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NIP (VAT ID No.): 679-25-51-640
REGON (Business ID No.): 351610904
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Account No.: PL 61 1140 1081 0000 3863 4100

DALI SYSTEMS COMMISSIONING

Glossary

- 1. Design documentation** - a detailed specification including a list of the lighting equipment, automation components, technical data cards, assembly instructions and installation guidelines, schemes and indications on how the all system components will be powered and connected to the lighting control installation; an addressing map of the devices and lighting control system elements, instructions and recommendations for the use of the system, a clear description of the scenes, luminaire grouping and lighting equipment operating modes, broken down into lighting control devices (e.g. the Vertex controllers), input devices (e.g. buttons, control panels), signal sources (e.g. light intensity sensors, presence and motion sensors, the BMS system), executive devices (e.g. the luminaires), and network elements (e.g. routers and PoE power supply units).
- 2. SLS** - a cloud-based service for remote access and monitoring for lighting systems using the VERTEX controller. The service allows for the remote control of the correct operation of the lighting system and makes it possible to provide remote technical/commissioning support in situations requiring it. The service is provided as a standard for every installation that includes the VERTEX master controller.
- 3. Technical readiness** - a stage of the installation work performed by the contractor laying out the electrical installation, consisting of the following:
 - 3.1. Installing the luminaires and lighting control devices.
 - 3.2. Laying down and connecting the power installation and the lighting control installation for the luminaires and lighting control devices.
 - 3.3. Controlling the compliance of the system's physical state, the completed installation and the connected devices with the Design Documentation.
 - 3.4. Acceptance of a technical commissioning stage by an internal contractor in accordance with the Checklist and removing all defects in the completed installation.
 - 3.5. Authorizing the system in the SLS for lighting control systems based on the VERTEX master controller.
 - 3.6. Submitting the system for the acceptance of a Technical Commissioning Stage by the ES-SYSTEM service technicians.
- 4. Functional readiness** - a stage of configuration and programming work carried out exclusively by the ES-SYSTEM Service team after the positive acceptance of the Technical Readiness Commissioning Stage. It consists of the following activities: identification of the individual luminaires, luminaire grouping, preparing scenes, the configuration of operating modes and DALI input devices (sensors, buttons), preparing the user interface for the operating panels and programming advanced operating modes for the system (adaptation lighting, presence detection, dynamic white light color changes, extended schedules for the display of light scenes).

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5. **Detailed design documentation** - provides more detailed information on the solutions included in the design documentation. It is used for the selection of the contractor for the work to be done, for performing the work, its quality control and the acceptance of the performed work.
6. **As-built documentation** - documentation of the electrical installation and the lighting control system installation that is prepared by the contractor performing the electrical work.
7. **DALI control bus** - an installation used to transfer commands in the DALI system, laid out particularly with cabling with a 2x1.5 mm² cross-section.
8. **Installation of structured LAN cabling** (twisted pair or fiber optic) - an installation that makes it possible to connect a larger group of DALI master controllers to a LAN network, made up of UTP CAT5e or CAT6 twisted pair or fiber optic cables that allow for exchanging data and messages among the DALI master controllers that are connected to the LAN network. This makes it possible to unify the control system and run commissioning and programming work from one physical point by connecting to the LAN network and thus eliminating the need to approach each controller individually. Connecting all the controllers existing in the installation to the LAN network is necessary in order to register the lighting control system in the SLS service and is a prerequisite for remote acceptances and providing remote commissioning support.
9. **DALI master controller** - a device that autonomously controls a single zone made up of up to 192 devices that are compliant with the DALI and DALI2 standards (ES-SYSTEM VERTEX, WAGO, LOYTEC, LUTRON, HELVAR). It is equipped with one or more DALI output buses. These controllers can be combined in larger systems via the LAN network (using twisted pair or fiber optic cabling).
10. **SLS Starter KIT – Access Modem** - a GSM modem and an active SIM card that is paired with it and allows access to the basic SLS service package for 5 years from the moment of registration of the VERTEX devices. The SIM card needs to be transferred to the user via an assignment agreement, and in case of sales outside the area of the Republic of Poland, individual arrangements may be necessary.

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Preparation stage for the System's Technical Readiness

Responsible entity – the Contractor

Scope

1. Luminaire installation in accordance with the Design Documentation; if changes were made to the original assumptions during the assembly stage, then those changes must also be entered in the documentation, especially on maps and plans; ES-SYSTEM must be notified of these revisions and changes as soon as possible (uruchomienie@essystem.pl).
2. Implementation of the electrical installation
3. Implementation of the lighting control installation
4. Marking the elements of the installation and the circuits in accordance with the Design Documentation
5. Putting the serial numbers of all of the elements of the lighting control system, particularly the emergency lighting devices, sensors and input devices in the as-built documentation and onto the building plans
6. Connecting the luminaires to the electrical and lighting control installations
7. Installing the lighting automation devices in accordance with the Design Documentation
8. Connecting the lighting automation devices to power and the lighting control installation
9. Verifying the correctness of the 230 V electrical installation, eliminating errors and faults if necessary
10. Verifying the correctness of the DALI bus installation and the structured LAN network, including eliminating any errors and faults
11. Formatting the batteries in the emergency luminaires in accordance with their instructions
12. Checking whether the network has active surge protection in accordance with the ES-SYSTEM requirements specified in the warranty conditions: for LED luminaires, surge protection devices with standard B + C surge protection are required (protection class I and II).
13. Lighting automation commissioning consists of the following:
 - a. Initial configuration of the DALI master controllers:
 - i) Commissioning the devices
 - ii) Assigning IP addresses
 - iii) Configuring the IP network that contains the DALI master controllers

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- iv) When commissioning the SLS service – connecting the SLS Access Modem device to one of the selected VERTEX master controllers and authorizing the system in the SLS service
- v) Scanning the DALI buses and detecting the devices and luminaires that are connected to them:
 - (1) Verification consisting of controlling the number of DALI devices and luminaires detected by the master controllers and ensuring that it complies with the Design Documentation
 - (2) Verifying the correct operation of the DALI luminaires connected to the DALI master controllers by controlling the DALI port – after the identification function has been enabled, all detected DALI luminaires should flash synchronously
- vi) The adopted modifications of the Design Documentation should be noted in the As-built Documentation
- vii) In the event of technical problems with devices or permanent faults or failures, a list containing the types of devices and a detailed description of the fault should be prepared and immediately sent to the sales consultant at ES-SYSTEM

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Contractor's checklist

1. Mechanical assembly

a. Were the luminaires installed in their final locations in accordance with the Design Documentation?

- YES
- NO

✓ Comments:

b. Were the sensors installed in their final locations in accordance with the Design Documentation?

- YES
- NO

✓ Comments:

c. Were the lighting control devices, the buttons and operator panels installed in their final locations in accordance with the Design Documentation?

- YES
- NO

✓ Comments:

d. Were all of the control panels (tablets) installed in their final locations, in accordance with the Design Documentation?

- YES
- NO

✓ Comments:

e. Were all of the network elements (especially switches, routers and PoE power supply units) installed in their final locations in accordance with the Design Documentation?

- YES
- NO

✓ Comments:

f. Were the DALI master controllers installed in the electrical switchboards in accordance with the Design Documentation?

- YES
- NO

✓ Comments:

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g. Were the serial numbers of the emergency luminaires drawn onto the building plan in the As-built Documentation?

• YES

• NO

✓ Comments:

h. Were the serial numbers of the lighting control devices (sensors, buttons) drawn onto the building plan in the As-built Documentation?

• YES

• NO

✓ Comments:

2. Electrical installation – supplying power

a. Are the luminaires connected and powered by 230 V AC voltage?

• YES

• NO

✓ Comments:

b. Was the effectiveness of the electrical shock protection measured?

• YES

• NO

✓ Comments

c. Is there continuity between the first and last element of all power lines?

• YES

• NO

✓ Comments:

d. Have all DALI master controllers been supplied with 230 V power?

• YES

• NO

✓ Comments:

e. Have all the actuators of the lighting control system (sensors, buttons, tablets) been properly supplied with power in accordance with the Design Documentation?

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- YES
 - NO
- ✓ Comments:

3. Electrical installation – the DALI control bus

- a. Have all of the elements of the system, such as the luminaires, sensors, buttons, controllers, network distribution devices (routers), operator panels and potential-free inputs been connected to the DALI control bus in accordance with the Design Documentation?

- YES
- NO

✓ Comments:

- b. Have the appropriate cross-sections and types of cables and DALI control bus lengths been maintained in accordance with the Design Documentation?

- The technical requirements regarding the installation have been described in the following chapters:
 1. Structured LAN cabling installation testing
 2. DALI cabling installation testing

- YES
- NO

✓ Comments:

- c. Have all interruptions in the continuity of the DALI control buses been eliminated?

- YES
- NO

✓ Comments:

- d. Have all short circuits been eliminated in the DALI control buses?

- YES
- NO

✓ Comments:

- e. Have all loops been eliminated in the circuits of the DALI control buses?

- YES
- NO

✓ Comments:

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- f. Has it been confirmed that there is no 230 V AC voltage connected to the circuits of the DALI control buses?
- YES
 - NO
- ✓ Comments:
- g. Has it been confirmed that the maximum permissible number of addresses per bus has not been exceeded (64)?
- YES
 - NO
- ✓ Comments:
- h. Have all electrical overloads been eliminated (i.e. excessively high current consumption by devices connected to the circuits of the DALI control buses)?
- YES
 - NO
- ✓ Comments:
- i. Have the circuits of the DALI control buses been connected to the DALI master controllers?
- YES
 - NO
- ✓ Comments:
- j. Is the number of actually installed DALI devices corresponding to the number of DALI devices in the Design Documentation?
- YES
 - NO
- ✓ Comments:
- k. Have the voltage levels been checked on the most remote devices on the circuits of the DALI control buses?
- YES
 - NO
- ✓ Comments:
4. Installation of the structured LAN cabling (hereinafter referred to as the LAN)
- a. If there is more than one DALI master controller, then have they been connected via the LAN to the switch or switches?

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- YES
 - NO
- ✓ Comments:

b. Has the structured LAN cabling installation been carried out in accordance with the ISO 11801 or EN 50173 standards using Fluke Network DSX-5000, DTX-1800 or DTX-1200 meters or using an equivalent with the same parameters and functions? (See chapter "Lighting control installation parameters and testing")

- YES
 - NO
- ✓ Comments:

c. Is the LAN connected to the devices that require LAN connection (switches, controllers, operator panels) and communicating with them?

- YES
 - NO
- ✓ Comments:

d. Is the number of devices that are actually connected to the LAN in accordance with the Design Documentation?

- YES
 - NO
- ✓ Comments:

e. Are the devices that should be powered in PoE technology powered properly?

- YES
 - NO
- ✓ Comments:

f. Have the DALI master controllers been marked with the IP addresses that had been assigned to them? Have the IP addresses been written down in the As-built Documentation and drawn onto the building plans?

- YES
 - NO
- ✓ Comments:

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- g. Is the SLS GSM Modem connected to one of the VERTEX devices and is the SLS LED emitting continuous blue light on all VERTEX devices?
- YES
 - NO
- ✓ Comments

5. Test run

- a. Have all DALI master controllers been assigned IP addresses?
- YES
 - NO
- ✓ Comments:
- b. Have all DALI master controllers been configured for operation in a work group?
- YES
 - NO
- ✓ Comments:
- c. Are all DALI master controllers visible in the DALI configuration application?
- YES
 - NO
- ✓ Comments:
- d. After scanning the system, are all DALI devices (luminaires, sensors, input devices) visible in the DALI configuration application?
- YES
 - NO
- ✓ Comments:
- e. Is the number of DALI devices visible in the system the same as in the Design Documentation? (General lighting luminaires, emergency luminaires, DALI power supply units, input devices, sensors, etc.)
- YES
 - NO
- ✓ Comments:

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f. Has the correctness of the operation of the DALI control buses been verified by using the identification of DALI master controller ports?

• YES

• NO

✓ Comments:

g. Have the names of the DALI master controllers been entered in the DALI configuration application in accordance with the Design Documentation?

• YES

• NO

1. Comments:

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Structured LAN cabling installation testing

Responsible entity – the Contractor

After the structured LAN cabling installation has been assembled, the contractor is required to perform the appropriate tests (for certification purposes) on all copper twisted pair and fiber optic cables to confirm that the LAN fulfills the requirements of the applicable standards.

The tests should be carried out in accordance with the limit values as defined in ISO 11801 or EN 50173. All tests must be passed with positive results.

The tests must be performed using a fully operational testing device with a valid certificate confirming it has been subjected to the process of calibration by its manufacturer, which is a confirmation of the correctness of its indications.

The as-built documentation should include the above-mentioned calibration certificate.

LAN copper twisted pair cabling testing

All twisted pair connections in the LAN should be tested to ensure that they fulfill the requirements of class E / category 6 according to ISO 11801 or EN 50173:

1. Test results should contain clear indications of the start and end of the cable routes in accordance with the Design Documentation.
2. The report should contain the following:
 - a. The test result for each LAN connection with a clearly marked start and end, marked in accordance with the documentation
 - b. A table with all of the test results for the connections in the LAN network in the following format:
 - i) <start marking, end marking> <result: positive>
 - ii) **A negative result is unacceptable – any faults must be eliminated before the installation is submitted for the acceptance of a Technical Readiness Stage**
3. The tests must be performed in a “Permanent Link” testing system (without patch cables).
4. The tests must be performed using a meter with an accuracy level of at least “Level IV”. The following meter types are recommended: Fluke Networks DSX-5000, DTX-1800 or DTX-1200.
5. Certification tests must be performed, during which the actual values of the connection’s parameters are measured and the meter subsequently automatically compares them to the limit values as defined in the current applicable cabling standards and determines the result of the comparison.
6. The results of the certification tests for all of the connections must be correct.
7. The tests must be performed in accordance with the requirements of the EN 50346 standard.

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8. The required scope of the tested parameters for each pair (combination of pairs) should include the following:

- A connection map – correctness and continuity of the assembled connections
- RL – Return Loss
- IL – Insertion Loss
- NEXT – Near End Crosstalk Loss
- PSNEXT – Power Sum NEXT
- ACR-N – Attenuation to Crosstalk Ratio at the Near end
- PSACR-N – Power Sum ACR-N
- ACR-F – Attenuation to Crosstalk Ratio at the Far end
- PSACR-F – Power Sum ACR-F
- Loop resistance for direct current (DC current loop)
- Propagation delay
- Delay skew

Fiber optic LAN cabling testing

All fiber optic cable connections in the system should be tested to ensure that they fulfill the requirements of the ISO 11801 or EN 50173 standards:

1. Test results should contain clear indications of the start and end of the cable routes in accordance with the Design Documentation.
2. The report should contain the following:
 - a. The test result for each LAN connection with a clearly marked start and end, marked in accordance with the documentation
 - b. A table with all of the test results for the connections in the LAN network in the following format:
 - i) <start marking, end marking> <result: positive>
 - ii) **A negative result is unacceptable – any faults must be eliminated before the installation is submitted for the acceptance of a Technical Readiness Stage**
3. Two-way testing must be performed, in which the source of the reference light signal will be placed in the first step at one end of the connection, and at the other end of the connection in the next step.



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4. Multimode connections (MM) should be tested in two transmission windows for the following wavelengths: 850 nm and 1300 nm.
5. Single mode connections (SM) should be tested in two transmission windows for the following wavelengths: 1310 nm and 1550 nm.
6. Certification tests must be performed, during which the actual values of the connection's parameters are measured and the meter subsequently automatically compares them to the limit values as defined in the current applicable cabling standards and determines the result of the comparison.
7. The test results for all of the connections must be positive.
8. The tests must be performed in accordance with the requirements of the EN 50346 standard.
9. The required scope of the tested parameters includes the following:
 - The continuity of the connection.
 - The length of the connection.
 - Fiber suppression for two wavelengths.

■
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DALI control bus testing

Technical parameters of the DALI circuits

1. Maximum number of physical DALI devices: 64
2. Maximum number of DALI groups: 16
3. Maximum number of DALI scenes: 16
4. Correct voltage range on the DALI bus: 9.5 V – 22.5 V, typically: 16 V
5. Maximum current on the DALI control bus:
 - a. Up to 180 mA for VERTEX controllers
 - b. Up to 250 mA for HELVAR DigiDim Router controllers
6. Transmission speed: 1200 baud
7. Maximum DALI control bus length:
 - a. Depends on the cross-section of the cable with the use of which it was installed. For cables with a cross-section of 1.5 mm², where the maximum voltage drop does not exceed 2 V, the distance is 300 m between the master controller and the most distant point.

Cabling verification

1. Controlling the number of devices
 - a. The number of devices connected to the DALI bus should be the same as in the Design Documentation
2. Controlling the cables used
 - a. An installation that is separated from the power lines
 - i) YDY 2 x 1.5 / YDYp 2 x 1.5 / YDYt 2 x 1.5 – two-core, single-wire, copper, unshielded cables with a 1.5 mm² cross-section
3. OMY 2 x 1.5 / OMYp 2 x 1.5 – two-core, multi-wire (flexible), copper, unshielded cables with a 1.5 mm² internal cross-section
4. Other, if compatible with the design
 - a. An installation that is combined with the power lines
 - i) YDY 4 x 1.5 / YDYp 4 x 1.5 / YDYt 4 x 1.5 – four-core, single-wire, copper, unshielded cables, with a 1.5 mm² cross-section – **for devices in protection class II**
 - ii) OMY 4 x 1.5 / OMYp 4 x 1.5 – four-core, multi-wire (flexible), copper, unshielded cables, with a 1.5 mm² cross-section – **for devices in protection class II**

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- iii) YDY 5 x 1.5 / YDYp 5 x 1.5 / YDYt 5 x 1.5 – five-core, single-wire, copper, unshielded cables, with a 1.5 mm² cross-section – **for devices in protection class I**
- iv) OMY 5 x 1.5 / OMYp 5 x 1.5 – five-core, multi-wire (flexible), copper, unshielded cables, with a 1.5 mm² cross-section – **for devices in protection class II**
- v) Other, if compatible with the Design Documentation

5. Verifying distance

- a. The length of the circuit of the DALI control bus from the master controller to the most distant point (device) must not exceed:
 - i) 300 meters for cables described in the previous item without the use of so-called “repeaters”
 - ii) 300 meters + the distance from the controller to the “repeater” – when using so-called “repeaters”
 - iii) the distance defined in the design – when using non-standard cabling that are compatible with the design

6. Verifying that there is no network voltage on the buses

- a. **PRIOR TO BEGINNING ANY WORK, IT IS NECESSARY TO USE A MULTIMETER TO CHECK IF THERE IS POSSIBLY ANY 230 V VOLTAGE ON THE DALI CONNECTORS, WHICH IS PROHIBITED DUE TO THE RISK OF DAMAGING THE DALI DEVICES**

7. The measurements should be performed at the ends of the DALI control bus near the DALI master controller

8. Voltage should be measured between lines D1 and D2

9. Measurement result: within the range between 9.5-22.5 V

10. Voltage should be measured between lines D1 and L1, D1 and L2, D1 and L3

11. Measurement result: ~0 V

12. Voltage should be measured between lines D2 and L1, D2 and L2, D2 and L3

13. Measurement result: ~0 V

14. Voltage should be measured between lines D1 and N

- a. Measurement result: ~0 V
- b. Voltage should be measured between lines D1 and PE
 - i) Measurement result: ~0 V

15. Verifying short circuits

- a. There should be no short circuit of line D1 (DA, DA+) from D2 (DA, DA-) anywhere on the DALI control bus
- b. This should be checked by measuring the continuity of the circuit on the DALI control bus using a universal meter between lines D1 and D2. This measurement should show **a lack of continuity**.

16. Verifying loops

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- a. There cannot be any loops at any of the DALI control bus's branching points
 - b. If there are loops in the DALI control bus circuits, the number of the DALI terminal devices detected by the master controllers will be different from the actual number of connected devices and the following events may occur:
 - i) The master controllers may show a changing, unstable number of devices
 - ii) After any loops have been eliminated, the number of the detected devices will be stable and will no longer change.
17. Verifying the voltage and current on the DALI control bus
- a. Measurements should be made on a connected and powered DALI control bus
18. **Measurements are only reliable when there is no transmission** the DALI control bus. **Make sure that the measurement is made while there is silence** on the DALI control bus. **In the event of active communication, the measurement results will be clearly lower than measurements during "silence"** on the DALI control bus.
19. Measure the voltage on the DALI control bus at the master controller for each bus
20. Measurement result: within the range between 9.5-22.5V
21. Measure the voltage of the DALI control bus near the most distant device from the master controller
22. Measurement result: within the range between 9.5-22.5V
23. Short-circuit the bus circuit near the most distant device from the master controller
24. Measure the voltage of the short-circuited DALI bus near the master controller
- a. Measurement result: within the range between 0-2 V
25. Voltage that is greater than 2 V indicates an exceedingly high bus resistance. In this situation, the DALI control bus length and the quality of the connections at the branching points should be verified.
26. Measure the short-circuit current of the DALI control bus
- a. Measurement result: depending on the specification of the master controller / the power supply of the bus, it should be no higher than 180 mA for VERTEX controllers and 250 mA for HELVAR DigiDim Router controllers.

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Acceptance of a stage included in the scope of the System's Technical Readiness

Responsible entity – the ES-SYSTEM Service Team

Conditions required for the acceptance

Persons required to conduct the acceptance:

- A representative of the contractor company
- A representative or administrator of the client (user)
- An ES-SYSTEM Automation Service Technician

1. A notification about the readiness for the acceptance of a stage included in the scope of Technical Readiness should be submitted no earlier than 15 working days before the Acceptance date. The notification should include the requirements for entering the construction site – passes, authorizations, OHS trainings, equipment, dispatch advice notes.
2. In connection with the Acceptance, it is necessary to provide the user with access to all installation elements, devices and premises of the facility where the Acceptance should take place. The user of the facility is obliged to allow for bringing the necessary tools and equipment into the facility, so that all devices that are part of the lighting system can be accessed.
3. Assistance should be ensured for the following persons:
 - a. Representatives of the contractor company assembling the installation (with knowledge regarding the assembled installation)
 - b. Representatives of the investor/user or administrator with knowledge about all lighting and lighting control installation details and the scope of the contractor company's work, authorized to grant permission to apply voltage to specific circuits in the installation
4. Providing documentation that allows for carrying out the acceptance of a stage specified in the scope of Technical Readiness and applying for the stage of commissioning specified in the scope of Functional Readiness, particularly the following:
 - a. The Design Documentation
 - b. The As-built Documentation containing the following elements that are consistent with the factual state:
 - i. List of circuits
 - ii. Number of luminaires
 - iii. Number of sensors

■
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- iv. Number of buttons
 - v. Number of network devices / switches (active devices)
 - vi. The number of DALI master controllers
 - vii. The number of operator panels
 - viii. All protocols from the performed measurements of the 230 V power installation, the DALI control buses, and structured LAN cabling
5. The documentation referred to in item 4b above must be provided at least 5 working days before the date of the acceptance of the part included in the scope of Technical Readiness.
 6. The ES-SYSTEM Service Team may refuse to perform the system commissioning service in the event of failure to meet the requirements set out in these guidelines. Beginning the system commissioning despite not meeting the above requirements does not by any means signify the confirmation of their fulfillment by default and does not release the contractor assembling the installation or the user from the obligation to assemble the installation in a manner that will allow for performing the commissioning of the lighting control system.

The ES-SYSTEM offer submitted for the commissioning of the system specified in it includes up to three interventions (including service visits and work done remotely) of the ES-SYSTEM Service Team with the purpose of performing the acceptance of the stage of Technical Readiness and the functional commissioning of the system.

Increasing the number of interventions (including service visits and work done remotely) for the purpose of performing the commissioning requires separate arrangements regarding the financial conditions. The arrangements must be made at least 2 weeks prior to the expected fourth service visit.

If the installation work was performed incorrectly, resulting in failure to obtain the acceptance of a stage specified in the scope of Technical Readiness, it will be regarded as the improper performance of the contract by the direct contractor of ES-SYSTEM and, as a consequence, subsequent visits of the ES-SYSTEM Service Team (including service visits and work done remotely) will take place at the expense of the user or the direct contractor of ES-SYSTEM at an additional charge.

If the Contractor is unable to eliminate all faults that prevent the acceptance of the Technical Readiness Stage by ES-SYSTEM in accordance with these guidelines, the ES-SYSTEM Service Team can eliminate the faults at the client or contractor's request for an additional charge, at an additional charge which will be determined individually.

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Preparation stage for the System's Functional Readiness

Conditions required before beginning work

1. A positive ACCEPTANCE of a stage included in the scope of Technical Readiness
2. The Design Documentation or requirements agreed on with the client/user include a detailed and sufficient description of the requirements that makes it possible to begin work on the configuration of the lighting control system.
 - a. The description of the requirements or the Design Documentation must include the following:
 - i. A description of the required scenes
 - ii. A description of the required groups
 - iii. A description of the required behavior of the trigger devices – buttons
 - iv. A description of the required operating modes
 - v. A description of the required System operation scenarios
 - vi. Graphic and functional design of the UI user interface for the operator panels
 - vii. The scope of integration with BMS, particularly the type of protocol that is used, a detailed description of functions that are subject to integration, a description of the data and messages that are exchanged as part of integration with BMS
3. Agreeing upon the date of beginning work with the installation contractor and the client and/or administrator
4. Providing access to all elements of the installation and devices (keys, high ladders, lifts)
5. Ensuring assistance for the following persons:
 - a. Representatives of the contractor company assembling the installation (with knowledge regarding the assembled installation)
 - b. Representatives of the investor/user or administrator with knowledge about all lighting and lighting control installation details and the scope of the contractor company's work, authorized to grant permission to apply voltage to specific circuits in the installation.

Responsible entity – the ES-SYSTEM Service Team or an Authorized Subcontractor of the ES-SYSTEM Service Team

Scope

1. Identification of DALI terminal devices (luminaires, sensors, buttons)
2. Grouping DALI luminaires in accordance with the Design Documentation
3. Configuring and programming lighting scenarios in accordance with the Design Documentation
 - a. Configuring buttons
 - b. Configuring sensors
 - c. Configuring lighting scenes
 - d. Configuring operating modes in accordance with the Design Documentation
 - i. Adaptive lighting
 - ii. Surveillance lighting
 - iii. Variable color temperature
 - iv. Circadian

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- v. And others included in the approved scope of the Design Documentation
4. Creating a UI user interface for the operator panels
 5. Controlling the correctness of operation.

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25.08.2020

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Checklist

1. Are all devices and luminaires included in the Design Documentation detected by the system and do they work correctly and react to DALI commands?
 - YES
 - NO
 - ✓ Comments:

2. Do the DALI trigger devices work properly?
 - a. Has the correctness of the triggering of scenes, scenarios or operating modes included in the Design Documentation been controlled?
 - YES
 - NO
 - ✓ Comments:

 - b. Do the luminaires react correctly
 - i. In accordance with the Design Documentation or approved requirements from the client?
 - YES
 - NO
 - ✓ Comments:

3. Do the motion / presence sensors work properly?
 - a. Is the efficiency and detection field compliant with the requirements included in the Design Documentation?
 - YES
 - NO
 - ✓ Comments:

 - b. Does the detection of motion or presence trigger lighting scenes and scenarios that are compliant with the Design Documentation or the approved requirements from the client?
 - YES
 - NO
 - ✓ Comments:

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4. Do the light sensors work properly?

a. Was the light measurement calibrated properly?

- i. Have measurements been performed correctly, including with a calibrated lux meter, and is there a plan in the report with **reference points** filled in, in which the measurements should be performed?

- YES
- NO

✓ Comments:

b. Do the sensors react correctly to the changes in the background lighting?

- YES
- NO

✓ Comments:

c. Are the sensors correctly associated with lighting scenarios, scenes and modes in accordance with the Design Documentation or the approved requirements from the client?

- YES
- NO

✓ Comments:

5. Has the correct operation of the operating modes and scenarios included in the design been controlled?

- a. Adaptive lighting
- b. Variable color temperature
- c. Surveillance lighting
- d. Circadian
- e. Scene display calendar
- f. Astronomical calendar
- g. And others included in the Design Documentation

In this case, a separate checklist should be prepared for each functionality separately, in accordance with the design and requirements.

- YES
- NO

✓ Comments:

6. Have test groups been set up for the emergency luminaires?

- YES
- NO



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✓ Comments:

7. Has an emergency lighting test schedule been programmed?

- YES
- NO

✓ Comments:

8. Has a functional test been completed with a positive report for the emergency luminaires?

- YES
- NO

✓ Comments:

9. Has the correctness of the operation of the functions associated with BMS building integration been verified?

- YES
- NO

✓ Comments:

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Acceptance of a stage included in the scope of the System's Functional Readiness – Total and final acceptance

Responsible entity – the ES-SYSTEM Service Team or an Authorized Subcontractor of the ES-SYSTEM Service Team

Conditions required for the acceptance

Persons required to conduct the acceptance:

- A representative of the contractor company
- A client's representative or administrator
- An ES-SYSTEM Automation Service Technician

1. A positive acceptance of the stage included in the scope of Technical Readiness
2. A positive acceptance of the stage included in the scope of Functional Readiness
3. A prepared, complete as-built documentation
4. A technical acceptance protocol prepared for signing

Scope

1. A tour of the facility and a random checks verifying of the compliance of the system's operation with the Design Documentation and approved customer requirements
2. Signing of the technical acceptance protocols

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