MRU 5+ MK-II

The ultimate marine motion sensor

The MRU 5+ product is upgraded with the best MEMS based gyro technology available. With exceptional low angle noise and bias stability the product is ideal for integrated INS/GNSS systems and demanding survey applications.

Features

- 0.008° roll and pitch accuracy
- Exceptional low angle noise and bias stability
- Outputs on RS-232, RS-422 and Ethernet
- High output data rate (200 Hz)
- Precise heave at long wave periods by use of PFree Heave® algorithm
- Each MRU delivered with Calibration Certificate
- No limitation in mounting orientation
- Lever arm compensation to two individually configurable monitoring points
- Meets IHO special order requirements
- EM® HighFrequency mode
- Small size, light weight, low power consumption
- 2-year warranty

Specifications

Product	MRU 5+ MK-II
Country of origin	Norge
Manufacturer	Kongsberg Discovery

Unique components

The MRU 5+ provides documented roll and pitch accuracy of 0.008° and angle noise less than 0.002°. Every unit is delivered with an individual calibration certificate documenting this accuracy. This is made possible by use of accurate inertial sensors including three rate gyros and linear accelerometers. The accelerometers included are of excellent tactical navigation grade performance.

For this upgraded MRU 5+ product a new MEMS based gyro is developed by Kongsberg Seatex AS called MRG5 (Mru Rate Gyro) model 5. The MRG5 is optimized for use in high-end applications. The MRU rate gyro combines very low noise, excellent bias stability and outstanding gain accuracy and is the best MEMS rate gyro available for maritime applications.

Very high reliability is achieved by using solid-state sensors with no moving parts and the proven MRU electrical and mechanical construction

Easy to set up and use

Interfacing the MRU 5+ to various sonar systems is made easy by including data protocols for the most commonly used multibeam echo sounder systems in the software. Using the configuration cable and the Windows version of the configuration software, MRC+, a series of simple menu prompts allow the user to choose the optimum configuration for his application. The MRU 5+ and the MRC+ software are flexible and can accommodate a wide variety of application types.

PFreeHeave® Algorithm

The PFreeHeave algorithm uses past measurements to output a correct and phase-free heave from MRU 5+. PFreeHeave has an advantage in long swell conditions and for applications that can utilize a heave signal that is delayed some minutes, typical seabed mapping applications.

Digital I/O protocols

MRU data is available through an Ethernet interface enabling easy distribution of MRU data to multiple users on board the vessel. Output protocols for commonly used survey equipment are available on two individually configurable serial lines and Ethernet/UDP.

External communication

The MRU 5+ accepts external input of speed and heading information on separate serial lines for improved accuracy in heave, roll and pitch during turns and accelerations. For time synchronization the MRU accepts 1-second time pulse (1PPS) input

Specifications

Product	MRU 5+ MK-II
Country of origin	Norge
Manufacturer	Kongsberg Discovery
Weight	2.2 kg
Dimensions	Ø 105 x 140 mm
Material	Anodised aluminium

Gyro output

Angular rate range	±75°/s
Angular rate noise	0.008°/s RMS
Bias stability (in run bias)	0.03°/h RMS
Bias stability (absolute bias)	20°/h RMS
Angle random walk	0.006°/√h (typical)
Scale factor error	0.03 % RMS

Acceleration output

Acceleration range (all axes)	±30 m/s2
Bias stability (absolute bias)	80 µg RMS
Acceleration noise	0.0003 m/s2 RMS
Velocity random Walk	3.3 µg/√Hz
Scale factor error	0.008% RMS

Data output protocols

MRU normal	Sounder
NMEA 0183 proprietary	EM3000
Atlas Fansweep	TSS1
Seapath binary 23, 25, 26	PFreeHeave®
PRDID	KM binary

Environmental specifications

Operational temperature range	-5 °C to +55 °C
Storage temperature range	-25 °C to +70 °C
Enclosure protection	IP66
Vibration	IEC 60945/EN 60945

Electrical

Voltage input	10 to 36 V DC
Power consumption	Max 8 W (typical 7.2 Watts)
Ethernet output ports	5
Ethernet UPD/IP	10/100 Mbps
Data output rate	200 Hz
Timing	< 1 ms
Analog channels (junction box)	# 4, ±10 V, 14 bit resolution
Com1	Bidirectional RS-422
Com2	Bidirectional RS-422 from junction box, user configurable RS 232, RS-422
Com3 & Com4	Input only, user con figurable RS-232, RS-422

Other data

MTBF (computed)	50000 h
MTBF (service history based)	100000 h
Input formats	NMEA 0183, incl. HDT, HDM, ZDA, GGA, VTG, VHW, VBW or MRU Normal format
Connector (MIL. spec.)	Souriau 851-36RG 16-26S50

Orientation output

Angular orientation range	±180°
Resolution in all axes	0.001°
Angle noise roll, pitch	0.002° RMS
Accuracy roll, pitch	0.008° RMS

Heave output

Output range	±50 m, adjustable
Heave accuracy for 0 to 25 s motion periods (real-time)	5 cm or 5% whichever is highest (RMS)
Heave accuracy for 10 s motion period (real-time)	1 cm or 3% whichever is highest (RMS)
Heave accuracy for 0 to 50 s motion periods (delayed)	2 cm or 2% whichever is highest (RMS)
Heave velocity accuracy	0,01 m/s RMS