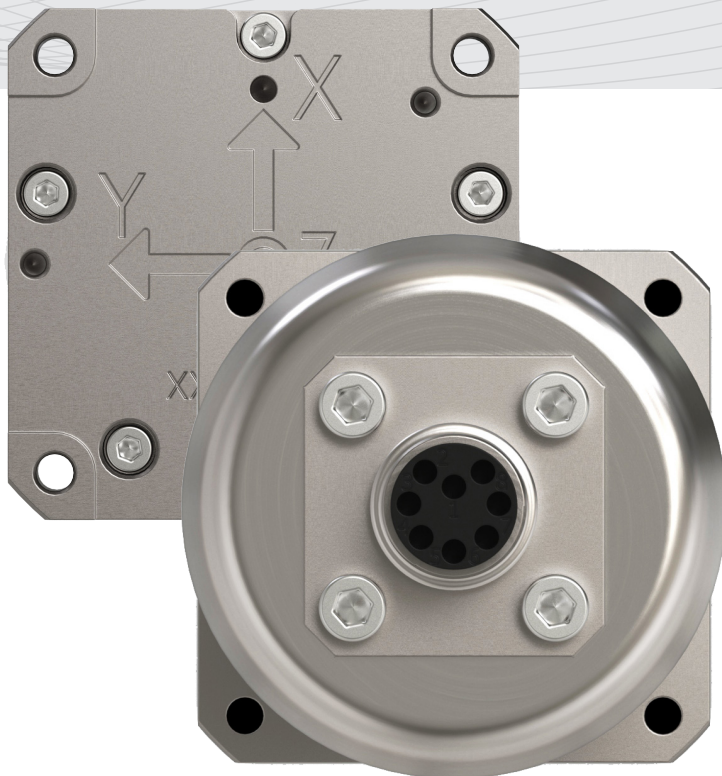


MOTION REFERENCE UNIT MRU SUBSEA



TECHNICAL SPECIFICATIONS



sMRU

HIGH PERFORMANCE, COMPACT & RELIABLE
6DOF MOTION SENSOR

↑↓ 5 CM / 5 %

↻ 0.01 - 0.05 RMS°

💧 6000 m

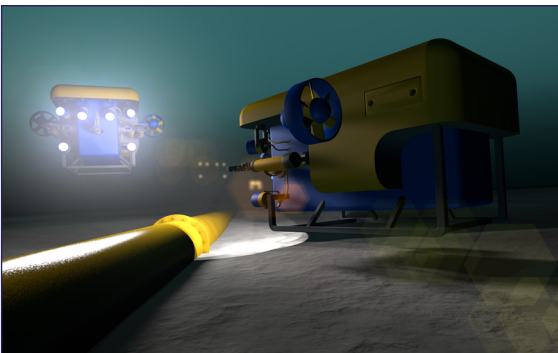
NORSUB MRU SUBSEA

HIGH-PERFORMANCE MOTION REFERENCE UNITS



NORSUB MRUs are high-performance, compact, and affordable 6 DOF motion sensors. They use state-of-the-art MEMS technology and advanced sensor fusion algorithms, resulting in accurate and reliable roll, pitch, yaw, surge, sway, heave position and velocity measurements. Performance is high also during horizontal accelerations and in irregular coupled motions.

TAILOR-MADE FOR SUBSEA USE



The MRU Subsea is ideal for use in subsea applications such as riser motion monitoring, ROV/AUV or subsea surveys. The MRU Subsea is a very compact motion sensor that is depth rated to 6000 m. The small size and footprint make it easy to install almost anywhere. The high performance in irregular motions makes it ideal for use in real sea conditions.

EASY INTERFACING



The MRU Subsea comes in a waterproof titanium housing with ethernet and serial ports for easy communication with your system. Industrial communication protocols can be used for PLC interfacing. The MRU comes with a wide range of standard and customized ASCII or binary data protocols. The MRU can be delivered with custom length cables and SubConn 8 pin connectors.

TECHNICAL SPECIFICATIONS



PERFORMANCE				
PARAMETER	MRU SUBSEA 3000	MRU SUBSEA 6000	MRU SUBSEA 9000	REMARKS
Roll & Pitch	$\pm 0.05^\circ$	$\pm 0.02^\circ$	$\pm 0.01^\circ$	RMS (dynamic)
Heave (real-time)	5.0 cm or 5.0 %	5.0 cm or 5.0 %	5.0 cm or 5.0 %	Whichever is greater for 0 to 25 s periods
Heading (optional)	$\pm 0.5^\circ$	$\pm 0.5^\circ$	$\pm 0.5^\circ$	Magnetic heading

RANGE				
PARAMETER	MRU SUBSEA 3000	MRU SUBSEA 6000	MRU SUBSEA 9000	REMARKS
Rotation speed	$\pm 150^\circ/\text{s}$	$\pm 450^\circ/\text{s}$	$\pm 450^\circ/\text{s}$	-
Acceleration	$\pm 3 \text{ g}$	$\pm 4 \text{ g}$	$\pm 10 \text{ g}$	-
Heave	$\pm 50 \text{ m}$	$\pm 50 \text{ m}$	$\pm 50 \text{ m}$	-
Yaw	$\pm 360^\circ$	$\pm 360^\circ$	$\pm 360^\circ$	Requires optional magnetometer
Pitch	$\pm 90^\circ$	$\pm 90^\circ$	$\pm 90^\circ$	-
Roll	$\pm 180^\circ$	$\pm 180^\circ$	$\pm 180^\circ$	-
Output frequency	0-100 Hz	0-100 Hz	0-100 Hz	Adjustable output frequencies

GYRO OUTPUT			
PARAMETER	MRU SUBSEA 3000	MRU SUBSEA 6000	MRU SUBSEA 9000
Scale factor error	0.2% max/min	0.2% max/min	0.2% max/min
Angular rate noise	0.05°/s RMS	0.025°/s RMS	0.015°/s RMS

ACCELERATION OUTPUT			
PARAMETER	MRU SUBSEA 3000	MRU SUBSEA 6000	MRU SUBSEA 9000
Acceleration noise	0.0025 m/s ² RMS	0.002 m/s ² RMS	0.0015 m/s ² RMS
Acceleration accuracy	0.01 m/s ² RMS	0.01 m/s ² RMS	0.01 m/s ² RMS

TECHNICAL SPECIFICATIONS



PHYSICAL CHARACTERISTICS

PARAMETER	MRU SUBSEA 3000/6000/9000
Weight	1.6 kg
Footprint (L X B)	7.6 cm X 7.6 cm
Height	16.5 cm
Depth rating	6000m
Connector	SubConn FCRI508M or SubConn FCRI508F
Remarks	Titanium housing
Application examples	Riser monitoring, BOP monitoring, ROV/AUV, subsea surveys, etc.

POWER & INTERFACE

PARAMETER	MRU SUBSEA 3000/6000/9000
Power consumption	6 W
Supply voltage	9-36 V DC (24 V nominal)
Internal storage	32 GB
Ports	Ethernet or Ethernet and RS-232 or Ethernet and 2 wire RS-485
Communication	Ethernet: UDP, Modbus TCP, Ethernet/IP. RS-485: Modbus RTU
Data protocols	NMEA, ASCII, Binary, Atlas, Gyrocompas 1, Ifremer Victor, MDL, Simrad EM 3000, SMCA, SMCC, TSS1 ++ (wide range of protocols included, see separate list)

ENVIRONMENTAL SPECIFICATIONS

PARAMETER	MRU SUBSEA 3000/6000/9000
Enclosure material	Titanium grade 5
Enclosure protection	6000 m
Operating temperature range	-20 to +70 degrees Celsius
Operating humidity (max)	No limit (sealed)
Storage temperature range	-40 to +80 degrees Celsius
Storage humidity	No limit (sealed)
Electromagnetic compatibility (immunity/emission)	IEC 60945/EN 60945
Vibration	IEC 60945/EN 60945
Max shock non-operational (10 ms peak)	2000 m/s ² (half-sine 0.5 msec)
MTBF (computed)	100000 h

NORSUB MRU SUBSEA

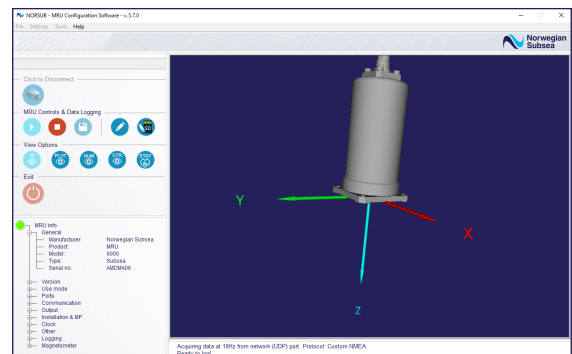
AN MRU FOR YOUR NEEDS

The MRU Subsea comes in three versions (3000, 6000, 9000) to accommodate for different performance requirements and budgets. A high-end magnetometer can be included to provide accurate magnetic heading measurements. The internal health monitoring system ensures high performance operability and fault detection. DP and gangway use modes are available.



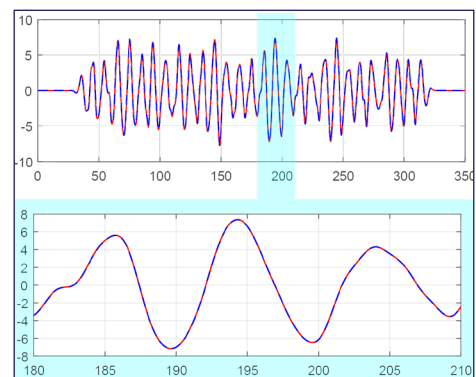
USER-FRIENDLY CONFIGURATION SOFTWARE

The free Windows-based NORSUB MRU Configuration Software is used to set-up the MRU. Here you can configure the communication ports, customize the output data protocol, configure the MRU installation parameters, set up remote monitoring points, calibrate the magnetometer. The software can also update the MRU firmware, log the MRU data to file, and plot output data.



EVERY UNIT IS TESTED AND VALIDATED

Every MRU is delivered with a Configuration, Calibration, and Validation Certificate. Every unit is calibrated and validated independently through a systematic sequence of rigorous tests in our labs simulating both regular and irregular sea motions. The calibration certificate is valid for four years and full product specifications are maintained in this period under normal operating conditions.



ABOUT US

Norwegian Subsea delivers high performance Motion Reference Units (MRU) and motion sensors for marine, subsea and land use.

Our products combine MEMS sensor technology and sensor fusion algorithms to give accurate and reliable motion, velocity and acceleration measurements for control and monitoring applications.

Norwegian Subsea was founded in 2014.

Today, we are a fast-growing supplier of motion sensors to customers worldwide.

We deliver motion sensors to satisfied customers in industries as diverse as ship motion monitoring, hydrography, green energy, and subsea oil production.

Our mission is to create better and more affordable motion sensors for users in marine, land and subsea industries. We do this by combining advanced sensor fusion algorithms with high quality hardware and the latest MEMS sensors. Our sensors are thoroughly put to test in state-of-the-art labs as well as in the field.

Norwegian Subsea is headquartered in Oslo, Norway.



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