

# Seapath® 385 series



KONGSBERG



## GNSS aided Inertial Navigation System

The all-new Seapath 385 is based on the legacy of the Seapath 300-series and incorporates new hardware and advanced navigation algorithms. The Seapath 385 is developed specifically for hydrographic surveying where high-precision heading, position, velocity, roll, pitch, heave and timing are critical measurements. Our solution combines state-of-the-art inertial technology and processing algorithms with multi-frequency GPS, GLONASS, Galileo, Beidou, QZSS and geostationary satellite signals.

### Function

The advanced Seapath sensor fusion algorithms integrate raw inertial sensor data from our unique and very high-performance MGC® (Motion Gyro Compass) or MRU (Motion Reference Unit), together with raw GNSS data and RTK, PPP or DGNSS corrections. Our unique navigation algorithms enable high accuracy position output even when no correction signals are available.

The Seapath is robust against GNSS dropouts by using the inertial sensor for dead reckoning navigation, providing all measurements even when GNSS is not available. The updated navigation algorithms ensure market leading dead reckoning performance. The Seapath 385 adds another layer of robustness in the unique use of both GNSS antennas for positioning in addition to heading.

Post-processing of the Seapath data is possible to further enhance accuracy in position and attitude. The Seapath 385 includes a new post-processing format that contains all necessary data and system configuration in a single file. Centimetre position accuracy can be achieved through downloaded satellite orbit and clock data or data logged from base stations.

### System configuration

The Seapath 385 is built on a new hardware platform, delivering improved processing capabilities and upgraded interfaces. The Seapath 385 is a modular rack-mounted system with a dedicated Processing Unit that connects to the inertial sensor and two GNSS antennas. The Processing Unit runs all critical computations independent from the user interface on the HMI Unit, which ensures continuous and reliable operation. The operator software can also be installed on the customer's computer and used instead of the HMI Unit.

### Interfaces

The Seapath 385 Processing Unit has 8 configurable RS-232/422 serial lines in addition to several Ethernet ports available over 5 LANs. Data for all 6 degrees of freedom can be output through NMEA messages or proprietary messages to external sensors and survey computers. Several simultaneous GNSS augmentation sources can be connected through configurable serial lines or Ethernet.

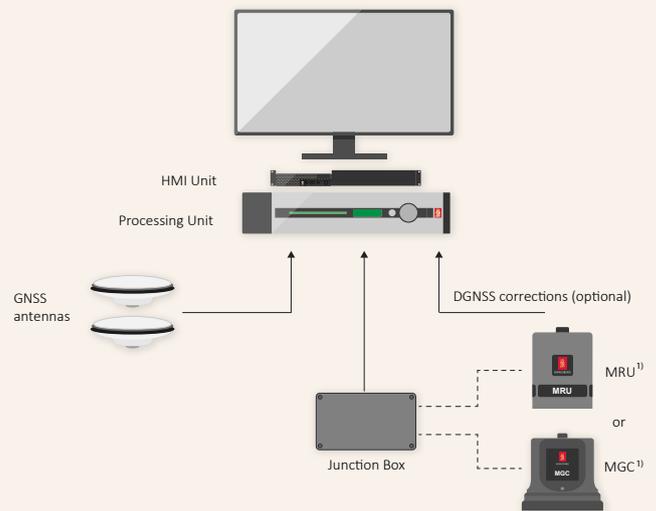
The Seapath 385 provides accurate measurements with a data rate of up to 200 Hz at multiple monitoring points, to accommodate sensors or systems relying on motion or position data across the vessel.

Product range	Motion			Position				
	Roll/pitch	Heading	Heave	Non-differential	Galileo HAS	RTK	Real-time PPP	Dead reckoning 60 s
Seapath 385-3/40	0.010°	0.05°	2 cm or 2 %	0.3 m	0.1 m	0.01 m	0.05 m	1.6 m
Seapath 385-5/60	0.008°	0.03°	1 cm or 1 %	0.3 m	0.1 m	0.01 m	0.05 m	0.6 m
Seapath 385-5+	0.005°	0.02°	1 cm or 1 %	0.3 m	0.1 m	0.01 m	0.05 m	0.3 m
Seapath 385-R2	0.008°	0.02°	1 cm or 1 %	0.3 m	0.1 m	0.01 m	0.05 m	0.6 m
Seapath 385-R3	0.007°	0.01°	1 cm or 1 %	0.3 m	0.1 m	0.01 m	0.05 m	0.2 m
Seapath 385-R4	0.005°	0.007°	1 cm or 1 %	0.3 m	0.1 m	0.01 m	0.05 m	0.08 m

The Seapath 385 supports all 3-axis versions of our MGC® and MRU line. All data are RMS values, 4-metre antenna baseline and for horizontal position. All roll and pitch values are with Automatic Online Calibration (AOC). With the AOC functionality, a recalibration of the MGC/MRU is no longer required. Heave values are valid for delayed heave up to a 50-second heave period and real-time heave up to a 10-second heave period. Longer periods will increase uncertainty. Roll, pitch, heading and heave are unaffected by a 60-second GNSS dropout.

## FEATURES

- 0.005° to 0.010° roll & pitch accuracy depending on MRU/MGC
- 1 cm/1% real-time heave accuracy for heave periods up to 10 seconds
- 1 cm/1% delayed heave accuracy by use of PFreeHeave® algorithm for heave periods up to 50 seconds
- Dual 555-channel multi-frequency, multi-constellation receivers
- All available GPS/GLONASS/Galileo/BeiDou/QZSS satellites used in position solution
- RTK, Galileo HAS, Fugro G4/G4+ and more corrections supported
- Includes SBAS corrections (WAAS, EGNOS, MSAS, GAGAN)
- Includes unique high-precision non-differential position algorithm
- Spoofing detection and rejection capabilities
- All data have the same time stamp and to an accuracy of 0.001 s to the actual measurement time
- Precise Time Protocol (PTP) and NTP available for time critical applications over Ethernet
- Data available in up to eight different monitoring points
- Up to 16 configurable output ports on Ethernet or serial line
- Logging of raw satellite and IMU data possible
- Remote support capabilities



1) The MRU and MGC can feed other systems with inertial data through the Junction Box while used as IMU in Seapath.

## Technical specifications

### Seapath® 385 series

#### Interfaces

Communication	8 serial RS-232/RS-422 lines and 5 Ethernet LANs
Data output interval	Programmable in 0.005-second steps and 1PPS pulse
Data output rate	Up to 200 Hz
1PPS signal accuracy	220 nsec

#### GNSS signal tracking

GPS	L1 C/A, L1C, L2C, L2P, L5
GLONASS	L1 C/A, L2 C/A, L2P, L3, L5
Galileo	E1, E5 AltBOC, E5a, E5b, E6
BeiDou	B1I, B1C, B2I, B2a, B2b, B3I
QZSS	L1 C/A, L1C, L1S, L2C, L5, L6

#### Power specifications

Processing Unit	100 - 240 VAC, 75 W (max)
HMI Unit	100 - 240 VAC, 170 W (max)
IMU	24 VDC from Processing Unit
GNSS antenna	5 VDC from Processing Unit

#### Weights and dimensions

Processing Unit	5.4 kg, 89 × 485 × 357 mm
HMI Unit	3.6 kg, 44 × 481 × 267 mm
IMU:	
miniMRU	0.5 kg, 100 × 80 × 46 mm
MRU	2.2 kg, 140 × Ø 105 mm
MGC	8.1 kg, 188 × 189 × 189 mm
GNSS antenna	0.5 kg, 55 × 176 mm

#### Environmental specifications

##### Operating temperature range

Processing Unit	-15 - 55 °C
HMI Unit	5 - 35 °C
IMU:	
miniMRU/MRU	-5 - 55 °C
MGC	-15 - 55 °C
GNSS antenna	-40 - 85 °C

##### Storage temperature range

Processing Unit	-20 - 70 °C
HMI Unit	-10 - 40 °C
IMU	-25 - 70 °C
GNSS antenna	-55 - 85 °C

##### Enclosure protection

Processing/HMI Unit	IP21
miniMRU	IP52
MRU/MGC	IP66
GNSS antenna	IP69K

##### Mechanical

Vibration	IEC 60945/EN 60945, IACS E10
-----------	------------------------------

##### Electromagnetic compatibility

Compliance to EMC, immunity/emission	IEC 60945/EN 60945, IACS E10
--------------------------------------	------------------------------

##### Product safety

Compliance to LVD, standard used	IEC 61010-1/EN 61010-1
----------------------------------	------------------------

Specifications are valid without multipath, without shadowing of antennas and for typical survey operations.

Specifications subject to change without any further notice.