LUMAWISE Motion

1. SCOPE

1.1. The LUMAWISE Motion is suitable for control of luminaires using the Zhaga Book 18 Z-LEX-R receptacle. The LUMAWISE Motion offers D4i (DALI-2) communication output to enable the control of D4i LED driver equipment luminaires and other lighting control applications. Typical applications for the LUMAWISE Motion product are within Smart City and Smart Grid applications:

- Street and roadway lighting control
- Commercial & campus outdoor lighting management
- Smart City control networks
- Smart Grid to Smart Cities bridging

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

- 114-160247: Application Specification
- 501-19317: Qualification Test Report

2.2. Industry Documents

- EN-55015 Limits and Methods of Measurement of Radio Disturbance Characteristics of Electrical Lighting and Similar Equipment.
- IEC-60512: Electromechanical Components for Electronic Equipment – Basic Testing Procedures And Measuring Methods.
- IEC 60529: Degrees of protection provided by enclosures (IP Code).
- IEC-61000-4: Electromagnetic Compatibility (EMC).
- IEC 62262: Degrees of Protection Provided by Enclosures Against External Mechanical Impacts.
- IEC 62386: Digital addressable lighting interface – Part 101: General requirements – system components.
- IEC 62386: Digital addressable lighting interface – Part 103: General requirements – control devices.
- IEC 62386: Digital addressable lighting interface – Part 303: Particular requirements – Input
- Devices – Occupancy sensor.
- IEC 62386: Digital addressable lighting interface – Part 351: Luminaire mounted control devices.
- EIA-364: Electrical Connector/Socket Test Procedures Including Environmental Classifications.
- D4i (DALI-2): According Dali Alliance DALI-2 test procedure (https://www.dali-alliance.org/).

2.3. Reference Document

- 109-160163 Test Specification (LUMAWISE Motion Functional test)

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

Current: Less than or equal 0.025A

Bus powered device, max current consumption, start up time

Operating Temperature: -40 to +65°C

Storage Temperature: -40 to +65°C

Operating Humidity: 15 to 96% non-Condensing

3.3. Test Requirements and Procedures Summary

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

Test Description	Requirement	Procedure
Initial examination of product.	Meets requirements of product drawing and Application Specification.	EIA-364-18. Visual and dimensional (C of C) inspection per product drawing.
Final examination of product.	Meets visual requirements.	EIA-364-18. Visual inspection.
ELECTRICAL		
Functionality Verification	Correct Response to DALI Commands	109-160163.
DALI bus current	Current ≤ 25 mA	109-160163
Overvoltage	Unit to remain fully functional	109-160163 Apply a DALI bus voltage of 22.5Vdc between DA+ and DA-.
Input Safety	Product fails in safe manor without smoke or fire external to the device.	Apply 230Vac to all pins
Impedance	8MΩ Minimum impedance	109-160163 Check impedance between pin 4 and all other pins.
DALI-2	Meets requirements of DALI testing part 101, 103, 303, 351.	109-160163 DALI ProbitLab2 procedure according DiiA
Conducted Emissions	Limits dB (µV) Quasi-peak: 84 to 74 Average: 74 to 64	CISRP 15 / EN 55015 Frequency range of 0.15-0.5 MHz Measure at a distance of 10 m.
Radiated Emissions	Frequency (MHz) / Quasi-peak limit dB(µV/m) 30 to 230: 30 230 to 300: 37	CISRP 15 / EN 55015 Frequency range of 30-300 MHz Measure at a distance of 10 m.

Test Description	Requirement	Procedure
Fast Transient/Burst Immunity	Test level per IEC 61547 DALI ports: ±0.5 kV (criteria B) Tr/Th: 5/50 ns Repetition rate: 5 kHz Repetition Duration: ≥ 2min per polarity Pass Criteria: B	IEC 61000-4-4 Injection via coupling network (33nF) Both positive and negative polarity discharges shall be applied. Test is applicable for all DC supply lines and for signal lines longer than 3m.
ESD immunity	Tests per IEC 61547 Air discharge level: 8 kV Contact discharge level: 4 kV Pass Criteria: B	IEC61000-4-2 10 discharges per location for each polarity
Conducted Immunity	Tests per IEC 61547 Frequency range: 0.15-80 MHz Field strength: 3 V rms Modulation: 1 KHz Pass Criteria: A	IEC61000-4-6 The Frequency range shall be swept with a modulated signal. The rate of sweep does not exceed 1.5x 10-3 decade/s. The dwell time at each frequency shall be not less than the time necessary for the DUT to be able to respond. Test is applicable for all DC supply lines and for signal lines longer than 3m. Coupling method: coupling / decoupling network (CDN) preferred.
Radiated Immunity	Test level per IEC 61547 Field Strength: 3 V/m Freq. Range: 80-1000MHz Modulation: 1kHz, 80% AM, sine wave Pass Criteria: A	IEC 61000-4-3 The DUT including supporting equipment is placed 0.8m above ground within an anechoic test chamber. Distance antenna to DUT: 3m Front face only with vertical and horizontal polarization.
MECHANICAL		
Vibration	Samples to respond to DALI commands during vibration. See Note (a).	IEC 60512-6-4 Method 1. Subject mated specimens to 5 to 500 Hz random levels at 4.9g. 100 minutes in each of 3 mutually perpendicular planes.

Test Description	Requirement	Procedure
Mechanical shock.	Sample to respond to DALI commands before and after shock in each axis. See Note (a).	IEC 60512-6-3. Subject mated specimens to 30 G's half-sine shock pulses of 11 milliseconds duration. Three shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks.
Impact	Lens may be deformed but device shall meet functional requirements of subsequent tests.	IEC 62262: Subject LUMAWISE Motion and mating receptacle to IK07 (2 Joule) impact.
ENVIRONMENTAL		
Thermal shock.	See Note (a) Samples to be tested powered off and mated to receptacle.	EIA-364-32, Test Condition I. Subject unmated specimens to 250 cycles between -40 and 70°C with 30-minute dwells at temperature extremes and 1 minute transition between temperatures.
Damp Heat, Cyclic.	See Note (a) Samples to be tested powered off and mated to receptacle.	IEC 60512-11-12. Subject mated specimens to 10 cycles (10 days) between 25 and 65°C at 90 to 100% RH.
Dry Heat.	See Note (a) Samples to be tested powered off and mated to receptacle.	IEC 60512-11-9. Subject mated specimens to 70°C for 500 hours.
Dry Heat – IP.	See Note (a)	IEC 60512-11-9. Subject mated specimens to 70°C for 240 hours.
Ingress Protection (IP 6X)	No ingress of dust allowed within any sealed area of the LUMAWISE Motion.	IEC 60529, IP6X Subject LUMAWISE Motion mated to receptacle to dust exposure. Receptacle to be mounted on sealed enclosure.
Ingress Protection (IP X6)	No ingress of water allowed within any sealed area of the LUMAWISE Motion.	IEC 60529, IPX6 Subject LUMAWISE Motion mated to receptacle to water spray. Receptacle to be mounted on sealed enclosure.
Ingress Protection (IP X8)	No ingress of water allowed within any sealed area of the LUMAWISE Motion.	IEC 60529, IPX8 Subject LUMAWISE Motion mated to receptacle to submersion at 0.5M for 4 hours. Receptacle to be mounted on sealed enclosure.

NOTE

a) Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence shown in Figure 2.

Figure 1

Product Qualification and Requalification Test Sequence

Test or Examination	Test Group (b)									
	A	B	C	D1	D2	E	F	G	H	J
	Test Sequence (c)									
Initial examination of product	1	1	1	1	1	1	1	1	1	1
Functionality Verification	2,6	2,6	2,5	2,5	2,5	2,4	2,5,7,10,12			
Humidity Freeze										
Dali-2/D4i Certification Test								2		
DALI bus current									2	
Overvoltage									4	
Input Safety									5	
Impedance									3	
Conducted Emissions							3			
Radiated Emissions							4			
Fast Transient/Burst Immunity							6			
Conducted Immunity							8			
Radiated Immunity							9			
ESD							11			
Vibration	3									
Mechanical shock	4									
Thermal shock			3							
Humidity		3	4							
Dry Heat		4								
Dry Heat - IP				3	3					
Impact						3				
Ingress Protection IP-x6				4		5				
Ingress Protection IP-6x					4					
Immersion Protection IP-x8										2
Final examination of product	7	7	7	6	6	6	13	3	6	3

NOTE

(b) See paragraph 4.1.A.

(c) Numbers indicate sequence in which tests are performed.

Figure 2

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

A. Specimen Selection

Specimens shall be prepared in accordance with applicable Instruction Sheets and shall be selected at random from current production. Minimum specimen quantities are shown in Figure 3.

Specimen Description	Test Group Quantity (Minimum)									
	A	**B**	**C**	**D1**	**D2**	**E**	**F**	**G**	**H**	**J**
2388426-1	4	4	5	3	3	3	5	1	3	3
2363638-1	4	4	5	3	3	3	5	1	1	3

Figure 3

4.2. Requalification Testing

If changes significantly affecting form, fit or function are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality, and reliability engineering.

4.3. Acceptance

Acceptance is based on verification that the product meets the requirements of Figure 1. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. If product failure occurs, corrective action shall be taken, and specimens resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

4.4. Quality Conformance Inspection

The applicable quality inspection plan shall specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.