

KNXperience, September 2021

KNX DALI Gateway Premium DG/Sx.64.5.1

Powerful Functions with new ETS Application V2.0

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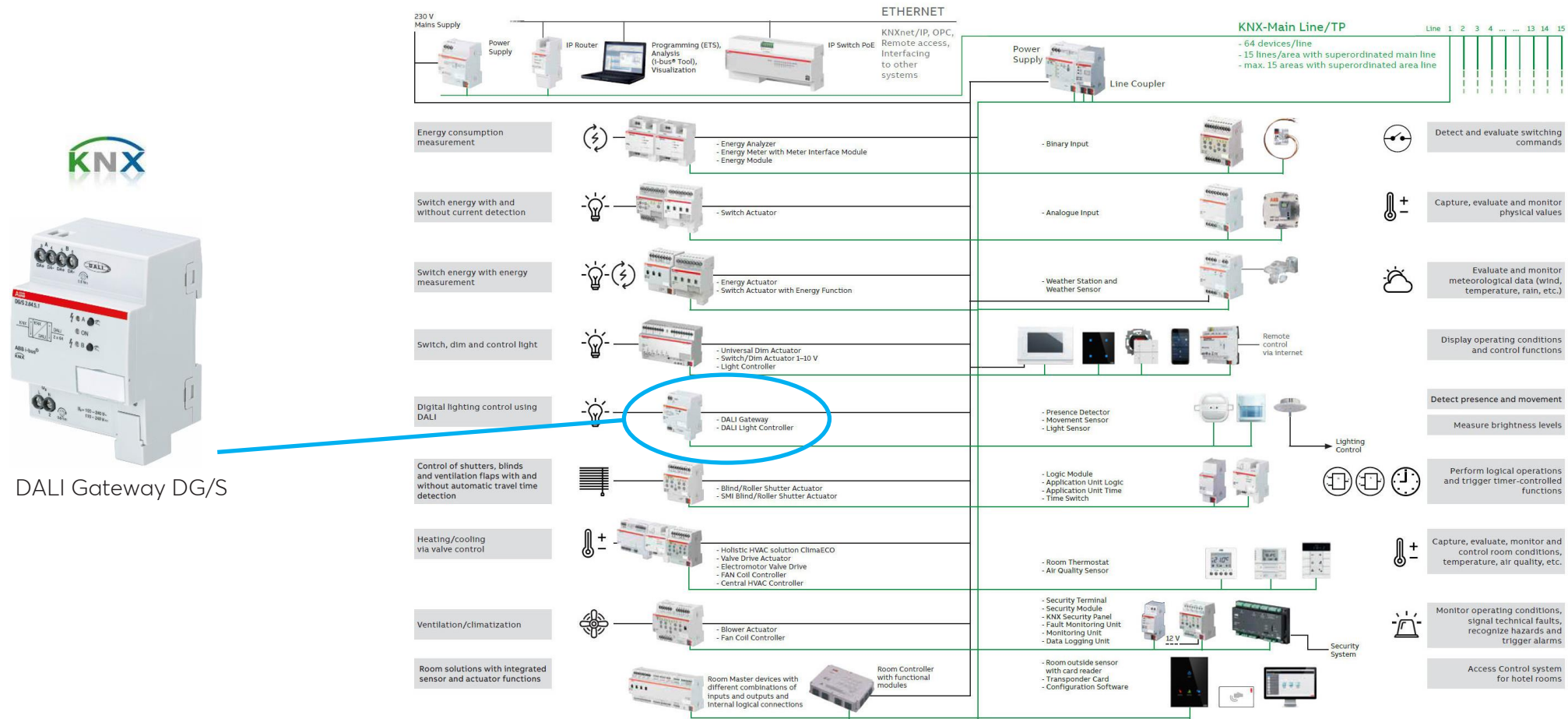


Agenda

1	Introduction and Overview
2	Color temperature control DT8 – Tunable white (Dim2Warm and Human Centric Lighting)
3	Color control DT8 – RGB(W) and HSV(W)
4	Sequences
5	Load shedding
6	Operating duration
7	Standby Switch-off
8	Enhancements in the ABB i-bus® Tool

KNX DALI Gateway Premium DG/Sx.64.5.1

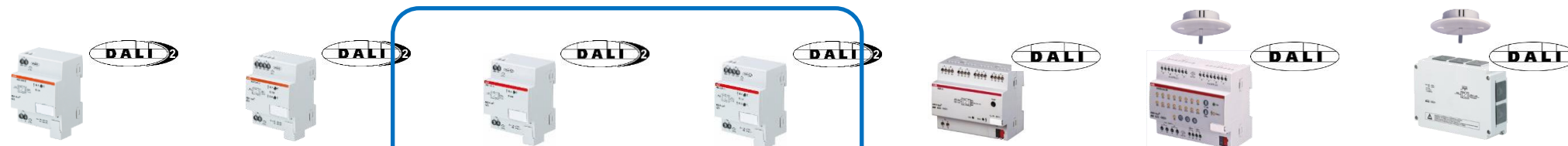
ABB i-bus® KNX – Product Range Overview



DALI Gateway DG/S

KNX DALI Gateway Premium DG/Sx.64.5.1

Overview of all ABB i-bus® KNX DALI Gateways and DALI Light Controller



	Gateway DG/S 1.64.1.1 Basic	Gateway DG/S 2.64.1.1 Basic	Gateway DG/S 1.64.5.1 Premium	Gateway DG/S 2.64.5.1 Premium	Gateway DG/S 8.1	Light Controller DLR/S 8.16.1M	Light Controller DLR/A 4.8.1.1
Controlled	Single/Group control	Single/Group control	Single/Group control	Single/Group control	Broadcast	Group control	Group control
DALI outputs	1	2	1	2	8 (A...H)	1	1
DALI ballast	64 (ballasts and EMC)	2 x 64 (ballasts and EMC)	64 (ballasts and EMC)	2 x 64 (ballasts and EMC)	128 (max. 16 per output)	64	64
DALI addressing	64 individual	A: 64 individual B: 64 individual	64 individual	A: 64 individual B: 64 individual	not necessary	64 individual	64 individual
Lighting groups	16 DALI	2 x 16 DALI	16 DALI	2 x 16 DALI	cable installation	16 DALI	8 DALI
Emerg. light conv.	Yes	Yes	Yes	Yes	-	-	-
DT8 Color temp. Tunable White T _C	-	-	Yes	Yes	-	-	-
New application V2.0, e.g. DT8 RGB(W), sequencer, load shedding, ...	-	-	Yes	Yes	-	-	-

KNX DALI Gateway Premium DG/Sx.64.5.1

Powerful Functions with new ETS Application V2.0

KNX DALI-Gateway Premium DG/S x.64.5.1

DG/S 1.64.5.1 (one channel, 64 ballasts)

DG/S 2.64.5.1 (two independent channels, 2 x 64 ballasts)

- » The following ballast can be operated on the DALI Gateway
 - » Normal DALI ballasts (device type 0 and 6)
 - » DALI self contained emergency lighting converter (device type 1), type A, B, C and D
 - » Color-controlled DALI ballast (device type 8: Tc, RGB(W), HSV(W))
- » Functions
 - » Flexible combination of DALI groups or single control
 - » ABB i-bus® Tool support
 - » Tunable white (Dim2Warm and Human Centric Lighting)
 - » Color control RGB(W) and HSV(W)
 - » Standby switch-off
 - » Sequences and Scenes
 - » Load shedding ...



DG/S 1.64.5.1



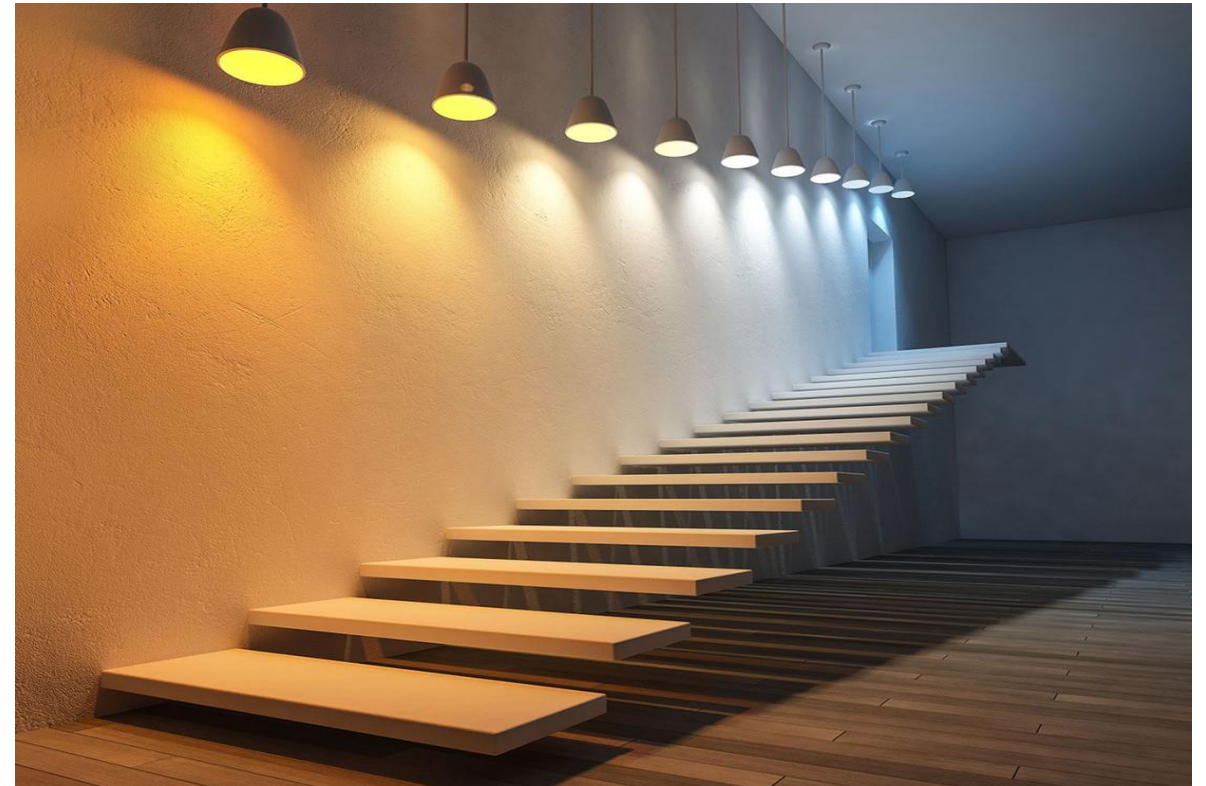
DG/S 2.64.5.1

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Tunable white – Color temperature control DT8

- » Change of color temperature T_C (warm and cold white) with dimming/setting of color temperature and brightness for lamps according to device type 8
 - » Typical range between 2,000K (Kelvin) and 6,000K depending on ballast and lamp
 - » Quality feature of light is not only brightness level, distribution in the room, no glare effects but also color temperature T_C
 - » Optimization of biological and emotional effects (performance and well-being) of light for human beings both in private environment and working activities
 - » Warm white → relaxation
Cold white → activity

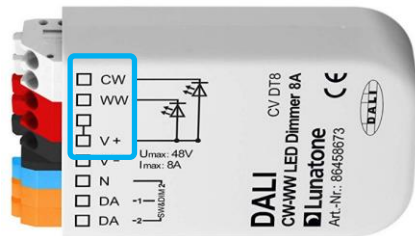


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Tunable white – Color temperature control DT8

- » There is a distinction between warm and cool color temperature ranges, as follows
 - » Warm light (up to 3,300 Kelvin) is homely and comfortable
This color of this light is rather like a sunset
 - » Neutral light (3,300–5,300 Kelvin) is stimulating and inviting, making it suitable primarily for working
 - » Cold light (5,300 Kelvin or more) is similar to daylight and promotes concentration



Ballast device type 8 T_C
→ one DALI address



3,000 Kelvin (warm white)



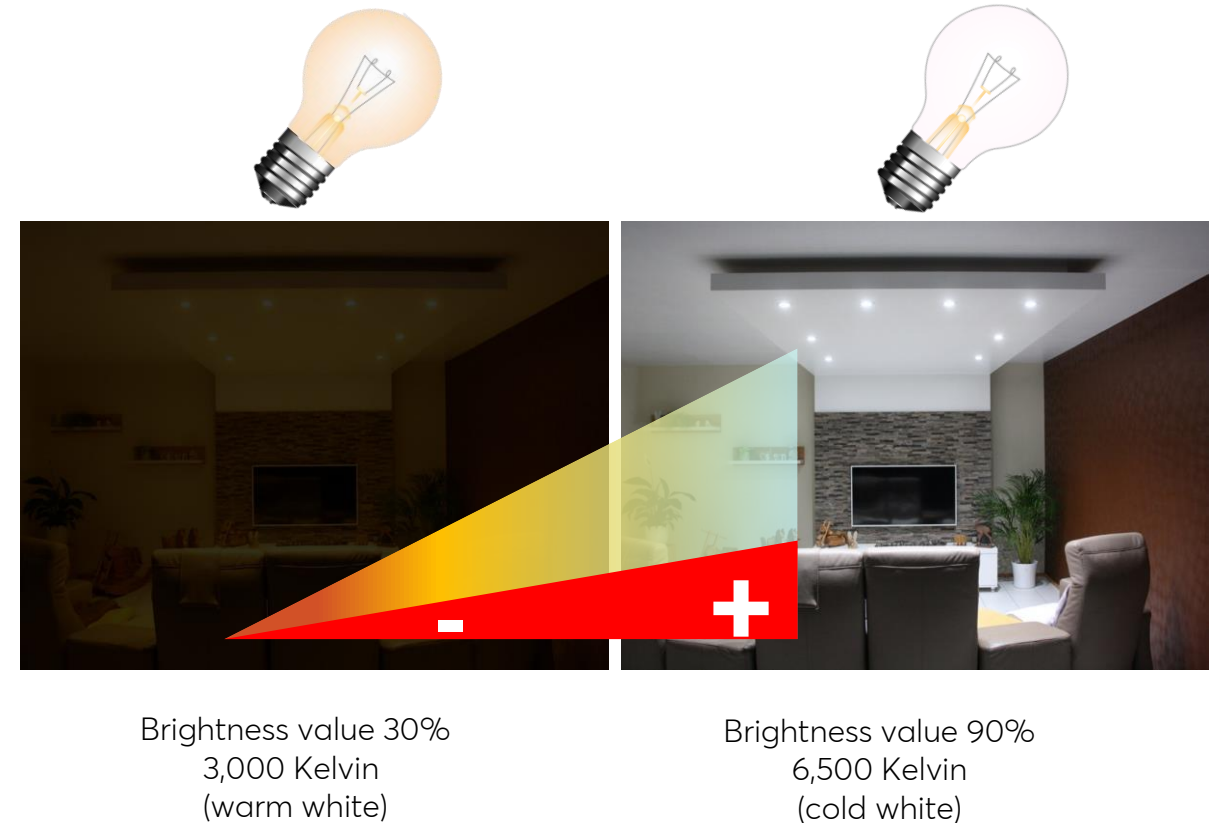
6,500 Kelvin (cold white)

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Tunable white – Dim2Warm

- » When dimming LEDs, however, the color temperature usually does not change
- » No matter how far down a warm white LED strip is dimmed, the color temperature always remains constant
- » The color temperature changes proportionally to the brightness
 - » Dimming up: Increasing of color temperature → cold white
 - » Dimming down: Decreasing of color temperature → warm white
- » This dependency is similar to the dimming behavior of a light bulb (light bulb effect)
- » Dim2Warm can be activated on a group or a ballast



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Powerful Functions with new ETS Application V2.0

Tunable white – Dim2Warm

Applications

- » Quite a few people associate the change in color temperature when dimming in the direction of warmer colors with cosiness and comfort
 - » At home in the bedroom or in the living room like in the glow of candles or by the cozy fireplace
- » To give the feeling of the warm and welcoming atmosphere
 - » Hotel bar, restaurant, ... in the evening
 - » In the morning at breakfast
- » ...



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Powerful Functions with new ETS Application V2.0

Tunable white – Human Centric Lighting HCL

- » The light of the sun is crucial for our health and well-being
- » Every artificial light source should therefore match the properties of sunlight as closely as possible
- » Light affects our mood and level of activity
- » Human Centric Lighting can adapt people's daily rhythms to one another and increase their motivation, well-being and productivity
- » Because our physiological response to light depends on the properties of light such as color spectrum, intensity and timing, the properties of artificial light in our environment are of great importance when we spend a long time in closed rooms

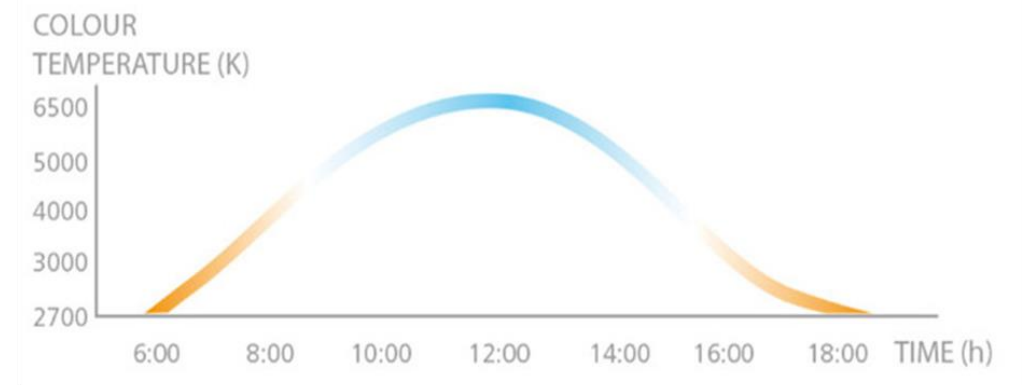


KNX DALI Gateway Premium DG/Sx.64.5.1

Powerful Functions with new ETS Application V2.0

Tunable white – Human Centric Lighting HCL

- » The daylight is simulated in the building, means the color temperature of the outside light is reproduced by color temperature controllable lights in the room
- » Actually, it is the function tunable white, automatized for a dynamic and suitable light situation with change of color temperature over the day and with all positive aspects mentioned before
- » In complex HCL lighting systems, brightness, light distribution, direction of light and color temperature are varied. The dynamic of the daylight, the seasons and the location of the building are considered
- » Applications
 - » Educational institutions
 - » Offices (improve the energy, motivation of employees)
 - » Healthcare facilities (avoid mood swings and depression)
 - » Industry (positive effect on production output)

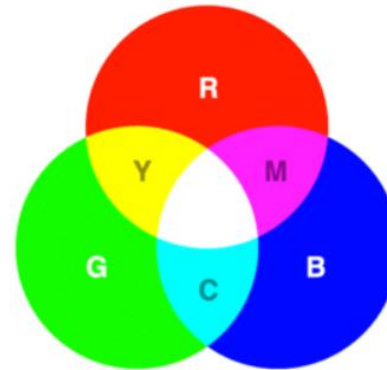
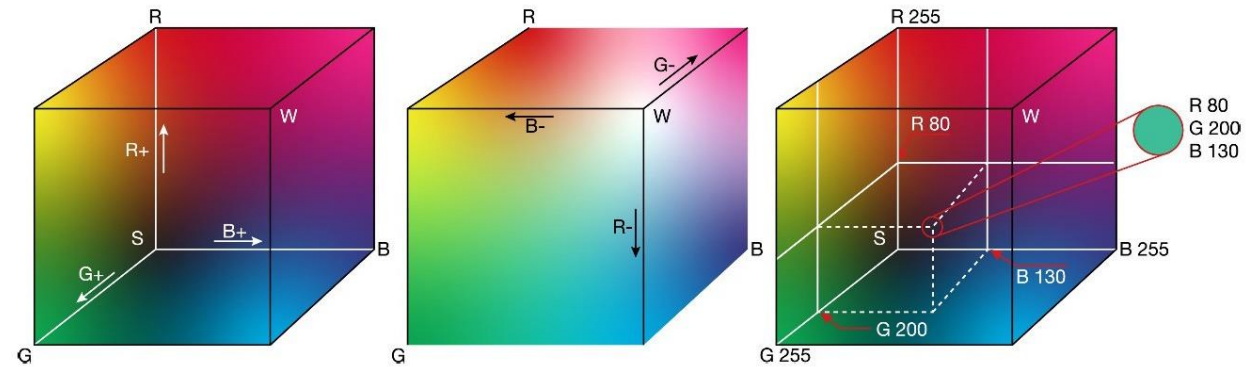


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Powerful Functions with new ETS Application V2.0

RGB(W) – Color control DT8

- » Colors are made of the primary colors **RED, GREEN** and **BLUE**
- » The RGB color space is based on exactly this model
- » A color is always defined in terms of the primary colors, expressed as the ratio between the color channels
 - » Mixing of three primary colors
 - » e.g. 100% red, 100% green and 0% blue produces yellow
- » If these three colors are added together, the result is theoretically white
- » Nowadays there is also the option to add a white component by mixing in an additional channel → RGB(W)
- » This white component helps produce a lighter light, which brightens the color and only a LED is used
- » There are still special variants, RGBWAF lights:
A = Amber, F = other color



Source: Internet

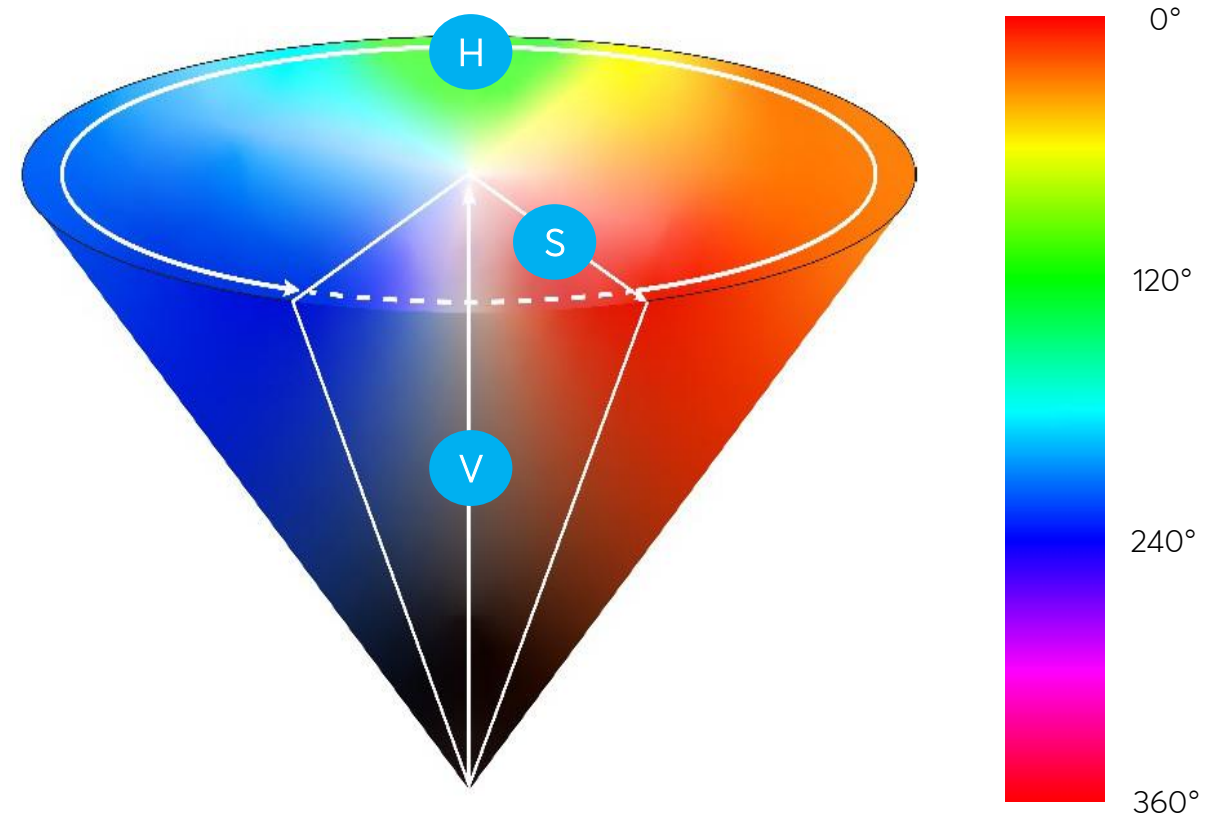
KNX DALI Gateway Premium DG/Sx.64.5.1

Powerful Functions with new ETS Application V2.0

HSV(W) – Color control DT8

The **HSV** color space defines color perception in terms of 3 coordinates:

- » **Hue:** This value determines the color shade and is shown on a 0°... 360° wheel.
0° correspond approximately to the color red, 120° to the color green and 240° to the color blue
- » **Saturation:** This value sets the saturation of the color shade.
At 100% saturation, the color is fully saturated - this is the pure color. If white is added to the color, the result becomes more pastel - the color is less saturated.
- » **Value:** This value sets the brightness of the color shade.
If the brightness is high, the color appears bright and if the brightness is low, the color appears dark. If the brightness is 0% this corresponds to black and at 100% to full brightness



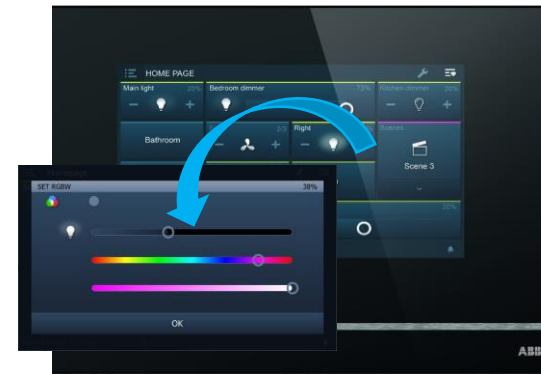
KNX DALI Gateway Premium DG/Sx.64.5.1

Powerful Functions with new ETS Application V2.0

RGB(W) and HSV(W) – Color control DT8

- » The RGB and HSV color spaces can be transformed into each other by means of calculations
- » Color control for each group and ballast
- » Dim color value and set value
- » Color control is also possible using scenes and sequences
- » Color control is performed using
 - » RGB(W)
 - » HSV(W) – Based on RGB(W) → RGB(W) ballast is required
- » The following options are available for color control:
 - » Single group objects for each color channel (4-bit and 1-byte)
 - » Combined 3-byte group object RGB/HSV, DPT_Color_RGB 232.600
 - » Combined 6-byte group object RGBW/HSVW, DPT_Color_RGBW 251.600

Busch-SmartTouch® KNX



App
"Busch-ControlTouch®"



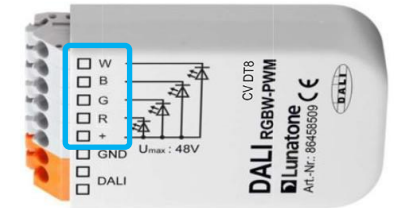
ABB RoomTouch® KNX



3-byte
RGB value
(DPT 232.600)



4-bit and
1-byte values
(DPT 3.007/5.001)



Ballast device type 8 RGBW
four channels
→ one DALI address

KNX DALI Gateway Premium DG/Sx.64.5.1

Powerful Functions with new ETS Application V2.0

Sequences

A sequence is a series of brightness values or color gradients

→ Lighting effects made easy

- » Shop
- » Restaurant
- » Hotel, e.g. outer facade, lobby
- » Sauna, swimming pool, wellness areas
- » Entertainment
- » Medical applications (relaxation, color light therapy, mood enhancer, ...)
- » Human Centric Lighting HCL simulates the daylight in a building
- » Different day and night sequence ...



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Powerful Functions with new ETS Application V2.0

Sequences

- » A sequence is used to call up other
 - » Color values RGB(W) and HSV(W)
 - » Color temperatures Tc
 - » Brightness values
- one after the other
- » 4 sequences per DALI output
- » Each sequence consists of up to 11 individual steps (10+1)
- » Each step can apply to a ballast, group, scene or output
- » Defined stop behavior with end step
- » A sequence can be started and stopped with the "Sequence x start-stop/Status" group object

3.7.101 DG/S1.64.5.1 DALI Gateway, Premium, 1f, MDRC > DALI output A > A Sequences > Sequence 1

General

Number of steps: 10

Number of cycles (0...255, 0 = not limited): 0

Reaction on stop via KNX: ☒ End step ☐ Complete the cycle

Perform end step: ☐ No ☒ Yes

Scenes, groups and ballasts used must be enabled.
Colors must be supported by output/groups/ballasts.
Dimming time and step duration start simultaneously.

Step	DALI	No.	Brightness	Color type	Color value	White value	Dimm time [s]	Step duration [s]
1	Group	6	97% (247)	RGBW	#803434	255	5	10
2	Scene	3					1	200
3	Ballast	36	77% (196)	Tc	3000		4	14
4	Ballast	5	No change	RGBW	#F777E0		6	25
5	Ballast	30	100% (255)	RGB	#F0E940		1	500
6	Scene	12					6	55
7	Group	7	90% (230)	Tc	6000		10	440
8	Scene	1					2	4
9	Scene	1					2	4
10	Scene	1					2	4
End	Output		0% (OFF)	None			0	0

Color selection interface showing a color wheel and sliders for R (247), G (119), B (224), H (310°), S (51%), and V (96%). The selected color is #F777E0.

KNX DALI Gateway Premium DG/Sx.64.5.1

Powerful Functions with new ETS Application V2.0

Sequences

Applications

- » HCL – “Human Centric Lighting” to simulate the daylight in a building
- » RGB(W) Color Control and color gradients
 - » A Sequencer is used to call a different color every minute
 - » The Sequencer runs endlessly
 - » When stopping, the end step has been executed and the lighting is switched off



3.7.101 DG/S1.64.5.1 DALI Gateway, Premium, 1f, MDRC > DALI output A > A Sequences > Sequence 3

General

Number of steps: 10

Number of cycles (0...255, 0 = not limited): 0

Reaction on stop via KNX: ☒ End step ☐ Co

Perform end step: ☐ No ☒ Yes

Scenes, groups and ballasts used must be enabled.
Colors must be supported by output/groups/ballasts.
Dimming time and step duration start simultaneously.

Step	DALI	No.	Brightness	Color type	Color value	White value	Dimmi time [s]	Step duration [s]
1	Group	5	100% (255)	RGBW	#FF0000	255	2	60
2	Group	5	100% (255)	RGBW	#FF9400	255	2	60
3	Group	5	100% (255)	RGBW	#CBFF00	255	2	60
4	Group	5	100% (255)	RGBW	#37FF00	255	2	60
5	Group	5	100% (255)	RGBW	#00FF6A	255	2	60
6	Group	5	100% (255)	RGBW	#00FFFF	255	2	60
7	Group	5	100% (255)	RGBW	#0065FF	255	2	60
8	Group	5	100% (255)	RGBW	#3700FF	255	2	60
9	Group	5	100% (255)	RGBW	#D000FF	255	2	60
10	Group	5	100% (255)	RGBW	#FF009D	255	2	60
End	Group	5	0% (OFF)	RGBW	#FFFFFF	255	2	60

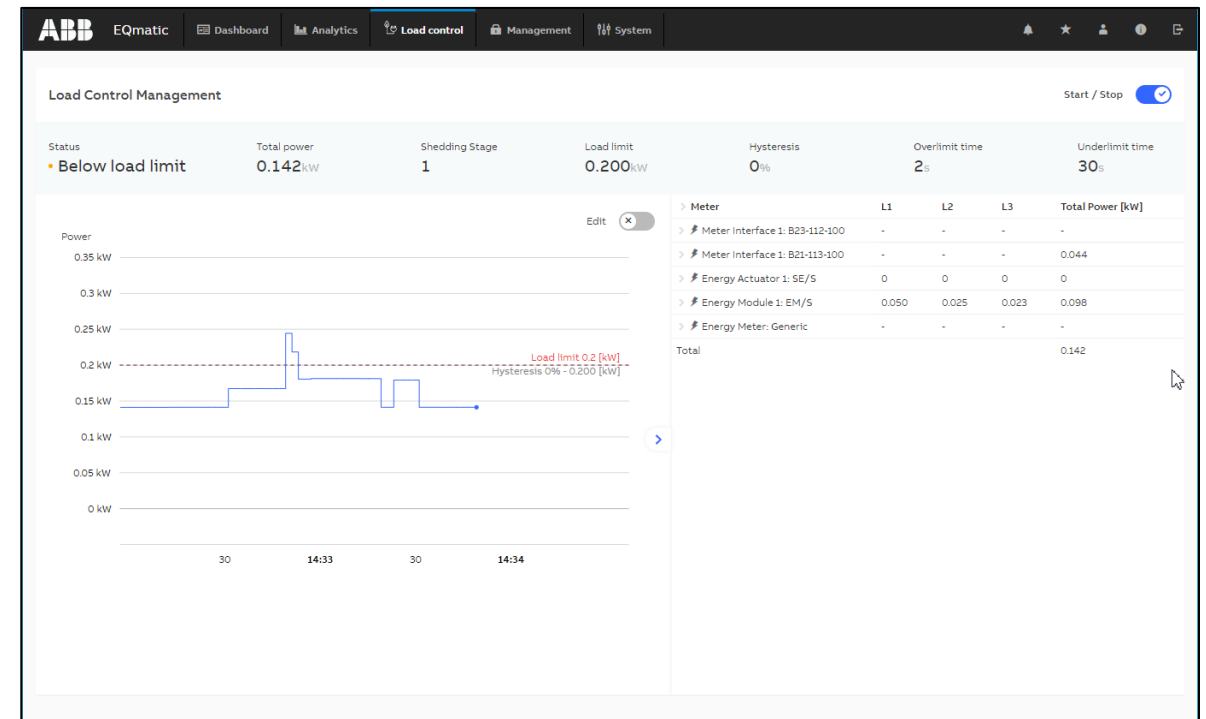
A photograph of a modern interior space with a large, curved, illuminated wall and a hot tub, showing the effect of the lighting sequence.

KNX DALI Gateway Premium DG/Sx.64.5.1

Powerful Functions with new ETS Application V2.0

Load shedding

- » Optimization of operating costs by avoiding load peaks
- » With the "Load shedding" function, a load control master (e.g. KNX Energy Analyzer QA/S, Energy Actuator SE/S) can manage an electrical installation energy efficiently
- » If a defined load limit is exceeded, the load control master sends commands in the form of load shedding stages on KNX and the slaves (e.g. Switch Actuator) react according to the parameterization
- » New: Integration of the DALI Gateway into a load control system
- » The load shedding levels can be defined in the DALI Gateway for each group or each ballast
- » The group/ballast receive the load shedding stages and react according to the parameterization
→ Limitation by setting the maximum brightness value



KNX Energy Analyzer QA/S 1.16.1

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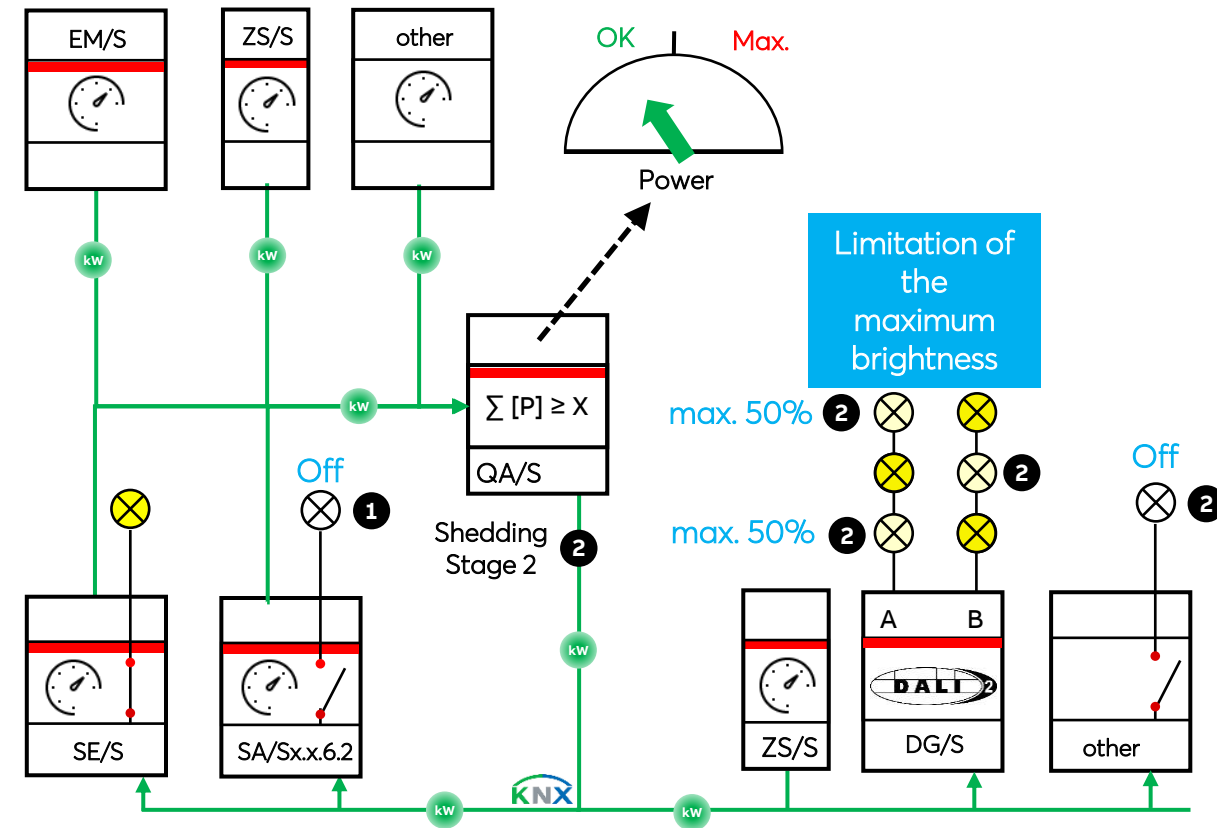
Powerful Functions with new ETS Application V2.0

Load shedding

Target: Prevention of electrical load peaks due to limited power and installation availability or significant costs

- » The master "KNX Energy Analyzer QA/S" sums up all received power values and manages depending on adjusted load limit the connected loads (turn on/off, dim) with priority
- » Loads not able to send any direct energy consumption values can also be integrated into load shedding via an energy meter (Meter interface ZS/S or KNX Energy Module EM/S)
- » Loads on each output can listen to load shedding stages from the QA/S to be turned off/on or dimmed depending on load threshold
- » Beside the 1-byte object load shedding stage (DPT 236.001) the QA/S can send also for each of the 8 stages ind. 1-bit telegrams
- » This allows to integrate easily also further loads controlled via other actuators which have no 1-byte object load shedding stage

→ The max. brightness of the DG/S groups/ballasts can be temporarily limited via the "Receive load shedding stage" group object

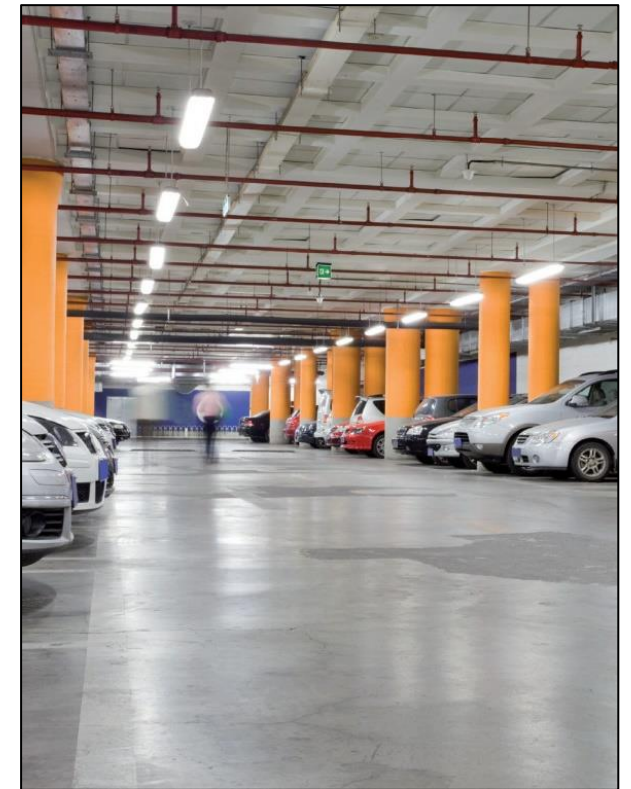


KNX DALI Gateway Premium DG/Sx.64.5.1

Powerful Functions with new ETS Application V2.0

Operating duration

- » The operating duration indicates how long a group or ballast remains switched on
- » It enables you to identify and plan timely maintenance for a lamp change → over time, the lamps lose their luminosity
- » The operating hours counter is not a mandatory function according to the DALI standard and is therefore not supported by many ballasts!!!
- » The DALI Gateway counts the operating duration when a ballast is considered to be switched on
→ The current brightness value is greater than 0% and there is no ballast or lamp fault

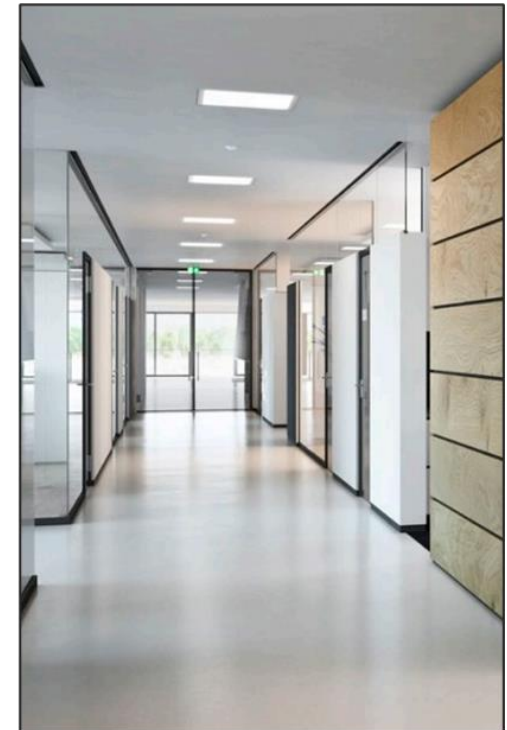
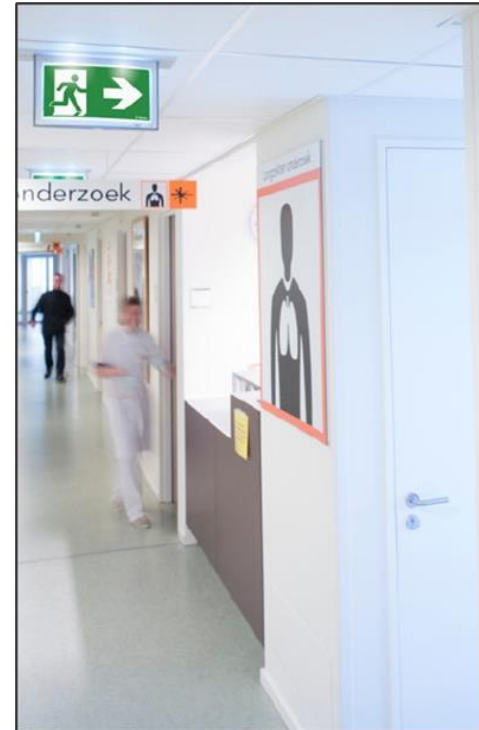


KNX DALI Gateway Premium DG/Sx.64.5.1

Powerful Functions with new ETS Application V2.0

Operating duration

- » Operating duration function
 - » Per group and ballast (incl. alarm function and value)
 - » Addressed (one group object for all ballasts and groups)
- » Depending on the DPT format selected, the operating duration is sent on the bus in seconds or hours
- » The operating duration can also be set with a write command (e.g. after a lamp has been replaced)
- » The alarm function sends an alarm ("1") when the operating duration reaches its alarm threshold
- » The operating time of a group is the operating time of the ballast with the most operating time within this group



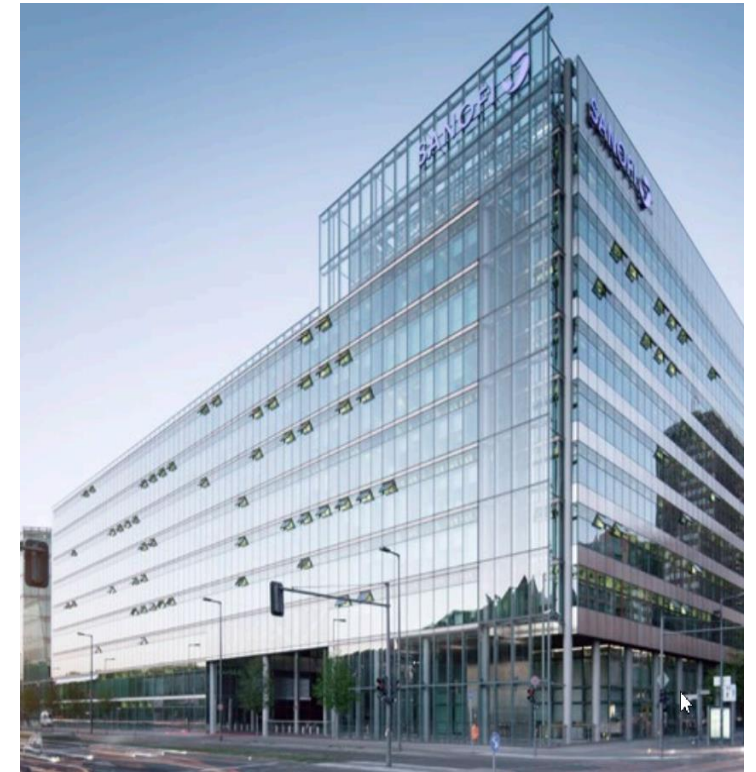
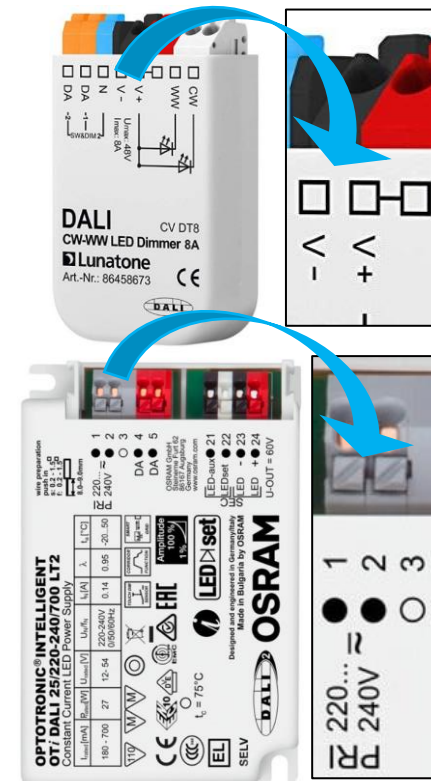
KNX DALI Gateway Premium DG/Sx.64.5.1

Powerful Functions with new ETS Application V2.0

Standby Switch-off

- » All ballasts are permanently connected to the supply voltage
- » A modern ballast has a power loss of approx. 0.1 to 0.2 Watts in stand-by mode (switched off)
- » With a large number of ballasts in a building, this leads to a not inconsiderable energy requirement
- » The "Standby switch-off" function saves energy by switching off the supply voltage of ballasts when they are all in standby (switched off)

→ This serves to save energy



Source: Internet

KNX DALI Gateway Premium DG/Sx.64.5.1

Powerful Functions with new ETS Application V2.0

Standby Switch-off

- » If only one ballast is left on at a DALI output, no standby switch-off is carried out
- » The supply voltage can, but does not have to, be switched off for all ballasts
- » The supply voltage of the ballasts is switched on or off in combination with a KNX Switch Actuator SA/S and, in the case of a higher load, via an installation contactor (e.g. ESB40)
- » The message "Ballast fault" is suppressed when the ballasts are switched off using the standby switch-off function
- » DALI emergency converter are not be integrated in Standby switch-off function

Note:

- » Ballasts must support individual DALI power-on level brightness on ballast voltage recovery, to be adjusted in the ETS application under "Fault" → last value before failure



Installation contactor
(e.g. ESB40)



Switch Actuator
SA/S



Source: Lunatone Industrielle Elektronik GmbH

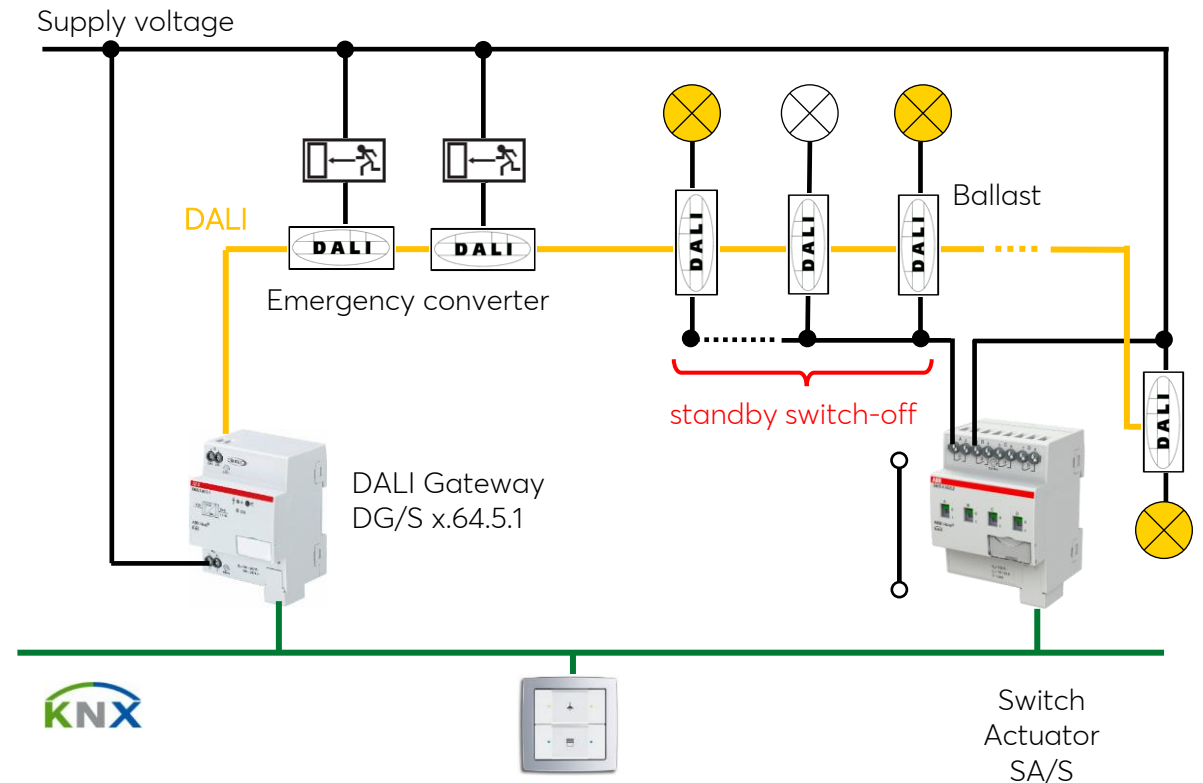
KNX DALI Gateway Premium DG/Sx.64.5.1

Powerful Functions with new ETS Application V2.0

Standby Switch-off

Some lights are turned on and all ballasts are supplied with supply voltage

→ no standby switch-off is possible



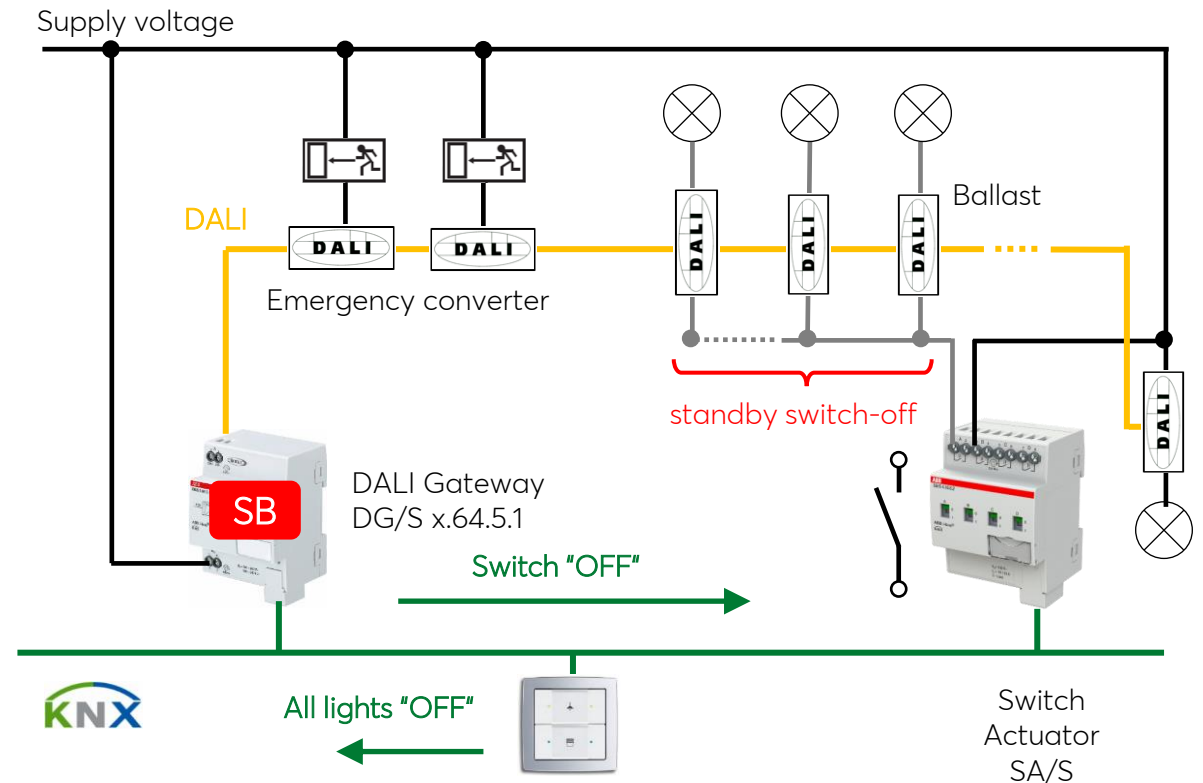
KNX DALI Gateway Premium DG/Sx.64.5.1

Powerful Functions with new ETS Application V2.0

Standby Switch-off

All lights are turned off and all ballasts are in standby at a DALI output

- » After an adjustable delay time (1...65,535sec.) the standby switch-off function is activated
- » A switch "OFF" telegram is sent on KNX
- » All Switch Actuator SA/S channels linked with this group address switches off the ballasts supply voltage → All connected ballasts are deenergized
- » The DG/S message "Ballast fault" is automatically suppressed



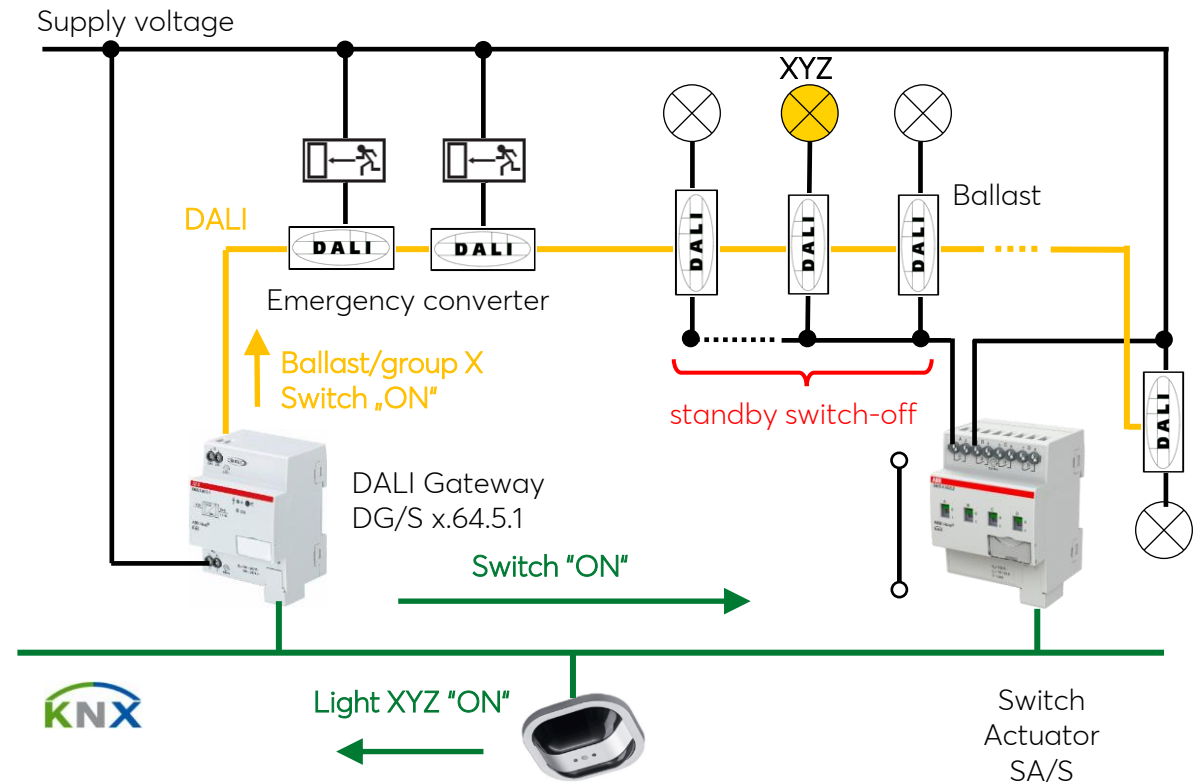
KNX DALI Gateway Premium DG/Sx.64.5.1

Powerful Functions with new ETS Application V2.0

Standby Switch-off

When the function is active, a KNX sensor (e.g. control element or presence detector) sends a group address to the DALI Gateway to switch on a DALI ballast/group

- » The standby switch-off function is deactivated
- » A switch "ON" telegram is sent on KNX
- » All Switch Actuator SA/S channels linked with this group address switches on the ballasts supply voltage
- » All connected ballasts are supplied with voltage again and start up
- » To ensure that the ballasts are ready for operation, a delay time (1...10 seconds) can be parameterized
- » After the delay time, the DALI Gateway sends an "On" command to the DALI ballast/group and the light switches on
- » Further actions to turn on lights are without delay

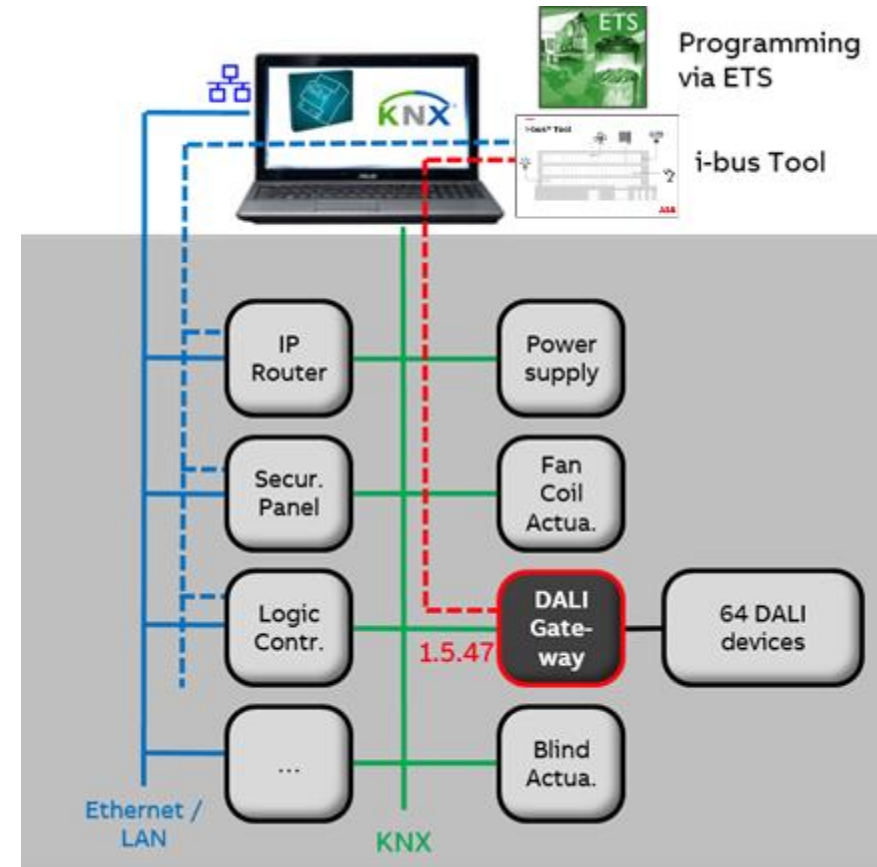


KNX DALI Gateway Premium DG/Sx.64.5.1

Powerful Functions with new ETS Application V2.0

Enhancements in the ABB i-bus® Tool

- » ABB i-bus® Tool is an additional software tool to make life easier when working with ABB i-bus® KNX devices
- » It supports system integrators and installers during commissioning and service
- » The ABB i-bus® Tool accesses an ABB i-bus® KNX device via a standard KNX interface USB or IP (individual address)
- » Internal information and states of the device hardware and software applications are now available in a transparent manner
- » Device functions can be carried directly from the tool
- » 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
- » Most of the KNX products from ABB and Busch-Jaeger are supported by the ABB i-bus® Tool



KNX DALI Gateway Premium DG/Sx.64.5.1

Powerful Functions with new ETS Application V2.0

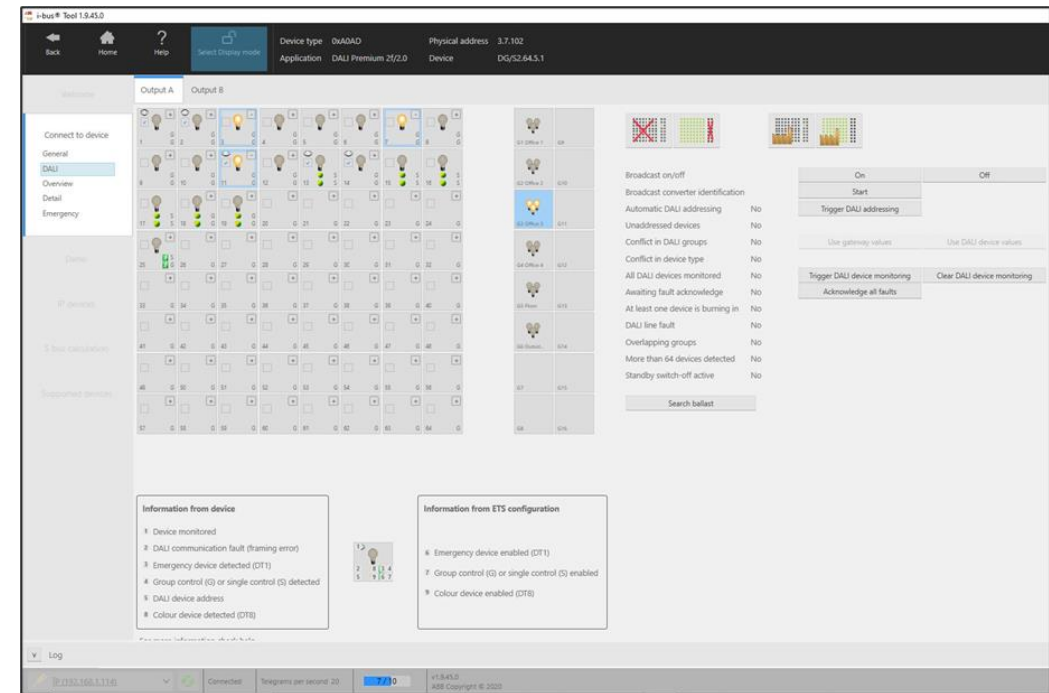
Enhancements in the ABB i-bus® Tool

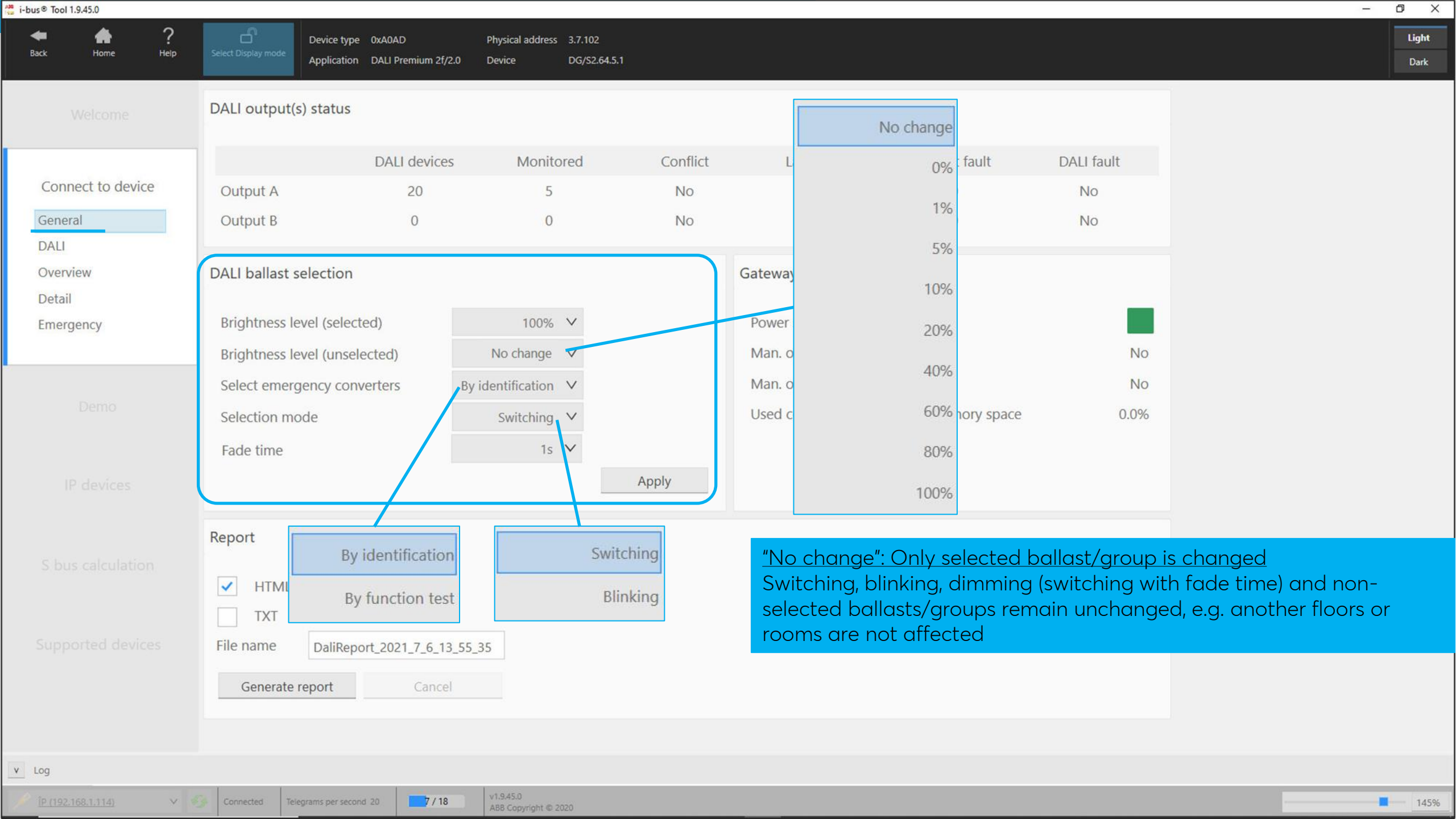
Needed to parametrize the DALI part of ABB's KNX DALI Gateways

Unique way to approach the DALI parametrization independent of the ETS in a user-friendly way plus a lot of options to make live easier for integrators and installers during commissioning but also during maintenance and troubleshooting

Main features:

- » Addressing DALI devices / ballasts
- » Assignment of the DALI devices into DALI groups
- » Display of all lamp and ballast faults
- » Status information and control of individual ballasts or DALI groups
- » Tests and monitoring of DALI emergency light
- » Commissioning of constant light control (DALI Light Controller)





DALI output(s) status

	DALI devices	Monitored	Conflict	L	0%	fault	DALI fault
Output A	20	5	No				No
Output B	0	0	No				No

DALI ballast selection

Brightness level (selected) 100% ▼

Brightness level (unselected) No change ▼

Select emergency converters By identification ▼

Selection mode Switching ▼

Fade time 1s ▼

Apply

No change

Gateway

Power 0%

Man. o 20%

Man. o 40%

Used c 60%

Memory space 0.0%

80%

100%

DALI fault No

Report

☒ HTML

☐ TXT

File name DaliReport_2021_7_6_13_55_35

Generate report Cancel

By identification

By function test

Switching

Blinking

"No change": Only selected ballast/group is changed
Switching, blinking, dimming (switching with fade time) and non-selected ballasts/groups remain unchanged, e.g. another floors or rooms are not affected

Light

Dark

145%



Back



Home



Help



Select Display mode

Device type 0xA0AD

Application DALI Premium 2f/2.0

Physical address 3.7.102

Device DG/S2.64.5.1

Light

Dark

Welcome

Output A

Output B

Connect to device

General

DALI

Overview

Detail

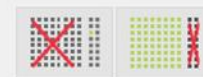
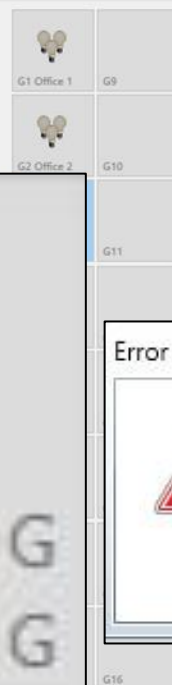
Emergency

Demo

IP devices

S bus calculation

Supported devices



Broadcast on/off

On

Off

Broadcast converter identification

Start

Automatic DALI addressing

No

Trigger DALI addressing

Unaddressed devices

No

Conflict in DALI groups

No

Use gateway values

Use DALI device values

Clear DALI device monitoring

Error



Can't change address of monitored ballasts

OK

Information from device

- 1 Device monitored
- 2 DALI communication fault (framing error)
- 3 Emergency device detected (DT1)
- 4 Group control (G) or single control (S) detected
- 5 DALI device address
- 8 Colour device detected (DT8)



Information from ETS configuration

- 6 Emergency device enabled (DT1)
- 7 Group control (G) or single control (S) enabled
- 9 Colour device enabled (DT8)

Monitoring of individual ballasts - not all at once

→ Step-by-step commissioning

→ Ballast is fixed in the DALI address field at the same time and address can not be changed

v Log

IP (192.168.1.114)

Connected

Telegrams per second 20

7/10

v1.9.45.0
ABB Copyright © 2020

97%

i-bus Tool 1.9.45.0

Back Home ? Select Display mode

Device type 0xA0AD Physical address 3.7.102
Application DALI Premium 2f/2.0 Device DG/S2.64.5.1

Light
Dark

Welcome

Output A Output B

Device/Group Device 13 Entrance

Connect to device

General
DALI
Overview
Detail
Emergency

Demo

IP devices

S bus calculation

Supported devices

Status

Status ☒

Current level 255 (100 %)

Current colour (RGBW in HEX) AD0EB000

Color enabled (ETS/Runtime) True/True

Color type CT_RGBW

Burn in and timers

Burn in Inactive

Burn in time left 0h 0min

Operating hours 8h 0 h

Additional function

Staircase lighting -

Slave -

Statuses

Force lock ☐ Lamp fault ☒

Base brightness ☐ Ballast fault ☒

Colour

Selected colour function None

Colour function status Inactive

Device supported colour types

Colour temperature Tc No

XY coordinates No

RGB(W) channels 4

Color control

Color picker

R 173
G 14
B 176
H 298°
S 92%
V 69%
W 0%

Selected color

Control

On Off

Log

IP (192.168.1.114) Connected Telegrams per second 20 8 / 8 v1.9.45.0 ABB Copyright © 2020 100%

- Current color RGB(W) in hex
- Color enabled in ETS and EVG supports color
- Color type (CT_RGBW)
- Operating time status
- EVG supported color types (Tc, XY, RGB(W))
- RGB(W) and HSV(W) color picker

KNX DALI Gateway Premium DG/Sx.64.5.1

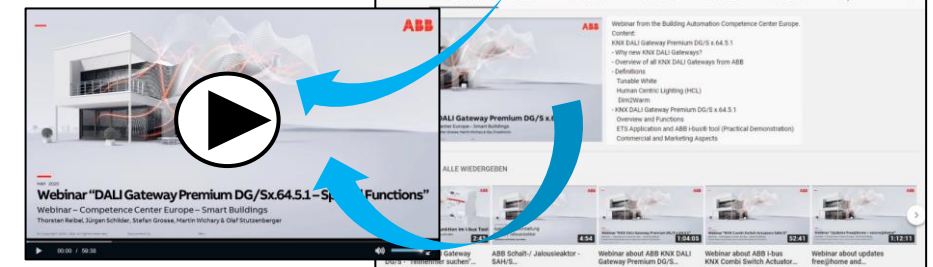
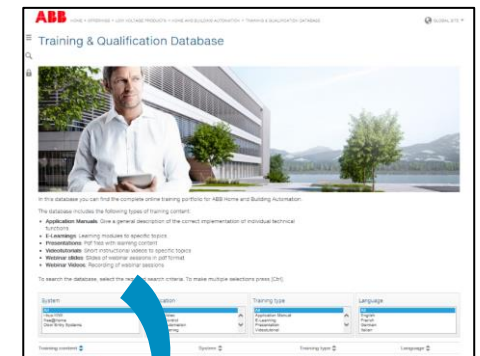
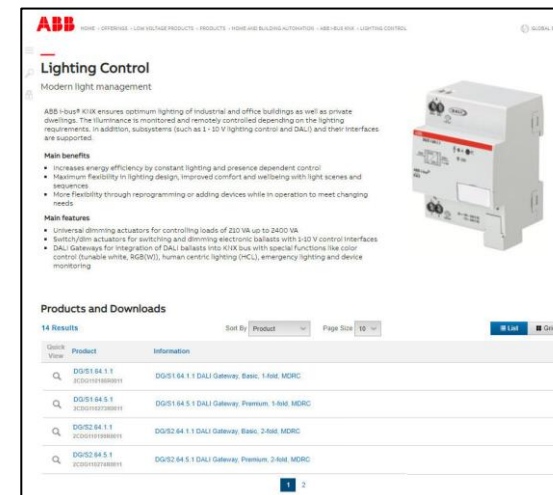
Powerful Functions with new ETS Application V2.0

Further information

- » www.abb.com/KNX
 - » Products and Downloads
 - Lighting Control → DALI Gateways
 - » Product information (manual, software, ...)
- » Training & Qualification Database

The database contains extensive training content

 - » [Webinar, Learning Sessions, ... slides and videos](#)
 - » Presentations
 - » Video tutorials
 - » and more ...
 - » <https://go.abb/ba-training>
- » YouTube
 - » Channel "ABB Home and Building Automation"
<https://www.youtube.com/user/ABBibusKNX>



A woman with long brown hair, wearing a grey blazer and black pants, is walking from right to left. She is carrying two shopping bags, one blue and one grey. She is smiling and looking back over her shoulder. The background is a modern building with dark wood paneling and a lit entrance. The scene is at night.

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