



LT-1000 NAVIGATION REFERENCE UNIT

designed and built for the demanding and rough environment at sea



www.thrane.eu



- 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)



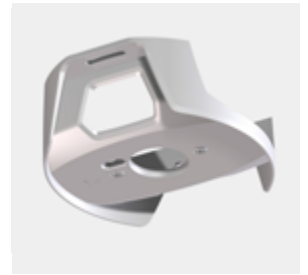
LT-1000 with pole mount



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 -40°C and +55°C (-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:

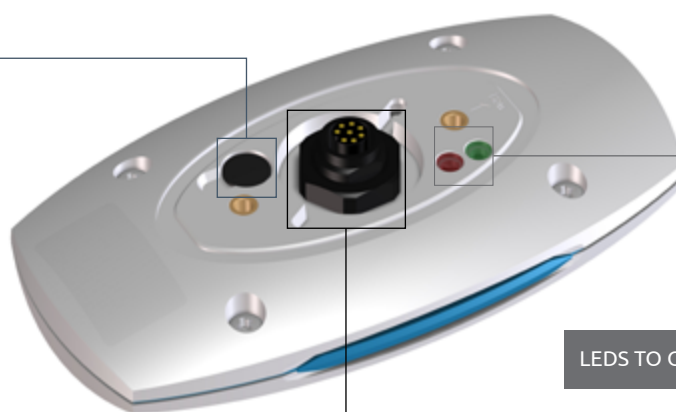
- Standard deviation calibration (figure 8-pattern). Default configuration
- Adaptive deviation calibration

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 receiver 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 measured 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 | Meteorological 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 | - |

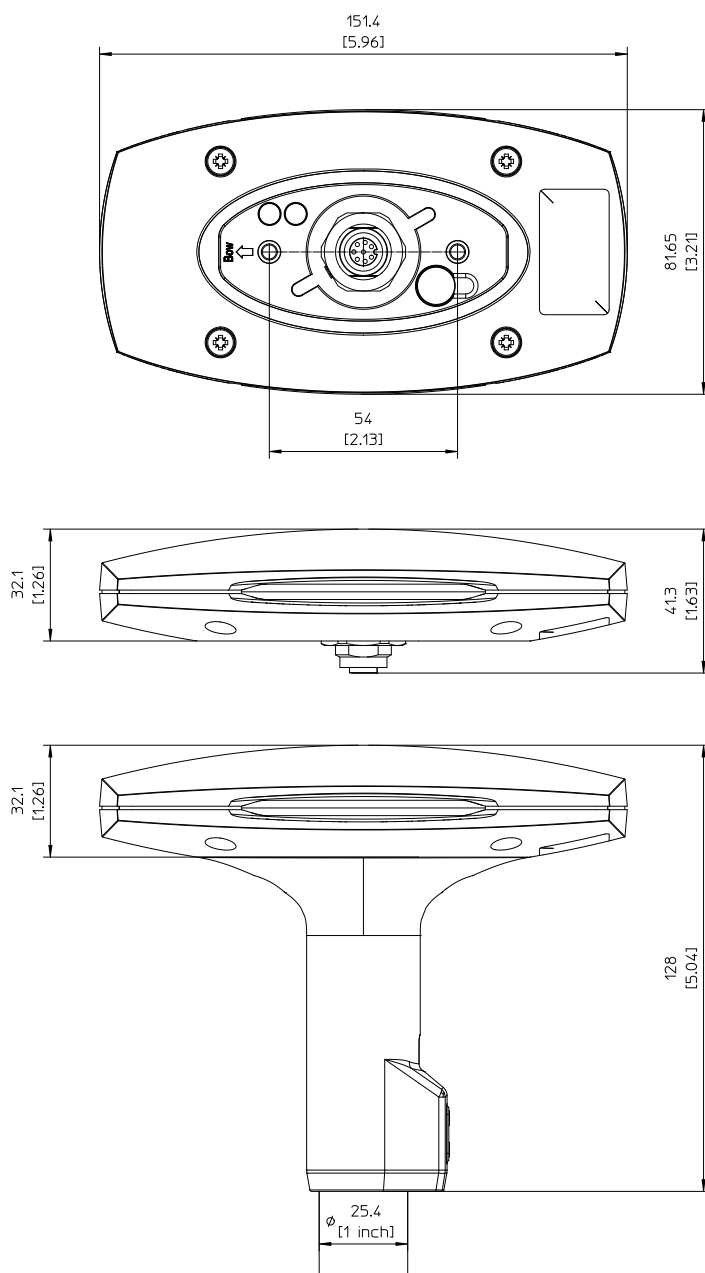
NMEA 0183 sentences are configurable (enable/disable, talker ID, output rate). For all GNSS sentences, talker ID "GN" can be configured to "GP".

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 | Proprietary 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/m ² |
| 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 |
| Maintenance | 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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