Motion Reference Unit
MRU-PD

- 3-in-1 solution: MRU + DGPS/RTK + HDT
- Kongsberg/Seatex, SMC & TSS data formats*
- Compatible with SBES/MBES
- Input from DVL - Doppler Velocity Log
- IHO SP44 standard compliant
- DGPS/RTK Position accuracy
- 5 cm Heave accuracy
- 5 cm Surge & Sway accuracy
- 0.05 deg Heading accuracy
- 0.02 deg Pitch and Roll accuracy
- 0.005 m/sec^2 Acceleration accuracy
- 0.0002 deg/sec Angular rate accuracy
- NMEA 0183, TSS1 output data format

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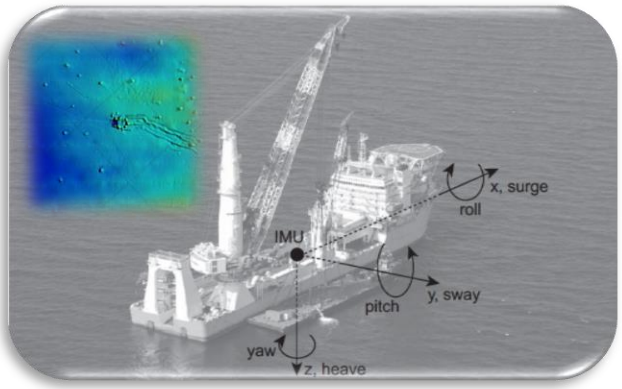
Inertial Labs
Attitude is Everything

MRU-PD
Datasheet Rev. 2.5

The Inertial Labs has developed professional version of **Motion Reference Units (MRU-PD)** to meet requirements from marine and hydrographic applications. **MRU-PD** is enhanced, high-performance strapdown Motion Sensor – affordable solution for survey, that determines Pitch & Roll, Heave, Sway, Surge, Accelerations, Angular rates, Heading, Velocity and Positions for any device on which it is mounted.



The Inertial Labs **MRU-PD Motion Reference Units** utilizes high precision, dual antenna GNSS receiver with DGPS and RTK positions accuracy, solid state 3-axes each of precision accelerometers, magnetometers, gyroscopes and barometric sensors to provide accurate Positions, Heading, Heave, Sway, Surge, Pitch and Roll of the device under measure. Integration of very low noise gyroscopes output provides high frequency, real-time measurement of the Vessel, Ships, Helidecs, ROV, Marine antennas, Cranes rotation about all three rotational axes.

Through a combination of proven sector expertise and a continued investment in technological innovation, Inertial Labs delivers the optimum balance of price and performance ratio solutions for its customers.

KEY FEATURES AND FUNCTIONALITY

- ABS Design Assessed
- Kongsberg/Seatex, Teledyne and SMC data formats*
- State-of-the-art algorithms for Vessels, Ships, Active Heave Compensators, Cranes, Helideck, ROV, AUV, DP-1, DP-2, DP-3 Buoys, Echo Sounders, Offshore Platforms
- 3 cm Oceanix Nearshore Horizontal Position Accuracy, 1-0.05 m VERIPOS Horizontal Position Accuracy
- 0.02 deg RMS Pitch & Roll accuracy
- 5% or 5 cm RMS Heave accuracy
- NMEA 0183, TSS1 output data formats
- ROS, LabVIEW, HYPACK, QINSY & Inertial Explorer support
- Environmentally sealed (IP67), compact design

Our **MRU**s featuring developed few micro g Bias in-run stability Micro Electro Mechanical System (MEMS)-based accelerometers. New generation of Inertial Labs 1 deg/hr Bias in-run stability MEMS-based gyroscopes are an ideal solution for demanding marine applications, with their electronic nature negating the problems associated with expensive mechanical gyro solutions, as well as those based on fiber optic (FOG) technology. Inertial Labs MEMS gyroscopes set the standard for the industry, with our high-end **MRU**s featuring gyros that enable sector-leading accuracy and reliability standards.

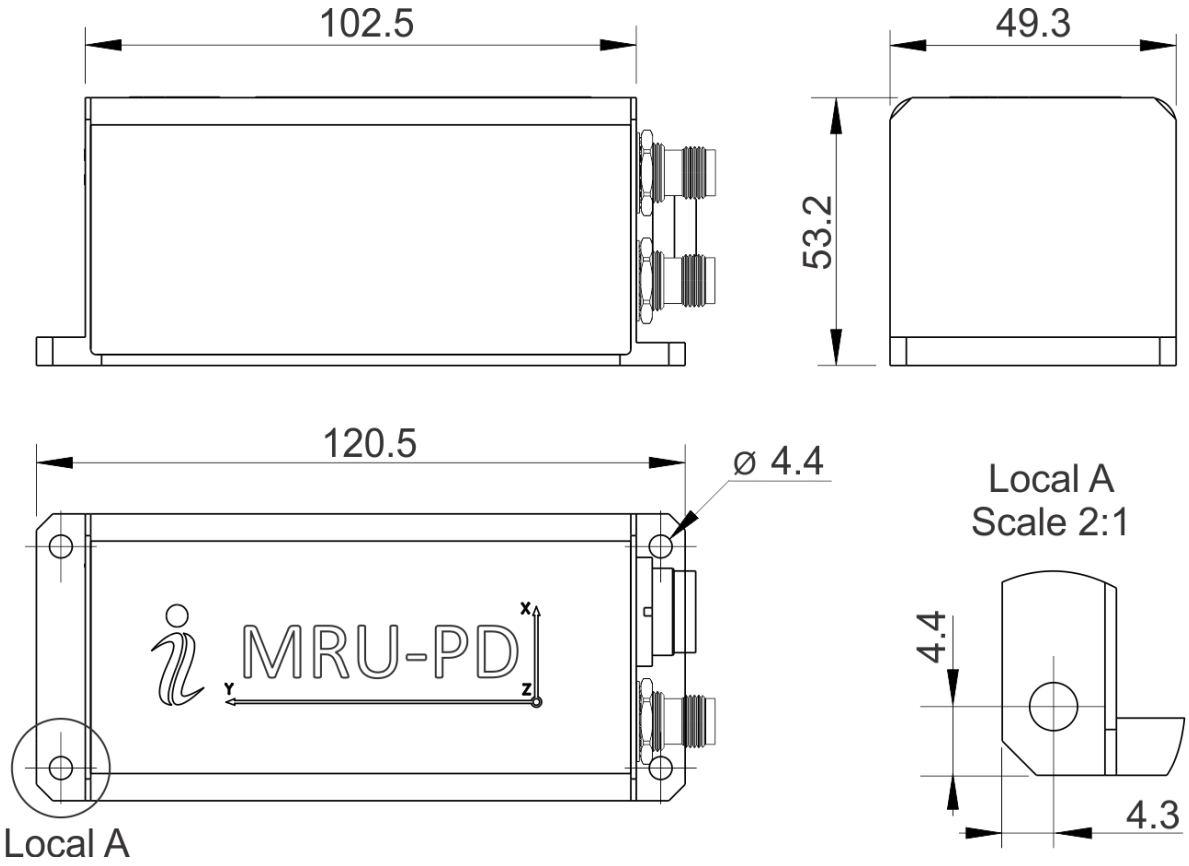
Measured Parameters	MRU-PD
Heave, Surge, Sway (% / cm)	✔
Pitch & Roll (deg)	✔
Precision Heading (HDT) (deg)	✔
Velocity (meters/sec)	✔
DGPS / RTK Positions (cm)	✔
ROS, LabVIEW, HYPACK, QINSy, Novatel IE support	✔

MRU-PD Specifications

Parameter	Units	MRU-PD
Output signals	• Heave, Surge, Sway, Heading/Yaw, Pitch, Roll, Positions, Velocities, Accelerations, Angular rates, Barometric data, PPS time	
Output data formats	• Kongsberg/Seatex, Ship Motion Control SMC, Teledyne TSS*	
Input Signal	• DVL (Doppler Velocity Log), External Stand Alone Magnetic Compass	
Compatibility	• SBES/MBES: Teledyne; R2Sonic; WAASP; Kongsberg; EdgeTech; NORBIT; IMAGENEX* • HYPACK, QINSY, Novatel Inertial Explorer software* • DP-1, DP-2, DP-3, AHC, HMS, Survey systems	
Update rate	Hz	1 … 200 (user settable)
Internal Data Logger		8 GB or 64 GB (optional)
Heave, Surge, Sway	**Units**	MRU-PD
Measurement range	meters	±300
Resolution	meters	0.01
Real time accuracy, RMS	% (meters)	5 (0.05)
Post Processing accuracy, RMS	% (meters)	2 (0.02)
Pitch and Roll	**Units**	MRU-PD
Range: Pitch, Roll	deg	±90, ±180
Angular Resolution	deg	0.005
Static Accuracy	deg	0.01
Dynamic Accuracy	deg RMS	0.02
Post processing accuracy	deg RMS	0.006
Heading	**Units**	MRU-PD
Range	deg	0 to 360
Angular Resolution	deg	0.001
Real time Static and Dynamic Accuracy	deg	0.08 (2 meters baseline)
Real time Static and Dynamic Accuracy	deg	0.05 (4 meters baseline)
Post processing accuracy	deg RMS	<0.03
Positions, Velocity and Timestamps	**Units**	MRU-PD
Horizontal position accuracy (SBAS), RMS	meters	0.6
Horizontal position accuracy (DGPS), RMS	meters	0.4
Horizontal position accuracy (RTK), RMS	meters	0.01
Horizontal position accuracy (Oceanix Nearshore) (1), RMS	meters	0.03
Horizontal position accuracy (VERIPOS) (1), RMS	meters	1-0.05
Horizontal position accuracy (PPK), RMS	meters	0.005
GNSS Velocity accuracy, RMS	meters/sec	<0.03
IMU Velocity accuracy, RMS	meters/sec* √hr	<0.009
PPS accuracy	nano seconds	20
Gyroscopes	**Units**	MRU-PD
Measurement range	deg/sec	±450
Bias in-run stability (RMS, Allan Variance)	deg/hr	1
Noise density	deg/sec√Hz	0.004
Accelerometers	**Units**	MRU-PD
Measurement range	g	±8
Bias in-run stability (RMS, Allan Variance)	mg	0.005
Noise density	mg√Hz	0.015
Pressure	**Units**	MRU-PD
Measurement range	hPa	300 – 1100
Bias in-run stability (RMS, Allan Variance)	Pa	2
Noise density	Pa/√Hz	0.8
Environment	**Units**	MRU-PD
Operating temperature	deg C	-40 to +70
Storage temperature	deg C	-50 to +85
MTBF	hours	55,500
Compliance to EMCD, immunity/emission		IEC 60945/EN 60945
Electrical	**Units**	MRU-PD
Supply voltage	V DC	9 to 36
Power consumption	Watts	5
Output Interface	-	RS-232 / RS-422 / Ethernet / CAN
Output data format	-	NMEA 0183, TSS-1, Binary ASCII characters
Physical	**Units**	MRU-PD
Size	mm	120 x 50 x 53
Weight	gram	320

(1) Requires a subscription to a Oceanix data service, contact Inertial Labs for more information.

MRU-PD mechanical interface drawing



Notes:

1. All dimensions are in millimeters.
2. All dimensions within this drawing are subject to change without notice. Customers should obtain final drawings before designing any interface hardware.
3. Data connector type: Binder Series 723. Male receptacle, shielded, rear-mounting
4. GNSS connector type: TNC-Female

MRU-PD part numbers description

Model	Gyro	Accel	Calibration	Connector	Color	GNSS Receiver	Version	Interface
MRU-PD	G450	A8	TGA TMGA (optional)	C3	B	O7720	VD4 VD42	12

Example: MRU-PD-G450-A8-TMGA-C3-B-O7720-V0.12
Description:

- MRU-PD: Dual Antenna, Professional version of Motion Reference Unit (Heave, Surge, Sway, Pitch, Roll, High precision Heading, Position and Velocity Sensor)
- G450: Gyroscopes measurment range = ±450 deg/sec
- A8: Accelerometers measurement range = ±8 g
- TGA: Gyroscopes and Accelerometers
- TMGA: Gyroscopes, Accelerometers, Embedded Fluxgate Magnetic Compass (optional)
- C3: 24 pins connector
- B: Black color of enclosure (IP-67 sealed)
- O7720: Dual Antenna GNSS receiver
- VD4: DGPS (40 cm position accuracy)
- VD42: RTK (1 cm position accuracy)
- V1.12: RS-232, RS-422, Ethernet and CAN

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