MRU E

KONGSBERG

The extended temperature motion sensor

This 5th generation roll, pitch and heave motion sensor is specially designed for use in marine applications that require an extended temperature range. The MRU E is designed to operate at ambient temperatures from -25 to +70 °C. It can be installed on open decks, inside cabinets or on bulkheads.

Typical applications

The MRU can be mounted directly under the helideck centre to measure 3-axes linear accelerations together with roll, pitch and heave. The MRU E is typically used in a Helideck Monitoring System where the helideck location is separate from the accommodation and the hull. The MRU E meets HCA requirements to measure helideck acceleration and calculate the Motion Severity Index (MSI).

Function

The MRU E is manufactured and calibrated in order to perform accurately at ambient temperatures from -25 to +70 °C. The unit incorporates three highly accurate accelerometers and three Micro-Electro-Mechanical-Structures (MEMS) angular rate gyros. This unit achieves high reliability by using solid state sensors with no moving parts and the proven MRU electrical and mechanical construction. A special mounting bracket for outdoor mounting of the MRU E is available. This bracket protects the MRU from weather and sea spray.

Output variables

The MRU E outputs roll, pitch and heave together with linear acceleration in 3-axes.

PFreeHeave® algorithm

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

External inputs

The MRU E accepts input of external speed and heading information on separate serial lines or Ethernet 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.

Digital I/O protocols

For this 5th generation MRU data is available through both Ethernet interface and serial lines 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.

FEATURES

- 0.010° roll and pitch dynamic accuracy
- Outputs real-time heave, roll, pitch and linear acceleration measurements
- Outputs on RS-232, RS-422 and Ethernet
- High output data rate (200 Hz)
- Each MRU delivered with Calibration Certificate
- No limitation in mounting orientation
- Lever arm compensation to two individually configurable monitoring points
- Meets HCA requirements
- Small size, light weight and low power consumption
- Selectable communication protocols in the Windows based MRU configuration software
- 2-year warranty

Technical specifications

MRU E

Orientation output

Angular orientation range	±180°
Resolution in all axes	0.0001°
Static accuracy roll & pitch1)	0.03° RMS
Dynamic accuracy roll & pitch2), (for a ±5° amplitude)	0.010 1-sigma

Gyro output

Angular rate range	±150°/s
Angular rate noise	0.015°/s RMS
Scale factor error	0.08 % RMS

Acceleration output

Acceleration range (all axes)	±45 m/s^2
Acceleration noise	0.015 m/s^2 RMS
Scale factor error	0.05% RMS

Heave output

Output range	±50 m, adjustable
Heave accuracy for 0 to 25 s motion periods (real-time) (RMS)	5 cm or 5% whichever is highest
Heave accuracy for 10 s motion period (real-time) (RMS)	1 cm or 1% whichever is highest
Heave accuracy for 0 to 50 s motion periods (delayed) (RMS)	2 cm or 2% whichever is highest
Heave velocity accuracy	0.01 m/s RMS

Electrical

Voltage input	10 - 36 VDC
Power consumption	Max 8 W (typical 7.2 W)
Serial ports:	
• COM1	Bidirectional RS-422
• COM2	Bidirectional RS-422 from junction box, user configurable RS-232, RS-422
• COM3 & COM4	Input only, user configurable RS-232, RS-422
Analog channels (junction box)	# 4, ±10 V, 14 bit resolution
Ethernet output ports	5
Ethernet UPD/IP	10/100 Mbps
Data output rate (max)	200 Hz
Timing	< 1 ms

Input formats

NMEA 0183, incl. HDT, HDM, ZDA, VTG, VHW, VBW 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
Material	Anodised aluminium
Connector (MIL. spec.)	Souriau 851-36RG 16-26S50

Weights and dimensions

Weight	2.0 kg
Dimensions	Ø 105 × 140 mm (4.134 × 5.525”)

Environmental specifications

Operating temperature	-25 - +70 °C
Storage temperature	-25 - +70 °C
Enclosure protection	IP66
Vibration	IEC 60945/EN 60945

Electromagnetic compatibility

Compliance to EMC, 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-axis sinusoidal angular motion with 10 minutes duration.*

Specifications subject to change without any further notice.

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