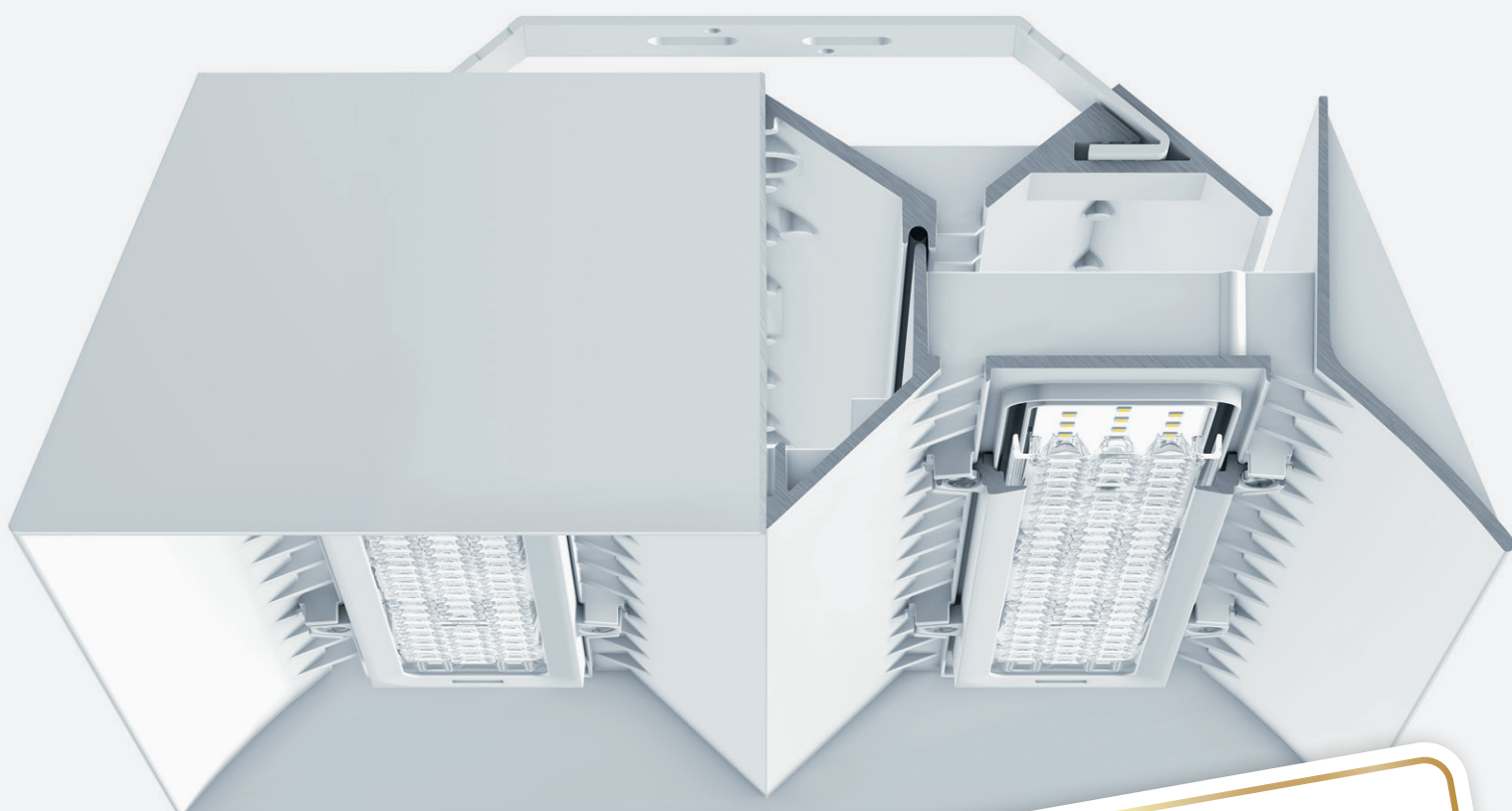


DLG-Test Report 6767

Zumtobel Lighting GmbH

High-bay LED luminaires CRAFT M, CRAFT L, CRAFT L HT

Resistance to ammonia, cleaning distance



ZUMTOBEL
CRAFT M, CRAFT L, CRAFT L HT
✓ Resistance to ammonia
✓ Cleaning distance
DLG Test Report 6767

Overview

A test mark „DLG-APPROVED for individual criteria“ is awarded for agricultural products which have successfully fulfilled a scope-reduced usability testing conducted by DLG according to independent and recognized evaluation criteria. The test is intended to highlight particular innovations and key criteria of the test object. The test may contain criteria from the DLG test scope for overall tests, or focus on other value-determining characteristics and properties of the test subject. The minimum requirements, test conditions and procedures as well as the evaluation bases of the test results will be specified in consultation with an expert group of DLG. They correspond to the recognized rules of technology, as well as scientific and agricultural knowledge and requirements. The successful testing is concluded with the publication of a test report, as well as the awarding of the test mark which is valid for five years from the date of awarding.



**ZUMTOBEL
CRAFT M, CRAFT L, CRAFT L HT**
 ✓ Resistance to ammonia
 ✓ Cleaning distance
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The ammonia resistance test was performed as a laboratory test according to the patented DLG test standard. This test is intended to determine the suitability of equipment for animal living areas to withstand the impacts of animal environments. The cleaning distance test assesses the suitability for cleaning animal living areas. Other criteria were not tested. As of 2017 the luminaires will be operated in the test chamber both passively (without power supply) as well as actively according to a determined test program.

Assessment – Brief Summary

The high-bay LED luminaires type CRAFT M, CRAFT L and CRAFT L HT have successfully completed the DLG test for ammonia resistance and cleaning distance.

According to this result, it can be assumed that these luminaires are resistant to the typical environmental conditions of animal living areas and that no reduction of the product lifetime will occur.

Furthermore the cleaning distance to be observed is evaluated as being suitable for the cleaning of animal houses. In addition, the high-bay LED luminaire type CRAFT L HT was operated actively in the chamber for the entirety of the test. No product damage was observed here.

*Table 1:
Overview of results*

Test result	Evaluation*
Resistance to ammonia of the luminaire housing	
resistant	+
Cleaning distance	
Minimum distance with flat spray nozzle: 5 cm	++
Ingress of water into the housing without damages: No	+

Evaluation scheme

Test result	Evaluation*
Resistance to ammonia	
resistant	+
partly resistant	○
non-resistant	-
Ingress of water into the housing without damages	
no/yes	+/-
Cleaning distance	
5 cm	++
10 cm	+
15 cm	○
20 cm	-
25 cm	--

* Evaluation range: ++ / + / ○ / - / -- (○ = standard, n.a. = not evaluated)

The Product

Manufacturer and applicant

Zumtobel Lighting GmbH
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Product:
High-bay LED luminaires CRAFT M, CRAFT L, CRAFT L HT

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Description and technical data

The CRAFT M, CRAFT L and CRAFT L HT high-bay LED luminaires tested here are suitable for the use in animal living areas and riding halls and can be used in replacement for conventional luminaires with energy discharge lamps (fluorescent lamps, metal halide lamps).

Table 2:
Technical data (according to manufacturer)

	CRAFT M	CRAFT L	CRAFT L HT
Electrical connection			
Voltage	186-250 V	186-250 V	186-250 V
Frequency	50/60 Hz	50/60 Hz	50/60 Hz
Performance	92.5 W/130 W	174.6 W/238 W	137.8 W
Dimension and weight			
Width/length	330 mm/390 mm	330 mm/680 mm	330 mm/680 mm
Height	114 mm	114 mm	114 mm
Weight	6,000 g	10,000 g	10,000 g
Additional technical data			
Number of LED modules	2	4	4
Housing material	aluminium	aluminium	aluminium
Colour temperature	4000 K/6500 K	4000 K/6500 K	4000 K/6500 K
Dimmable	yes*	yes*	yes*
Light angle	Wide Beam/Narrow Beam	Wide Beam/Narrow Beam	Wide Beam/Narrow Beam
Light yield	135-144 lm/w	135-144 lm/w	154 lm/w

* dimming protocol: Dali

The Method

Resistance to ammonia

The ammonia resistance of the high-bay LED luminaires was determined by a laboratory test with three luminaires according to the patented DLG test standard for agricultural use. The laboratory test is designed to replicate the conditions of a usage period of at least 10 to 20 years exposure to animal living areas.

The test was carried out in a climate chamber under the following climate conditions:

Test duration	1500 h
Air temperature	70 °C
Relative humidity	70 %
Ammonia concentration	750 ppm

For assessing the ammonia resistance, each luminaire was examined visually, gravimetrically and the plastic parts additionally through measurement of the hardness (Shore D) before and after the climate testing. As of 2017 luminaires will additionally be operated during the ammonia fumigation according to a defined light program at DLG, to record any impacts caused by thermal cycling.

Cleaning distance

During test bench examinations of the mechanical resistance to high-pressure cleaners the minimum cleaning distance was determined.

The minimum cleaning distance is defined as the distance between nozzle and surface when no damages can be observed at the housing surface.

The test was conducted under the conditions presented in table 3.

Table 3:

Test conditions cleaning distance

Line pressure	~150 bar
Water	cold, approx. 1,000 l/h, no detergents
Nozzle type	Flat spray nozzle, 25°
Exposition time	1 minute
Distance	250 mm, 200 mm, 150 mm, 100 mm, 50 mm
Ambient temperature	10°C

The tested high-bay LED luminaires included type CRAFT M LED13000-840 PM WB LDO WH, CRAFT L LED26000-840 PM WB LDO WH and CRAFT L HT LED20000-840 PC WB LDO WH. After the tests the luminaires underwent visual examination to a reference sample that was identical in construction.

The Test Results in Detail

Resistance to ammonia

Visual test

During the comparing visual check after the ammonia exposure it was only observed that minor discolorations at the outsides of the luminaires occurred, but that no changes to the luminaire performance can be expected by this.

The luminaires are not designed to be gas-proof, so small amounts of ammonia in the form of ammonium compounds entered into the luminaire.

The defects are rated as insignificant.

Gravimetric test

When comparing the weight before and after the ammonia exposition no measurable increase or decrease in weight was observed. All determined changes were within the measurement uncertainty.

Hardness test

During the hardness test (Shore D) no measurable changes were observed. All determined changes were within the measurement uncertainty.

Following the results of these tested parameters the luminaire is evaluated as resistant to ammonia.

Cleaning distance

Even with a distance of only 50 mm no damages were observed at the luminaire.

At no time a water ingress into the luminaires was noticed.

To reliably avoid any damage of the luminaires during cleaning, the luminaires should not be directly exposed to high-pressure cleaners, but may be cleaned by low pressure water or by hand according to the manufacturer's indication.

Functional test

No defects were observed. All luminaires worked after the conducted tests.

Summary

According to the results the high-bay LED luminaires type CRAFT M, CRAFT L and CRAFT L HT have met the requirements regarding the test criteria for ammonia resistance and cleaning distance (evaluation "o" or better) for the awarding of the test mark DLG-Approved. Thus, it can be expected that the luminaires are resistant to ammoniacal air in animal living areas and that no reduction of the product lifetime.

Furthermore, the cleaning distance to be observed is rated as suitable for the use during cleaning of animal living areas.

Additionally the high-bay LED luminaire CRAFT L HT was operated both passively and actively during the ammonia fumigation in the test chamber and passed both tests successfully.

Other criteria were not tested.

More information

Further test results on luminaires can be downloaded under:
www.dlg-test.de/beleuchtung

Test performed by

DLG e.V.,
Test Center Technology and Farm Inputs,
Max-Eyth-Weg 1,
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Germany

DLG test scope

DLG-Approved Test "Ammonia resistance"
(current as of 03/2012)

Area of expertise

Livestock systems

Project director

Dipl-Ing Susanne Gäckler

Test engineer(s)

Dipl-Ing (FH) Tommy Pfeifer*

* Author

The DLG

In addition to being the executing body of well-known tests for agricultural engineering, farm inputs and foods, the DLG is also an open forum for the exchange of knowledge and opinions in the agricultural and food industry.

Some 180 full-time employees and more than 3,000 volunteer experts are developing solutions to current problems. The more than 80 committees, working groups and committees thereby form the basis of expertise and continuity for the professional work. At the DLG, a great deal of specialist information for agriculture is created in the form of information leaflets and working papers, as well as articles in journals and books.

DLG organises the world's leading professional exhibitions for the agriculture and food sector. This contributes to the transparent presentation of modern products, processes and services to the public. Secure the competitive edge as well as other bene-

fits, and contribute to the expert knowledge base of the agricultural industry. Further information can be obtained under www.dlg.org/mitgliedschaft.

The DLG Test Center Technology and Farm Inputs

The DLG Test Center Technology and Farm Inputs in Groß-Umstadt is the benchmark for tested agricultural products and farm inputs, as well as a leading testing and certification service provider for independent technology tests. The DLG test engineers precisely examine product developments and innovations by utilizing state-of-the-art measurement technology and testing methods gained from practice.

As an accredited and EU registered testing laboratory the DLG Test Center Technology and Farm Inputs offers farmers and practitioners vital information and decision support for the investment planning for agricultural technology and farm inputs through recognized technology tests and DLG testing.

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