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LUMAWISE Drive LED Holder Type Z50 DALI-2 series

1. SCOPE

1.1. Content

This specification covers performances, tests and quality requirements of the LUMAWISE Drive Type Z50 Platform with part numbers x-2316511-y, applied according application specification 114-133109.

Prefix 'x' defines different output currents and suffix 'y' defines COB size versions.

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

1.3. Qualification Test Results

Successful qualification testing on the subject product line has not been completed. The Qualification Test Report number will be issued upon successful qualification testing.

2. APPLICABLE DOCUMENTS AND FORMS

The following documents and forms constitute a part of this specification to the extent specified herein. Unless otherwise indicated, the latest edition of the document applies.

2.1. TE Documents

- C-2316511: Customer Drawing
- 114-133109: Application Specification
- 501-19267: Qualification Test Report
- 503-133082-3: LUMAWISE Drive LED Holder Type Z50 DALI-2 series – Tc temperature recording

2.2. Industry Documents

- UL 8754: UL Standard for Safety Holders, Bases, and Connectors for Solid-State (LED) Light Engines and Arrays.
UL file: E469276
- UL 8750 Light Emitting Diode (LED) Equipment for Use in Lighting Products.
UL file: E469276
- IEC 60838-2-2: Miscellaneous lamp holders – Part 2-2: Particular requirements – Connectors for LED-modules
- IEC 61347-2-13 Lamp controlgear - Part 2-13: Particular requirements for d.c. or a.c. supplied electronic controlgear for LED modules
Dekra certificate number: 2224069.50
- IEC 61547 Equipment for general lighting purposes – EMC immunity requirements
Dekra certificate number: 2231611.01
- CISPR 15: Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment
- EN 55015: Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment

- FCC Title 47, part 15, subpart B: Unintentional Radiators
TE Test Lab Qualification Test Report: 501-19267.
- IEC 62386:101 Digital addressable lighting interface - Part 101: General requirements - System components
- IEC 62386:102 Digital addressable lighting interface – Part 102: General requirements – Control gear
- IEC 62386:207 Digital addressable lighting interface - Part 207: Particular requirements for Control gear – LED modules (device type 6)
- DALI-2 According DiiA DALI-2 test procedure
<https://www.digitalilluminationinterface.org>

3. REQUIREMENTS

3.1. Design and Construction

Product shall be of the design, construction, materials and physical dimensions specified on the applicable product drawing.

3.2. Ratings

The LED holders must be stored in a temperature range of -20 to 60 °C [-4 to 140 °F] and used within 1 year from the date code located on the bottom of the holder.



NOTE

The maximums for energy presented here are independent of each other. It is not possible to meet two of them without violating the third one.

Part number	Typical Output Voltage	Output range Voltage	Nominal Output Current	Functionality
0-2316511-y	36 V dc	25 V dc to 41 V dc	350 mA	DALI-2 dimming
1-2316511-y			500 mA	
2-2316511-y			700 mA	
3-2316511-y			1050 mA	

Table 1

Note: Suffix 'y' defines LED size versions, see Customer Drawing for definitions.

3.3. Thermal rating (maximum allowed operating temperature)

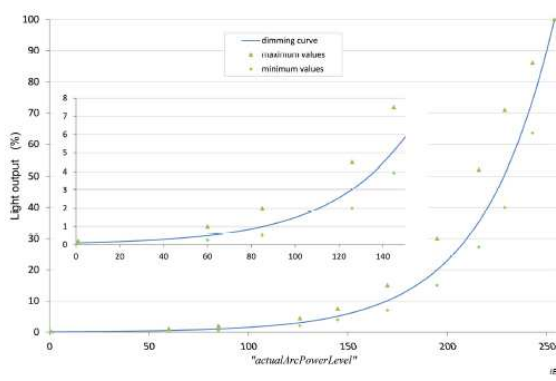
The Tc point as defined in the Application Specification (114-133082) should not exceed 110 °C

See test report: 503-133082-3: LUMAWISE Drive LED Holder Type Z50 DALI-2 series – Tc temperature recording

3.4. Test Requirements and Procedures Summary

Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

TEST DESCRIPTION	REQUIREMENT	PROCEDURE
Examination of product	Meets requirements of product drawing.	Visual, dimensional, and functional inspection per quality inspection plan and EIA-364-18B/IEC 60512-1-1
ELECTRICAL		
Drive efficiency	≥ 92% efficiency	<p>The samples shall be powered with 48 V dc and DALI ON maximum on the control lines.</p> <p>Test with DC electronic load fixed on 36 V dc output voltage.</p>
Forward Voltage to LED	<p>Typical output voltage between 25 V dc – 41 V dc.</p> <p>Output current in range of ± 5 % of nominal output current (per version)</p>	<p>The samples shall be powered with 48 V ± 1 % dc, DALI ON maximum on control lines.</p> <p>The LED-load is controlled by DC electronic load on 25, 36 and 41 V dc.</p>
Output Current	Typical output current should be within a tolerance of ± 5%.	<p>The samples shall be powered with 48 V dc and DALI ON maximum on the control lines.</p> <p>The LED-load is controlled by DC electronic load fixed on 36 V dc output voltage.</p> <p>Current is measured between the LED contacts with the DC electronic load in series.</p> <p>Test done on all output current variants.</p>
65 V dc input including reverse polarity	<ol style="list-style-type: none"> 1. Product must function while 65 V dc is applied. 2. After removing reverse polarity conditions, product must function correct. 	<ol style="list-style-type: none"> 1. 65 V dc to P3 and ground to P4 2. 65 V dc to P4 and ground to P3 <p>Test with DC electronic load fixed on 36 V dc output voltage.</p>
Output flicker	No flicker percentage higher than 5 % shall occur.	<p>IESNA lighting handbook flicker percentage.</p> <p>Flicker percentage to be recorded.</p> <p>Test with LED-load.</p> <p>Measured at 100% output and 3% output.</p>

Input Safety	Product must fail safe without smoke or fire.	<ol style="list-style-type: none"> 65 V dc applied on DALI control lines 230 V ac applied on power lines.
DALI specific		
Power used during Standby	<p>No power usage higher than 0.5W shall occur in standby.</p> <p>No light output shall occur.</p>	<p>Samples shall be powered with 43, 48 or 53 V dc and DALI OFF command. Current is measured on power input lines and power consumption is calculated.</p>
DALI current draw	No current draw higher than 2 mA shall occur during idle mode.	Samples shall be powered with 48 V dc. Current is measured on control lines.
Dimming Curve Output Current	<p>Logarithmic dimming curve according the standard, see picture below. (EN 62386-102)</p> 	<p>Unit is powered on 48 V dc.</p> <p>Test to be conducted with LED load, at following dim levels: 126 (3.0%), 145 (5.1%), 170 (10.1%), 195 (20.0%), 216 (35.4%), 229 (50.5%) and 243 (74.1%) with 254 (100%) as reference level.</p> <p>Light output relative to maximum Light output will be measured.</p> <p>Dim levels below 126 / 3% are limited to 3%.</p>
Start up and shut down time	<p>Time to 100 % output should not exceed 90 milliseconds.</p> <p>Time from 100 % output to off should not exceed 100 milliseconds.</p>	<p>Samples shall be powered with 48 V dc.</p> <p>Power on and off the 48 V dc lines for hardware response time.</p> <p>Power DALI ON/OFF command for software response time.</p> <p>Test to be conducted with LED load.</p>
Commissioning	<p>Units must be individually addressable.</p> <p>Units must respond on command from master, controller and motion sensor.</p> <p>Unit shall only respond on individual address or group mode. When broadcast mode is used, all units must respond on command. See note §3.6.</p>	<p>Samples shall be powered with 48 V dc.</p> <p>Samples are individually addressed and placed in 2 group modes.</p> <p>DALI ON and DALI OFF commands are applied to</p>

		<p>different individual addresses and groups. DALI PIR sensor is used for broadcast mode.</p> <p>Test to be conducted with LED load.</p> <p>Test executed with maximum cable length according DALI: IEC 62386-101:2014 © IEC 2014 Table A.1: 45 meter.</p>
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EMC related

ESD immunity	<p>Test level per IEC61547:</p> <p>Air discharge level: 8 kV</p> <p>Contact discharge level: 4 kV</p> <p>Pass Criteria B</p>	<p>IEC61000-4-2</p> <p>10 discharges per location for each polarity.</p>
Radiated RF EM Field immunity	<p>Test level per IEC61547:</p> <p>Field Strength: 3 V/m</p> <p>Freq. Range: 80-1000MHz</p> <p>Modulation: 1kHz, 80% AM, sine wave</p> <p>Pass Criteria: A</p>	<p>IEC 61000-4-3</p> <p>The DUT including supporting equipment is placed 0.8m above ground within an anechoic test chamber.</p> <p>Distance antenna to DUT: 3m</p>
Electrical Fast transient / Burst immunity	<p>Test level per IEC61547:</p> <p>Signal, data and control lines: $\pm 0.5\text{kV}$</p> <p>DC Power Supply lines: $\pm 0.5\text{kV}$</p> <p>Tr/Th: 5/50ns</p> <p>Repetition rate: 5kHz</p> <p>Duration: $\geq 2\text{min}$ per polarity</p> <p>Pass Criteria: B</p>	<p>IEC61000-4-4</p> <p>Injection via coupling network (33nF).</p> <p>Both positive and negative polarity discharges shall be applied.</p>
Immunity to Conducted Disturbances	<p>Test level per IEC61547:</p> <p>Frequency range: 0.15-80 MHz</p> <p>Field strength: 3 V rms.</p> <p>Modulation: of 1 kHz.</p> <p>Pass Criteria: A</p>	<p>IEC61000-4-6</p> <p>The Frequency range shall be swept with a modulated signal. The rate of sweep does not exceed 1.5×10^{-3} decade/s.</p> <p>The dwell time at each frequency shall be not less than the time necessary for the DUT to be able to respond.</p> <p>Test is applicable for all DC supply lines and for signal lines longer than 3m.</p>

		Coupling method: coupling / decoupling network (CDN) preferred.																											
Disturbance voltage limits	<p>CISPR 15 / EN 55015 and FCC</p> <p>Disturbance voltage limits at power inlet (DC) terminals:</p> <table border="1"> <thead> <tr> <th>Frequency</th> <th>QP Limit dB (μV)</th> <th>Average Limit dB (μV)</th> </tr> </thead> <tbody> <tr> <td>9 – 50 kHz</td> <td>110</td> <td></td> </tr> <tr> <td>50 – 150 kHz</td> <td>90 to 80</td> <td></td> </tr> <tr> <td>150 – 500 kHz</td> <td>66 to 56</td> <td>56 to 46</td> </tr> <tr> <td>0.5 – 5.0 MHz</td> <td>56</td> <td>46</td> </tr> <tr> <td>5 – 30 MHz</td> <td>60</td> <td>50</td> </tr> </tbody> </table> <p>Disturbance voltage limits at control terminals</p> <table border="1"> <thead> <tr> <th>Frequency</th> <th>QP Limit dB (μV)</th> <th>Average Limit dB (μV)</th> </tr> </thead> <tbody> <tr> <td>0.15 – 0.50 MHz</td> <td>84 to 74</td> <td>74 to 64</td> </tr> <tr> <td>0.50 – 30 MHz</td> <td>74</td> <td>64</td> </tr> </tbody> </table>	Frequency	QP Limit dB (μ V)	Average Limit dB (μ V)	9 – 50 kHz	110		50 – 150 kHz	90 to 80		150 – 500 kHz	66 to 56	56 to 46	0.5 – 5.0 MHz	56	46	5 – 30 MHz	60	50	Frequency	QP Limit dB (μ V)	Average Limit dB (μ V)	0.15 – 0.50 MHz	84 to 74	74 to 64	0.50 – 30 MHz	74	64	<p>Test with LED-load.</p> <p>Frequency range of 9 kHz to 30 MHz.</p> <p>Power inlet connected via LISN.</p> <p>Control terminals connected via CDN.</p> <p>Measurements at both maximum and minimum dim level.</p>
Frequency	QP Limit dB (μ V)	Average Limit dB (μ V)																											
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Radiated disturbances	<p>FCC Limits:</p> <table border="1"> <thead> <tr> <th>Frequency (MHz)</th> <th>Field Strength (μV/m)</th> <th>Field Strength (dBμV/m)</th> </tr> </thead> <tbody> <tr> <td>30 – 88</td> <td>100</td> <td>40.0</td> </tr> <tr> <td>88 – 216</td> <td>150</td> <td>43.5</td> </tr> <tr> <td>216 – 960</td> <td>200</td> <td>46.0</td> </tr> <tr> <td>Above 960</td> <td>500</td> <td>54.0</td> </tr> </tbody> </table> <p>CISPR 15 / EN 55015 Limits</p> <table border="1"> <thead> <tr> <th>Frequency (MHz)</th> <th>Field Strength (dBμV/m)</th> </tr> </thead> <tbody> <tr> <td>30 – 230</td> <td>40.0</td> </tr> <tr> <td>230 - 300</td> <td>47.0</td> </tr> </tbody> </table>	Frequency (MHz)	Field Strength (μ V/m)	Field Strength (dB μ V/m)	30 – 88	100	40.0	88 – 216	150	43.5	216 – 960	200	46.0	Above 960	500	54.0	Frequency (MHz)	Field Strength (dB μ V/m)	30 – 230	40.0	230 - 300	47.0	<p>Test with LED-load.</p> <p>Frequency range of 30 MHz to 1 GHz.</p> <p>Measurement distance 3m with antenna vertical and horizontal oriented.</p>						
Frequency (MHz)	Field Strength (μ V/m)	Field Strength (dB μ V/m)																											
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216 – 960	200	46.0																											
Above 960	500	54.0																											
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30 – 230	40.0																												
230 - 300	47.0																												

ENVIRONMENTAL

TEST DESCRIPTION	REQUIREMENT	PROCEDURE
Thermal cutout test	Driver should switch back to an output current of 105 mA (based on the 1050 mA version -10%). Test with LED-load.	Running the LUMAWISE DALI-2 above 110 °C measure at the Tc, tested with a small sized heatsink: 10 mm thickness. For reference of heat stabilization, LUMAWISE DALI-2 Tc temperature is measured in parallel on a normal sized heatsink: 50 mm thickness.
Thermal shock	See note.	EIA-364-32, Test Condition VIII / IEC 60512-11-4 Subject specimens to 25 cycles between -40 °C and 105 °C with 30-minute dwells at temperature extremes and 1-minute transition between temperatures.

Figure 1 end

3.5. Sequence for Commissioning testing

1. Units are connected to 48 V dc power
2. Units are connected to same DALI bus
3. DALI bus contains Lunatone DALI Master, DALI PIR Sensor, DALI touch controller and DALI power supply.
4. Units are addressed from A0 to A3 corresponding from Unit 1 to Unit 4.
5. Unit 1 and 2 are placed in Group 0, Unit 3 and 4 in Group 1.
6. DALI touch controller button 1 is configured for Group mode 0 and button 2 for Group mode 1.
7. DALI PIR sensor is configured for maximum light output on while motion is detected
8. Sequence from Table 2 is followed
9. Power cycle for 48 V dc line: sequence from Table 2 is repeated without addressing again. Address and group states should remain same.

Action	Group 0		Group 1	
	Unit 1	Unit 2	Unit 3	Unit 4
Motion event is generated	100 % output	100 % output	100 % output	100 % output
Master writes 0 to unit 2	100 % output	0 % output	100 % output	100 % output
Touch controller button 1 is activated	100 % output	100 % output	100 % output	100 % output
Touch controller button 1 is activated	0 % output	0 % output	100 % output	100 % output
Touch controller button 2 is activated	0 % output	0 % output	0 % output	0 % output
Master writes 200 to unit 3	0 % output	0 % output	20 % output	0 % output

Master writes 200 to unit 4	0 % output	0 % output	20 % output	20 % output
PIR sensor is activated	100 % output	100 % output	100 % output	100 % output
Master writes off to all units	0 % output	0 % output	0 % output	0 % output
Master writes 254 to unit 1	100 % output	0 % output	0 % output	0 % output
Touch controller button 2 is pressed for 3 seconds	100 % output	0 % output	Output is stepped up per level	Output is stepped up per level
Touch controller button 1 is pressed for 3 seconds	Output level stays same as previous state	Output is stepped up per level	Output level stays same as previous state	Output level stays same as previous state

Table 2

3.6. Product Qualification and Requalification Test Sequence

TEST OR EXAMINATION	TEST GROUP (a)				
	A	B	C	D	E
	TEST SEQUENCE (b)				
Examination of product	1, 11	1, 10	1, 10	1, 5	1, 3
Drive efficiency	2, 10	2, 9	2, 4, 6, 8	2,4	
Forward Voltage to LED	3				
Output Current	4				
65 V dc input including reverse polarity			7		
Output flicker	5				
Input Safety			9		
Power used during Standby	6				
DALI current draw	9				
Dimming Curve Output Current	7				
Start up and shut down time	8				
Commissioning				3	
DALI-2 / IEC 62386-101 & 102 / DiA					2
ESD immunity		3			
Radiated immunity		4			
Fast transient/Burst immunity		5			
Injected currents		7			
Disturbance voltage limits		6			
Radiated disturbances		8			
Thermal cutout test			3		
Thermal shock			5		



NOTE

- (a) Test group A shall contain 5 samples from highest current version and 2 samples of each other current version. Test group B, C will be done with 2 samples of the 1050 mA, Test group D and E shall contain 4 samples, 1 of each current version.
- (b) Numbers indicate sequence in which tests are performed.
- (c) For group C a thermal couple should be soldered to the Tc of the driver (see 114-133109).

Figure 2