

Hagen, 10th May 2021

**Test Certificate No. 0913-2021-01
regarding the suitability of the LTL3500 retroreflectometer
for measuring the luminance coefficient under diffuse illumination Q_d
and the coefficient of retroreflected luminance R_L
of road markings**

1 Originator

DELTA – a part of FORCE Technology, Venlighedsvej 4, 2970 Hørsholm, Denmark.

2 Brief

Determination of the suitability of the portable LTL3500 retroreflectometer (hereinafter called “LTL3500”) for measuring the luminance coefficient under diffuse illumination Q_d and the coefficient of retroreflected luminance R_L of the surfaces of road markings according to the German regulation “Zusätzliche Technische Vertragsbedingungen und Richtlinien für Markierungen auf Straßen”, edition 2013, (ZTV M 13), appendix 7.1 and 7.2.

According to the originator, the LTL3500 is identical to the retroreflectometer LTL3000 (hereinafter referred to as LTL3000), which has been checked for suitability in the context of the test certificate from Straus-Zert No. 0913-2020-05, since both of them have exactly the same optical measuring system. Both devices measure R_L and Q_d . The only difference between the LTL3000 and the LTL3500 are that the LTL3000 uses a low placed display whereas the LTL3500 has the display placed on a foldable handle and the LTL3500 has two cameras and offers more software features than the LTL3000.

3 Specifications on the measuring device to be tested

The technical data of the measuring device LTL3500 to be tested is provided in table 1 (according to the originator’s declaration).

The only differences to the LTL3000 can be found with the serial numbers 20 (photos), 26 (dimensions) and 27 (weight).

1	Simulation distance	30 m
2	Observation angle	2.29°
3	Illumination angle	1.24°
4	Observation angular spread	± 0.17°
5	Illumination angular spread	0.33° / 0.17° (horizontal / vertical)
6	Illumination method	Q _d : method A according to EN 1436:2018, Annex A.3 R _L : method A according to EN 1436:2018, Annex B.3
7	Measuring area (W x L)	50 mm x 180 mm
8	Illumination area (W x L)	> 50 mm x 180 mm
9	Illumination system for Q _d	LED
10	Measuring sensor	Silicon photo detector
11	Measuring range	0 – 4,000 mcd·m ⁻² ·lx ⁻¹
12	Measuring range of profiled markings	up to a height of 15 mm
13	Repeatability	± 2 %
14	Reproducibility	± 5 %
15	Measurement time	< 1 s
16	Memory	eMMC (NAND flash)
17	Memory capacity	8 GB
18	Interface	USB memory stick
19	Display	Colour touch screen
20	Pictures (resolution/format)	5 megapixels (2592 x 1944 pixels)
21	Accumulator	Li-ion 10.8 V 2.0 Ah
22	Operating temperature	0° C to +60° C
23	Storage temperature	-15° C to +60° C
24	Humidity	non-condensing
25	Material housing	Aluminium (structural parts) and polymer (housing)
26	Dimensions (L x W x H)	470 mm x 150 mm x 280 mm
27	Weight	5.6 kg
28	Standards	EN 1436

Table 1 Technical Data of the LTL3500 according to the originator's declaration

4 Assessment of the suitability of the measuring device to be tested

The suitability of a device for measuring Q_d and R_L of road markings can be confirmed if the conditions mentioned in the appendices 7.1 and 7.2 of ZTV M 13 are met.

In test certificate from StrAus-Zert No. 0913-2020-05 it was certified that the LTL3000 fulfills the conditions specified the appendices 7.1 and 7.2 of ZTV M 13. Since, according to the applicant, the LTL3500 has the same optical measurement system as the LTL3000, the measurement results can also be applied to the LTL3500.

5 Overall assessment

The requirements of ZTV M 13, appendices 7.1 and 7.2 were met with the LTL3000 corresponding to the test certificate from StrAus-Zert No. 0913-2020-05. According to the applicant, the LTL3500 has the same optical measurement system as the LTL3000.

Therefore it is hereby confirmed that the LTL3500 retroreflectometer is suitable for measuring the luminance coefficient under diffuse illumination Q_d and the coefficient of retroreflected luminance R_L of the surfaces of road markings, just like the LTL3000.

On behalf



Dr. Claudia Drewes
Vice Managing Director StrAus-Zert

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