

# MRU 2



KONGSBERG



## THE ROLL AND PITCH MOTION SENSOR

This fifth generation MRU 2 is designed for high accuracy roll and pitch measurements in marine applications.

### Typical applications

The MRU 2 is typically used for roll and pitch measurements in offshore riser monitoring systems, dynamic positioning systems, telecommunication antenna systems and motion damping systems on high speed crafts.

This unit has to be mounted in a fixed direction relative to the ship and is best suited for applications with limited range in roll and pitch. If unlimited mounting orientation and/or unlimited mounting range is required, one of the MRU models with sensors in all three axis is recommended.

### Function

The MRU 2 incorporates two highly accurate accelerometers and two Micro-Electro-Mechanical-Structures (MEMS) angular rate gyros. This unit achieves high reliability 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. By configuring the unit with the vector between the MRU and the vessel Center of Gravity (CG), the MRU 2 will output accurate roll and pitch measurements even when it is mounted high up in the ship, like on the bridge. This is due to the capability to suppress the effect of horizontal acceleration on the roll and pitch performance. This makes the MRU 2 superior to inclinometers, pendulous devices and standard Vertical Reference Units.

### Output variables

The MRU 2 outputs static and dynamic roll and pitch angles and corresponding angular rate vectors. The unit outputs surge and sway accelerations.

### Digital I/O protocols

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 data are available on two individually configurable serial lines and Ethernet/UDP. Output variables are transmitted as IEEE 32-bit floats (recommended) or as scaled integers. In addition, ASCII-based NMEA 0183 proprietary sentences can be selected as data output protocols.

## FEATURES

- 0.10° roll and pitch accuracy
- Outputs high accuracy roll and pitch measurements
- Suppression of horizontal acceleration when mounted off the vessel Center of Gravity (CG)
- Outputs on RS-232, RS-422 and Ethernet
- High output data rate (200 Hz)
- High reliability and no mechanical wear-out parts
- Small size, light weight and low power consumption
- Each MRU delivered with Calibration Certificate
- Selectable communication protocols in the Windows based MRU configuration software
- 2-year warranty



## TECHNICAL SPECIFICATIONS

### MRU 2

#### ROLL AND PITCH OUTPUT

Angular orientation range	±25°
Resolution roll, pitch	0.001°
Static <sup>2</sup> accuracy	0.08° RMS
Dynamic <sup>1</sup> accuracy (for a ±5° amplitude)	0.1° RMS

#### GYRO OUTPUT

Angular rate range	±100 °/s
Angular rate noise	0.1°/s RMS
Scale factor error	0.5 % RMS

#### SURGE AND SWAY ACCELERATION OUTPUT

Acceleration range	±30 m/s <sup>2</sup>
Acceleration noise <sup>2</sup>	0.002 m/s <sup>2</sup> RMS
Acceleration accuracy	0.01 m/s <sup>2</sup> RMS

#### ELECTRICAL

Voltage input	10 to 36 V DC
Power consumption	Max. 4.9 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 ports	5
Ethernet UDP/IP	10/100 Mbps
Output data rate (max)	200 Hz
Timing	<1 ms

#### 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 x 140 mm (4.134" x 5.525")

#### 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

#### ELECTROMAGNETIC COMPATIBILITY

Compliance to EMC, immunity/emission	IEC 60945/EN 60945
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<sup>1</sup> When the MRU is exposed to a combined two-axes sinusoidal angular motion with 10 minutes duration.

<sup>2</sup> When the MRU is stationary over a 30-minute period.

Specifications subject to change without any further notice.

#### KONGSBERG SEATEX

Switchboard: +47 73 54 55 00  
 Global support 24/7: +47 33 03 24 07  
 E-mail sales: km.seatex.sales@km.kongsberg.com  
 E-mail support: km.support.seatex@km.kongsberg.com

[kongsberg.com/maritime](http://kongsberg.com/maritime)



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