Test report no. BOS/4232/BE/23

Quality assessment of LZXD1S LED retrofit for D1S xenon bulbs.

M-TECH Poland Sp. z o. o. has decided to submit the LZXD1S LED retrofit, which is an alternative for D1S xenon bulbs, for advanced testing at the renowned BOSMAL Automotive Research and Development Institute Ltd located in Bielsko-Biała. The institute specializes in conducting research, development, and production for domestic and foreign companies, primarily in the automotive sector.
The main purpose of the test was to verify whether the LZXD1S retrofit constitutes an improvement over traditional xenon bulbs and to validate declared performance values. The test encompassed key photometric, colorimetric, and electrical parameters that are subject to homologation regulation for standard xenon bulbs. M-TECH intends to demonstrate that their products meet the highest quality standards.

The scope of the report's conformity with Regulation No. 99 of the United Nations Economic Commission for Europe (UNECE) for D1S-type lamps included measurements of photometric, colorimetric, and electrical parameters of LED substitutes.
Conformity with Regulation No. 99 of the UNECE involved:

- Luminous flux (CIE 84:1989 test method)
- Light color (test method according to CIE 63:1984 and CIE 15:2018)
- UV radiation content (test method according to Regulations 37 and 99 of the UNECE)
- Electrical parameters

BOSMAL Automotive Research and Development Institute Ltd
TESTING LABORATORIES
Electrotechnics and Electronics Department
Electrotechnics, Electronics and Photometry Testing Laboratory
TEST REPORT
Number: BOS/4232/BE/23 Date: 26.07.2023
Subject: Testing of LED replacements for lamp types D1S and H7
Ordered by: M-Tech Poland Sp. z o.o.
ul. Redena 10
41-807 Zabrze
Written by: Marcin Legierski
Authorized by: Piotr Michałek
Report contains: 9 pages
CHECKED BY: KIEROWNIK ZAKŁADU Elektrotechniki i Elektroniki mgr inż. Wojciech Sawicz
APPROVED BY:

Methodology:
The tests were conducted according to the BOS/4232/BE/23 method, which included the analysis of key photometric, colorimetric, and electrical parameters of the LED retrofit. The tests also encompassed the evaluation of light distribution, operational stability, and compliance with homologation standards for vehicle light sources.

Test procedure and results:
Measurements were performed in a photometric darkroom. Spectroradiometric measurements were carried out in the wavelength range of 200 nm to 800 nm with a resolution of 1 nm using a broadband spectroradiometer. Luminous flux and chromaticity coordinates were measured using an integrating sphere. The ambient temperature during the test was 23 ± 2 °C. The orientation of the lamps during the test was horizontal with the plug facing downwards.

Table 1

Lp.	Marking (BOSMAL)	Code (Customer's)	Illustration	Type		Quantity	Headlamp category according to Regulation No. 149 ECE UN	Supply voltage
				Light source category	Regulation ECE UN			
1	2.1	LZXD1S	Fig. 1	D1S	No. 99	1 pc + headlamp	D for right hand traffic	13,5 VDC (via headlamp module)

Power supply:
- Sample 2.1 was powered using a headlamp power module.
- Supply voltage was 13.50 ± 0.02 VDC.
- The relative expanded uncertainty for luminous intensity measurements is ±5%.

Luminous flux:
The maximum luminous flux declared by the manufacturer was 4200 lumens. After conducting the tests, it was found that the actual luminous flux was around 4100 lumens, which is still significantly above the homologation value for traditional xenon bulbs.

Table 2

Marking	Luminous flux [lm]			Electrical parameters			Test result
	Immediately after powering on	30 min after powering on	Requirements R 37/99 ECE UN	Supply voltage [V]	Power [W]	Power of the complete system [W]	
2.1	4073	4061	3200 ± 450	86.6	34.6	42.9	negative
Uncertainty*	± 5%		-	±0.6	±0.3	±0.3	-

Values marked red do not meet the requirements
* Relative expanded uncertainty for p≈0.95 and k=2

Research Report No. BOS/4232/BE23
Table 2 Describes the luminous flux values and electrical parameters.
Table 4 Measured luminous values and requirements.

Operational stability:
After 30 minutes of operation, the luminous flux decreased minimally, indicating the effectiveness of the active cooling in the LED retrofit, which ensures stable operating conditions for the LED.

The conducted tests on LZXD1S retrofits yielded interesting results. Primarily, the luminous flux, declared by the distributor at a maximum of 4200 lumens, was confirmed to be around 4100 lumens (which exceeds the allowable homologation value for standard burners and negatively impacts the test result). Importantly, even after 30 minutes of operation, this value only decreases by a few lumens. This is a crucial piece of information as it clearly shows that the LZX series product is equipped with efficient active cooling, preventing the LED from heating up during operation, thereby maintaining its efficiency and longevity.

Table 3

Marking	Chromaticity coordinates*		Correlated colour temperature [K]	Red light content []	UV radiation content [W/lm] (#)		Test result
	x []	y []			Regulation No. 99 ECE UN	Regulation No. 37 ECE UN	
2.1	0.316	0.330	6320	0.08	$k_{UV} \leq 10^{-6}$	-	positive
Uncertainty*	±0.007	±0.008	±250	±0.01	-	-	-
Requirements:	Fig. 3		-	≥0.05	$\leq 10^{-5}$	$k1 \leq 2\times10^{-4}$ $k2 \leq 2\times10^{-6}$	-

Values marked red do not meet the requirements
* Relative expanded uncertainty for p≈0.95 and k=2

Light distribution:
The LZXD1S LED retrofit achieved a positive result in the light distribution test regarding the sharpness and position linearity of the light-dark boundary. The measured values of the distributed light are slightly above the homologation standards.

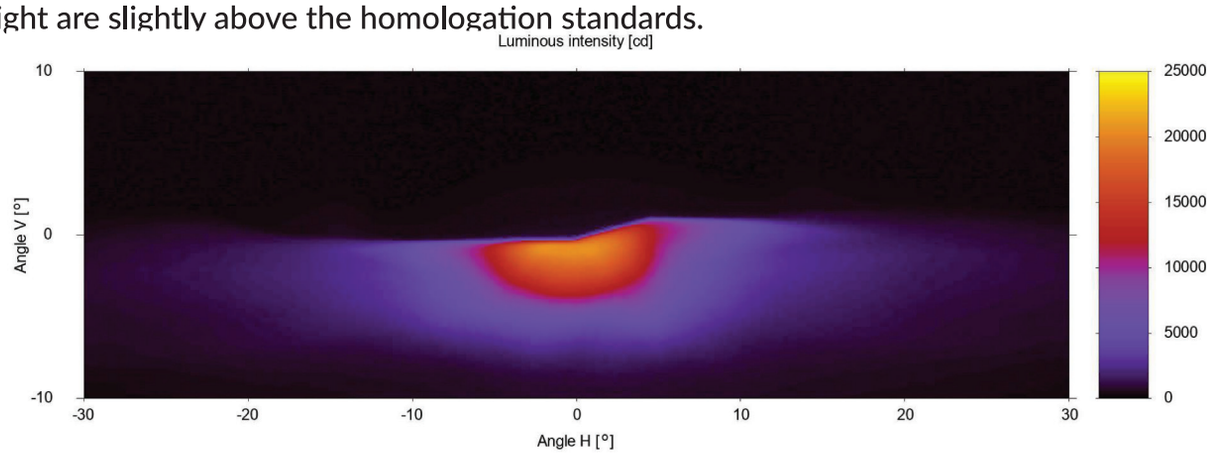

Table 5: Sharpness and position of the cut-off – sample 2.2

Parameter	H [°] 2.5			Minimum requirements	Maximum requirements
Sharpness factor G	0.13			0.13	0.40
Parameter	**H [°]**			**Difference in the position of the inflection points**	
	3.5	**2.5**	**1.5**	**Measured**	**Required**
Inflection point position V [°]	-0.40±0.05	-0.55±0.05	-0.55±0.05	0.15	≤0.2

Conclusions:
The LZXD1S retrofit received a positive result in the light distribution test in terms of the sharpness and position linearity of the light-dark boundary. Additionally, the measured values of distributed light are almost 100% compliant with the standards imposed in the UN Regulation No. 149 for homologation.
The presented results clearly demonstrate that M-TECH LED retrofits could be successfully used as a safer and more efficient light source compared to standard xenon bulbs, but they are hindered solely by legal restrictions. These results also clearly indicate how M-TECH prioritizes quality and transparency. M-TECH emerges as a reliable partner that not only offers innovative lighting solutions but also provides clear information about its products. The ability to anticipate future market needs, combined with a commitment to quality and safety, makes M-TECH a trustworthy choice for those seeking not only proven products but also a reliable business partner.

Dawid Bystroń
Product Manager