Webinar DG/S x.64.1.1 – Part 2
BU EPBP GPG Building Automation

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New Generation DALI-Gateways DG/S x.64.1.1 – Part 2

- Summary of the main features of the new DALI-Gateways
- DG/S 2.64.1.1 (2-fold) – benefits
- Installation
- Selected functions in ETS
- DG/S x.64.1.1 and emergency lighting
- Telegram communication on DALI (DALI Query)
- New functions in i-bus® Tool with demonstration
- Firmware Update tool in ETS with DG/S x.64.1.1
KNX DALI-Gateways DG/S x.64.1.1

Overview Devices

**DG/S x.64.1.1**

KNX DALI-Gateways 1-fold and 2-fold

- Supply voltage 100 - 240V AC/DC, 50/60Hz
  → Suitable for worldwide use
- Integrated DALI power supply
  → No additional power supply required
- DALI Outputs 230V secure
  → Incorrect connection with mains voltage does not destroy the device
- Manual operation with broadcast function
  → Test of installation and lighting
- 2 LEDs for device ON and DALI fault
  → Quick and easy diagnostics
- Fast application download via IPS/S 3.1.1 or IPR/S 3.1.1 (support long frames)
  → Time saving
KNX DALI-Gateways DG/S x.64.1.1

Overview Devices

DG/S x.64.1.1

KNX DALI-Gateways 1-fold and 2-fold

- Extended fault and status information via ETS and i-bus® Tool
  - Additional diagnostic options during operation and commissioning
- Flexible combination of DALI groups, KNX single control or KNX groups
  - DG/S 1.1 and DG/S 1.16.1 in one device, no longer the risk to select the wrong one
- Support DALI emergency lighting converter (DALI type 1)
  - General and emergency lighting in one system, with more functions and less investment
KNX DALI-Gateways DG/S x.64.1.1

Overview Devices

DG/S x.64.1.1

- KNX DALI-Gateways 1-fold and 2-fold
- Current functions* DG/S 1.1, DG/S 1.16.1 and DGN/S 1.16.1 are covered → **Downward compatibility**
- Special functions like turn off brightness, basic brightness, partial failure or templates → **new unique features**
- DALI commissioning via i-bus® tool → **unique support during commissioning and fault detection**
- Huge amount of group addresses (2000/4000) and group objects (1119/2233) → **no more problems with limited number and assignments of group addresses**

* Except sequence and overlapping DALI Groups
KNX DALI-Gateways DG/S x.64.1.1

Overview Devices

DG/S 1.64.1.1

KNX DALI-Gateway 1-fold

- **One** output for up to 64 DALI devices
- 16 DALI groups and 16 scenes
- …
KNX DALI-Gateways DG/S x.64.1.1

Overview Devices

DG/S 2.64.1.1

KNX DALI-Gateway 2-fold

- **Two independent** outputs for up to 128 DALI devices (2 x 64)
- Two independent DALI outputs
- Manual operation per channel with two buttons
- 16 DALI groups and 16 scenes each output, means in total 32 DALI groups and 32 scenes
- Thanks to comprehensive KNX groups no limits in combining all connected ballasts in any groups, even from further gateways

→ Two separate 'DALI worlds' in one component, very economical solution with reduced costs per channel, competitive solution, less competitors
KNX DALI-Gateways DG/S x.64.1.1

Single and Group Control
KNX DALI-Gateways DG/S x.64.1.1

Installation

Steps (1)

- Connecting the KNX power supply and bus cable, supply voltage at the KNX DALI-Gateway and the DALI line.
  Connection of all DALI lamps (power supply and DALI control cable)
- Switch on
  - 1. KNX power supply,
  - 2. Power supply for the DALI ballasts, then wait a few seconds until the ballasts are ready for operation
  - 3. Mains voltage of the DALI-Gateway, yellow LED at the gateway flashes
- DG/S starts the initialization phase
  - Allocation of DALI addresses*, or
  - Trigger addressing via i-bus® tool*

* Depends on ETS parameter ‘Enable automatic DALI addressing’ Yes/No
KNX DALI-Gateways DG/S x.64.1.1

Installation

Steps (2)

– Checking the DALI voltage:
  • Enable manual operation
    No DALI QUERY commands (cyclical requests of the DALI ballasts) are sent in manual mode. This means that no new DALI devices will be detected in manual operation and only the manual control buttons triggering switching commands will be sent to DALI. The actual DALI voltage can now be measured due to the absence of DALI telegrams.

– Measuring the DALI voltage (9.5 ... 21V DC)
  • DALI disconnected (Open circuit voltage)
  • DALI connected, at the end of each string with ballasts
    → between 9.5 and 21 V DC → OK
Steps (3)

- Testing the KNX bus voltage:
  - Press programming button → LED on → KNX Bus ok → Press programming button → LED off
- Checking the supply voltage at the DALI Gateway:
  - Switch on the voltage
  - Green LED on and yellow LED flashes
  - After a few seconds, the yellow LED goes off
  - Voltage not available: Green LED flashes (5 Hz)
- Testing the lighting:
  - By manually switching all the lights via control button on the device
In the ETS application of the gateways, up to 64 individual ballasts or up to 16 DALI groups can be parameterized per channel, with the following parameter blocks:

- Standard parameter e.g. dimming time
- Status and fault messages
- Functions (Forced operation, Block, burn-in, partial failure)
- Slave function
- Staircase

Normally not necessary to make individual parameter settings for each ballast or group.

This is very time-intensive so that simplification is useful for identical or slightly different settings.
The template is used in the ETS application of the KNX DALI-Gateways divided into the five parameter blocks mentioned plus general parameter.

- For the individual ballasts, DALI groups and for output A or B (Broadcast) you have the choice between transferring the template or individual parameter settings.
- Channels A/B of DG/S 2.64.1.1 are independent of each other.
**Turn off Brightness**

- The turn-off brightness can be parameterized for:
  - Output A / B
  - DALI Group
  - Ballast
  - Parameter template for individual ballasts, DALI groups and output A / B
- Turn off brightness means that, when sending a switch-off command, the lighting does not switch off completely, but goes to a selectable brightness value between 1 and 100%.
- The function can be used with "normal" switching off as well as "automatic switching off" (staircase lighting function)
Turn off Brightness

- Time to reach the turn off brightness can be fixed or variable via communication object ‘Flexible time for dimming/fade time’
- The turn off brightness can be activated and deactivated via a telegram
- The corresponding communication object must be enabled under the parameter page Output / Functions

**Important:** To enable a function it is often necessary to adjust parameters on two different pages. In such a case a help text informs about it

- **Application:** For security reasons darkness in corridors of hospitals or homes for elderly people is not accepted during the night
The Basic Brightness function is the part of the staircase lighting function and represents a further switch-off stage before the turn off brightness.

Parameter for staircase lighting:
- Brightness value and dimming time of staircase lighting
- Staircase lighting time
- Staircase lighting will switch off after reaching basic brightness
- Basic brightness for staircase lighting
- Dim period to reach basic brightness
- Basic brightness hold time
- Increase staircase lighting by switching on several times
The right diagram shows the sequence of a staircase lighting function with the adjustable values and times:

- Dimming to basic brightness is used as a pre-warning.
- If the push button is pressed again before the staircase lights or switches off, the time is restarted.
- It is very easy to extend the staircase lighting time by the user, up to a 5 times by pressing several times.
Fault Lamp/Ballast

- An important fault message is the missing function of a luminaire or the DALI ballast
- The information in the message (1 bit telegram with value 1) is either lamp fault or ballast fault or as a group signal lamp or ballast fault
- The error message can be parameterized for:
  - Output A / B
  - DALI Group
  - **New: Individual ballasts**
  - Parameter template for individual ballasts, DALI groups and output A / B
Fault Lamp/Ballast

- Separate fault messages for lamp faults and ballast faults can be parameterized for the entire output A or B

- Example: As a collective fault signal, information should be sent to the technical building service if either a luminaire or a ballast fails in the lighting system. If the corresponding message is displayed on the smart phone, the visualization of the building is then checked where exactly the error is.
  
  - The collective fault message (lamp or ballast) is generated from the fault message per channel mentioned above
  - In addition, the messages of the individual ballasts or DALI groups are displayed in the visualization
KNX DALI-Gateways DG/S x.64.1.1

ETS – Partial Failure

Partial Failure Output A
- Malfunction DALI voltage
- Active emergency lighting
- Lamp failure
- Electronic ballast fault

Output A, selected ballasts/DALI Groups
- e.g. 100 %
- e.g. 100 %
- e.g. 80 %
- e.g. 50 %

Other DALI Gateways or Actuators or Message
- e.g. 50%
- e.g. 100 %
- e.g. ON

Telegramm / Message

Internal
External
AND/OR
AND/OR
Partial Failure

- A partial failure of the lighting is defined as:
  - Malfunction DALI voltage
  - Active emergency lighting
  - Lamp failure
  - Electronic ballast fault

and can be chosen in the parameters (Parameter page Output/Functions)

- Selected ballasts or DALI groups can have an adjustable brightness level in case of a partial failure (Parameter page ballast x/group x functions)
Partial Failure

- **Forward partial failure internally to DALI output:**
  - All DALI groups and ballasts, which are to consider the partial failure function, go to the parameterized brightness value

- **Forward partial failure externally via object "Activate partial failure / status":**
  - A telegram with the value 1 is sent via this communication object, e.g. to switch further lighting circuits of other DALI-Gateways or to transmit a message

- **Example:** In case of partial failure (defined as lamp or ballast failure) all corridor and staircase lighting in an office building is turned on with maximum brightness
For each channel of the KNX DALI Gateways, a status byte is available in the application after enabling.

- The status byte indicates different states of the DALI output, which can be helpful for fault diagnosis during commissioning.
- Each individual bit represents a status information according to the table.

### Statusbyte Output A/B

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
</table>
| 0   | Bit 0: 1 = DALI controller failure in gateway, which occurs when the gateway supply voltage fails.
|     | 0 = There is communication with the DALI controller in the gateway          |
| 1   | Bit 1: 1 = DALI fault. This may be a DALI short circuit or overload, but a DALI fault also occurs when the gateway supply voltage fails (see bit 0).
|     | 0 = DALI voltage present                                                    |
| 2   | Bit 2: 1 = DALI overvoltage (>30 V), 0 = no DALI overvoltage                |
| 3   | Bit 3: 1 = DALI overcurrent/short circuit (>100 mA), 0 = no DALI overcurrent|
| 4   | Bit 4: 1 = More than 64 DALI devices are connected to the DALI output.
|     | 0 = No more than 64 DALI devices are connected to the DALI output          |
| 5   | Bit 5: 1 = DALI groups conflict. A group conflict occurs if a DALI device is parametrized as an individual device in ETS but also assigned to a DALI group.
|     | 0 = No DALI group conflict                                                  |
| 6   | Bit 6: 1 = DALI device type conflict. This occurs if the device type setting in ETS does not match the DALI device. For example, DALI device 37 is enabled as an emergency lighting converter (DALI type 1) in ETS, but the device with DALI address 37 is not a converter (type 1).
|     | 0 = No DALI device type conflict                                           |
| 7   | Bit 7: 1 = Overlapping DALI groups. This occurs if a DALI device is a member of two different DALI groups. This cannot be done with i-bus® Tool. But an overlapping DALI group can arise if a previously parametrized DALI device with a preprogrammed DALI group is connected to the DALI output.
|     | 0 = No overlapping DALI groups                                             |
| 8 to 15 | Bit 8 to 15: 0, not in use                                                   |
The status byte is available after enabling for:
- DALI Group
- Ballast
- Parameter template for individual ballasts and DALI groups

Example: The status byte indicates the states of the DALI output which are to be displayed in a visualization:
- DALI group blocked (Bit 3)
- Ballast 10 in burn-in mode (Bit 7)
Emergency Lighting is defined as lighting which will be active in case of malfunction of the general artificial lighting in the building.

- **Task:**
  - Minimum brightness to avoid panic
  - Illumination of emergency escape route
  - Orientation guide for exits
  - Secured light for special working areas
  - Light for security staff (e.g. fire brigade)

- In case of power failure on ballasts emergency light will be switched on automatically
- **Essential:** Monitoring of the system
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Emergency Lighting

**DG/S 1.64.1.1**

- Supported are DALI emergency converter according to IEC 62 386 type 1 (single battery emergency lights)
- It monitors an emergency lighting system with single battery and provides the information (test results) on standardized DALI telegrams according to IEC 62 386-202
- The DALI-Gateway evaluates this information and transfer the test results to the KNX
- Brightness value of emergency light adjustable in ETS Application, some converter are parametrisable, normally 100 %

→ **General and emergency lighting in one system, with more functions and less investment**
Type of Emergency Lighting Test

- **Function Test:**
  - The functional safety of the electronics of the emergency lighting converter and the correct operation of the lamp and the switching device for a single battery are checked

- **Duration Test**
  - The test is used to determine whether the single battery supplies the system within the limits of the rated operating time in emergency lighting mode.

- **Partial Duration Test**
  - A duration test which is interrupted by the gateway after the parametrized period
Emergency Lighting Test – Group Objects per Emergency Light

- Function Test
- Duration Test
- Partial Duration Test

Emergency Lighting Converter Status

1 Byte

Trigger Emergency Lighting Test (Status)

2 Byte

Emergency Lighting Test Result

6 Byte
Emergency Lighting Test

**Group Objects Em. Light X**

- **Trigger Emergency Lighting Test (1 Byte):**
  - Depending on Value (0-6) different tests (duration, partial duration or function) for the assigned emergency converter will be triggered or stopped
  - Data format can be either KNX format DPT_CTC or DGN/S 1.16.1 format to be compatible with former device DGN/S

- **Option: Trigger Emergency Lighting Test Status (1 Byte, for DGN/S format only):**
  - Additional status information in group object available (Bit 3...7)

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**Em. Lighting Test**

- Function Test
- Duration Test
- Partial Duration Test

**Enable Group objects**

- "Trigger em lighting test"
  - Yes, DGN/S1.16.1 format with status
  - No
  - Yes, KNX format DPT_CTC
  - Yes, DGN/S1.16.1 format with status

**Bit 0...2**

- 000, stops the test currently running
- 001, function test is requested
- 010, partial duration test is requested
- 011, duration test is requested
- 100, battery is queried
- 101, 110 and 111 without function or not taken into account in the request evaluation

**Bit 3...7**

- 0, without function or not taken into account in the request evaluation.
Group Objects Em. Light X

- Emergency Lighting Converter *Status* (2 Byte):
  - Status information of the Converter, e.g.
  - Normal or Emergency mode active
  - Inhibit or Rest mode active
  - Any test running
  - Which test is running
  - Any fault status detected
  - …
**Group Objects Em. Light X**

- Emergency Lighting Test *Result* (6 Byte):
  - Result depending on type of Emergency Lighting Test triggered, e.g.
  - Test successful or not
  - Way of triggering
  - Battery Capacity
  - Battery Discharging time
  - …

### Emergency Lighting Test Result

<table>
<thead>
<tr>
<th>6&lt;sub&gt;MSB&lt;/sub&gt;</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1&lt;sub&gt;LSB&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTRF</td>
<td>LTRD</td>
<td>LTRP 0000</td>
<td>SFSDP00</td>
<td>LDTR</td>
<td>LPDTR</td>
</tr>
<tr>
<td>NNNNNNNN</td>
<td>NNNrrrr</td>
<td>NNNNNNrr</td>
<td>UUUUUUUU</td>
<td>UUUUUUUU</td>
<td>UUUUUUU</td>
</tr>
</tbody>
</table>

The coding is based on numeric values generated from bit fields of various lengths:

**LTRF** Result of last function test (4-bit numeric value 0…15)
- 0 = Reserved, no function
- 1 = Function test passed within execution time\(^1\)
- 2 = Function test passed but not within execution time\(^1\)
- 3 = Function test failed
- 4 = Function test failed. Result determined outside execution time\(^1\)
- 5 = Function test stopped manually
- 6 - 15 = Reserved, no function

**LPDTR** corresponds to battery charge (DALI 241) (1-byte, unsigned)
- 0, corresponds to discharged battery
- 254, corresponds to fully charged battery
- 255, emergency lighting converter does not support the *Battery charge state status function*
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Emergency Lighting Test – Group Objects per Output A/B

- Function Test
- Duration Test
- Partial Duration Test

Emergency Lighting Test Status addressed

Emergency Lighting Test Result addressed

Activate / Status

Inhibit / Rest Mode

Synchronize autom. Em. Lighting Test

Stop Emergency Lighting Test

Trigger Em. Lighting Test addressed

Output A / B

2 Byte

1 Bit

1 Bit

1 Bit
Emergency Lighting

**Group Objects Output A/B**

- **Trigger Emergency Lighting Test addressed:**
  - Data format can be either KNX format DPT_CTC or DGN/S 1.16.1 format to be compatible with former device DGN/S.
  - **High Byte:** Contains a number which determines the type of emergency light test to be started.
  - **Low Byte:** Contains a number (0...63) which represents DALI device to be tested.

---

2 Byte

**Trigger Em. Lighting Test addressed**

- **Em. Lighting Test**

---

2 Byte

**"Trigger em lighting test (add1)"**

- Yes, KNX format DPT_CTC
- No
- Yes, KNX format DPT_CTC
- Yes, DGN/S 1.16.1 format

---

**Bit 0...5** = contains the binary number (0...63). This number is the number of the DALI emergency lighting converter (Emergency light x) that the High byte information relates to, plus 1.

- **Bit 6** = 0
- **Bit 7** = 1

**The value of the High byte contains the information on which emergency lighting test to trigger.**

- **Value 0 (000)** = Reserved, no function
- **Value 1 (001)** = Function test requested (corresponds to DALI Cmd 227)
- **Value 2 (010)** = Duration test requested (corresponds to DALI Cmd 228)
- **Value 3 (011)** = Partial duration test requested
- **Value 4 (000)** = Stops the test currently running (corresponds to DALI Cmd 229)
- **Value 5 (101)** = Function test flag reset (corresponds to DALI Cmd 230). This means that if a function test is requested and cannot be executed, a flag is set in the emergency lighting converter indicating that the test is pending. This flag can be canceled so that a function test is no longer pending.
- **Value 6 (110)** = Duration test flag reset (corresponds to DALI Cmd 231). This means that if a duration test is requested and cannot be executed, a flag is set in the emergency lighting converter indicating that the test is pending. This flag can be canceled so that a duration test is no longer pending.
- **Value 7...255** = Reserved, no function.
Stop Emergency Lighting Test:
• All running emergency lighting tests in the channel will be stopped

Group Objects Output A/B

Stop Emergency Lighting Test

Em. Lighting Test

- Function Test

1 Bit
Emergency Lighting

**Automatic Emergency Lighting Test**

- The automatic emergency lighting test is an optional function of the DALI standard for emergency lighting converters according to DIN EN 62 386-202.

- **Condition:** Converter supports automatic test

- The automatic emergency lighting test is an independent function of an emergency lighting converter. The converter performs the tests cyclically according to its own time adjustments, no external trigger required

- In principle all type of tests can be performed

- Test cycle to be parametrized in the application (Value x 15 min)
Emergency Lighting

Group Objects Output A/B

- Synchronize automatic Emergency Lighting Test:
  - This communication object is used to transfer the start request for the automatic emergency lighting tests from the gateway to the emergency lighting converters. The start itself is carried out by the emergency lighting converter when it is ready.
  - To be parametrized whether a dedicated emergency converter uses this mode.
  - Offset time between converters to run automatic test adjustable.

Synchronize autom. Em. Lighting Test

Duration Test

Partial Duration Test

Allow emergency lighting tests (em lighting converters must support this)

Offset time between testing two consecutive em lighting converters

Enable fct Automatic emergency lighting test

Object "Synch auto emergency lighting tests"

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May 30, 2017
**Inhibit Mode (Emergency light not active):**
- The inhibit mode is a time-limited state (15 min) of the emergency light converter, in which the emergency light does not go into the emergency lighting mode in the event of mains voltage failure.

**Rest Mode (Emergency light active):**
- The Rest Mode is a state in which the emergency light is switched off during emergency lighting operation. The Rest Mode is automatically deactivated after voltage recovery.

- Only one group object
- To be parametrized whether a dedicated emergency converter uses these modes
Emergency Lighting Test Status addressed:

- **High Byte:** Contains in coded form the test result of the emergency light converter
- **Status information of the Converter, e.g. any test running**
- **Which test is running**
- **Test is running or stopped**
- **Lamp/Converter fault detected**

- **Low Byte:** Contains a number (0...63) which represents the tested DALI device

```
Bit 0...5 = Contains the binary number (0...63). This number is the number of the DALI device that the High byte information relates to, plus 1.
Bit 6 = 0, without function or not taken into account in the request evaluation.
Bit 7 = 1, status value request. If a telegram with a set bit 7 is received, it is interpreted as a test status request and corresponding feedback is sent. When the answer is returned, the value of bit 7 is reset to 0.
Bits 8 ... 10 = 000, no test
= 001, function test
= 010, partial duration test
= 011, duration test
= 100, battery query (does not require a time and therefore is not displayed)
= 101 and 110 without function not taken into account in evaluation
= 111, there is no valid test state or the queried DALI device does not support DALI Standard IEC 62386-202 for emergency lighting converters. The content of bit 8...15 is invalid.
Bit 11 and 12 = 00, test finished (the Em lighting test result group object shows whether the test is a pass or fail)
= 01, test pending, not yet started
= 10, test running
= 11, test interrupted
Bit 13 = 1, testing manually started
Bit 14 = 1, lamp fault (emergency lighting converter)
Bit 15 = 1, device (emergency lighting converter) fault
```
KNX DALI-Gateways DG/S x.64.1.1

Emergency Lighting

Group Objects Output A/B

- Emergency Lighting Test Result addressed:
  - Kind of last test
  - Test successful
  - Battery Fault
  - Battery Capacity
  - Discharge Time
  - Lamp or Converter failure

Low Byte:
Contains a number (0…63) which represents the tested DALI device

Bit 0...5 = contains the binary number (0…63). This number is the number of the DALI device that the High byte information relates to, plus 1.
Bit 6 = 0 indicates that the information concerns an individual emergency lighting converter
Bit 7 = 1, status value request. If a telegram with a set bit 7 is received, it is interpreted as a request for various status messages about the DALI device and corresponding feedback is sent. When the answer is returned, the value of bit 7 is set to 0.
Bit 8 = 1, last test was a function test
Bit 9 = 1, last test was a partial duration test
Bit 10 = 1, last test was duration test
Bit 11 = 1, if there is at least one fault in bit 16...23 or it is not possible to poll the emergency lighting converter battery
Bit 12 = 1, battery query finished (must be supported by the converter, optional only in DALI standard)
Bit 13...14 = 0, without function
Bit 15 = 1, there is no valid test state or the queried DALI device does not support DALI Standard IEC 62386-202 for emergency lighting converters. The content of the other bits is invalid.
Bit 16...23 = correspond to DALI telegram 252 ("query failure status")
Bit 16 = 1, switching defective. The emergency lighting converter did not respond during the test.
Bit 17 = 1, battery fault (battery fully discharged before rated operating time completed)
Bit 18 = 1, battery defective, battery fault
Bit 19 = 1, emergency lighting lamp fault
Bit 20 = 1, function test was triggered but could not be started in the predefined time
Bit 21 = 1, duration test was triggered but could not be started in the predefined time
Bit 22 = 1, function test fault, fail
Bit 23 = 1, duration test fault, fail
Bit 24...31 = Depending which test has been undertaken, this highest byte contains the battery charge state (0...255 = 0...100%) or the duration of the test until the battery was discharged. The value corresponds to the time in 2 x min.
1. Trigger em lighting test (CTC): “01” *Function test requested*

2. Em lighting test status - addressed Output A: “29 10h → 0-0-1-01-001-0-0-010000”
   Device 17, function test, test pending, testing manually started, no lamp or ballast fault

3. Em lighting test status - addressed Output A: “31 10h → 0-0-1-10-001-0-0-010000”
   Device 17, function test, test running, testing manually started, no lamp or ballast fault

4. Em converter status - Output A Emergency light 17: “70 55h → 0111-0000-01-01-01-01”
   Function test running, inhibit mode not active, no test pending, no faults present

---

**Test: Emergency lighting converter**

<table>
<thead>
<tr>
<th>#</th>
<th>Time</th>
<th>Source A</th>
<th>Source Name</th>
<th>Destination Name</th>
<th>Rout</th>
<th>Type</th>
<th>DPT</th>
<th>Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24.05.2017</td>
<td>11:29:37</td>
<td>USB/S1.1 USB-Interface,MDRC</td>
<td>976 Trigger em lighting test (CTC) - Output A Emergency light 17</td>
<td>6</td>
<td>GroupValueW...</td>
<td>5010</td>
<td>Recording was started.</td>
</tr>
<tr>
<td>2</td>
<td>24.05.2017</td>
<td>11:30:06</td>
<td>DG/S1.64 11 DALI Gateway, Basic...</td>
<td>41 Em lighting test status - addressed Output A</td>
<td>6</td>
<td>GroupValueW...</td>
<td>7001 pulses 29 10</td>
<td>10512 pulses</td>
</tr>
<tr>
<td>3</td>
<td>24.05.2017</td>
<td>11:30:08</td>
<td>DG/S1.64 11 DALI Gateway, Basic...</td>
<td>41 Em lighting test status - addressed Output A</td>
<td>6</td>
<td>GroupValueW...</td>
<td>7001 pulses 31 10</td>
<td>12560 pulses</td>
</tr>
<tr>
<td>4</td>
<td>24.05.2017</td>
<td>11:30:32</td>
<td>DG/S1.64 11 DALI Gateway, Basic...</td>
<td>978 Emergency lighting converter status - Output A Emergency light 17</td>
<td>6</td>
<td>GroupValueW...</td>
<td>7001 pulses 70 55</td>
<td>28757 pulses</td>
</tr>
<tr>
<td>5</td>
<td>24.05.2017</td>
<td>11:31:20</td>
<td>DG/S1.64 11 DALI Gateway, Basic...</td>
<td>978 Emergency lighting converter status - Output A Emergency light 17</td>
<td>6</td>
<td>GroupValueW...</td>
<td>7001 pulses 10 55</td>
<td>4181 pulses</td>
</tr>
<tr>
<td>6</td>
<td>24.05.2017</td>
<td>11:31:25</td>
<td>DG/S1.64 11 DALI Gateway, Basic...</td>
<td>41 Em lighting test status - addressed Output A</td>
<td>6</td>
<td>GroupValueW...</td>
<td>7001 pulses 01 10</td>
<td>272 pulses</td>
</tr>
<tr>
<td>7</td>
<td>24.05.2017</td>
<td>11:31:27</td>
<td>DG/S1.64 11 DALI Gateway, Basic...</td>
<td>42 Em lighting test result - addressed Output A</td>
<td>6</td>
<td>GroupValueW...</td>
<td>12 000 cou...</td>
<td>01 00 10 272 counts</td>
</tr>
<tr>
<td>8</td>
<td>24.05.2017</td>
<td>11:31:30</td>
<td>DG/S1.64 11 DALI Gateway, Basic...</td>
<td>977 Em lighting test result - Output A Emergency light 17</td>
<td>6</td>
<td>GroupValueW...</td>
<td>419.001 al...</td>
<td>10 80 00 00 00 00</td>
</tr>
<tr>
<td>9</td>
<td>24.05.2017</td>
<td>11:31:32</td>
<td>DG/S1.64 11 DALI Gateway, Basic...</td>
<td>977 Em lighting test result - Output A Emergency light 17</td>
<td>6</td>
<td>GroupValueW...</td>
<td>419.001 al...</td>
<td>10 80 00 00 00 00</td>
</tr>
</tbody>
</table>
KNX DALI-Gateways DG/S x.64.1.1

Emergency Lighting

Test: Emergency lighting converter

5. Em converter status - Output A Emergency light 17: “10 55h → 0001-0000-01-01-01-01”
   Function test passed within execution time, inhibit mode not active, no test pending, no faults

6. Em lighting test status - addressed Output A: “01 10h → 0-0-0-00-01-0-0-010000”
   Device 17, function test, test finished, no lamp or ballast fault

7. Em lighting test result - addressed Output A: “00 00 01 10 → …. 0-00-0-0-0-0-0-010000”
   Device 17, last test was a function test, no function test fault (not failed)

8. Em lighting test result - Output A Emergency light 17: “10 00 80 00 00 00 → 0001- … 1000 - ….”
   Last function test passed within execution time, triggered by gateway,

<table>
<thead>
<tr>
<th>#</th>
<th>Time</th>
<th>Source A</th>
<th>Source Name</th>
<th>Destination Name</th>
<th>Routine Type</th>
<th>DPT</th>
<th>Info</th>
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<td>24.05.2017 11:29:37,486</td>
<td>1.1.255</td>
<td>USB/SI.1 USB Interface, MDRC</td>
<td>976</td>
<td>Trigger em lighting test (CTC) - Output A Emergency light 17</td>
<td>6</td>
<td>GroupValueWireless</td>
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<tr>
<td>2</td>
<td>24.05.2017 11:30:05,905</td>
<td>1.1.53</td>
<td>DG/S164.11 DALI Gateway, Basic, 41</td>
<td>41</td>
<td>Em lighting test status - addressed Output A</td>
<td>6</td>
<td>GroupValueWireless</td>
</tr>
<tr>
<td>3</td>
<td>24.05.2017 11:30:08,303</td>
<td>1.1.53</td>
<td>DG/S164.11 DALI Gateway, Basic, 41</td>
<td>41</td>
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<td>6</td>
<td>GroupValueWireless</td>
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<tr>
<td>4</td>
<td>24.05.2017 11:30:08,303</td>
<td>1.1.53</td>
<td>DG/S164.11 DALI Gateway, Basic, 978</td>
<td>41</td>
<td>Emergency lighting converter status - Output A Emergency light 17</td>
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<tr>
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<td>41</td>
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<td>DG/S164.11 DALI Gateway, Basic, 977</td>
<td>41</td>
<td>Em lighting test result - Output A Emergency light 17</td>
<td>6</td>
<td>GroupValueWireless</td>
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<td>9</td>
<td>24.05.2017 11:31:32,778</td>
<td>1.1.53</td>
<td>DG/S164.11 DALI Gateway, Basic, 41</td>
<td>41</td>
<td>Em lighting test status - addressed Output A</td>
<td>6</td>
<td>GroupValueWireless</td>
</tr>
</tbody>
</table>

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KNX DALI-Gateways DG/S x.64.1.1

Emergency Lighting

Summary

- Comprehensive and powerful solution to integrate emergency and conventional lighting in one DALI/KNX system
- Application in the new gateways is optimized compared with DGN/S 1.16.1
- General and emergency lighting combined in one system with all benefits of less wiring and installation
- Fulfills international standard IEC 62386-202
- Visualization required to log the test results

→ In any commercial project with KNX, DALI and emergency lighting it’s a must to discuss this solution
DALI Communication

**Principle**

- DALI Protocol is standardized, transferred with 1200 Baud on a 2 wires cable
- The DALI-Gateway as the Master queries all DALI addresses (0-63) for brightness level/lamp failure. (QUERY ACTUAL LEVEL, QUERY LAMP FAILURE) This is a continuous process for all possible addresses, called DALI Query. Time between each query is up to 40-50 msec.
- DALI commands:
  - DIRECT ARC POWER (on or value)
  - Dim up/down
  - Set fade time
KNX DALI-Gateways DG/S x.64.1.1

DALI Communication

Access to DALI telegrams

- DALI USB Interface
- Software “DALI Monitor”
DALI Communication

DALI QUERY

- DG/S 1.64.1.1, 6 ballasts are connected
  - QUERY ACTUAL LEVEL A0 (Ballast No. 1)
  - Answer: 254 (100 % Brightness)
  - QUERY LAMP FAILURE A0
  - → no answer from A0 as it is ok
  - The same for ballast No. 2 – 5
  - QUERY ACTUAL LEVEL A6 (Ballast No. 7)
  - → no answer from A6 as it does not exist, therefore no QUERY LAMP FAILURE necessary
  - The same for ballast No. 8 – 64
  - QUERY ACTUAL LEVEL A0 (Ballast No. 1)
  - ...

<table>
<thead>
<tr>
<th>Query</th>
<th>Answer</th>
<th>Lamp Failure</th>
<th>Time</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>01A0</td>
<td>A0</td>
<td>254 (0xFE)</td>
<td>11:28:49.391</td>
<td>12.05.2017</td>
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<tr>
<td>01B0</td>
<td>A1</td>
<td>84 (0x54)</td>
<td>11:28:49.471</td>
<td>12.05.2017</td>
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<tr>
<td>02A0</td>
<td>A2</td>
<td>254 (0xFE)</td>
<td>11:28:49.465</td>
<td>12.05.2017</td>
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<tr>
<td>03A0</td>
<td>A3</td>
<td></td>
<td>11:28:49.459</td>
<td>12.05.2017</td>
</tr>
<tr>
<td>04A0</td>
<td>A4</td>
<td></td>
<td>11:28:49.515</td>
<td>12.05.2017</td>
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<td>05A0</td>
<td>A5</td>
<td></td>
<td>11:28:49.549</td>
<td>12.05.2017</td>
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<td>06A0</td>
<td>A6</td>
<td></td>
<td>11:28:49.553</td>
<td>12.05.2017</td>
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<tr>
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<td>A9</td>
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<td>A11</td>
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<td>A12</td>
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<td>A13</td>
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<tr>
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<td>12.05.2017</td>
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<td>A22</td>
<td></td>
<td>11:28:50.302</td>
<td>12.05.2017</td>
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<tr>
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</tr>
<tr>
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<td>A24</td>
<td></td>
<td>11:28:50.400</td>
<td>12.05.2017</td>
</tr>
</tbody>
</table>
Via the parameter in ETS it’s feasible to extend the time each query, starting from 100 ms to 25.5 s. This might be necessary for some ballasts where the queries with standard time are too fast, e.g. emergency lighting converter.

With Parameter adjustment 3 x 100 ms the time between each query is around 300 ms.

Please note:

- i-bus® tool connected to DALI Gateway results in ignoring additional pause, standard time 40-50 ms is valid.
- With manual mode active, DALI QUERY is disabled in order to measure the DALI voltage correctly.
**DALI Command**

- Any command to take action is processed immediately
  - DIRECT ARC POWER A0 (Switch off ballast No. 1)
  - Later cycle DALI QUERY ACTUAL LEVEL A0: Answer 0 (off)
DALI Groups versus KNX Groups

- **DALI Group:**
  - Only one telegram to be sent on DALI as the DALI system knows about the group
  - In huge groups no delay in operation

- **KNX Group:**
  - For each ballast in a group one DALI telegram to be transmitted with a delay of 30 ms
  - In huge groups (e.g. 60 participants) almost 2 s delay, means a visible 'running light'

---

DALI Group with 5 ballasts:

<table>
<thead>
<tr>
<th>DAP</th>
<th>FE</th>
<th>G0</th>
</tr>
</thead>
<tbody>
<tr>
<td>80FE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

KNX Group with 5 ballasts:

<table>
<thead>
<tr>
<th>DAP</th>
<th>FE</th>
<th>G0</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000</td>
<td>A0</td>
<td></td>
</tr>
<tr>
<td>0200</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>0400</td>
<td>A2</td>
<td></td>
</tr>
<tr>
<td>0500</td>
<td>A3</td>
<td></td>
</tr>
<tr>
<td>0800</td>
<td>A4</td>
<td></td>
</tr>
</tbody>
</table>
As mentioned a command on DALI is carried out at once, on DALI the actual brightness level is updated latest in the next query cycle, which can take some time.

The DALI Gateway sends immediately after execution of a command the status on the KNX bus. It is a kind of simulation as the gateway assumes that the light is really on, which is most probably correct. During the DALI Query process finally the gateway achieves the real status from the ballast. Assumed the DALI Query time is not extended in the ETS application the maximum time to get the real status from the DALI ballast is up to 6 s. (worst case)
KNX DALI-Gateways DG/S x.64.1.1

DALI Communication

**Conclusion**

- DALI as a Master (Gateway) – Slave (Ballasts)
  System allows with DALI QUERY to achieve the brightness level and to detect lamp failure

- Commands (e.g. light on) are sent directly on DALI to take action

- Status information of the lamps are thanks to (simulated) feedback quickly on KNX available

- In the event of big KNX groups delay in sending the commands on DALI (each ballast one DALI command) has to be considered

- In addition individual status information can cause higher traffic on KNX and delay in status information
DALI-Gateways and i-bus® Tool

Webinar “i-bus® Tool – benefit in practice” from March 2017

Webinar “i-bus® Tool – a professional Service Tool” from March 2014

Videos and slides are available on Training & Qualification Database

→ Application “Installation and Commissioning”

→ Link
Overview i-bus® Tool

It supports system integrators during commissioning and service.

Internal information and states of the device hardware and software applications are now available in a transparent manner.

The i-bus® Tool is optional, i.e. the ABB i-bus® KNX devices must still be commissioned using just the ETS.

An important principle is that no divergences to the ETS project can result through the i-bus® Tool.

Download: www.abb.com/knx
  > Services & Tools
  > Engineering Tools
The DALI Tool is mandatory for setting up the KNX DALI devices.

- The status of the DALI outputs and gateways is displayed in compact form.
- Faults (lamp, ballast or communication) in the DALI system or in the gateway are highlighted by red lettering or red fields.
- DALI addresses can be assigned.
- Assignment of the DALI devices into DALI groups.
- Commissioning of constant light control (DALI Light Controller).
- ...
i-bus® Tool: New functions for DALI

Pages
- Overview
  All connected DALI devices are displayed
- Detail
  Individual devices or groups can be tested
- Emergency converter
  Only the emergency lighting converters (DALI type 1 according to EN 62386-202) are displayed and can be tested

Manual operation blocked or running
Finding and testing of individual ballasts and groups (switching, dimming or blinking of selected DALI devices)
Trigger DALI addressing (only when ETS no)
Trigger and clear DALI monitoring
i-bus® Tool: New functions for DALI

Information about overlapping groups, more than 64 devices, ...

Display operating states ballasts/groups (staircase lighting / slave light controller / forced operation / blocked, ...) 

Display DALI Telegram errors (framing errors) 

Legend with information from devices and ETS configuration → Comparison of information from ballast and ETS programming 

Display and monitoring of burn-in mode 

Start and display different tests of an emergency lighting converter (function, duration, partial duration and battery capacity test) 

...
KNX DALI-Gateways DG/S x.64.1.1

Update of KNX devices

The ETS app “KNX Bus Update” serves for the firmware update of various ABB KNX devices (e.g. DALI-Gateways, presence detectors) via the ETS (Engineering Tool Software).

The app can be used with ETS4 or ETS5

Free of charge!

Download the app (https://my.knx.org) and install the product license on your ETS dongle.

Download the current firmware files of the KNX devices (*.fwupd)
**KNX DALI-Gateways DG/S x.64.1.1**

**Update of KNX devices**

Start ETS and build up a communication to the KNX installation (USB or IP)
Download individual address and application
Open app (Extras → ABB → …)
Import update file (*.fwupd)
Select device type (e.g. DG/S) and press “Reload” button
Possible updates of devices will be displayed
Choose the latest version of the update file
Select device(s) and start firmware update

All parameters and group addresses will not be deleted from the device while updating the firmware!!!
KNX DALI-Gateways DG/S x.64.1.1
Training & Qualification

**KNX Certified Training**

Certified KNX Courses in Heidelberg
- Advanced Course 17th to 21st July
- Tutor Course 09th to 13th October

And many more training courses in the calendar “International Training Dates 2017”

**Certified KNX Basic Course April 2017 in Heidelberg**
KNX DALI-Gateways DG/S x.64.1.1

Next Webinar

**KNX Sensors for commercial Buildings**

Wednesday 21\(^{st}\) June 2017

- Morning 09:00 am Europe Time (Berlin, UTC + 2h)
- Afternoon 03:00 pm Europe Time (Berlin, UTC + 2h)

- Push buttons with integrated temperature sensor
- Push button coupler for ocean
- RTC with integrated inputs, CO\(_2\) and humidity sensor and controller
- Motion sensor

* Topic is subjected to change
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