LT-1000 NAVIGATION REFERENCE UNIT

designed and built for the demanding and rough environment at sea

NMEA

www.thrane.eu

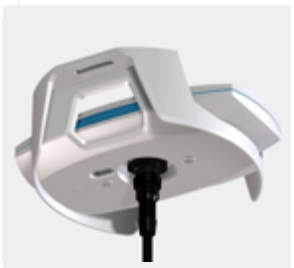
LT-1000 IN SHORT

- Navigation Reference Unit with 12 precision sensors
- True heading, magnetic heading, deviation, variation, roll, pitch, position, satellite information, ground speed, course over ground, time and date, air pressure, and temperature
- 72-ch. GNSS (GPS/GLONASS/BeiDou) satellite receiver with SBAS correction
- Simultaneous NMEA 0183 and NMEA 2000
- Configurable NMEA 0183 (enable/disable, talker ID, output rate)
- Easy configurable NMEA 2000 termination resistor (open or terminated)
- Easy configurable NMEA 0183 data rate (4800 or 38400 baud)
- Each unit is factory calibrated and functionally tested over temperature prior to shipment
- Worldwide maritime certification

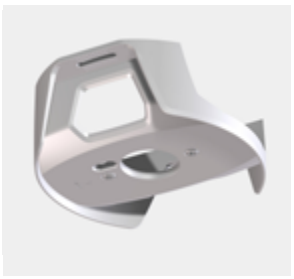
INSTALLATION OPTIONS (MOUNTING KIT)

LT-1000 with pole mount

Pole mount



LT-1000 with roof mount



Roof mount

Introduction
The LT-1000 Navigation Reference Unit (NRU) is a maritime navigation product from Lars Thrane A/S. The LT-1000 NRU is designed for the leisure as well as the professional maritime markets. The LT-1000 unit meets all standards and certification requirements needed for worldwide maritime navigation equipment.

Performance
The LT-1000 NRU is a small, compact, and very advanced unit with 12 precision sensors (magnetometers, gyros, accelerometers, GNSS, barometer, and thermometer). With the use of sensor-fusion and Kalman filtering, the LT-1000 NRU outputs: true heading, magnetic heading, deviation, variation, roll, pitch, position, satellite information, ground speed, course over ground, time and date, air pressure, and temperature in real-time, with high precision and resolution. The LT-1000 NRU includes advanced technologies such as:

- Kalman filtering & sensor fusion
- Calculation of magnetic variation based on the World Magnetic Model (WMM)
- Compensation for soft and hard iron (deviation)
- Built-in magnetometer calibration algorithm
- Receive and track multiple satellite systems (GPS, SBAS, GLONASS, and BeiDou)
- Support for Satellite-Based Augmentation System (SBAS): EGNOS, WAAS and MSAS

The LT-1000 NRU makes use of the latest technology within GNSS receivers, with market leading acquisition and tracking performance.

The LT-1000 NRU is designed and built for the demanding and rough environment at sea and with an operational temperature range from -40ºC and +55ºC (-40˚F to +131˚F).

Installation & Navigation
The LT-1000 Navigation Reference Unit is easy to mount on a 1” pole (optional installation: roof mount) with a single cable supporting NMEA 0183, NMEA 2000, and power. Two deviation calibration options are available:

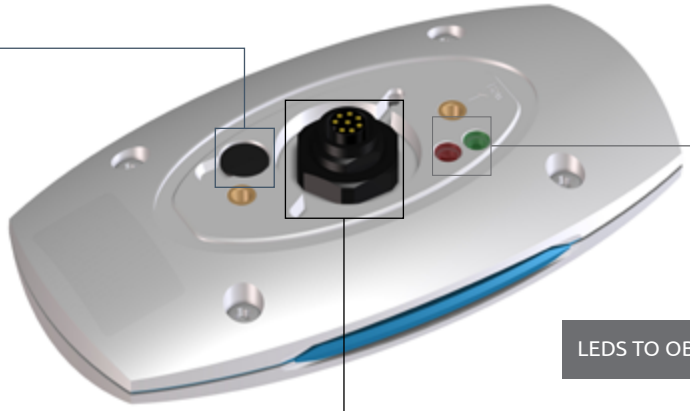
- Standard deviation calibration (figure 8-pattern). Default configuration
- Adaptive deviation calibration

The adaptive deviation calibration algorithm is an alternative to the standard deviation calibration algorithm (figure 8-pattern) and should be used by vessels that cannot perform the standard deviation calibration figure 8-pattern. The new adaptive deviation calibration algorithm will improve performance over time as the vessel navigates on different courses. The adaptive deviation calibration algorithm must be activated using the LT-Service Tool. Use the LT-Service Tool for optional configuration and offset adjustment of the LT-1000 NRU. The LT-Service Tool is a PC program, which may run on any Windows PC.

More than 40 years of experience have been put into the design and construction of the advanced LT-1000 NRU, with an exceptional performance and specification level.

INSTALLATION

MICROSWITCH CONFIGURATION:
NMEA 0183 (4800/38400 BAUD)
NMEA 2000 (OPEN/TERMINATED)



LEDS TO OBSERVE STATUS OF SENSOR

8-PIN OUTPUT CONNECTOR FOR
NMEA 0183, NMEA 2000 & POWER

PERFORMANCE

DATA	ACCURACY	RESOLUTION	RANGE/COMMENTS
Heading[1]	Static: < 0.5˚ (rms) Dynamic: < 1.5˚ (rms)	0.1˚	Heading is calculated with input from Sensor-fusion technology and Kalman filtering
Position[2]	GNSS: < 2.5 m SBAS: < 2 m	0.1 m	CEP, 50%, 24 hours static, -130 dBm, > 6 SVs. By default the GNSS reciever is configured for GPS/GLONASS & SBAS reception Time-To-First-Fix (cold acquisition): 27 s
Speed	0.1 knot	0.1 knot	0 to 195 knots
Roll/Pitch	Static: < 0.5˚(rms)	0.1˚	±90˚
Rate of turn	< 1˚/s	0.1˚/s	0 to 45˚/s
Air Pressure	1 hPa	0.1 hPa	800 to 1100 hPa
Air Temperature[3]	1˚C (1.8˚F) 2˚C (3.6˚F)	0.1˚C (0.1˚F)	0˚C to +55˚C (32˚F to +131˚F) -40˚C to 0˚C (-40˚F to +32˚F)

1: The dynamic heading accuracy is specified with roll/pitch less than ±45° and ROT ≤ 45°/s. - **2:** The LT-1000 NRU has an immunity filter against Iridium and Inmarsat transceivers. - **3:** Solar radiation and environmental conditions will affect the meassured air temperature (accuracy is specified as on-board sensor performance)

NMEA 0183

SENTENCE	DESCRIPTION	RATE
4800 BAUD		
GNRMC	Recommended Minimum Specific GNSS Data	1 Hz
HCHDG	Heading and Magnetic Heading Variation	1 Hz
HCHDM	Magnetic Heading	1 Hz
HCHDT	True Heading	10 Hz
HCROT	Rate of Turn	1 Hz
PFEC,GPatt	Attitude	1 Hz
WIMDA[1]	Meteorogical Composite	0.5 Hz
38400 BAUD		
GNDTM	Datum Reference	1 Hz
GNGGA	GPS Fix Data	1 Hz
GNGLL	Position Latitude/Longitude WGS84	1 Hz
GNGSA	GNSS DOP and Active Satellite	1 Hz
GNRMC	Recommended Minimum Specific GNSS Data	1 Hz
GNVTG	Course Over Ground and Ground Speed	1 Hz
GNZDA	Time and Date	1 Hz
GPGSV[2]	GNSS Satellites in View	1 Hz
HCHDG	Heading and Magnetic Heading Variation	10 Hz
HCHDM	Magnetic Heading	10 Hz
HCHDT	True Heading	10 Hz
HCROT	Rate of Turn	10 Hz
HCTHS	True Heading and Status	10 Hz
PFEC,GPatt	Attitude	10 Hz
WIMDA[1]	Meteorological Composite	2 Hz
WIXDR[3]	Transducer Measurements	2 Hz

NMEA 2000

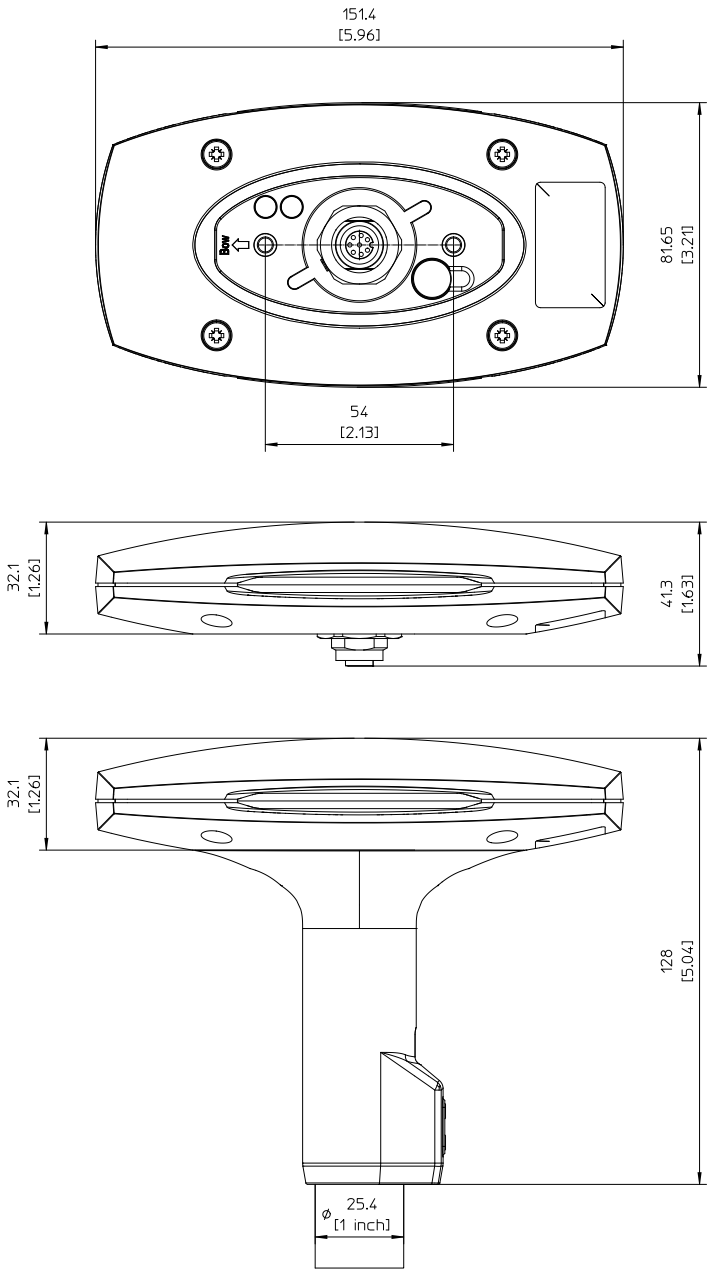
PGN	DESCRIPTION	RATE
PERIODIC PGNs		
126992	System Time	1 Hz
126993	Heartbeat	< 0.1 Hz
127250	Vessel Heading	10 Hz
127251	Rate of Turn	10 Hz
127257	Attitude	10 Hz
127258	Magnetic Variation	1 Hz
129025	Position, Rapid Update	10 Hz
129026	COG & SOG, Rapid Update	4 Hz
129029	GNSS Position Data	1 Hz
129044	Datum	0.1 Hz
129539	GNSS DOPs	1 Hz
129540	GNSS Sats in View	1 Hz
130311	Environmental Parameters	2 Hz
130312	Temperature	0.5 Hz
130314	Actual Pressure	0.5 Hz
130316	Temperature, Extended range	0.5 Hz
RESPONSE TO REQUESTED PGNs		
126464	PGN List (Transmit and Recieve)	-
126996	Product Information	-
129538	GNSS Control Status	-
OTHER PGNs		
059392	ISO Acknowledgement	-
059904	ISO Request	-
060928	ISO Address Claim	-
126208	NMEA Request/Command/Acknowledge	-

NMEA 0183 sentences are configurable (enable/disable, talker ID, output rate). For all GNSS sentences, talker ID "GN" can be configured to "GP".
1: Pressure (inHg, Bar) and Air Temperature (˚C) only - **2:** Talker ID (GP, GL, GB) depends on satellite system (GPS/SBAS, GLONASS, BeiDou) - **3:** Pressure (Pa) and Temperature (˚C)

SPECIFICATIONS

LT-1000 NAVIGATION REFERENCE UNIT

Certification & standards	CE, IEC 60945, IEC 60950, EN 300 440 FCC, IC, RCM, RoHS NMEA 0183, NMEA 2000
Equipment class	Protected, according to IEC 60945
Weight, with pole mount	240 g (0.53 lbs)
Weight, with roof mount	281 g (0.62 lbs)
Dimensions, with pole mount	151.4 x 81.6 x 128.0 mm (5.96 x 3.21 x 5.04 in)
Dimensions, with roof mount	151.4 x 136.0 x 46.0 mm (5.96 x 5.35 x 1.81 in)
Temperature, operational	-40°C to +55°C (-40°F to +131°F)
Temperature, storage	-40°C to +85°C (-40°F to +185°F)
Vibration, operational	IEC 60945 (sine) & Proprietary Maritime Random profile (240 h)
Vibration, survival	Properitary Maritime Random profile (100 h)
Vibration, shock	Proprietary Maritime profile (60 g pk, 11 ms)
Waterproof rating	IP46
Humidity	95% non-condensing @ 40°C
Wind, operational	80 knots (93 MPH)
Wind, survival	110 knots (127 MPH)
Ice, survival	25 mm (1 in)
Solar radiation	1120 W/m2
Communication interface	8-pin female connector for NMEA 0183, NMEA 2000 and power
Input voltage	9-40 VDC
Power consumption	< 1 W
Load Equivalent Number (LEN)	2 (NMEA 2000)
Compass safe distance standard	0.3 m (1 ft)
Compass safe distance steering	0.3 m (1 ft)
Mounting, pole mount	25.4 mm (1 in)
Warranty	2 year
Maintenence	None



IN THE BOX

LT-1000 NRU (incl. pole mount)	P/N: 51-100142
10 m Cable Multi 8-pin Simple-Cut (M)	P/N: 91-100172
Screw-in Conn. NMEA 2000 Micro-C (M)	P/N: 91-100174
Quick Installation Guide	P/N: 97-100171
Safety Instruction Sheet	P/N: 97-100435
Unit Test Sheet	P/N: 46-100161

ACCESSORIES

LT-1000 NRU roof mount	P/N: 91-100214
LT-1000 NRU pole mount	P/N: 91-100223
10 m Cable Multi 8-pin Simple-Cut (M)	P/N: 91-100172
30 m Cable Multi 8-pin Simple-Cut (M)	P/N: 91-100173
Screw-in Conn. NMEA-2000 Micro-C (M)	P/N: 91-100174

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98-100183 REV. 1.02 LT-1000 Product Sheet
Subject to change without further notice