

DELTA – Your professional retroreflectometer partner

DELTA is known for its highly reliable range of retroreflectometers used throughout the world for measuring retroreflection of pavement markings and traffic signboards.

Ensuring that markings and signs are performing according to current standards will help in guiding the traffic safely at daytime and nighttime. This helps reduce the number of accidents, fatalities and injuries on the roads. Besides, knowing the condition of road assets allows road owners to make financially sound decisions related to road maintenance.

Four decades ago DELTA was the first to introduce a retroreflectometer. Besides, DELTA has been deeply involved over the years in writing the international standards on retroreflection measurement of pavement markings and road traffic signs. As the globally leading supplier of retroreflectometers and the preferred choice of professionals we invite you to come and use our instruments and our extensive knowledge and experience within this field.

LTL-M - Continuous measurements of pavement markings

DELTA's LTL-M mobile retroreflectometer measures retroreflection of pavement markings and is the latest model in our well-known LTL-range of instruments. LTL-M is built over a patented technology based on a DELTA developed flash system, digital camera technology and real-time digital image processing. The result is a measurement system delivering hitherto unparalleled accurate measurements.



LTL-M is easy to mount on any type of standard vehicle using fittings supplied with the system, is calibrated in a simple one-step process and can be operated by one person. LTL-M measures night visibility of markings continuously, measures double lines simultaneously and reports them individually as well as records the width of the markings. LTL-M in addition records the presence of RRPMs (Raised Retroreflective Pavement Markers).

LTL-X Mark II & LTL-XL handheld retroreflectometers for pavement markings

DELTA offers two models of handheld retroreflectometers for measuring retroreflection of pavement markings: LTL-X Mark II and LTL-XL. The two models are similar in design, software and functionality but with a few different features targeted at different measurement needs.



LTL-XL measures nighttime (R_L) and daytime (Q_d) visibility of all types of dry and wet pavement markings. LTL-XL is able to measure profiled markings up to 5 mm.

LTL-X Mark II measures R_L and can measure high profile markings up to 15 mm in profile depth besides measure during continuous wetting (condition of rain).

Both instruments use LED technology, which makes the instrument almost maintenance free.

Measuring times of 1-3 seconds and a large memory of more than 200,000 measurements makes the instrument fast and easy to use. Setting up the instrument for measuring is done on a bright colour LED display clearly visible even during sunshine. Both instruments can be delivered with built-in GPS for review of measurement data on e.g. Goggle Earth, and built-in printer for instant printing of measurement data. Data transfer is by USB connection.

RetroSign GRX for road traffic signs, high visibility clothing, license plates and reflective tape

Since the mid 90s DELTA has offered various models of RetroSign for measuring retroreflection of road traffic signs, high visibility clothing, license plates and reflective tapes. RetroSign GRX is the most recent launch from DELTA offering many features not seen in such instrument so far. GRX offers the possibility to measure up to 7 observation angles simultaneously as well as 7 entrance angles using magnetic attached and identified lens attachments. RetroSign GRX is able to take pictures of signs, automatically detect sign colors, read barcodes and QR codes for asset management programs as well as supports an easy calibration procedure by scanning calibration reference values.



GRX is an all in one instrument easily fitted for different measurement geometries. An app allows transfer of measurement data to a tablet for data back-up, data processing, data presentation and mapping, asset management and wireless transfer of data to company back-office.

We have the user in mind

DELTA's instruments have been developed with the user in mind. They come with single-handed operation and single-touch controls, which makes the operator work easily and simply with our instruments. The instruments are offered as a base model allowing the user to add features according to his or her needs and financial capability.

DELTA's instruments come standard with USB interface or wireless communication for easy transfer of data. Data storage and presentation are made either in proprietary software (LTL-X Mark II and LTL-XL) or generally available software like Excel and Google Earth.

Calibration and traceability

DELTA's instruments are all very easy to calibrate in a simple one-step process. The calibration references are calibrated in DELTA's DANAK accredited laboratory and are traceable to PTB (Physikalisch-Technische Bundesanstalt, Germany) and NIST (National Institute of Standards and Technology, USA).

International standards

DELTA's instruments comply with the internationally recognised standards EN 1436, ASTM E-1710, ASTM E-2177 and ASTM E-2832, for pavement markings, EN 12899, ASTM E-1709, and ASTM E-2540 for road traffic signs and EN 20471 for high visibility clothing.



Contact and further information

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Good reasons for investing in a retroreflectometer

DELTA – a leading and reliable force behind improving driving safety

DELTA is known throughout the world for its highly reliable and robust range of hand-held retroreflectometers (LTL, RetroSign). The instruments are used for measuring retroreflection of road markings and road signs with the main purpose of improving driving safety. DELTA has been at the forefront of developing instruments for measuring retroreflection since 70's. DELTA has in parallel been a leading force behind writing current standards applied in Europe (EN 1436, EN 12899) and the US (ASTM E 1709, ASTM E 1710, ASTM E 2176, ASTM E 2177, ASTM E 2302, ASTM E 2540, ASTM E 2832).

"DELTA is your most knowledgeable and competent partner when it comes to improving driving safety – and we are proud of it".

Standards – what are their purpose?

Standards are instructions telling national road authorities what measurements need to be enforced and what limits to adhere to in order to ensure safe driving. Having standards enforced will increase road safety, especially when driving during nighttime and during poor weather conditions like rain and fog. International studies show that relatively more accidents and fatalities happen during nighttime driving compared to daytime driving.

"Standards explain what measurements to enforce to ensure safe driving - for your benefit of the individual and the society".

Driving safety – what does it really mean?

Driving on roads can be dangerous - accidents happen, some fatal. Loss of life is a tragedy. People being hospitalised is a significant cost to society, and to the individual in care and lost labour. Do authorities take such costs into consideration when they decide about road maintenance – and thus driving safety? Money spent on improving driving safety is less than the cost caused by road accidents.

"Effective investments into driving safety give good returns on the investment – and save lives".

Retroreflectometers – use them to improve driving safety!

Using a retroreflectometer is the only way to objectively evaluate if a road marking or a road sign provides the minimum retroreflection level stated in a standard - and thus provides the best possible guidance to safe driving under various driving conditions. Perceptual evaluations of e.g. road sign quality are much worse - even trained inspectors have a hit rate below 50 % in regions of interest regarding retroreflectivity. In contrast DELTA's retroreflectometers in seconds can measure the retroreflection level and provide a non-disputable result and proof whether a road marking or a road sign meets or fails minimum requirements in the standard.

"Investments in retroreflectometer give good returns on the investment – and save lives".

Retroreflectometers – help spend your maintenance budget more efficiently!

Financial resources are limited for most of us. Having a road maintenance budget to spend, how do you spend it most efficiently? For road markings and road signs available resources should first of all be used to avoid low performing markings and signs – and keep roads safe at a high level. DELTA's retroreflectometers measure accurately the performance of your markings and signs, and let you invest your resources where you get the best return on investments.

"A retroreflectometer allows you to make clever and effective decisions – to the benefit of safe driving".

DELTA – your preferred partner in durable and easy-to-use instruments

You won't find more reliable, durable and easy-to-use instruments for your road safety improvement program than DELTA's instruments.

They are reliable due to a careful design and DELTA's in-house competence as an accredited calibration laboratory. They are durable and will last for years with proper treatment. The instruments are

very easy to use and handle – we have had the user in mind when we developed our instruments. Our proprietary software makes transfer of data via USB or bluetooth to a PC and onwards to Excel or Google Earth simple and fast.

“Our instruments are used worldwide day after day, again and again - do you want to test one?”

DELTA – your preferred partner in improving driving safety

You won't find a better partner in your road safety improvement program than DELTA. We know as nobody else the retroreflection business inside out. We deliver state-of-the-art instruments for improving driving safety by documenting that road markings and road signs deliver what they are expected to do – or if they need to be taken care of.

“Our instruments are used by professionals - to save your life”.

Contact and further information

For further information about DELTA's LTL-M mobile retroreflectometer please contact:



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LTL-XL



RetroSign



LTL-M



The LTL-M mobile retroreflectometer features

The efficient and accurate 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 used mounted on a vehicle measuring retroreflection at traffic speed, providing full overview of the condition of the road markings. The instrument operates with an accuracy of typically $\pm 5\%$ and a repeatability of typically $\pm 3\%$, which is in line with DELTA's hand-held retroreflectometers LTL-2000, LTL-X, and LTL-XL.

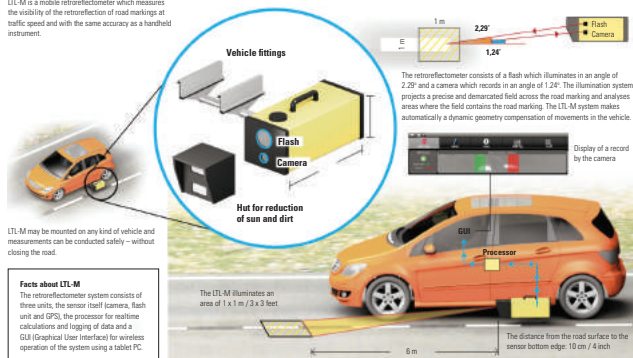
LTL-M is a robust, reliable and advanced instrument designed for professionals using modern digital camera and illumination technology. This technology results in high measurement accuracy independent of changes in the geometry of the system caused by vehicle bouncing during driving.

The LTL-M system consists of three parts

- The sensor unit mounted on the outside of the vehicle containing camera and flash system
- The real time processor placed inside the vehicle
- The GUI (Graphical User Interface) Tablet PC placed next to the driver

LTL-M captures night visibility of road markings

LTL-M is a mobile retroreflectometer which measures the visibility of the retroreflection of road markings at traffic speed and with the same accuracy as a handheld instrument.



LTL-M illustration from the Danish engineering magazine Ingeniøren



LTL-M mounted on a vehicle

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

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

LTL-M comes with GPS and can be delivered with DMI (Distance Measuring Instrument) and an overhead camera. GPS makes it possible to determine exactly where specific measurements have been carried out. A DMI unit ensures correct distance measures if GPS contact cannot be established. An overhead camera supports additional visual inspection of problem areas when data are reviewed.

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



Video overlay

The software supplied with the instrument generates an easy-to-read txt.file, a graph and a google earth map for measurement evaluation and presentation. LTL-M lends itself to remote service and easy software upgrades through internet link-up when new advanced road marking analysis is offered.

The LTL-M calibration reference is calibrated at DELTA's DANAK-accredited laboratory and is traceable to standards issued by PTB (Physikalisch-Technische Bundesanstalt, Germany) and NIST (National Institute of Standards and Technology, USA). The instrument itself does not need re-calibration unless damaged – except for a recommended calibration of the LTL-M calibration reference every 2 years. The recommended once-daily field calibration of the instrument is simple and fast 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

- Provides continuous measurements of full width and length of markings at traffic speed
- Digital camera and real-time image processing
- Measures RL under dry conditions
- Measures 1x1 m/3x3 feet pr picture, 25 picture per sec.
- Accuracy in line with hand-held retroreflectometers
- Measures daylight contrast
- Measures plane and profiled markings up to 25 mm/1 inch
- Shows and stores day and time
- Records road studs (RRPMs)
- Records line width
- Provides average values between 1 m/3 feet and indefinite

Straus Zert certification

Test Certificate No. 0913-2011-02 on the suitability of the LTL-M dynamic retroreflectometer for the dynamic measurement of the coefficient of retroreflected luminance RL of road marking.

Overall assessment:

The LTL-M retroreflectometer is suitable for the dynamic measurement regardless of speed, of the coefficient of retroreflected luminance RL of road markings, and delivers the same results as a static retroreflectometer

StrausZert, Germany, December 6, 2011

LTL-M complies with the following standards

EN 1436 (R_L), ASTM E 1710 and EN 1463-1.
US patent no.: US 9,176,057 B2

Contact and further information

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LTL-M

Specifications



System overview

The LTL-M system consists of:

Sensor: 500 x 180 x 200 mm/19.7 x 7.1 x 8.0 in

12.5 kg/28 lbs

Processor: 400 x 170 x 200 mm/ 16.0 x 6.8 x 8.0 in

8 kg/18 lbs

Tablet PC: 256 x 175 x 10 mm/10.0 x 6.9 x 0.4 in

0.6 kg/1.3 lbs

The LTL-M light source is a flash system. The LTL-M measurement system consists of a digital camera and proprietary software.

Optical specifications

Field of measurement: 1000 x 1000 mm / 39.4 x 39.4 in

Illumination angle R_L : According to EN 1436 and ASTM E 1710

Observation angle R_L : According to EN 1436 and ASTM E 1710

LTL-M works based on reversed geometry, this is according to ASTM E 1767.

Illumination angular spread:

- Horizontal: 0.33°
- Vertical: 0.17°

Observation angular spread: $\pm 0.17^\circ$

Equivalent observation distance: 30 m

R_L range (mcd·m⁻²·lx⁻¹): 0 - 2000

RRPMs/Road studs: 2 % level for new (white), 0.14 CIL value

Regulatory compliance

EU

The LTL-M system without GPS unit complies with the following directives of the European Parliament and of the Council:

- Directive 2004/104/EC of 14 October 2004 relating to the radio interference (electromagnetic compatibility) of vehicles and amending Directive 70/156/EEC on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers.
- Directive 2011/65/EU of 8 June 2011 on restriction of the use of certain hazardous substances (RoHS).
- Directive 2002/96/EC of 27 January 2003 on waste electrical and electronic equipment (WEEE).

The LTL-M system without GPS unit complies with Regulation No. 10 of the Economic Commission for Europe of the United Nations (UN/ECE) - Uniform provisions concerning the approval of vehicles with regard to electromagnetic compatibility:

- UN ECE R10 revision 3

The equipment is tested to the following standards:

Automotive Directive:

- CISPR 25:2008
- ISO 7637-2:2004+A1
- ISO 11452-2:2004
- ISO 11452-4:2011
- ISO 10605:2008

The LTL-M GPS unit complies with the following directives of the European Parliament and of the Council:

- Directive 1999/5/EC of 9 March 1999 on radio equipment and telecommunications terminal equipment.
- Directive 2011/65/EU of 8 June 2011 on restriction of the use of certain hazardous substances (RoHS).
- Directive 2002/96/EC of 27 January 2003 on waste electrical and electronic equipment (WEEE).

The equipment is tested to the following standards:

R&TTE article 3.1a (health & safety):

- EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011

R&TTE article 3.1b (electromagnetic compatibility):

- EN 301489-1 V1.8.1:2008
- EN 301489-3 V1.4.1:2002

R&TTE article 3.2 (radio parameters):

- EN 300440-2 V1.4.1:2010

USA

The LTL-M system including GPS unit complies with the following rule part of the Federal Communications Committee:

- FCC CFR 47 Part 15, Subpart B, specific rule parts §15.5 & §15.29.

The incorporated GPS module is not an intentional transmitter in FCC definitions, and the LTL-M system is exempted from other rule parts that the specifically mentioned pursuant to §15.103.

As automotive equipment, the LTL-M system is exempted from safety testing under authority of OSHA.

Electrical characteristics

Power supply: 12 V vehicle power/15 A

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: 85%, non condensing

Data

Typical repeatability: +/- 3%

Typical reproducibility: +/- 5%

Standards

EN 1436 and ASTM E-1710 for pavement markings

EN 1463-1: 1997 for RRPMS

Features

- Continuous measurement of night time visibility (R_L) of road markings at driving speed
- Automatic compensation for vehicle movements (Patented)
- Measures daylight contrast and line geometry
- Measures presence of road studs (RRPMs)
- Measures all types of plain and profiled markings
- Measures white and yellow markings
- Measures dry markings
- Measures profiles up to 25 mm / 1 in
- Stop and mark function during operation
- Measured data are automatically stored
- Multilingual menu
- Can be operated by one person
- Software for reporting and transfer of data to MS-Excel
- Data presentation on Google Earth
- Future software upgrades can easily be integrated

Standard delivery

- LTL-M retrorreflectometer system (sensor, processor, user interface tablet PC)
- GPS
- Transportation boxes on wheels
- Software for data presentation
- Calibration standard with DANAK certificate and alignment board
- Vehicle fixture (2 sets)
- User manual and quick guide
- Spare window glasses and gaskets

- Tablet PC windscreen holder
- Remote service dongle (D-Link)

Options

- Overhead video camera
- DMI (Distance Measurement Instrument)

Approval

StrausZert, Test no.: 0913-2011-02

US patent no.: US 9,176,057 B2

Warranty

2 years

R&TTE Declaration of Conformity (DoC) and US Attestation of Conformity (AoC) can be supplied by DELTA upon request or viewed on: roadsensors.madebydelta.com/technical-background/certification

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LTL-M mobile retroreflectometer – a global success

LTL-M from DELTA was introduced in 2011 and has been very well accepted by the global market for measuring retroreflection of pavement markings. The instrument is used both on roads and more recently on airfields.

One of the first users of LTL-M was Ramböll RST, a Swedish service provider offering measurement services, primarily of road surface parameters. In December 2017, DELTA interviewed Berne Nielsen, Department Manager, about Ramböll's experience with LTL-M.



Who is Ramböll and Ramböll RST, and what is your line of business?

Ramböll is a leading community adviser with over 13,000 experts in the Nordic region, North America, UK, Continental Europe, Middle East, and India and has a significant representation in Asia, Australia, South America, and Sub-Saharan Africa. We are passionate about inspirational and innovative solutions that will benefit customers, end users, and the society.

Ramböll RST is a leader in rational and economical operation and maintenance of traffic facilities. Ramböll RST's unique skills and analytical methods allow road and street maintenance to be controlled for the greatest technical and economic benefits.

Why has Ramböll RST chosen LTL-M?

We had previously used instruments from two other manufacturers, but we were never really satisfied with their performance and measurement accuracy. When DELTA announced that they were developing LTL-M, we contacted them early to test the instrument. The LTL-M impressed us positively in terms of accuracy and repeatability, but also how easy it is to handle and calibrate.

How many LTL-M does Ramböll RST operate?

We ordered a couple of units early and over a couple of years we have been replacing all instruments of other makes with LTL-Ms. In total, we and our system customers now have 10 LTL-Ms in operation. We expect the number will increase to 12 during 2018.

What does Ramböll use the LTL-M for?

Ramböll currently uses LTL-M for national state measurements in Sweden, Norway, and Denmark. The aim of the measurements is to objectively determine the road marking function in the different regions of the countries and for different road classes. Furthermore, we use the LTL-M to analyse how well the road marking meets the government's requirements.

In addition to the marking function measurements, we also carry out numerous checks on new markings and inventory measurements annually to support maintenance operations. Ramböll RST mainly conducts check measurements in the Nordic region and in northern Europe.



Why is Ramböll RST satisfied with the LTL-M?

As we build and develop measurement systems, we are always interested in using the best sensors in the market. LTL-M is, according to us, the best option today for measuring a road marking retroreflection. A big bonus is that LTL-M is also easy to handle and use. DELTA's service level has so far been very good, which is of great importance to us.

Additional information about Ramböll RST and Ramböll can be located on www.rambollrst.se and www.ramboll.com.

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Vehicle-mounted mobile retroreflectometers provide road operators with accurate data on road marking performance

On the move

How new technology is driving forward progress in the area of vehicle-mounted mobile retroreflectometers

Words | Kjeld Aabye, DELTA, Denmark

The need for accurate data on the performance of pavement markings has never been greater. Road authorities are looking to provide suitable safety levels across their increasingly congested roads. Meanwhile, due to the ageing population in many parts of the world, a growing number of elderly drivers are hitting the roads. Compared to young people, elderly drivers tend to have slower reaction times and need more light to see traffic guidance tools such as pavement markings.

It's obvious that the better the optical retroreflections of road markings are, the more visible they are to drivers. Maintaining a good level of visibility is critical to road marking maintenance.

DELTA's latest LTL-M mobile retroreflectorometer for assessing road marking performance boasts improved accuracy due to its use of new technology. The accuracy is now in line with readings taken with traditional handheld devices such as the company's LTL-X and LTL-XL



models. In technical terms, this means the system works with a typical repeatability of $\pm 3\%$ and a typical reproducibility of $\pm 5\%$. In addition, the LTL-M offers complete coverage of the entire pavement markings. This is in contrast to the limited, sample-based coverage offered by traditional handheld retroreflectorometers – or even traditional mobile retroreflectorometers. This new product is a major advance on first-generation retroreflectorometers, which were less accurate due to vehicle movement affecting readings and wind and vehicle load variations that affected the measurement geometry. With these older systems, variations of as much as $\pm 40\%$ have been documented.

The issue of geometry

Most existing mobile retroreflectometers work with 6m geometry. This means that the most accurate measurements are achieved when the system measures at – or close to – the 6m point. During driving, the measurement distance will typically fluctuate between 5m and 7m. If a mobile system is not able to compensate for such inaccuracies, this will result in incorrect readings.

The diagram below shows that if the sensor unit is vertically lifted by 5% or 1.2cm compared to the nominal measurement height, it results in readings of 22% below the correct values. In parallel, if the sensor is tilted 5% off the horizontal level, it results in readings that are 10% too low.

The LTL-M measures 100% of the marking surface up to a speed of 55mph. It is therefore able to measure a detailed cross-sectional retroreflection of the road markings. As many markings have strong transversal variation, a reading taken by a handheld instrument with a 4-5cm wide measurement field in the centre does not represent the true visibility. DELTA's system provides a detailed analysis of the variation that can be correlated to either the true visibility (as the driver sees the marking in full width and length) or to a middle section for correlation to a handheld instrument.

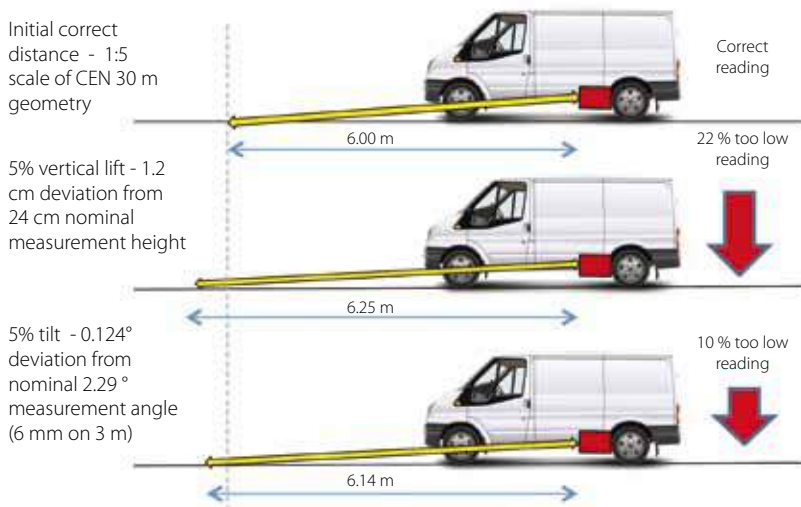


(Above) Once the LTL-M mobile retroreflectometer unit is attached to a vehicle (as shown below) it can accurately measure retroreflection of road markings at speeds of up to 55mph



The system also offers the opportunity to accurately measure both white and yellow markings automatically without requiring recalibration. Other key features include good linearity up to at least 2,000 mcd/lx/m²; measurement of profiled markings up to 25mm; easy, once-daily field calibration traceable to national standards; and the suppression of daylight to retain measurement accuracy.

- Retroreflectivity reading errors caused by vehicle movements are seriously affecting the accuracy.
- DELTA's LTL-M retroreflectometer automatically compensates for vehicle movements and achieves accurate readings.



Accuracy as standard

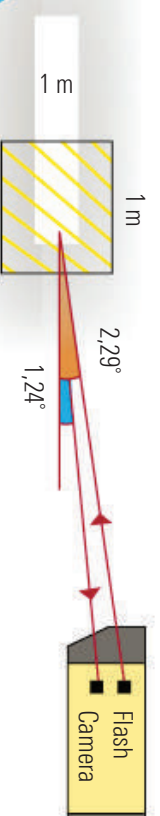
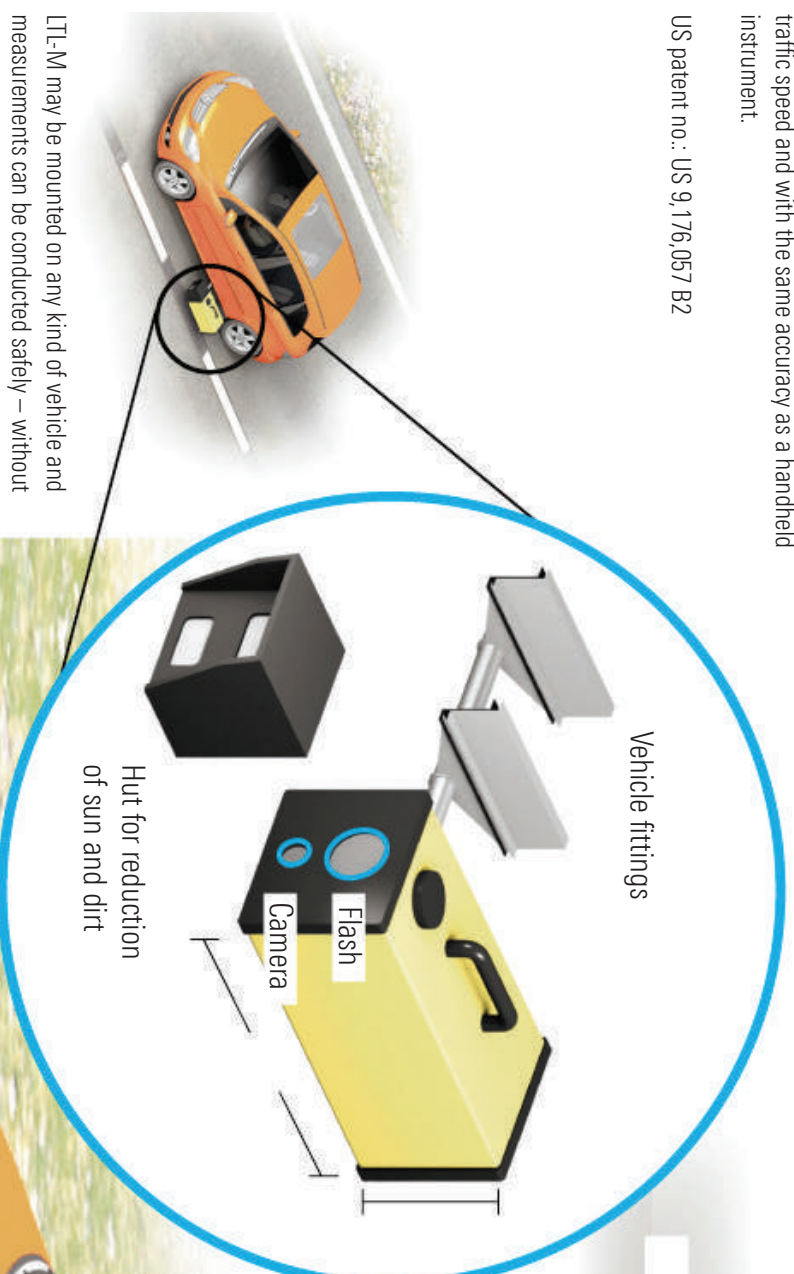
The technology applied to measuring the retroreflection of pavement markings is detailed in various standards, notably EN 1436 and ASTM E 1710. Both standards describe a 30m geometry and the corresponding angles for illumination and observation, focusing on handheld retroreflectometers. The geometry of the existing mobile retroreflectometers follows these standards. There are, however, activities taking place both by CEN and ASTM to expand existing (or indeed write new) standards to cover the mobile measurement of markings. These standards are expected to follow the current 30m geometry. However, they will elaborate on potential error sources of the mobile technology, offer recommendations to the technical specifications of such instruments and possibly even require that instrument suppliers publicly state how their mobile system handle such conditions and what the limitations of their instruments are. This work is expected to be finalised within the next two years. ■

LTL-M captures night visibility of road markings



LTL-M is a mobile retroreflectorometer which measures the visibility of the retroreflection of road markings at traffic speed and with the same accuracy as a handheld instrument.

US patent no.: US 9,176,057 B2



The retroreflectorometer consists of a flash which illuminates in an angle of 2.29° and a camera which records in an angle of 1.24°. The illumination system projects a precise and demarcated field across the road marking and analyses areas where the field contains the road marking. The LTL-M system makes automatically a dynamic geometry compensation of movements in the vehicle.



Display of a record by the camera



Facts about LTL-M
The retroreflectorometer system consists of three units, the sensor itself (camera, flash unit), the processor for realtime calculations and logging of data and a GUI (Graphical User Interface) for wireless operation of the system using a tablet PC.

Source: Ingeniøren

The LTL-XL & LTL-X Mark II retroreflectometer features

The professional choice for measuring the retroreflection of road markings

LTL-XL & LTL-X Mark II instruments

LTL-XL and LTL-X Mark II are robust, long lasting and advanced instruments, designed for professionals using the latest developments in light and sensor technology. Using DELTA's gradient index technology and patented optical system, the instruments can measure all types of flat and profiled markings. The sensor response, combining the CIE eye response and the CIE illuminant A, meets both CEN and ASTM requirements for profile capacity and colour.

LTL-XL and LTL-X Mark II comply with the following standards: EN 1436, ASTM E 1710, ASTM E 2177, ASTM E 2302, ASTM E 2832

General features

- Memory capacity for 200.000 measurements
- Multiple language menu
- Easy readable colour LED display
- GPS positioning
- Data presentation on Goggle Earth
- USB interface
- Stray light compensation
- Shows and stores day, time, humidity and temperature
- Facility for entering and storing of road ID, marking type and user ID
- Facility for averaging measurements
- Wet timer to facilitate measuring wet road markings
- Comes with maintenance free LED light
- Single handed operation, user-friendly



The LTL-XL specific features

- R_L and Q_d under dry and wet conditions
- Short measurement time of 1-3 seconds
- Measures plain and profiled markings up to 5 mm/0.2 inch



The LTL-X Mark II specific features

- R_L under dry, wet and continuous wetting
- Short measurement time of less than 1 second
- Measures plain and profiled markings up to 15 mm/0.6 inch

Performance

LTL-XL and LTL-X Mark II measure all types of road markings at a simulated distance of 30 m with the highest level of accuracy. The instruments operate with a reproducibility of $\pm 5\%$ and a repeatability of $\pm 2\%$.

LTL-XL and LTL-X Mark II measure, depending on the model chosen, R_L (nighttime visibility), Q_d (daytime visibility), visibility under dry, wet and continuous wetting.

LTL-XL and LTL-X Mark II measure white and yellow markings with no adjustment.

LTL-XL and LTL-X Mark II have automatic stray light compensation, so daylight and other outside light sources will not affect the accuracy of the measurements.

The Road Sensor Control (RSC) software supplied with the instrument, combined with the USB interface, makes it easy to download data and generate reports like MS-Excel reports. GPS data can easily be transferred to a GPS program like Goggle Earth for visual overview showing the results and where measurements have been taken.

Add-ons

LTL-XL and LTL-X Mark II can be fitted with telescopic handle and wheels to make the handling of the instrument ergonomic and easy. The adjustable handle will allow the operator to work in upright position, and the wheels make it easy to move the instrument to a new measurement location. All operations can be carried out single-handed with single-touch securing easy and safe use in traffic.

LTL-XL and LTL-X Mark II can be fitted with built-in precision GPS and printer. GPS makes it possible to determine exactly where any specific measurement has been carried out. The printer can provide you with immediate written proof of a measurement. The internal

memory automatically stores the measurements with relevant support data.

Calibration standards

LTL-XL and LTL-X Mark II instruments are calibrated at DELTA's DANAK-accredited laboratory and assuring traceability to PTB (Physikalisch-Technische Bundesanstalt, Germany) and NIST (National Institute of Standards and Technology, USA). The recommended daily calibration of the instruments is simple and easy to carry out.

Contact and further information

For further information about DELTA's LTL-XL and LTL-X Mark II, please contact:



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Telescopic handle



Wheels



Printer



GPS

DELTA

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LTL-XL

Specifications

Optical specifications

Field of measurement:

- Width: 50 mm / 1.97 in
- Height: 185 mm / 7.28 in

Illumination angle R_L EN 1436: 1.24°

Illumination angle R_L ASTM E 1710: 88.76°

Observation angle R_L EN 1436: 2.29°

Observation angle R_L ASTM E 1710: 1.05°

Illumination angle Qd: Diffuse

Illumination angular spread:

- Horizontal: / Vertical: 0.33 / 0.17°

Observation angular spread: $\pm 0.17^\circ$

Equivalent observations distance: 30 m

R_L range ($\text{mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$) 0 - 2000

Qd range ($\text{mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$) 0 - 318

Instrument dimensions

Length: 573 mm / 22.56 inch

Width: 222 mm / 8.74 inch

Height: 538 mm / 21.18 inch

Weight: 7 Kg / 15.5 lbs

Construction:

Structural parts: Aluminum

Housing: Polymer

Keyboard: Silicone rubber

Circuit boards: Epoxy glass

Regulatory compliance

Radio: EN 300440-1 V1.6.1:2010

EMC: EN 301489-1 V1.8.1:2008, EN 301489-3 V1.4.1:2002

Safety: EN/IEC 60950-1 :2006, EN/IEC 60950-22 :2006

FCC: 47 CFR, FCC Part 15B, Class A

Electrical characteristics

Power supply:

Battery: Built in 12 volt / 2.1 Ah NiMH or 12 volt / 4.5 Ah NiMH

High Power

Charging time: Approx. 1 hour 30 min / 3 hour 30 min

External charger power supply: Friwo FW7530/15

(100-240 VAC / 15VDC)

Charger fuse (5*20 mm): T3.15A

Power supply fuse (5*20 mm): T3.15A

Data

Data memory: >200.000 measurements

Data transfer: USB 2.0

Typical repeatability: +/- 2%

Typical reproducibility: +/- 5%

Environmental specification

Temperature:

- Operating: 0°C to +60°C / 32°F to 140°F
- Storage: -15°C to +60°C / 5°F to 140°F
- Humidity: <85%, non condensing

Timing

Measurement time: Qd or R_L 1 sec. / R_L + Qd : 3 sec.

Standards

EN 1436 (R_L & Qd), ASTM E-1710 (R_L), ASTM E-2177 (R_L wet), ASTM E-2302 (Qd)

Features

- Night time (R_L) and daytime (Qd) visibility measurement
- Ergonomic and easy-to-use lightweight design.
- Single handed operated and user-friendly
- Air humidity and temperature recorded
- Safeguarded for the future with seamless connection to any system, such as PCs and PDAs
- Measures plain and profiled markings up to 5 mm / 0.2 inch
- Measures dry and wet markings
- Measurement statistics
- ID functions (road, operator, line type, colour)
- Multilingual menu
- Data storage and communication
- Software for PC downloads
- Stray light compensated

Standard delivery

- LTL-XL Retroreflectometer
- Transportation box on wheels
- Calibration standard with DANAK certificate
- Battery charger
- Quick guide

Downloads

To be downloaded from www.roadsensors.com under 'Products':

- LTL-XL user and PC software manuals
- LTL software pack. Provide automatic download of driver and RSC software

Options

- Built-in GPS
- Adjustable telescopic handle
- Wheels
- Built-in printer

Approval

StrausZert, Test no 0913-2010-07

Warranty

2 years

R&TTE Declaration of Conformity (DoC) and US Attestation of Conformity (AoC) can be supplied by DELTA upon request or viewed on: roadsensors.madebydelta.com/technical-background/certification





LTL-X Mark II

Specifications



Optical specifications

Field of measurement:

- Width: 45 mm / 1.77 in
- Height: 200 mm / 7.87 in

Illumination angle R_L EN 1436: 1.24°

Illumination angle R_L ASTM E 1710: 88.76°

Observation angle R_L EN 1436: 2.29°

Observation angle R_L ASTM E 1710: 1.05°

Illumination angular spread:

Horizontal: / Vertical: 0.33 / 0.17°

Observation angular spread: $\pm 0.17^\circ$

Equivalent observations distance: 30 m

R_L min. reading ($\text{mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$): 0

R_L max. reading ($\text{mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$): 2000

Construction

Structural parts: Aluminum

Housing: Polymer

Keyboard: Silicone rubber

Circuit boards: Epoxy glass

Instrument dimensions

Length: 573 mm / 22.6 in

Width: 222 mm / 8.7 in

Height: 538 mm / 21.2 in

Weight: 9 Kg / 20 lb

Regulatory compliance

Radio: EN 300440-1 V1.6.1:2010

EMC: EN 301489-1 V1.8.1:2008, EN 301489-3 V1.4.1:2002

Safety: EN/IEC 60950-1 :2006, EN/IEC 60950-22 :2006

FCC: 47 CFR, FCC Part 15B, Class A

Electrical characteristics

Battery: Built in 12 volt / 4,5 Ah Hi-Power

External charger power supply: Friwo FW7530/15
(100-240 VAC / 15VDC)

Charging time: Approx. 3 hour 30 min

Charger fuse (5*20 mm): T3.15A

Power supply fuse (5*20 mm): T3.15A

Data

Data memory: 200,000 measurements

Data transfer: USB 2.0

Typical repeatability: $\pm 2\%$

Typical reproducibility: $\pm 5\%$

Environmental specification

Temperature:

- Operating: 0°C to +60°C / 32°F to 140°F
- Storage: -15°C to +60°C / 5°F to 140°F
- Humidity: < 85%, non condensing

Timing

Measurement time: < 1 sec

Time between measurement: 1 sec

Standards

EN 1436 (R_L & Qd), ASTM E 1710 (R_L), ASTM E 2177 (R_L wet), ASTM E 2832 (R_L continuous wetting)

Features

- Easy readable colour LED display
- Night time visibility (R_L) measurement
- Measures plain texture and profiled markings up to 15 mm/0.6 in
- Measures dry and wet markings and under continuous wetting
- Wet timer to facilitate measuring wet road markings
- Shows and stores day, time, humidity and temperature
- Facility for averaging measurements
- ID functions (road, operator, line type)
- Multilingual menu
- Data storage and communication
- RSC software for PC downloads and data presentation
- Ergonomic design and operation, single hand operated
- Stray light compensated
- Maintenance free LED light

Standard delivery

- LTL-X Mark II retroreflectometer
- Transportation box on wheels
- Telescopic handle and wheels
- Built-in printer
- Calibration standard with DANAK certificate

- Battery charger
- Quick guide
- Built-in GPS

Downloads

To be downloaded from www.roadsensors.com under 'Products':

- LTL-X Mark II user and PC software manuals
- LTL software pack. Provide automatic download of driver and RSC software

Warranty

2 years

R&TTE Declaration of Conformity (DoC) and US Attestation of Conformity (AoC) can be supplied by DELTA upon request or viewed on: roadsensors.madebydelta.com/technical-background/certification





The RetroSign GRX retroreflectometer features

The professional choice for measuring all types of retroreflective sheeting on road traffic signs, high visibility clothing, license plates and reflective tapes

The RetroSign instrument

RetroSign GRX is the most advanced retroreflectometer available on the market currently for measuring retroreflection of road traffic signs, high visibility clothing, license plates and conspicuity tapes. RetroSign GRX is built in accordance with existing standards to allow for retroreflection measurement of various colours and all type of retroreflective materials including fluorescence types. RetroSign GRX uses a LED light source and meets the sensor response as stated in ASTM E 1709 for combining the CIE eye response and CIE illuminant 'A'.

RetroSign GRX has a rugged design and is built for long-lasting field work even if it can also be used in the laboratory. The software is simple and intuitive and guides the user through the different steps of a measurement program. RetroSign GRX allows the user to create templates with almost unlimited measurement related information (pre-defined or specific entries) of series of measurements with the same basic data. An ID for the user can be entered.

Standard compliance

RetroSign GRX complies with the following standards: EN 12899 (road traffic signs), EN 20471 (high visibility clothing), ASTM E 1709 & ASTM E 2540 (road traffic signs) and ASTM E 1809 (high visibility clothing).

Technology

RetroSign GRX is based on point aperture geometry comparable to laboratory readings reflecting real-world driving conditions and allows detection of incorrect application of direction sensitive microprismatic sheeting.

RetroSign GRX uses advanced sensor technology to allow for measurement of up to seven observation angles in addition to automatic colour recognition. The angles available to the user are:

0.2°, 0.33°, 0.5°, 0.7°, 1.0°, 1.5° and 2.0°. A built-in digital camera makes it possible to take pictures of signs as well as scan barcodes and QR codes for asset management purpose.

The man-machine user interface is through a large 5" WVGA colour touch display clearly visible even in bright sunshine. The instrument automatically detects and compensates for ambient light present which could affect the measurement result.



The working range of the instrument is 0 – 2.000 cd x lx⁻¹ x m⁻².

Scalability

GRX scalability - also after purchase - is an extremely powerful feature. Users can upgrade their system in the field as their needs change. The GRX comes with all features but just those paid for are made available.

Instrument types

RetroSign GRX is offered in three base models where the figure tells the number of observation angles offered

- **GRX-1** (1 entrance and 1 main observation angle)
- **GRX-3** (1 entrance and 3 observation angles)
- **GRX-7** (1 entrance and 7 observation angles)

The entrance angle is provided as a front adapter with one of the two standard angles of -4° (ASTM) or +5° (CEN) supplied with the instrument. Further entrance angles of +10°, +15°, +20°, +30°, +40° and +45° are offered for special measurement purposes. Using the

RetroSign GRX will be available as one model for both CEN and ASTM geometries. The geometry is being controlled by the front mounted entrance angle adapter. The instrument automatically reads which adapter has been attached and records this information.



RetroSign GRX offers a range of basic features:

- Measurement of 1, 3 or 7 observation angles
- Calibration reference with values as number or QR code for scanning
- Automatic colour recognition
- Colour contrast calculation (background and legend)
- Manual pass/fail evaluation
- Memory of >2 mio measurements, >2,000 measurements with pictures
- Replaceable and rechargeable battery available from the market
- Data transfer to PC via USB memory stick
- Data presentation in generally available software like Excel and Google Earth

RetroSign GRX offers a range of built-in features which add value to the performance of the instrument.

- GNSS for location identification and mapping
- Camera for taking photos of signs
- Camera for scanning of barcodes and QR codes for asset management
- Wireless communication
- Instrument rotation and tilt
- Sign facing direction
- US MUTCD Library with automatic pass/fail evaluation
- Wireless data transfer to tablet for data back-up, processing, presentation and asset management

In addition to built-in features the following items are available:

- Wireless operated extension pole, 1.5 to 2.7 m / 4.9 to 8.9 feet.
- Entrance angle adapters of -4°, +5° +10°, +15°, +20°, +30°, +40° and +45°

Data can be transferred to a PC using a USB memory stick, or can be transferred to a tablet (iPad) via WiFi. From the tablet data can be sent instantly to the company back office if required. See the GRX App & tablet feature leaflet for further information on this option.

RetroSign GRX measurements transferred to a PC will be presented as a log file in Excel and displayed on Google Earth. If other output formats are required, DELTA will be able to assist in developing such solutions.



For further information about DELTA's RetroSign GRX, please contact:



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Retrosign GRX

Specifications

Measurement of the Coefficient of retroreflected luminance R_A (nighttime retroreflection) of road traffic signs, high visibility clothing, license plates and reflective tapes.

Geometry

Road traffic signs: EN 12899, ASTM E-1709 & ASTM E-2540
High visibility clothing: EN 20471 & ASTM E-1809

GRX-1

- Entrance / illumination angle: -4° or $+5^\circ$
- Observation angle: 0.2° or 0.33°

GRX-3

- Entrance / illumination angle: -4° or $+5^\circ$
- Observation angles: Three angles of 0.2° 0.33° , 0.5° , 0.7° 1.0° , 1.5° , 2.0°

GRX-7

Geometry:

- Entrance / illumination angle: -4° or $+5^\circ$
- Observation angles: 0.2° 0.33° , 0.5° , 0.7° 1.0° , 1.5° , 2.0°

Further entrance angles are offered as easy changeable front adapters for special measurement purposes: 10° , 20° , 30° , 40° & 45° .

The instrument uses point aperture geometry which enables the user to determine if direction sensitive micropismatic sheeting is correctly positioned on a sign.

Typical accuracy

- Repeatability: $\pm 2\%$
- Reproducibility: $\pm 5\%$

Measurement specifications

R_A and color recognition measured by sensors

Barcodes and QR codes measured by digital camera

Field of measurement, \varnothing : 25 mm / 1.0 inch

Spectral responsivity: According to ASTM E-1709 & E-2540

Range ($\text{cd} \cdot \text{lx}^{-1} \cdot \text{m}^{-2}$): 0 - 2000

The instrument automatically detects and compensates for ambient light.

Instrument dimensions & material

Length: 270 mm / 10.6 in

Width: 110 mm / 4.3 in

Height: 285 mm / 11.2 in

Weight: 1.9 kg / 4.2 lbs

Housing: ABS polymer

Regulatory compliance

EU

The equipment complies with the following directives of the European Parliament and of the Council:

- Directive 1999/5/EC of 9 March 1999 on radio equipment and telecommunications terminal equipment.
- Directive 2011/65/EU of 8 June 2011 on restriction of the use of certain hazardous substances (RoHS).
- Directive 2002/96/EC of 27 January 2003 on waste electrical and electronic equipment (WEEE).

The equipment is tested to the following standards:

R&TTE article 3.1a (health & safety):

- EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011

R&TTE article 3.1b (electromagnetic compatibility):

- EN 301489-1 V1.8.1:2008
- EN 301489-3 V1.4.1:2002

R&TTE article 3.2 (radio parameters):

- EN 300440-2 V1.4.1:2010

USA

The equipment complies with the following rule part of the Federal Communications Committee:

- FCC CFR 47 Part 15 Subpart B, Class A.

The equipment complies with the following safety specification:

- IEC 60950-1:2005 (2nd Edition); Am 1:2009

Electrical characteristics

Power supply:

- Rechargeable and replaceable Li-Ion 10.8 V 2.0 Ah

External chargers:

- 230 V / 50 Hz
- 110 V / 60 Hz
- Charge time: approx. 45 min

Data

Data memory: > 2 mio. measurements without pictures
> 2.000 measurements with pictures

Interface: USB memory stick (standard, to PC), WiFi (optional, to iPad).

Location Positioning System (GNSS)

Latitude/longitude format: Decimal degrees
Datum: WGS 84

WiFi and wireless radios

Frequency band: 2400 to 2480 MHz
Maximum transmitted radio-frequency power: Below 93mW

Environmental specification

Temperature:

- Operating: 0°C to +60°C / +32°F to +140°F
- Storage: -10°C to +60°C / +14°F to +140°F
- Recommended storage: 0 to +30°C / +32 to 86°F
- Humidity: 85%, non-condensing

Timing

Measurement time: 1 sec.

Standard delivery

- RetroSign GRX instrument
- One angle adapter (-4° ASTM, +5° CEN)
- Carrying case
- Calibration reference with DANAK calibration certificate
- Two batteries
- Battery charger (110 or 230 V)
- Quick guide
- User manual is available on www.roadsensors.com
- USB memory stick for data transfer

Add-ons

- Built-in camera for picture of sign
- Built-in barcode and QR code reader
- Built-in GPS
- Built-in wireless communication
- Instrument rotation and tilt
- Sign face direction (compass)
- MUTCD library
- Additional entrance angles of 10°, 20°, 30°, 40° & 45°
- Extension Pole Kit, 1.5-2.7 m / 4.9-8.9 feet
- App for data back-up, processing and mapping on tablet

Standard features

- Fast and simple calibration by scanning QR code
- Use of templates for uniform measurement series
- Automatic average calculation for 2 – 10 measurements
- Automatic pass/fail on colors and/or color contrast
- Sign background and legend contrast
- User ID
- Sign ID with multiple sign data entry options
- Data processing and mapping in existing software

Scalability

RetroSign GRX may be upgraded with additional features after initial purchase. The upgrade comes with a price tag, is done by scanning a QR code, and will work instantly.

Warranty

2 years

R&TTE Declaration of Conformity (DoC) and US Attestation of Conformity (AoC) can be supplied by DELTA upon request or viewed on: roadsensors.madebydelta.com/technical-background/certification

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RetroSign GRX for control measurement of high visibility clothing

RetroSign GRX is a recently launch from DELTA being a modern and easy to use instrument for measuring retroreflection of different types of reflective tape and sheeting material. RetroSign GRX can, among others, be used for checking if retroreflection of high visibility clothing / safety garments is performing in accordance with existing standards. Measuring the retroreflection can be relevant both for new garments documenting the initial performance as well as checking used garments – the performance of reflective tape will decrease over time due to e.g. degradation by sunlight and wear during work and after laundry.

The minimum retroreflection level of high visibility clothing is stated in national and international standards like EN 20741 (EU) and ASTM E 1809-01 (USA, withdrawn).

A check of retroreflection of high visibility clothing can be considered under the following conditions:

- Type approval of new material
- Quality control after production / import and before sale
- Check if minimum retroreflection is achieved after laundry or under field use in general

EN 20471 require the following test of high visibility clothing:

- Retroreflection performance requirements of new material
 - Entrance angles $+5^\circ$, $+20^\circ$, $+30^\circ$, $+40^\circ$
 - Observation angles 0.2° , 0.33° , 1.0° , 1.5°
- Retroreflection performance requirements after test experience for example on clothes used in the field or after laundry
 - Entrance angles $+5^\circ$
 - Observation angles 0.2°

ASTM E1809 require the following test of high visibility clothing:

- Retroreflection performance requirements intended to be used for field measurement
 - Entrance angles -4°
 - Observation angles 0.2°

RetroSign GRX will be most suitable for measuring the requirements stated in the above standards:

- EN 20471 new material testing: RetroSign GRX-7 with standard entrance angle adapter LS102563 and additional entrance angle adapters LS102578, LS102579 and LS101580
- EN 20471 after test exposure: RetroSign GRX-1 with standard entrance angle adapter LS102563
- ASTM E1809 for field use: RetroSign GRX-1 with standard entrance angle adapter LS102558

RetroSign GRX can be delivered as a base model as well as with additional features like:

- Photo capability combining a photo of the measured object with the measurement result
- Scanning of barcodes and QR codes for asset management together with the measurement
- Wireless communication for data transfer to own management program

Please see the RetroSign GRX product specifications and feature leaflet for further information or check our website roadsensors.com.

RetroSign GRX iPad App

After having finished a measurement program with RetroSign GRX the data may be transferred to an iPad for further analysis and back-up. To make this possible the RetroSign GRX must have wireless communication (optional feature) installed, and the RetroSign GRX app downloaded from Apple's App Store – the App can be easily accessed by scanning the below QR code.



RetroSign GRX
DELTA Dansk Elektr...



The tablet option is an easy way of handling the data and offers a variety of useful functionalities such as:

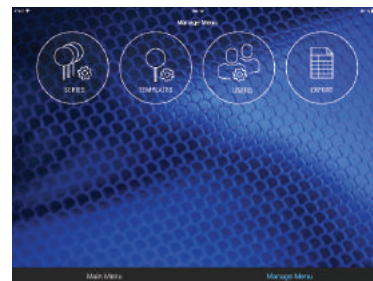
- Transfer of data from GRX for back-up
- Add/change of data e.g. field variables
- Preparation, set-up, and change of new inspection series
- Data analysis function
- Inspection locations on tablet mapping tool with location information
- Search function e.g. background colour, installation date, legend colour, MUTCD code, pass/fail, series name
- Libraries for measurement functions
- Instant export to company back-office
- Export to cloud drive

The GRX App operates with two menus:

Main Menu for review of measurement data downloaded from the RetroSign GRX.



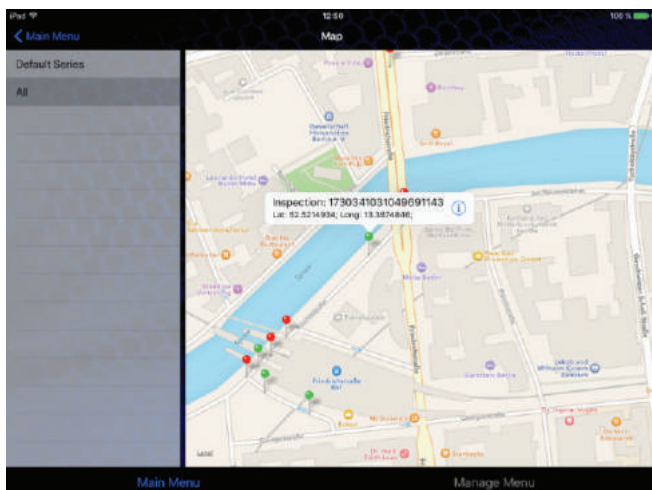
Manage Menu for setting up new inspections, series, and templates for uploading to the RetroSign GRX.



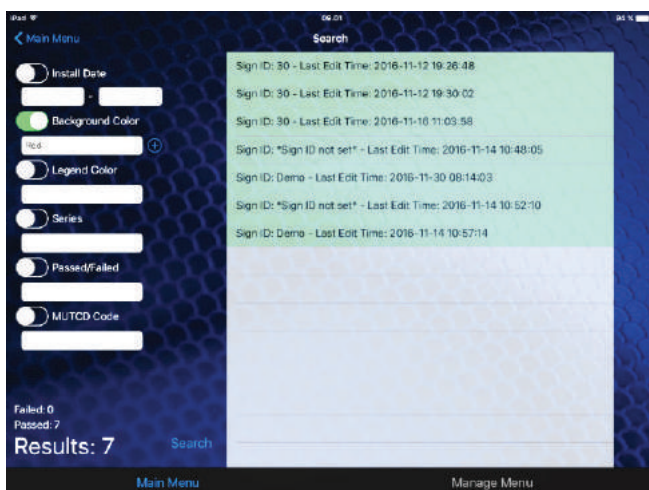
The measurement results for background colour, legend colour and contrast are presented as figures and the first two parameters in addition as a graph. The colours of the object measured, a picture of the sign measured (optional), and if the measurement passes or fails the set threshold level (if activated) is shown in the Inspection Details page. It is possible to mark areas of damage on the sign picture and note comments.



For the US market the MUTCD sign library (optional) will in addition show a reference picture of the measured sign taken from the library and will automatically apply the minimum retroreflection requirements from the MUTCD (not shown on the picture above) for checking compliance.



The App has a search function which allows for searching on a number of parameters in the full database of measurements. This makes the iPad function as a small asset management database.



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Marking Thickness Gauge

The quality and performance of pavement markings have increased in recent years thanks to better paint and thermoplastic materials and higher performing glass beads. In addition new, marking types have improved in particular the performance during wet conditions at nighttime by allowing better run-off of water. In parallel, cost of materials has increased having made road owners interested in knowing the actual amount of paint or thermoplastic applied. Measurement of the thickness of the markings is used for verification.



DELTA's Marking Thickness Gauge is a digital device for measuring the thickness of pavement markings dry, after application. The Marking Thickness Gauge is very easy to operate and comes in a sturdy construction and ergonomic design. The Marking Thickness Gauge can measure markings within the measurement range of -12.7 mm to +12.7 mm / -0.5 inch to +0.5 inch. The digital display provides reliable measurement results in seconds.

The Marking Thickness Gauge is a robust instrument which will last many years if handled with care and transported in the original transportation box.

Specifications

Dimensions: 80 x 70 x 130 mm

Weight : 950 gr

Material: Stainless steel

Mitutoyo Absolute Digimatic Indicator

Resolution: 0.01 mm

Range: +/- 12.7 mm

Accuracy: 0.02 mm

Display: LCD

Battery and protection level

Battery ID: SR44

Battery type: Silver oxide

Battery life: Approx 20,000 hours under normal use

Dust / water protection level: IP42

Warranty

2 years

The following parts are contained in the Marking Thickness Gauge delivery:

- 1 Marking Thickness Gauge
- 1 Transportation box
- 1 User manual

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Road Marking Control Kit

The quality and performance of pavement markings have increased in recent years thanks to better paint and thermoplastic materials and higher performing glass beads. In addition, new marking types have improved in particular the performance during wet conditions at nighttime by allowing better run-off of water. In parallel, cost of materials has increased having made road owners interested in checking the quality of road marking during and after application as well as knowing the actual amount of paint or thermoplastic applied. DELTA's Road Marking Control Kit offer the tools needed to inspect these parameters.



Road Marking Control Kit is exclusively designed for quality control of road markings. The Road Marking Control Kit contains the following tools:

- Marking Thickness Gauge
- Wet Film Comb
- Insertion Thermometer
- Thermometer and Hygrometer
- Electronic Weight
- Illuminated Microscope
- Magnifying Glass
- Folding Ruler

The Marking Thickness Gauge measures the thickness of markings in dry conditions for verification of the amount of paint or thermoplastic applied.

The Wet Film Comb determines the thickness of paint or thermoplastic material during application.

The Insertion Thermometer is used for checking the temperature of liquid coatings such as paints and thermoplastic.

The Thermometer and Hygrometer is used for checking ambient temperature and relative humidity at the marking installation location to evaluate application conditions.

The Electronic Weight is used for control weighting of materials used in connection with the marking installation such as glass beads.

The Illuminated Microscope provide 40x magnification for inspection of the marking macrostructure and glass bead spread and embedment.

The Magnifying Glass provide an easy and simple 6x magnification for inspection of markings.

The Folding Ruler can be used for any length measurement tasks.

For additional information on specifications of the individual items included in the Road Marking Control Kit please contact DELTA or check the Marking Thickness Gauge leaflet.

Warranty

2 years

DELTA

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