

MRU H

The versatile heave compensator



MRU H, the versatile heave compensator, represents the fifth generation MRU specially designed for heave compensation applications. As an ideal sensor for a range of marine applications requiring highly accurate heave measurements, this unit enhances the precision in environments with extreme horizontal accelerations.

Features

- 0.05° roll and pitch accuracy
- High accuracy heave measurements even in dynamic environments
- 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
- Meets IHO special order requirements
- No limitation to mounting orientation
- Small size, light weight and low power consumption
- Each MRU delivered with Calibration Certificate
- 2-year warranty
- Selectable communication protocols in the Windows based MRU configuration software

Specifications

| | |
|--------------------------|---------------------|
| Product | MRU |
| Country of origin | Norge |
| Manufacturer | Kongsberg Discovery |

Typical applications

The MRU H is specially designed for motion measurements in marine applications requiring highly accurate heave measurements in environments with extreme horizontal accelerations. This MRU is an ideal sensor for roll, pitch and heave compensation of offshore cranes and echo sounders. The MRU H can also be used for typical ship motion monitoring applications such as helideck motion monitoring, hydroacoustic positioning systems, as well as hull stress monitoring.

Function

The MRU H 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 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.

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, typical seabed mapping applications.

Output variables

The MRU H outputs roll, pitch and heave together with linear acceleration in 3-axes. The MRU H outputs heave position, velocity and accelerations in adjustable frames. In addition roll and pitch angles and corresponding angular rate vectors are output.

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.

External communication

The MRU H 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.

Specifications

| | |
|--------------------------|---------------------|
| Product | MRU |
| 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 | ±100°/s |
| Angular rate noise | 0.1°/s RMS |
| Scale factor error | 0.2 % RMS |

Acceleration output

| | |
|--------------------------------------|----------------------------|
| Acceleration range (all axes) | ±30 m/s ² |
| Acceleration noise | 0.002 m/s ² RMS |
| Acceleration accuracy | 0.01 m/s ² RMS |
| Scale factor error | 0.02% 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 |

Data output protocols

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

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 configurable 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 |

Environmental specifications

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

Orientation output

| | |
|--|-----------------|
| Angular orientation range | $\pm 180^\circ$ |
| Resolution in all axes | 0.001° |
| Accuracy roll, pitch for a $\pm 5^\circ$ amplitude | 0.05° RMS |