1. SCOPE

1.1 Content

This specification covers electrical functional tests and quality requirements of the ALR-11000 Series Digital Photocell with part numbers Base Part Number 2410739-x according to the Product Specification 108-160585 in latest revision.

2. APPLICABLE DOCUMENTS

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

- 108-160585 ALR-11000 Series Digit Photocell Product Specification.

2.2 Industry Documents

- IEC-61000-4-2: Electromagnetic Compatibility (EMC), Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test.
- IEC-61000-4-3: Electromagnetic Compatibility (EMC), Part 4-3: Testing and measurement techniques – Radiated, radio-frequency electromagnetic field immunity test.
- IEC-61000-4-4: Electromagnetic Compatibility (EMC), Part 4-3: Testing and measurement techniques – Electrical fast transient/burst immunity test
- IEC-61000-4-6: Electromagnetic Compatibility (EMC), Part 4-3: Testing and measurement techniques – Immunity to conducted disturbance, induced by radio-frequency fields.
- IEC-62386-101: Digital addressable lighting interface, Part 101 – General requirements – System components.
- IEC-62386-103: Digital addressable lighting interface, Part 103 – General requirements – Control devices.
- IEC-62386-351: Digital addressable lighting interface, Part 351 – Luminaire-mounted Control Devices.
- IEC 61347-1: Lamp controlgear – Part 1: General and safety requirements.
- IEC 61347-2-11: Lamp controlgear – Part 2-11: Requirements for miscellaneous electronic circuits used with luminaires.
- IEC 61547: Equipment for general lighting purposes – EMC immunity requirements
- CISPR 15 / EN55015: Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment.

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 ALR-11000 Series Digital Photocell must be stored in a temperature range of -40 °C to +80 °C
Operating temperature: -40 °C to +80 °C.

3.3 Test Requirements and Procedures Summary

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

4. TEST CONDITIONS

4.1 Power and DALI connection requirements

The DUT shall always be connected compliant to the Zhaga book 18 recommendations:

- Contact 1: connected to +24Vdc (± 5%) of an auxiliary power supply.
- Contact 2: connected to GND of an auxiliary power supply and to DA- (Negative side of DALI bus).
- Contact 3: connected to DA+ (Positive side of DALI bus).
- Contact 4: not connected.

Receptacle, with TE Part number 2363638-1, should be used during all tests. The pinout of this receptacle is given in Figure 1.

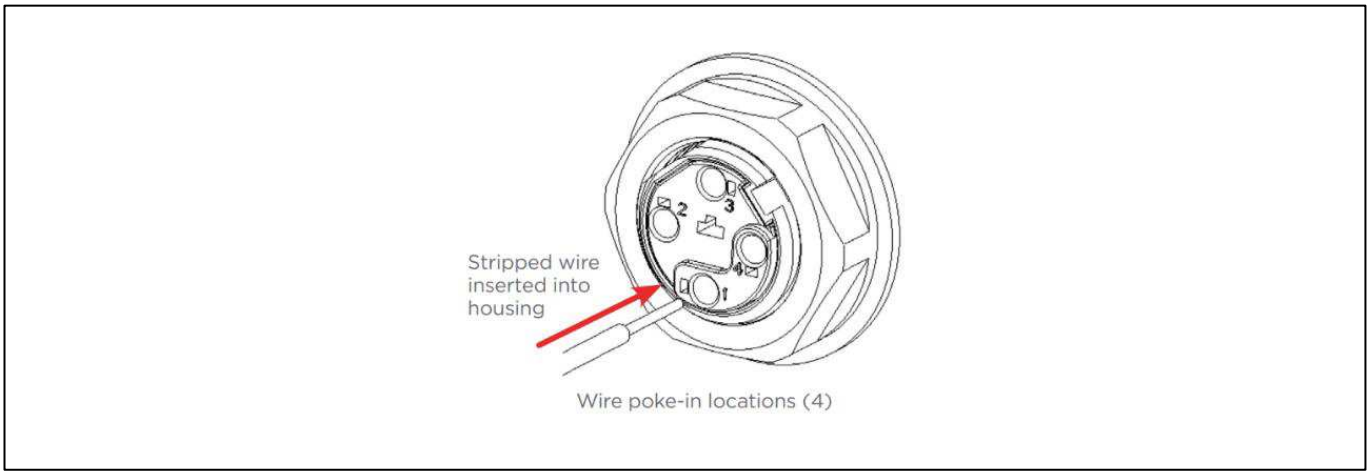

Figure 1 Pinout of receptacle.

4.2 Equipment

- DALI communication protocol tests need to be done with the ProbitLab2 device versions:
  - Hardware: ProbitLab2 V4.12.
  - Software: ProbitBench V4.3.2.0
- DALI communication protocol tests are conforming the test sequences DiiA V2 2.3.2.0.
- Auxiliary power supply inputs should be connected to an Agilent E3631A power supply with the voltage set to 24V (± 5%) and the (maximum) current set to 0.1A, or to 24V Auxiliary output of a commercially available DALI-2 certified power supply like the Inventronics EBS-080S105BT2, EBS-080S070BT2 or EUM-150S150BT.
- To monitor the DALI waveforms, the oscilloscope output of the ProbitLab2 can be connected to an Agilent MSO-X oscilloscope (e.g., MSO-x 3034A or MSOX6004A).
- Checking functionality of the device can be done with a Lunatone DALI USBmini (24138923DO) and commercially available DALI-2 certified power supply like the Inventronics EBS-080S105BT2, EBS-080S070BT2 or EUM-150S150BT as AUX & DALI bus power supply.
- Any DMM with precision of 1mV / 0.01 mA is allowed to be used (e.g., Agilent 34410A).
- Impedance measurements should be done with an LCR meter (e.g., Agilent 4263B) and DMM (e.g., Agilent 34410A).
- Connection diagrams from below paragraph must be used and may not be deviated unless indicated per test description.

4.3 Connection Diagrams

4.3.1 Connection diagram for electrical tests

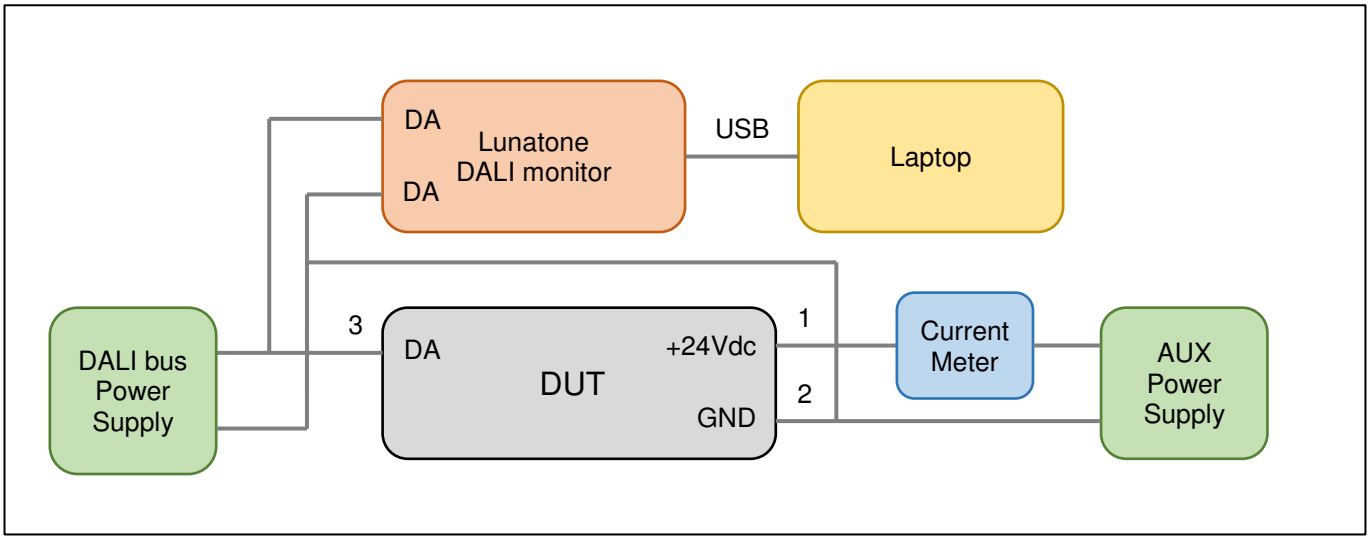

Figure 2 DUT connections for electrical tests

4.3.2 Connection diagram for EMC tests

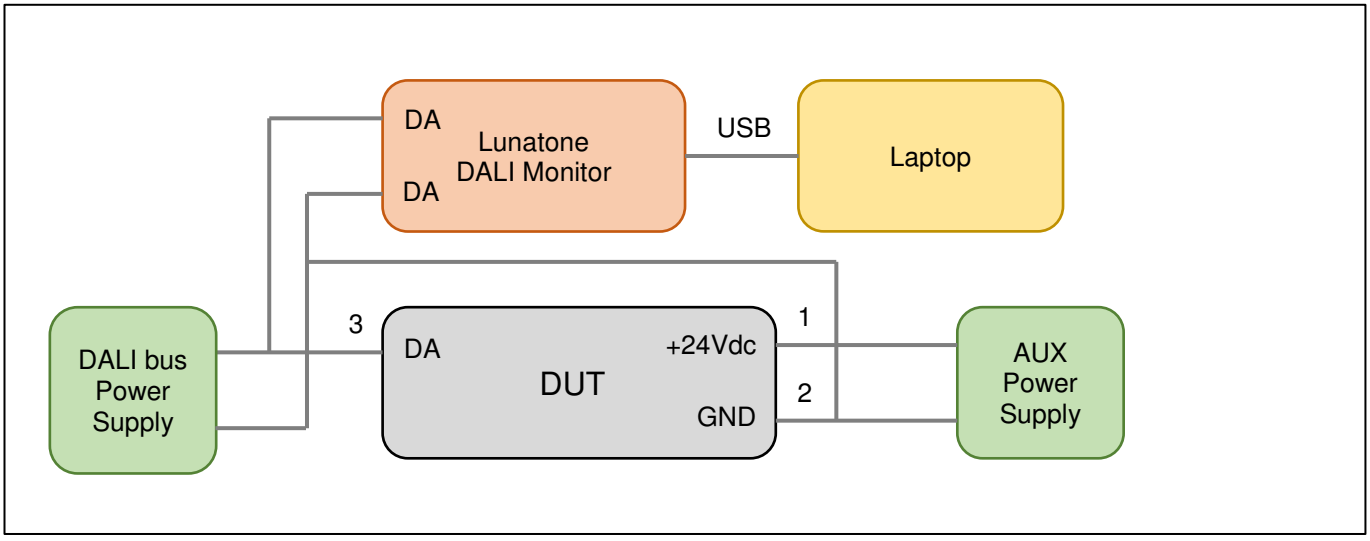

Figure 3 DUT connections for EMC tests

4.3.3 Connection diagram for DALI test sequences using ProbitLab2

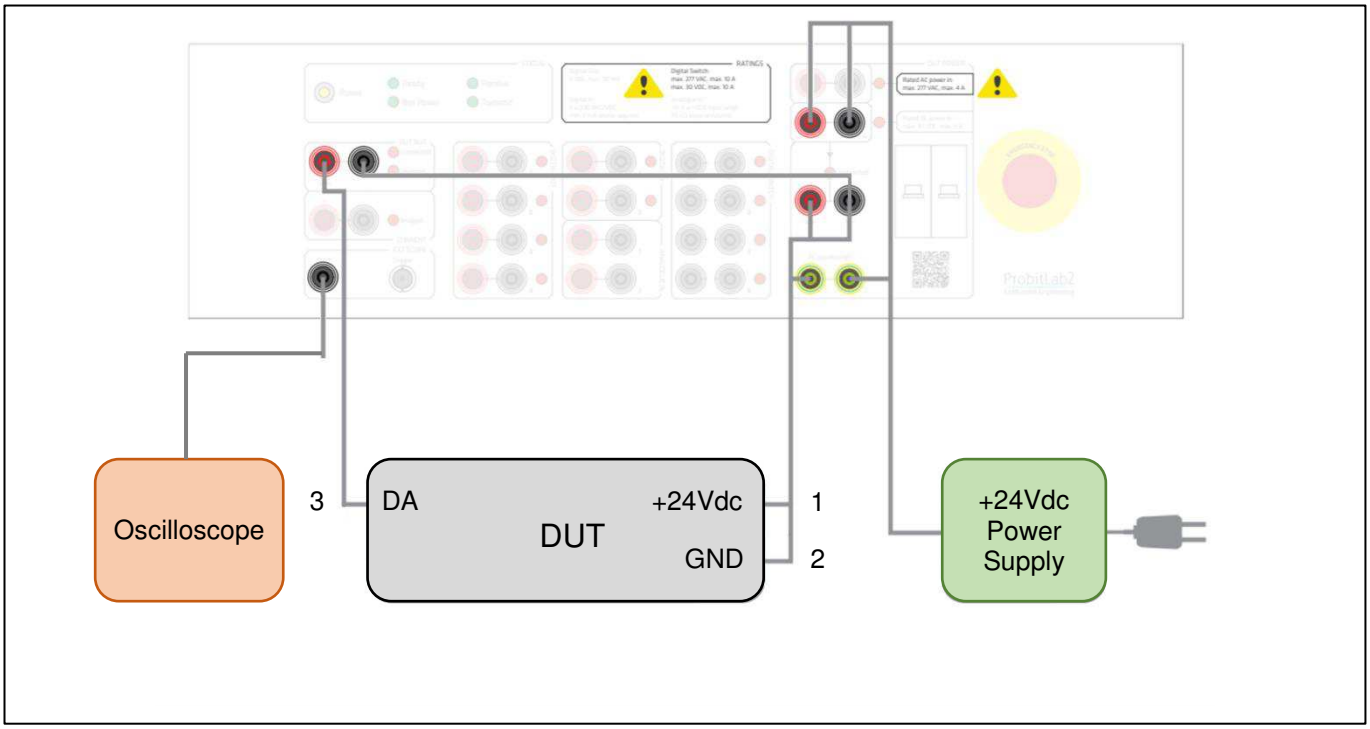

Figure 4 ProbitLab2 connections

4.3.4 Connection diagram for DALI test sequence 3.4: Current rating

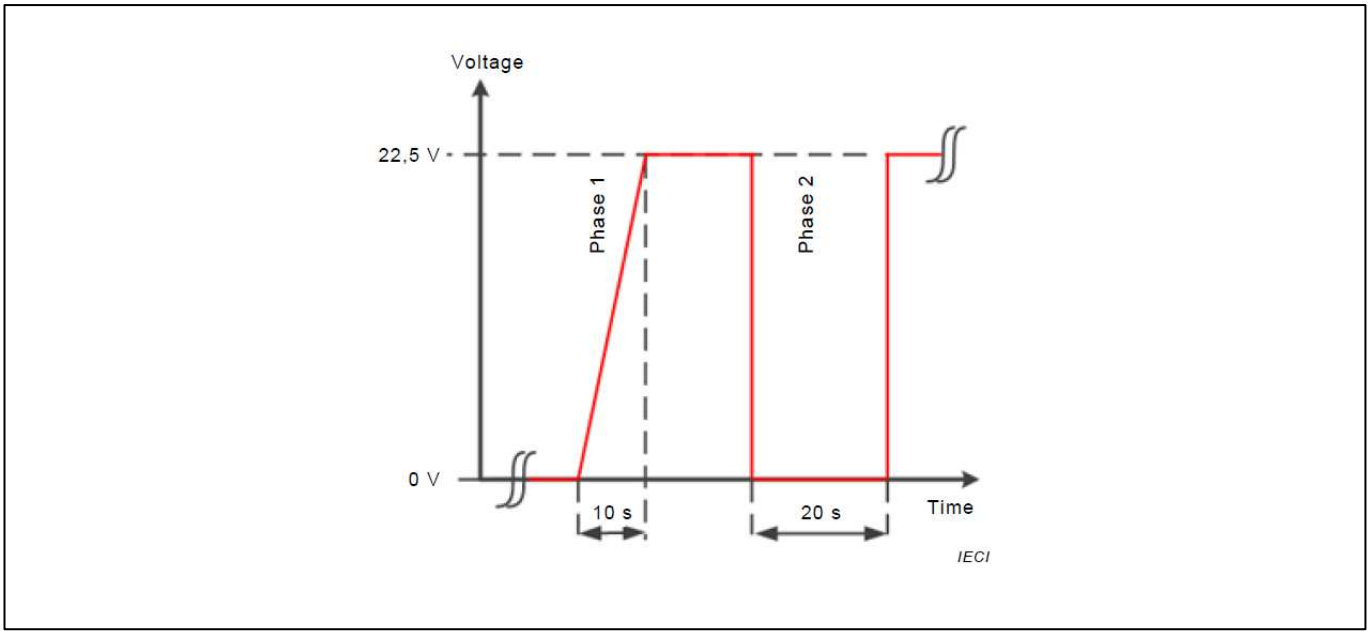

Figure 5 Definition of phases during which the current should be measured.

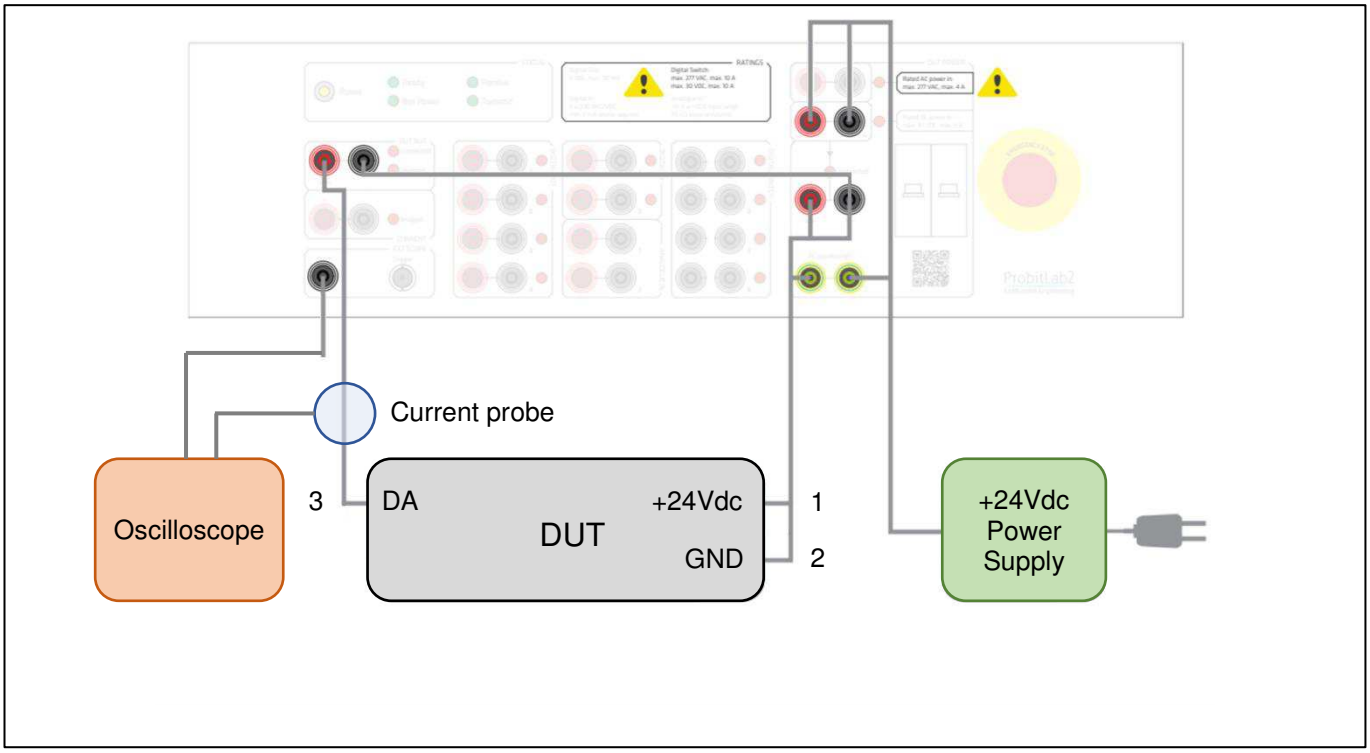

Figure 6 ProbitLab2 connections for current measurements as requested in sequence 103-3.4.

5. TEST DEFINITIONS

5.1 Electrical Tests

Purpose of test	**AUX Current, Power and Overvoltage tests**
Standards	-
Equipment	AUX Power supply: Agilent E3631A. Current meter: Agilent 34410A. DALI monitor: Lunatone.
Connection diagram	See Figure 2
Procedure	• Set AUX power supply voltage to 26.4V, initiate constant DALI commands with the Lunatone and measure the maximum current. Check correct response to DALI commands. Maximum current equals measured value. Maximum power equals 26.4V x measured value. • Set AUX power supply voltage to 30V, wait for 1 minute. Set AUX power supply voltage to 24.0V and check correct response to DALI commands. • Set AUX power supply voltage to 21.6V and check correct response to DALI commands.
Requirements	• Maximum current should be ≤ 20 mA. Maximum power should be ≤ 0.5 W. • Sample should react normally to commands during / after applying overvoltage of 30V. • Sample should react normally to commands at applying low voltage of 21.6V.

Table 1 Electrical Tests.

5.2 Input Safety Tests

Purpose of test	**Safety tests**
Standards	-
Equipment	Isolated mains supply (230Vac).
Connection diagram	See Figure 2.
Procedure	• Apply 230Vac between pin 1 and pin 2. • Apply 230Vac between pin 1 and pin 3. • Apply 230Vac between pin 2 and pin 3.
Requirements	During the test smoke nor fire should be outside of the device.

Table 2 Safety Tests.

5.3 Impedance Tests

Purpose of test	Measure impedance of un-used pin 4
Standards	-
Equipment	Resistance meter: Agilent 34410A. LCR meter: Agilent 4263B.
Connection diagram	Measure pin 4 to other pins.
Procedure	• Measure resistance between pin 4 and pin 1, 2 and 3. • Measure impedance between pin 4 and pin 1, 2 and 3 at 100Hz.
Requirements	• Resistance should be ≥ 8 MΩ. • Impedance should be ≥ 8 MΩ.

Table 3 Impedance Tests.

5.4 EMC Tests

Purpose of test	EMC tests for CE marking
Standards	IEC 61000-4. IEC 61000-6.
Equipment	AUX Power supply: Inventronics EBS-080S105BT2 / EBS080S070BT2. DALI monitor: Lunatone
Connection diagram	See Figure 3
Procedure	• ESD tests (IEC 61000-4-2, 8kV air, 4kV contact, pass criteria B, 10 discharges per location for each polarity). • Radiated Immunity (IEC 61000-4-3, 3V/m, 80 – 1000MHZ, criteria A). • Fast transient / burst immunity (IEC 61000-4-4, ±0.5kV, criteria B). • Conducted immunity (IEC 61000-4-6, 3Vrms, 0.15 – 80MHz, criteria A). • Radiated emission (CISPR 15 / EN 55015, 30MHz – 300MHz). • Conducted emission (CISPR 15 / EN 55015, 150kHz – 30MHz). Functionality can be checked via correct response to DALI commands.
Requirements	According to IEC 61000-4 / -6

Table 4 EMC Tests.

5.5 Cold Exposure Test

Purpose of test	Cold Exposure test
Standards	IEC 60512-11-10.
Equipment	AUX Power supply: Inventronics EBS-080S105BT2 / EBS080S070BT2. DALI monitor: Lunatone
Connection diagram	See Figure 3
Procedure	While samples are at -40 °C, correct responses to DALI commands should be checked for at least 6 hours.
Requirements	According to IEC 61000-4 / -6

Table 5 Cold Exposure Test.

5.6 DALI-2 Certification Tests

Purpose of test	DALI-2 product certification
Standards	IEC 62386-101, 103 and DiiA Part 351.
Equipment	AUX Power supply: Agilent E3631A Oscilloscope: Agilent MSO-X 6004A DALI tester: ProbitLab2 + ProbitBench
Connection diagram	See Figure 4.
Procedure	According to test sequences defined in IEC 62386-101, 103 and DiiA part 351. NVM save time requirement: 30 seconds. Device type: 0 (Type A).
Requirements	All test sequences should be passed. Registration file should be available and sent to DiiA. Registration should be granted by DiiA.

Table 6 DALI-2 Tests.

5.7 DALI-2 Memory Bank Content

Purpose of test	Check of Memory Bank content
Standards	-
Equipment	Power supply: Agilent E3631A DALI tester: ProbitLab2 + ProbitBench
Connection diagram	See Figure 4.
Procedure	Use the Mediator Toolbox of the ProbitLab2 with setting “Basic 103” Read memory bank content of Memory Banks 0, 1, 2 and 201.
Requirements	Values should be according to Table 8 to Table 11.

Table 7 DALI-2 Memory Bank Content Check.

Address	Content (binary)	Content (hexadecimal)	Description	Remark
0x00	0001 1010	1Ah	Address of last accessible memory location	
0x01		n.a.	Reserved - not implemented	Timeout
0x02	1100 1001	C9h	Number of last accessible memory bank	Memory Bank 201
0x03	0000 0111	07h	GTIN byte 0 (MSB)	GTIN (dec) = 8720627307871
0x04	1110 1110	EEh	GTIN byte 1	GTIN (hex) = 07 EE | 6D E4 | 95 5F
0x05	0110 1101	6Dh	GTIN byte 2	
0x06	1110 0100	E4h	GTIN byte 3	
0x07	1001 0101	95h	GTIN byte 4	
0x08	0101 1111	5Fh	GTIN byte 5 (LSB)	
0x09	0000 0010	02h	Firmware version (major)	FW version 2.3
0x0A	0000 0011	03h	Firmware version (minor)	
0x0B	0000 0000	00h	Identification number byte 0 (MSB)	PN (dec) = 2410739
0x0C	0000 0000	00h	Identification number byte 1	PN (hex) = | 00 00 | 00 00 | 00 24 | C8 F3 |
0x0D	0000 0000	00h	Identification number byte 2	
0x0E	0000 0000	00h	Identification number byte 3	
0x0F	0000 0001	00h	Identification number byte 4	
0x10	0010 0100	24h	Identification number byte 5	
0x11	1100 0100	C8h	Identification number byte 6	
0x12	1111 0011	F3h	Identification number byte 7 (LSB)	
0x13	0000 0011	03h	Hardware version (major)	HW version 3.1
0x14	0000 0001	01h	Hardware version (minor)	
0x15	0000 1000	08h	101 version number	NEN-EN-IEC 62386-101:2015, version = 2.0
0x16	1111 1111	FFh	102 version number of all integrated control gear	NEN-EN-IEC 62386-102:2014, version = 2.0
0x17	0000 1000	08h	103 version number of all integrated control devices	NEN-EN-IEC 62386-103:2014, version = 2.0
0x18	0000 0000	01h	Number of logical control device units in the bus unit	Lumawise Zhaga DSA contains one control device
0x19	0000 0000	00h	Number of logical control gear units in the bus unit	Lumawise Zhaga DSA does not contain a control gear.
0x1A	0000 0000	00h	Index number of this logical control gear unit	Index number of control gear = 0

Table 8 Content of Memory Bank 0.

Address	Content (binary)	Content (hexadecimal)	Description	Remark
0x00				Timeout

Table 9 Content of Memory Bank 1.

Address	Content (binary)	Content (hexadecimal)	Description	Remark
0x00	0000 0100	04h	Address of last accessible memory location	
0x01			Indicator byte	Timeout
0x02	1111 1111	FFh	Lock bye	
0x03	0000 0001	01h	Version of the memory bank	
0x04	0400 0001	41h	Astro clock part number	Might deviate depending upon preset location of device

Table 10 Content of Memory Bank 2.

Address	Content (binary)	Content (hexadecimal)	Description	Remark
0x00	0000 0111	07h	Address of last accessible memory location	
0x01			Indicator byte	Timeout
0x02	1111 1111	FFh	Lock bye	
0x03	0000 0001	01h	Version of the memory bank	
0x04	0000 0000	00h	Type of device	Type A (= 0)
0x05	0000 0010	02h	Maximum current consumed from bus power supply Rounded up with 1 mA resolution	Measured value = 1.94 mA, rounded up to 2 mA
0x06	0000 0101	05h	Maximum average power consumed from the AUX power supply. Rounded up with 0.1W resolution.	Measured value = 0.44 W, rounded up to 0.5 W
0x07	0000 0000	00h	Application controller arbitration	

Table 11 Content of Memory Bank 201.

6. REVISION HISTORY

LTR	REVISION RECORD	AUTHOR	APPROVER	DATE dd.mm.yyyy
1	First draft	Gied Habraken		18.05.2022
2	Second version	Gied Habraken		14.06.2022
3	Third version	Gied Habraken		17.06.2022
4	Fourth version	Gied Habraken		16.11.2022
5	Fifth version	Gied Habraken		21.11.2022
6	Sixth version	Gied Habraken		10.01.2023