

MRU 5



KONGSBERG



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THE IDEAL MARINE MOTION SENSOR

This fifth generation MRU 5 is specially designed for high precision motion measurements in marine application and for users requiring high accuracy roll, pitch and heave measurements.

Typical applications

The MRU 5 is the ideal sensor for motion compensation of multi-beam echo sounders, offshore cranes, hydroacoustic positioning systems and dynamic motion monitoring of roll, pitch and linear accelerations on offshore structures. The MRU 5 provides documented roll and pitch accuracy of 0.02° RMS at a $\pm 5^\circ$ amplitude. The unit maintains its specified accuracy aboard any surface vessel or subsea vehicle.

Function

The MRU 5 incorporates three highly accurate accelerometers and three high-end Kongsberg Seatex developed Micro-Electro-Mechanical-Structures (MEMS) gyros of type MRG (MRU Rate Gyro). The MRG gyro combines low noise, excellent bias stability and gain accuracy. Very high reliability is achieved by using solid state sensors with no rotational or mechanical wear-out parts.

The unit is delivered with Windows based configuration and data presentation software. In this software vector arms from where the MRU is mounted to center of gravity (CG) and two individually configurable monitoring points (MPs), can be defined. The heave measurements can be output in four different locations (the MRU itself, CG, MP1 and MP2) simultaneously

on serial lines or Ethernet port. Typical monitoring point is the transducer head or the crane tip.

Output variables

The MRU 5 outputs roll, pitch and yaw angles and corresponding angular rate vectors. The unit outputs relative (dynamic) heave, surge and sway positions, velocities and accelerations in adjustable frames.

External inputs

The MRU 5 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 1-second time pulse (1PPS) input on a TTL line (XIN) or as RS-232/422 signal.

Digital I/O protocols

For this fifth 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 MRU 5

- 0.02° roll and pitch accuracy
- Outputs on RS-232, RS-422 and Ethernet
- High output data rate (200 Hz)
- Precise heave at long wave periods by use of PFreeHeave® algorithms
- Lever arm compensation to two individually configurable monitoring points
- Meets IHO special order requirements
- Small size, light weight and low power consumption
- No limitation to mounting orientation
- Each MRU delivered with Calibration Certificate
- Selectable communication protocols in the Windows based MRU configuration software
- 2-year warranty



TECHNICAL SPECIFICATIONS

ROLL AND PITCH OUTPUT

Angular orientation range	±180°
Angular rate range	±150 °/s
Resolution roll, pitch	0.001°
Angular rate noise	0.025 °/s RMS
Static ²⁾ accuracy	0.02° RMS
Dynamic ¹⁾ accuracy (for a ±5° amplitude)	0.02° RMS
Scale factor error	0.08 % RMS

HEAVE OUTPUT

Output range	±50 m
Periods (real-time)	0 to 25 s
Periods (delayed)	0 to 50 s
Heave accuracy (real-time)	5 cm or 5 %, whichever is highest
Heave accuracy (delayed)	2 cm or 2 %, whichever is highest

ACCELERATION OUTPUT

Acceleration range	±30 m/s ²
Acceleration noise ²⁾	0.002 m/s ² RMS
Acceleration accuracy	0.01 m/s ² RMS

ELECTRICAL

Power requirements	10 to 36 V DC, max. 12 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
Input serial line	Two RS-232 or RS-422
Ethernet ports	Three output and one input
Ethernet UDP/IP	10/100 Mbps

Specifications subject to change without any further notice.

Digital output variables	24 (max), serial or Ethernet
Output data rate (max)	200 Hz
Timing	<1 ms

ENVIRONMENTAL SPECIFICATIONS

Temperature range	-5 °C to +55 °C
Humidity range, electronics	Sealed, no limit
Enclosure protection	IP-66
Vibration	IEC 60945/EN 60945

ELECTROMAGNETIC COMPATIBILITY

Compliance to EMC, immunity/emission	IEC 60945/EN 60945
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OTHER DATA

MTBF (computed)	100000 h
Housing dimensions	Ø 105 x 140 mm (4.134" x 5.525")
Material	Anodised Aluminium
Weight	2.4 kg
Connector	Souriau 851-36RG 16-26S50

DATA OUTPUT PROTOCOLS

- MRU normal	- Atlas Fansweep
- NMEA proprietary	- TSS1
- Souder	- Seapath binary 23
- EM3000	- PFreeHeave®

1) When the MRU is exposed to a combined two-axes sinusoidal angular motion with 10 minutes duration.

2) When the MRU is stationary over a 30-minute period.