1. SCOPE

1.1 Content

This specification covers electrical functional tests and quality requirements of the Streetlight Motion Sensor with part number 2388426-1 according to the Product Specification 108-160457 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

- 108-160457 Streetlight Motion Sensor.

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-62386-303: Digital addressable lighting interface, Part 303 – Particular requirements – Input devices – Occupancy sensor.
- 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 Streetlight Motion Sensor must be stored in a temperature range of -20 °C to +70 °C
Operating temperature: -20 °C to +70 °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: not connected.
- Contact 2: connected 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

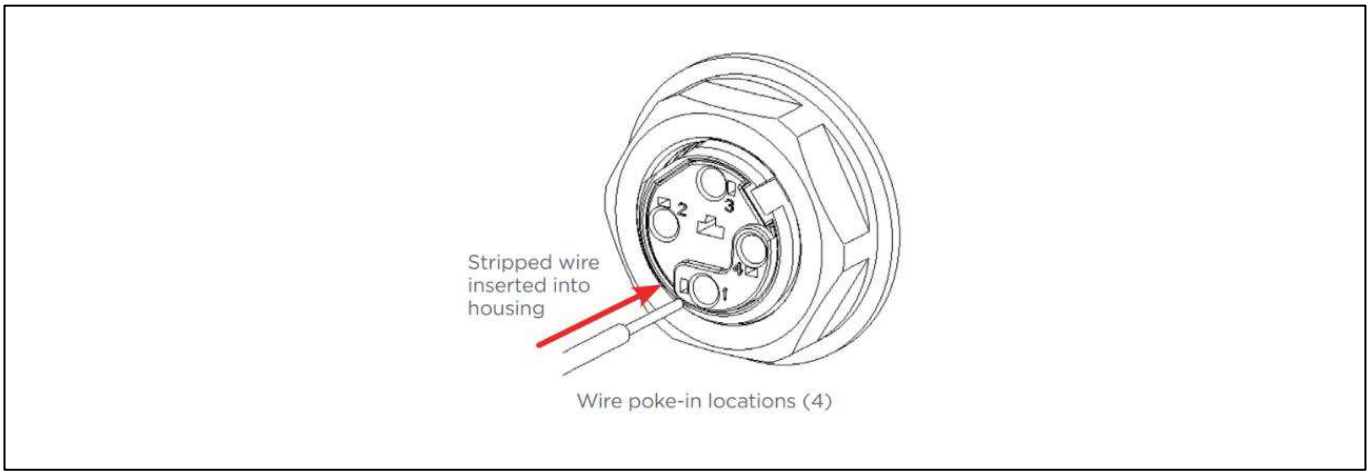

Figure 1 Pinout of receptacle.

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.
- DALI bus should be connected to the ProbitLab2 or to 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 a commercially available DALI-2 certified power supply like the Inventronics EBS-080S105BT2, EBS-080S070BT2 or EUM-150S150BT.
- Any DMM with precision of 1mV / 0.01 mA is allowed to be used (e.g., Agilent 34410A or Keithley 2700).
- Impedance measurements should be done with an LCR meter (e.g., Agilent 4263B) and DMM (e.g., Agilent 34410A).
- Power supply for overvoltage check: Agilent E3631A.
- 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

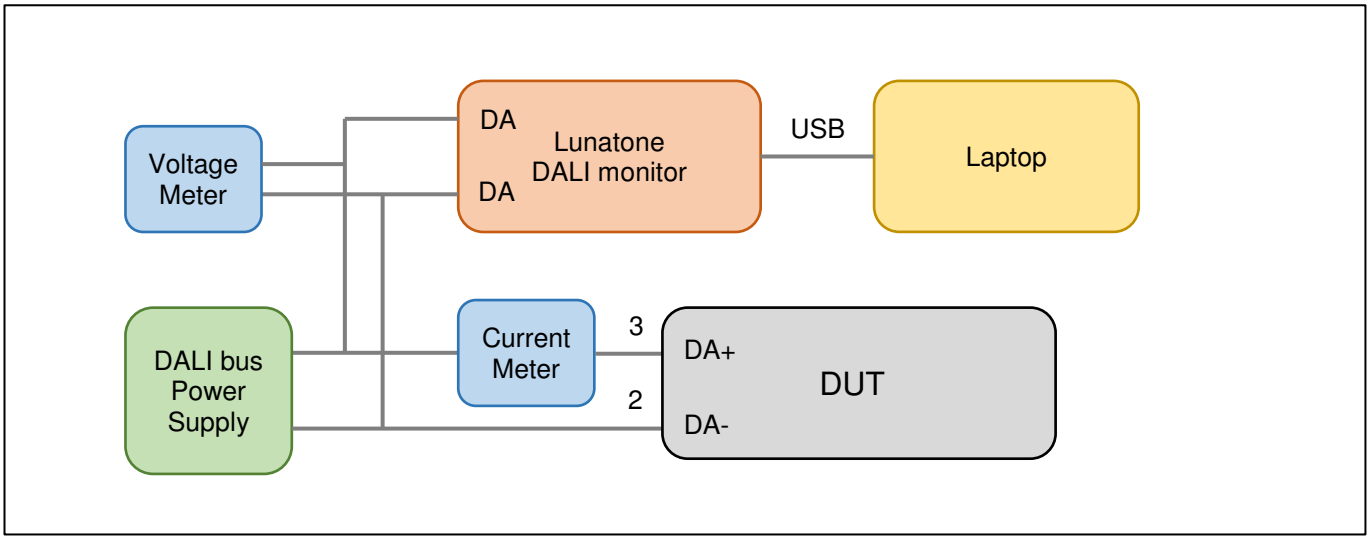

Figure 2 DUT connections for electrical tests (1)

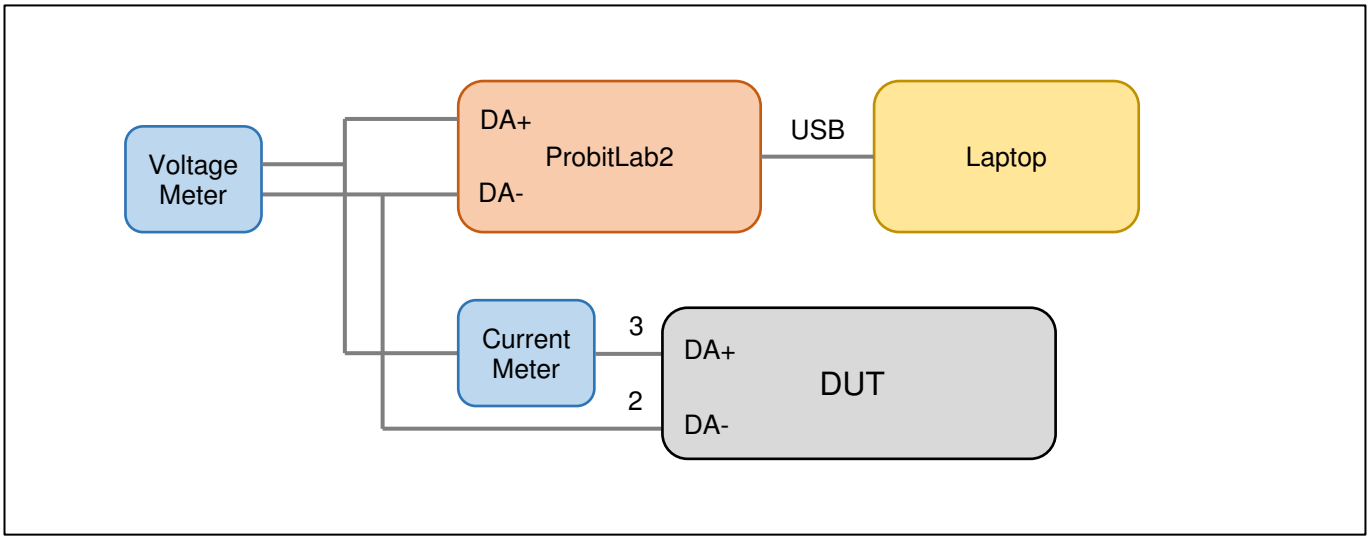

Figure 3 DUT connections for electrical tests (2)

The DALI bus voltage can be adjusted in case ProbitLab2 is used.

4.3.2 Connection diagram for EMC tests

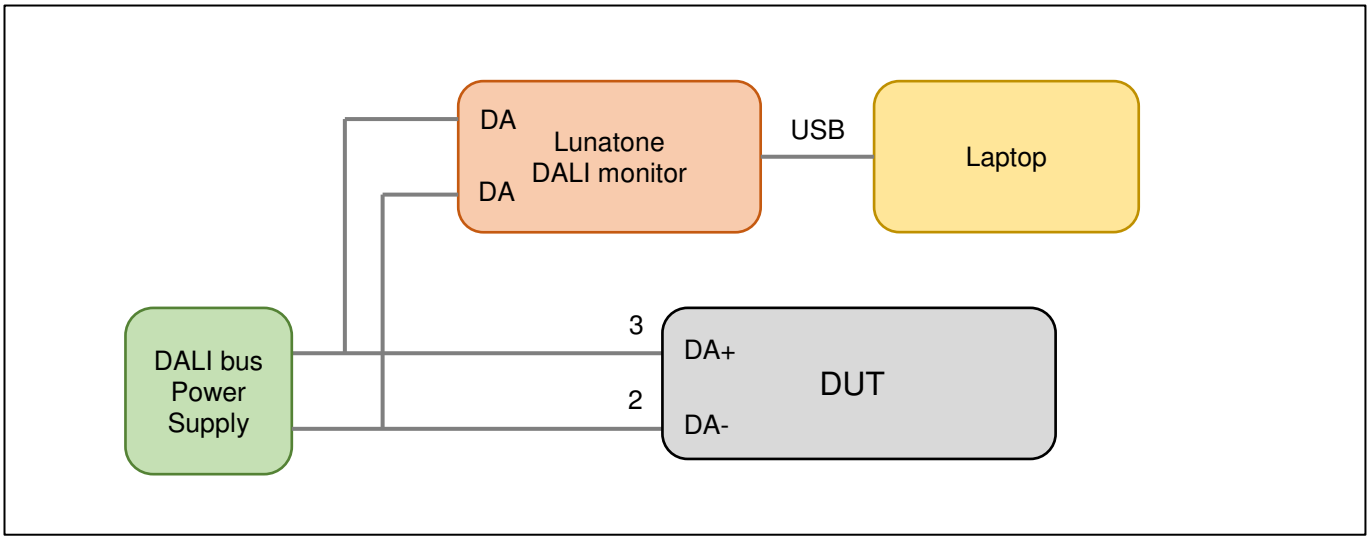

Figure 4 DUT connections for EMC tests

4.3.3 Connection diagram for DALI test sequences using ProbitLab2

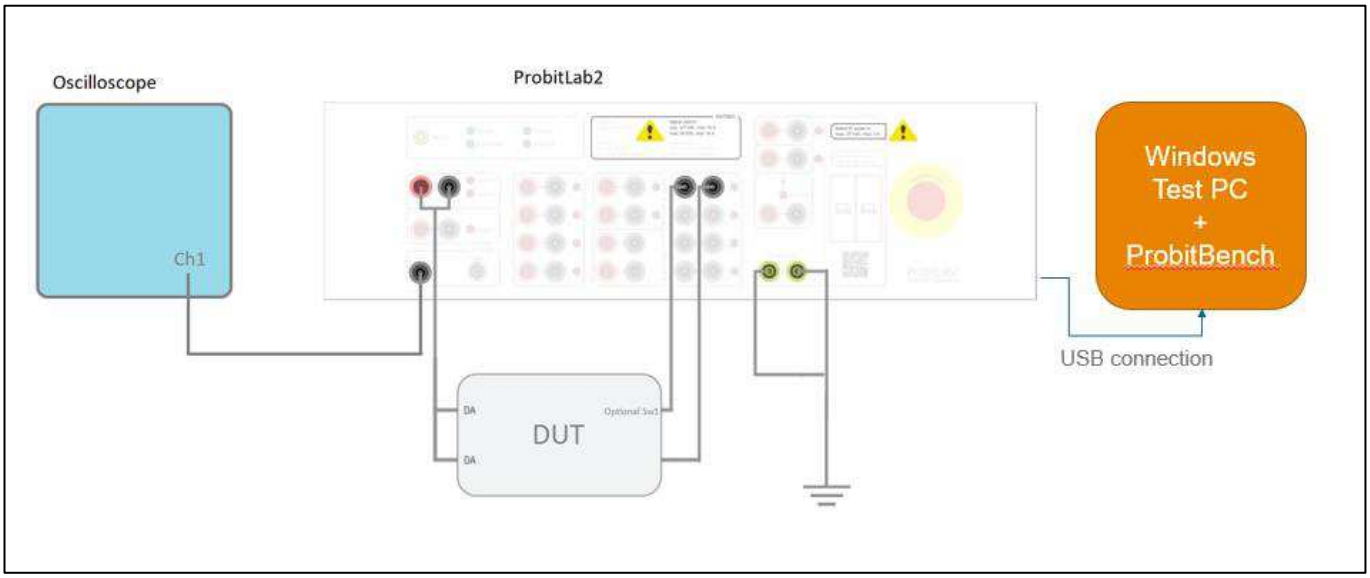

Figure 5 ProbitLab2 connections

4.3.4 Connection diagram for DALI test sequence 3.4: Current rating

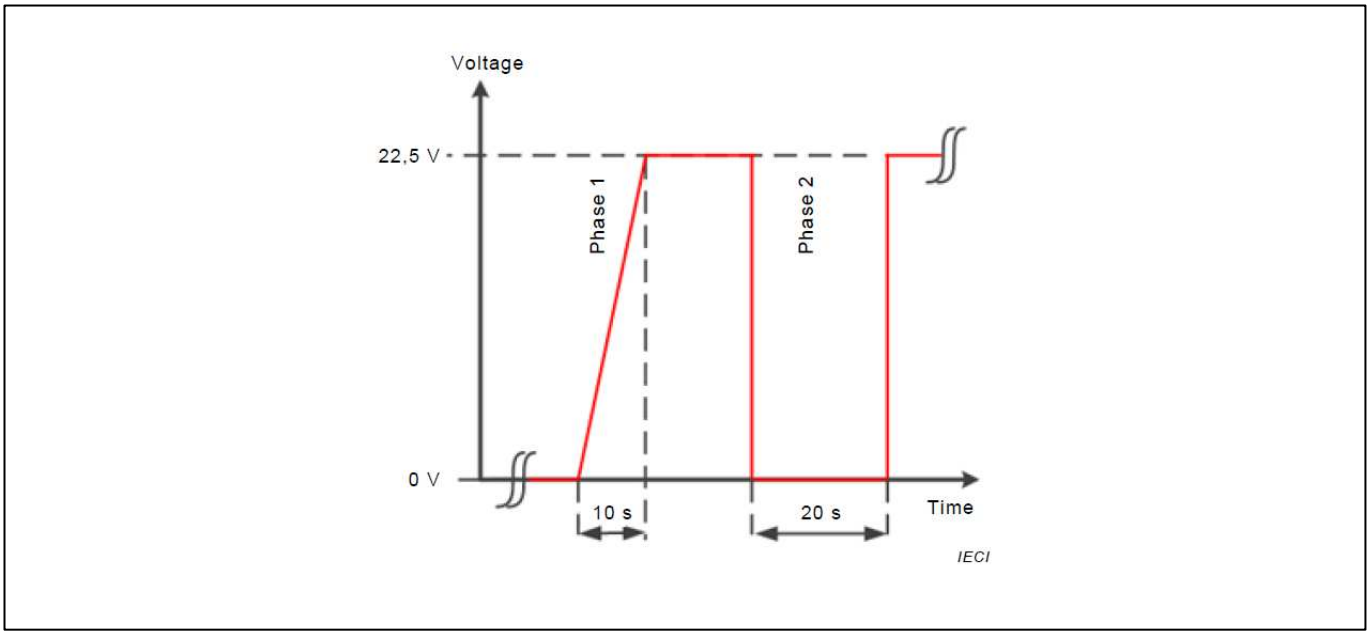

Figure 6 Definition of phases during which the current should be measured.

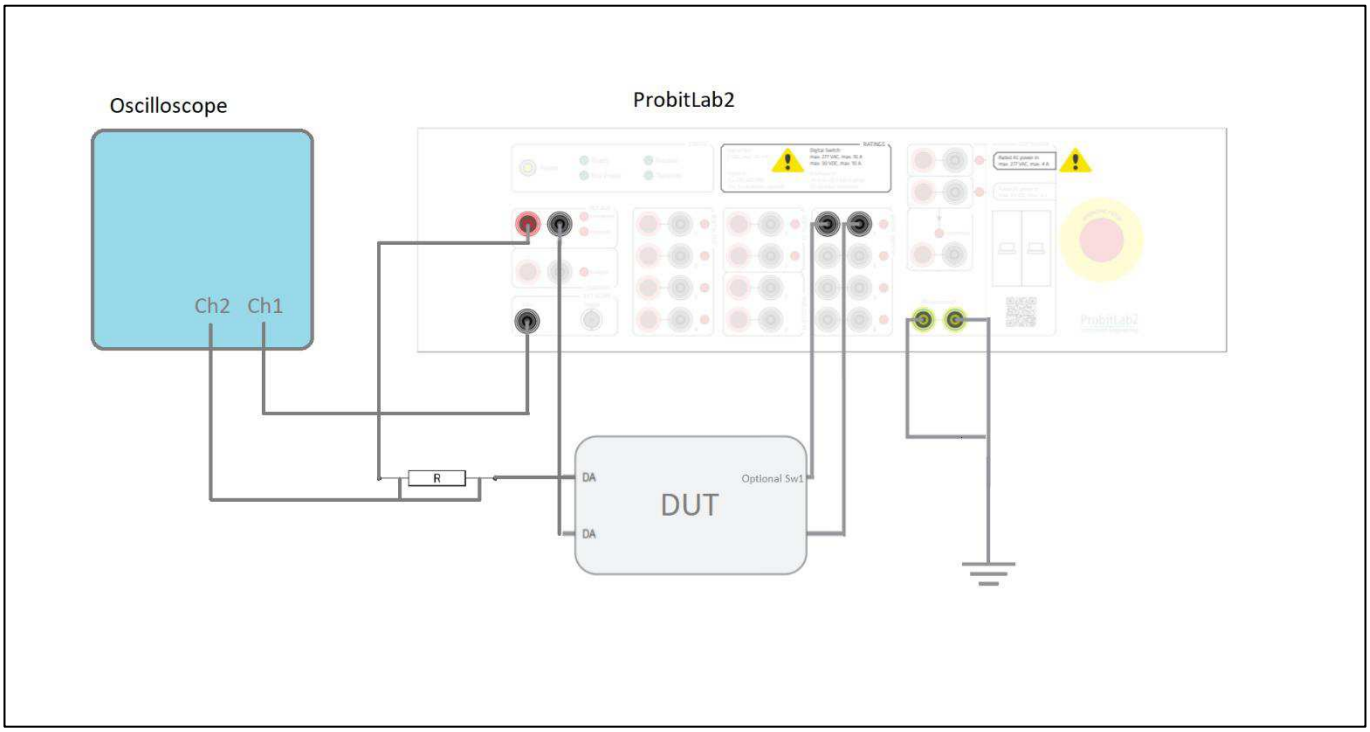

Figure 7 ProbitLab2 connections for current measurements as requested in sequence 103-3.4.

5. TEST DEFINITIONS

5.1 Electrical Test 1

Purpose of test	**DALI Current and Power in idle and operational mode**
Standards	IEC 62386-101.
Equipment	Current meter: Agilent 34410A. Voltage meter: Keithley 2700. DALI bus power supply: Inventronics EBS-080S105BT2. DALI monitor: Lunatone.
Connection diagram	See Figure 2
Procedure	Measure DALI bus voltage and DALI current into the DUT in following two situations: • No commands sent by the Lunatone. • Continuous stream of commands sent by the Lunatone.
Requirements	• Maximum current should be ≤ 25 mA. Maximum power should be ≤ 2 W.

Table 1 Electrical Test 1.

5.2 Electrical Test 2

Purpose of test	**DALI Current and Power for different bus voltages**
Standards	IEC 62386-101.
Equipment	Current meter: Agilent 34410A. Voltage meter: Keithley 2700. DALI bus power supply: ProbitLab2.
Connection diagram	See Figure 3
Procedure	• With the ProbitBench SW set DALI bus voltage of the ProbitLab2 to 16V and measure DALI bus voltage and DALI bus current into the DUT. • With the ProbitBench SW set DALI bus voltage of the ProbitLab2 to 10V and measure DALI bus voltage and DALI bus current into the DUT. • With the ProbitBench SW set DALI bus voltage of the ProbitLab2 to 20.5V and measure DALI bus voltage and DALI bus current into the DUT.
Requirements	• Maximum current should be ≤ 25 mA. Maximum power should be ≤ 2 W.

Table 2 Electrical Test 2.

5.3 Electrical Test 3

Purpose of test	**DALI Start-up Current**
Standards	IEC 62386-101.
Equipment	Voltage meter: Oscilloscope connected to ProbitLab2. Current meter: Current probe connected to oscilloscope (N2824A with 100mΩ). DALI bus power supply: ProbitLab2.
Connection diagram	See Figure 3
Procedure	With the ProbitBench SW set DALI bus voltage of the ProbitLab2 to 16V and measure DALI bus current when DALI bus is switched on. Before switching on the DALI bus make sure it is switched off for at least 1 minute.
Requirements	Maximum current should be ≤ 25 mA.

Table 3 Electrical Test 3.

5.4 Electrical Test 4

Purpose of test	**Overvoltage test**
Standards	IEC 62386-101.
Equipment	DALI bus power supply: ProbitLab2.
Connection diagram	See Figure 3
Procedure	• Set DALI bus voltage to 22.5 V at the ProbitLab2. • Read out content of Memory Bank 0. • Set DALI bus voltage to 16.0 V at the ProbitLab2.
Requirements	Memory Bank 0 values should be equal to Table 12.

Table 4 Electrical Test 4.

5.5 Input Safety Tests

Purpose of test	**Safety tests**
Standards	-
Equipment	Isolated mains supply.
Connection diagram	See Figure 8.
Procedure	• Apply 230Vac between pin 1 and pin 4. • Apply 230Vac between pin 2 and pin 3.
Requirements	During the test smoke nor fire should be outside of the device.

Table 5 Safety Tests.

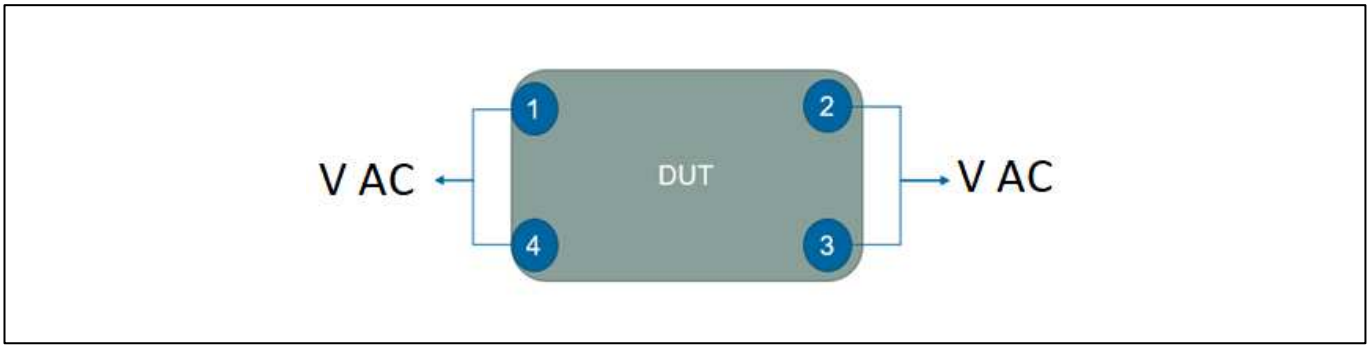

Figure 8 Connection diagram for input safety.

5.6 Impedance Tests

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

Table 6 Impedance Tests.

5.7 EMC Tests

Purpose of test	**EMC tests for CE marking**
Standards	IEC 61000-4. IEC 61000-6.
Equipment	DALI Power supply: Inventronics EBS-080S105BT2 / EBS-080S070BT2. DALI monitor: Lunatone
Connection diagram	See Figure 4
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 7 EMC Tests.

5.8 DALI-2 Certification Test 1

Purpose of test	DALI-2 product certification
Standards	IEC 62386-101, 103 and DiiA Part 351.
Equipment	Oscilloscope: Agilent MSO-X DALI tester: ProbitLab2 + ProbitBench
Connection diagram	See Figure 5.
Procedure	According to test sequences defined in IEC 62386-101, 103 and DiiA part 351. NVM save time requirement: 30 seconds. Device type: 1 (Type B).
Requirements	All test sequences should be passed. Registration file should be available and sent to DiiA. Registration should be granted by DiiA.

Table 8 DALI-2 Certification Tests.

5.9 DALI-2 Certification Test 2

Purpose of test	DALI-2 product certification
Standards	IEC 62386-303.
Equipment	Oscilloscope: Agilent MSO-X DALI tester: ProbitLab2 + ProbitBench
Connection diagram	See Figure 5.
Procedure	Connect Switch 1 of the ProbitLab2 to GND and GPIO1. Connect Switch 4 of the ProbitLab2 to GND and the output of one of the PIR sensors. Set the two CAP values (Memory Bank 2 address 0x0B and 0x0F) to 250dec before starting the test. According to test sequences defined in IEC 62386-303. NVM save time requirement: 30 seconds. Device type: 1 (Type B). Run 103-2.1 plus all 303 sequences in one sequence.
Requirements	All test sequences should be passed. Registration file should be available and sent to DiiA. Registration should be granted by DiiA.

Table 9 DALI-2 Tests.

5.10 DALI-2 application controller arbitration

Purpose of test	**DALI-2 application controller arbitration testing with Type A device**
Standards	IEC 62386-101, 103, 303 and DiiA part 351.
Equipment	DALI-2 Type A device DALI tester: ProbitLab2 + ProbitBench
Connection diagram	See Figure 5 (plus DALI-2 Type A device added to the DALI bus).
Procedure	• Connect DALI-2 Type A device to DALI bus. • Transmit XX commands. • Monitor DALI-2 sniffer to verify no DAPC commands are being sent by DUT and answer on the application controller query is XXX • Disconnect DALI-2 Type A device from DALI bus. • Transmit XXX commands and verify behavior within 15 minutes. • DUT must transmit DAPC commands as master controller.
Requirements	

Table 10 DALI-2 application controller arbitration

5.11 DALI-2 Memory Bank Content

Purpose of test	**Check of Memory Bank content**
Standards	-
Equipment	DALI tester: ProbitLab2 (HW) + ProbitBench (SW)
Connection diagram	See Figure 5.
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 12 to Table 15.

Table 11 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) = 8720627307857
0x04	1110 1110	EEh	GTIN byte 1	GTIN (hex) = 07 EE | 6D E4 | 95 51
0x05	0110 1101	6Dh	GTIN byte 2	
0x06	1110 0100	E4h	GTIN byte 3	
0x07	1001 0101	95h	GTIN byte 4	
0x08	0101 0001	51h	GTIN byte 5 (LSB)	
0x09	0000 0010	02h	Firmware version (major)	FW version 1.0
0x0A	0000 0011	03h	Firmware version (minor)	
0x0B	0000 0000	00h	Identification number byte 0 (MSB)	PN (dec) = 2388426-1 (23884261)
0x0C	0000 0011	00h	Identification number byte 1	PN (hex) = 00 00 | 00 00 | 01 6C | 71 E5
0x0D	0000 0000	00h	Identification number byte 2	
0x0E	0000 0011	00h	Identification number byte 3	
0x0F	0000 0000	01h	Identification number byte 4	
0x10	0000 0011	6Ch	Identification number byte 5	
0x11	0000 0000	71h	Identification number byte 6	
0x12	0000 0011	E5h	Identification number byte 7 (LSB)	
0x13	0000 0001	01h	Hardware version (major)	HW version 1.0
0x14	0000 0000	00h	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 0001	01h	Number of logical control device units in the bus unit	
0x19	0000 0000	00h	Number of logical control gear units in the bus unit	
0x1A	0000 0000	00h	Index number of this logical control gear unit	Index number of control gear = 0

Table 12 Content of Memory Bank 0.

Address	Content (binary)	Content (hexadecimal)	Description	Remark
0x00	0001 0000	10h	Address of last accessible memory location	
0x01	0000 0000	00h	Indicator byte	
0x02	1111 1111	FFh	Memory bank 1 lock byte	
0x03	1111 1111	FFh	OEM GTIN byte 0 (MSB)	
0x04	1111 1111	FFh	OEM GTIN byte 1	
0x05	1111 1111	FFh	OEM GTIN byte 2	
0x06	1111 1111	FFh	OEM GTIN byte 3	
0x07	1111 1111	FFh	OEM GTIN byte 4	
0x08	1111 1111	FFh	OEM GTIN byte 5 (LSB)	
0x09	1111 1111	FFh	OEM Identification number byte 0 (MSB)	
0x0A	1111 1111	FFh	OEM Identification number byte 1	
0x0B	1111 1111	FFh	OEM Identification number byte 2	
0x0C	1111 1111	FFh	OEM Identification number byte 3	
0x0D	1111 1111	FFh	OEM Identification number byte 4	
0x0E	1111 1111	FFh	OEM Identification number byte 5	
0x0F	1111 1111	FFh	OEM Identification number byte 6	
0x10	1111 1111	FFh	OEM Identification number byte 7 (LSB)	

Table 13 Content of Memory Bank 1.

Address	Content (binary)	Content (hexadecimal)	Description	Remark
0x00	0001 0011	13h	Address of last accessible memory location	
0x01	0000 0000	00h	Indicator byte	
0x02	1111 1111	FFh	Lock byte	
0x03	0000 0001	01h	PIR 0	0 - No motion; 1 - Motion; 2 - Sensor Failure
0x04	0000 0001	01h	PIR 1	0 - No motion; 1 - Motion; 2 - Sensor Failure
0x05	1011 1000	B8h	Luxmeter (LSB)	Value in Lux x 10
0x06	0010 1000	28h	Luxmeter	
0x07	0000 0000	00h	Luxmeter	
0x08	0000 0000	00h	Luxmeter (MSB)	
0x09	1110 1101	EDh	NTC (LSB)	Value in °C x 10
0x0A	0000 0000	00h	NTC (MSB)	
0x0B	0011 0010	32h	CAP	Parameter for motion algorithm (Night mode)
0x0C	0000 1010	0Ah	THRESHOLD	Parameter for motion algorithm (Night mode)
0x0D	0000 0010	02h	MULTIPLE	Parameter for motion algorithm (Night mode)
0x0E	0000 0001	01h	DECAY	Parameter for motion algorithm (Night mode)
0x0F	0011 0010	32h	CAP	Parameter for motion algorithm (Day mode)
0x10	0000 1010	0Ah	THRESHOLD	Parameter for motion algorithm (Day mode)
0x11	0000 0001	01h	MULTIPLE	Parameter for motion algorithm (Day mode)
0x12	0000 0001	01h	DECAY	Parameter for motion algorithm (Day mode)
0x13	0000 0001	01h	STATUS	1 - Day; 2 - Dusk; 3 - Night; 4 - Dawn

Table 14 Content of Memory Bank 2
(Note: green values may differ depending upon environment and settings.

Address	Content (binary)	Content (hexadecimal)	Description	Remark
0x00	0000 0111	07h	Address of last accessible memory location	
0x01	0000 0000	00h	Indicator byte	Timeout
0x02	1111 1111	FFh	Lock byte	
0x03	0000 0001	01h	Version of the memory bank	
0x04	0000 0001	01h	Type of device	Type B (= 1)
0x05	0000 0010	19h	Maximum current consumed from bus power supply Rounded up with 1 mA resolution	25 mA
0x06	0000 0000	00h	Maximum average power consumed from the AUX power supply Rounded up with 0.1W resolution	The SLMS does not have an AUX power supply
0x07	1111 1111	FFh	Application controller arbitration	

Table 15 Content of Memory Bank 201.

6. REVISION HISTORY

LTR	REVISION RECORD	Author	APP	DATE dd.mm.yyyy
1	First draft	Marceline Keser Gied Habraken		13.06.2022
2	Second draft	Gied Habraken		17.06.2022
3	Third draft	Gied Habraken		21.07.2022
4	Fourth draft	Gied Habraken		21.09.2022
5				