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instruments

# The LTL-M mobile retroreflectometer features

## The efficient way to measure the retroreflection of road markings

LTL-M measures all types of road markings at a simulated distance of 30 m with the highest level of accuracy. LTL-M is to be used mounted on a vehicle measuring retroreflection at normal traffic speed proving full overview of the condition of the road markings. The instrument operates with an accuracy of typically +/- 5% in line with DELTA's handheld retroreflectometers LTL-2000, LTL-X and LTL-XL.

LTL-M is a robust, reliable and advanced instrument designed for professionals using the latest camera and illumination technology. This technology results in high accuracy independent of changes in the geometry of the system through an automatic image processing compensating for vehicle movements.


LTL-M prototype.

The LTL-M system consists of 3 units:

- The sensor system mounted on the outsite of the vehicle with camera, flash light and GPS
- The processor placed in the car
- The GUI (Graphical User Interface) Tablet PC placed next to the driver

LTL-M measures $R_L$ (nighttime visibility) under dry and wet conditions, daylight contrast as well as records line geometry and missing or non-working road studs (RPMs).

LTL-M measures white and yellow of road markings up to 25 mm/1 inch profile with no adjustments needed. Both calibration and change of light source can be done with a simple operation in the field.

LTL-M comes with built-in precision GPS and can be delivered with an overhead camera. GPS makes it possible to determine exactly where any specific measurement has been carried out. A camera will make visual inspection possible of problem areas possible.

Measurement data, GPS data and other recorded data will be automatically stored. The system will give the driver the option of stopping and marking measurement during operation as well as inform about possible problems and malfunctions.

The software supplied with the instrument will be able to generate an easy-to-read report on the measurements as well as transfer data to Excel for further processing. LTL-M will be prepared for future software upgrades when new advanced road marking analysis is offered.

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LTL-M calibration standard is calibrated at DELTA's DANAK-accredited laboratory and is traceable in accordance with standards issued by PTB (Physikalish-Technische Bundesanstalt, Germany) and NIST (National Institute of Standards and Technology, USA). The instrument itself does not need re-calibration unless damaged. The recommended daily field calibration of the instrument is simple and easy to carry out.

DELTA offers service of the instrument at its factory and re-calibration of the calibration unit at its DANAK-accredited laboratory.


LTL-M GUI tablet PC.

## The LTL-M features in brief

- Provide continuous measurements of full width and length of markings
- Measure $R_L$ under dry and wet conditions
- Measure 1x1 metres/3x3 feet
- Accuracy comparable to handheld retroreflectometers*
- Measure daylight contrast
- Measure plane and profiled markings up to 25 mm/1 inch
- Show and store day and time
- Record road studs (RPMs)
- Record line geometry and marking off-set
- Can provide average values between 1 and 200 metres/3 and 650 feet
- Multiple language menu

## LTL-M complies with the following standards:

EN 1436 and ASTM E 1710

* LTL-M has been tested October 2009 on Danish and Swedish roads in a NMF, the Nordic Meeting for Improved Road Equipment, project. The study was carried out by VTI, the Swedish National Road and Transport Research Institute. The results are reported in "Evaluation of the LTL-M. Mobile measurements of the road marking" by Sven-Olof Lundkvist 2010.

The full report on the study can be downloaded from www.roadsensors.com

## Contact and further information

For further information about DELTA's LTL-M mobile retro-reflectometer please contact Market Manager Kjeld Aabye at +45 72 19 46 30 or e-mail: kaa@delta.dk.

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# LTL-M

Specifications*


**Optical specifications**

| | |
|---|---|
| Field of measurement: Width: | 1000 mm / 39,4 inch |
| Illumination angle to road: | 1.24° |
| Observation angle to road: | 2.29° |
| Illumination angular spread: | |
| - Horisontal: | 0.33° |
| - Vertical: | 0.17° |
| Observation angular spread: | ±0.17° |
| Equivalent observations distance: | 30 m |
| $R_L$ range (mcd·m-2·lx-1) | 0-2000 |

**Instrument dimensions**

| | |
|---|---|
| Length: | 500 mm / 19.7 inch |
| Width: | 200 mm / 7.9 inch |
| Height: | 300 mm / 11.8 inch |
| Weight: | 15 Kg / 33 lbs |

**Compliance**

| | |
|---|---|
| EMC: | EN 61326 : 2007 |
| Low voltage: | Not applicable, battery driven |
| ROHS: | Compliance to the requirement of and its exception. Directive 2002/95/EC; 2002/96/EC Annex 1A |

**Electrical characteristics**

| | |
|---|---|
| Power supply: | 12 V |

**Environmental specification**

| | |
|---|---|
| Temperature: | |
| - Operating | 0°C to +45°C / 32°F to 113°F |
| - Storage | -15°C to +55°C / 5°F to 131°F |
| Humidity: | non condensing |

**Standards**

EN 1436
ASTM E-1710

**Features**

- Continuous measurement of night visibility ($R_L$) of road markings at driving speed
- Automatic compensation for vehicle movements**
- Measures daylight contrast and line width
- Measures presence of, missing and non-working road studs (RRPM's)
- Measures all types and colors of plain and profiled markings
- Measures dry and wet markings
- Measures profiles up to 15 mm
- Stop and mark function during operation
- Air humidity and temperature is recorded
- Measured data are automatically stored
- Can be operated by one person
- Software for reporting and transfer of data to Excel
- Graphical presentation of measurement values
- Future software upgrades can easily be integrated
- ID (road, operator, line type, color) can be added
- may be integrated with existing GIS systems

**Standard delivery**

LTL-M retroreflectometer
Software for report and graphical generation
Calibration standard
Vehicle fixture
Quick guide
User manual on CD/DVD
Carrying case

**Options**

Video camera

*Preliminary specifications
**Patent pending

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