48 00 Telefax: +33 5 56 13 48 01

FURUNO ESPAÑA S.A.
Madrid, Spain
Phone: +34 91-725-90-88 Telefax: +34 91-725-98-97

FURUNO DANMARK AS
Hvidovre, Denmark
Phone: +45 36 77 45 00 Telefax: +45 36 77 45 01

FURUNO NORGE A/S
Ålesund, Norway
Phone: +47 70 102950 Telefax: +47 70 127021

FURUNO SVERIGE AB
Västra Frölunda, Sweden
Phone: +46 31-7098940 Telefax: +46 31-497093

FURUNO FINLAND OY
Espoo, Finland
Phone: +358 9 4355 670 Telefax: +358 9 4355 6710