MRU 5+

KONGSBERG

The ultimate marine motion sensor

The MRU 5+ is the highest performing MEMS based Motion Reference Unit in the market. It contains sensors with exceptionally low noise and good bias stability, making it ideal for demanding applications.

Unique components

The MRU 5+ provides a documented dynamic roll and pitch accuracy that is better than 0.002° 1-sigma in dynamic applications. With 0.008° RMS static roll and pitch accuracy the MRU 5+ is an excellent inclinometer replacement as well. The product has a gyro in-run bias stability of typically 0.03°/h. Every unit is delivered with an individual calibration certificate documenting this accuracy. The obtained performance is made possible by use of accurate inertial sensors including three rate gyros and linear accelerometers. The quartz accelerometers included are of excellent tactical navigation grade performance.

The MRU 5+ product is updated with the most sophisticated MEMS gyro available, the mMRG03 (milli Mru Rate Gyro). The mMRG03 is developed and manufactured by Kongsberg Discovery AS. 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 marine applications is made easy by including data protocols for the most commonly used marine systems in the software. By using the configuration cable and the Windows version of the configuration software, MRC+, a series of simple menu prompts allow you to choose the optimum configuration for your 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 the MRU 5+. PFreeHeave has an advantage in long swell conditions and for applications that can utilize a heave signal that is some minutes delayed, typically seabed mapping applications.

Digital I/O protocols

MRU data is available through serial lines and 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 a 1-second time pulse (1PPS) input.

FEATURES

- 0.002° roll and pitch dynamic accuracy
- Exceptionally low angle noise and bias stability
- High output data rate (200 Hz)
- Outputs on RS-232, RS-422 and Ethernet
- Precise heave at long wave periods by use of PFreeHeave® algorithm
- Each MRU delivered with Calibration Certificate
- No limitation in mounting orientation
- Lever arm compensation to two individually configurable monitoring points
- Small size, light weight, low power consumption
- 2-year warranty

Technical specifications

MRU 5+

Orientation output

Angular orientation range	±180°
Resolution in all axes	0.0001°
Static accuracy, roll & pitch[1]	0.008° RMS
Dynamic accuracy, roll & pitch[2] (for a ±5° amplitude)	0.002° 1-sigma

Gyro output

Angular rate range	±75°/s
Angular rate (noise bandwidth 0 - 10 Hz)	0.010°/s RMS
Scale factor error	0.02 % RMS

Acceleration output

Acceleration range (all axes)	±45 m/s^2
Acceleration noise	0.0003 m/s^2 RMS
Scale factor error	0.008 % RMS

Heave output

Output range	±50 m, adjustable
Heave accuracy 0 - 25 s motion periods (real-time)	5 cm or 5 % whichever is highest (RMS)
Heave accuracy 10 s motion periods (real-time)	1 cm or 1 % whichever is highest (RMS)
Heave accuracy 0 - 50 s motion periods (delayed)	1 cm or 1 % whichever is highest (RMS)
Heave velocity accuracy	0.01 m/s RMS

Electrical

Voltage input	10 - 36 VDC
Power consumption	Max 8 W (typical 7.2 Watts)
Serial ports:	
COM 1	Bidirectional RS-422
COM 2	Bidirectional RS-422 from junction box, user configurable RS-232, RS-422
COM 3 & COM 4	Input only, user configurable RS-232, RS-422
Analog channels (junction box)	# 4, ±10 V, 14-bit resolution
Ethernet output ports	5
Ethernet UDP/IP	10/100 Mbps
Data output rate	200 Hz (max)
Timing	< 1 ms

Input formats

NMEA 0183, incl. HDM, HDT, THS, VBW, VHW, VTG , ZDA or MRU Normal format

Data output protocols

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

Other data

MTBF (computed)	50000 h
MTBF (service history based)	100000 h
Connector	Souriau 851-36RG 16-26S50

Weight and dimensions

Weight	2.2 kg
Dimensions	Ø 105 × 140 mm (4.134” x 5.525”)

Environmental specifications

Operating temperature range	-5 - 55 °C
Storage temperature range	-25 - 70 °C
Enclosure protection	IP66
Material	Anodised aluminium
Vibration	IEC 60945/EN 60945

Electromagnetic compatibility

Compliance to EMCD, immunity/emission	IEC 60945/EN 60945

1 *When the MRU is stationary over a 30-minute period.*
2 *When the MRU is exposed to a combined two-axes sinusoidal angular motion with 10 minutes duration.*

Specifications subject to change without any further notice.

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