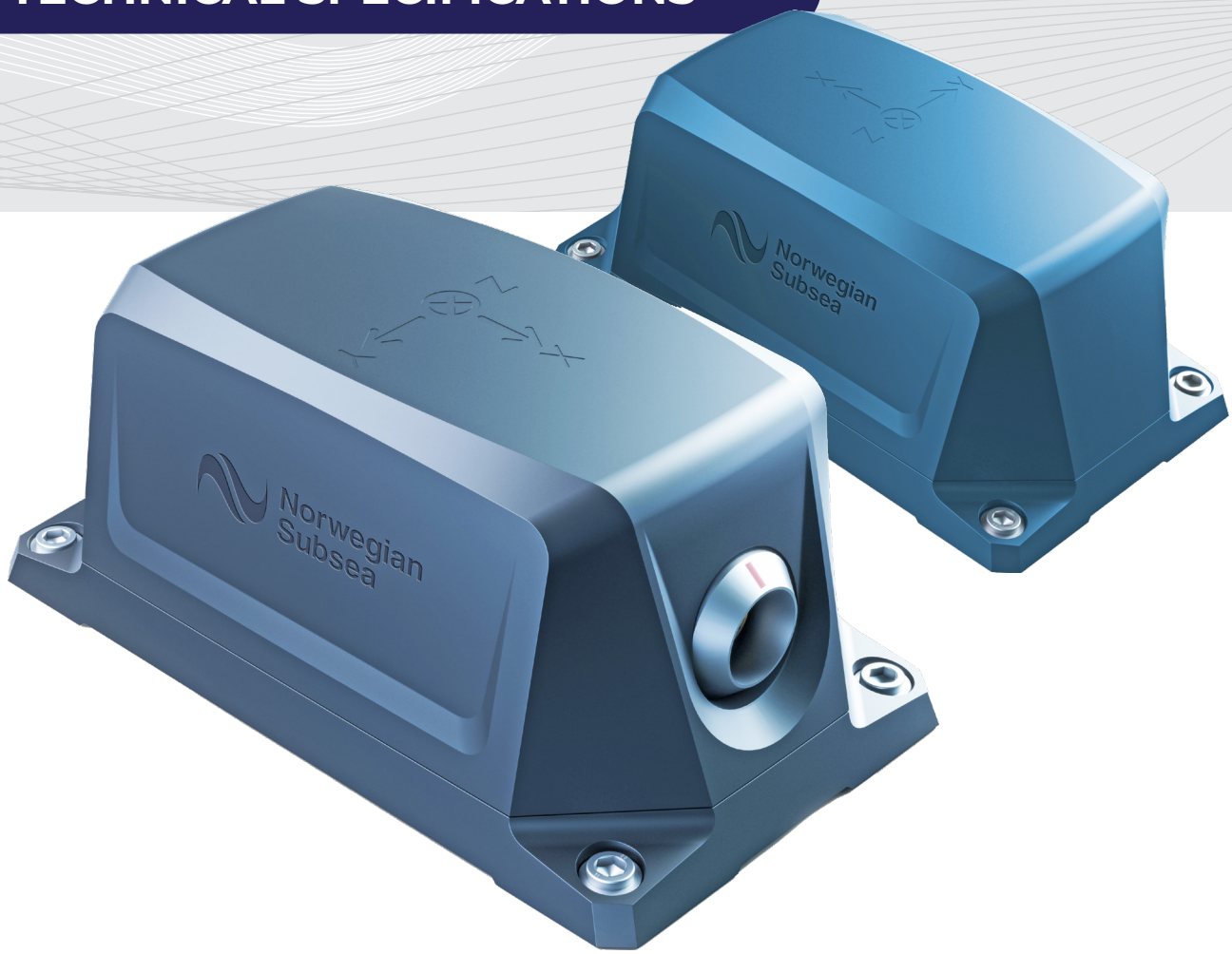
MOTION REFERENCE UNIT

MRU MARINE

Norwegian Subsea

TECHNICAL SPECIFICATIONS



MRU

HIGH PERFORMANCE, AFFORDABLE & ROBUST

6DOF MOTION SENSOR

5 CM / 5 %

0.01 - 0.05 RMS°

IP68

NORSUB MRU MARINE

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 MARINE USE

The MRU Marine is ideal for use in marine applications such as active heave compensation of offshore cranes & winches, motion compensated gangways, helideck motion monitoring, motion compensation of wave radars and sonars, motion monitoring of ships and floating offshore wind turbine structures. High performance in irregular motions makes it ideal for real sea conditions.

EASY INTERFACING

The MRU Marine comes with ethernet and serial ports for easy communication with your system. Industrial communication protocols (e.g. Modbus TCP, Ethernet/IP, Modbus RTU) can be used for PLC interfacing. The MRU comes with a wide range of standard and customized data protocols in ASCII or binary formats. Custom length cables, junction boxes, pigtail cables are available too.

TECHNICAL SPECIFICATIONS

PERFORMANCE				
PARAMETER	MRU MARINE 3000	MRU MARINE 6000	MRU MARINE 9000	REMARKS
Roll & Pitch	± 0.05°	± 0.02°	± 0.01°	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)	± 0.5°	± 0.5°	± 0.5°	Magnetic heading

RANGE				
PARAMETER	MRU MARINE 3000	MRU MARINE 6000	MRU MARINE 9000	REMARKS
Rotation speed	± 150°/s	± 450°/s	± 450°/s	-
Acceleration	± 3 g	± 4 g	± 10 g	-
Heave	± 50 m	± 50 m	± 50 m	-
Yaw	± 360°	± 360°	± 360°	Requires optional magnetometer
Pitch	± 90°	± 90°	± 90°	-
Roll	± 180°	± 180°	± 180°	-
Output frequency	0-100 Hz	0-100 Hz	0-100 Hz	Adjustable output frequencies

GYRO OUTPUT			
PARAMETER	MRU MARINE 3000	MRU MARINE 6000	MRU MARINE 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 MARINE 3000	MRU MARINE 6000	MRU MARINE 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 MARINE 3000/6000/9000
Weight	1.2 kg
Footprint (L X B)	15.4 cm X 8.6 cm
Height	6.7 cm
Depth rating	IP68
Connector	Marine 16 pin male connector
Remarks	Aluminum housing
Application examples	Active heave compensation, motion compensated gangways, helideck monitoring, wave radar, hydrography, ship monitoring, stabilizing fins, buoys, aquaculture, dynamic positioning, offshore floating wind turbines.

POWER & INTERFACE	
PARAMETER	MRU MARINE 3000/6000/9000
Power consumption	6 W
Supply voltage	9-36 V DC (24 V nominal)
Internal storage	32 GB
Ports	Ethernet, RS-232, RS-485 (422)
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 user manual)

ENVIRONMENTAL SPECIFICATIONS	
PARAMETER	MRU MARINE 3000/6000/9000
Enclosure material	Anodized aluminum 6061-T6
Enclosure protection	IP-68
Operating temperature range	-40 to +85 degrees Celsius
Operating humidity (max)	No limit (sealed)
Storage temperature range	-40 to +85 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

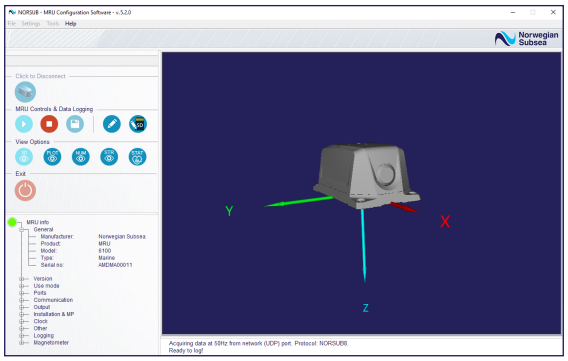
NORSUB MRU MARINE

AN MRU FOR YOUR NEEDS

The MRU Marine 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 operatibility and fault detection. DP and gangway use modes are available.

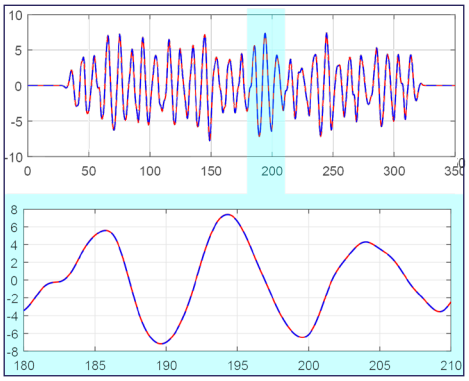
USER-FRIENDLY CONFIGURATION SOFTWARE

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 CALIBRATED, TESTED & 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 mantained 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.

Norwegian Subsea

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