series dimmer actuators, DMG 2 S, Upgrade Module DME 2 S and Booster DMB 2

DMG 2 S	4910270
DME 2 S	4910271
DMB 2	4910272

Contents

1 Functional characteristics

The MIX series comprises basic modules and upgrade modules such as switching, heating and blinds actuators and input module.

You can connect a maximum of 2 upgrade modules of this series to any basic module in this series.

1.1 General

The DMG 2 S Universal Dimmer is a modular device. Using its outputs, it can dim or switch electrical consumers such as high-voltage halogen lamps and low-voltage halogen lamps with upstreamed conventional or electrical transformers.

1.2 Operation

Each channel of the dimmer actuators has an LED which indicates its status and a manual switch with the settings ON/OFF/BUS. To operate the manual switch and the LED, the powersupply over the load is needed. The busvoltage is not needed.

Turning the manual switch to "0" dims the load to 0% irrespective of all other parameters, and the status LED for the channel is switched OFF.
Turning the manual switch to "1" dims the load to 100% irrespective of all other parameters, and the status LED for the channel lights up red.

Turning the manual switch to the "Bus" setting allows you to control the dimmer via the bus. The status LED for the channel comes ON at a dimmer value of 1% and is switched OFF at 0%.

The device dims down to 0% in the event of excess temperature or a short circuit in the load. The status LED will flash in this event.

1.3 Features of the dimmer actuators

- Manual switch for each channel
- Status LED for each channel
- High dimmer output, upgradeable with boosters to a maximum of 1000 W
- Special function for dimmable energy-saving lamps.
- Upgradeable modular concept for a variety of applications
- Upgradeable to 6 channels per bus user
- Different modules can be combined to meet the exact requirements of the user and to offer the best possible value for money
- Channels can be integrated into a maximum of 8 scenes
- Adjustable response to bus failure and restoration of the bus/mains power

1.4 Difference between Model 491 0 220 and the new Dimmer 491 0 270

- **Special function for dimmable energy-saving lamps.**
- **Shorter time for the *Soft switching* function is possible**
- **Improved load recognition**
- **Not as sensitive to ripple control signals**
- **Even brightness progression with *Soft switching***

2 Technical data

2.1 Technical data for DMG 2 S, DME 2 S and DMB 2

Table 1

	Unit	DMG 2 S	DME 2 S	DMB 2	Comment
Mains: 230V 50 Hz	W / VA	< 0,5		< 1,5	Per channel with open circuit
EIB power supply	mA	max. 10			
Minimum load	W / VA	20 *			per channel
Channels per module	-	2			
Maximal symmetrical load	W / VA	2 x 300	2 x 300	Upgrade by 2 x 300	All channels used individually
Maximal asymmetrical load	W / VA	1 x 500	1 x 500	Upgrade by 500	Only one channel per module used
Example of asymmetrical load	W / VA	1 x 400 and 1 x 100	1 x 400 and 1 x 100	Upgradeby 1 x 400 and 1 x 100	Total output per module max. 500
Line length, dimmer load	m	max. 100	Do not connect any other consumers to lines between load and dimmer.		
Fuse	Automatic circuit breakers Characteristic B 16 A				
Terminal cross sections	Solid: 0.5 mm² (dia. 0.8) to 4 mm² Strand with wire end sleeve: 0.5 mm² to 2.5 mm² Cross head screwdriver PZ 1				
Permitted ambient temp. Protection class Protection rating Device standard	-5 °C ... +45 °C (-5T45) II provided it is correctly installed IP 20 in accordance with EN 60529 EN 60669, EN 50090				
Housing	45 x 71 x 60 mm (4 TE)				

* refer to the next section.

Important: Observe varying minimum and maximum outputs with dimmable energy-saving lamps. See appendix: Dimming energy-saving lamps (ESL))

2.2 Dimmable loads

Table 2

Load type	Dimmable		Comment
	YES	NO	
Halogen lights and incandescent lamps for 230V~	**X**		-
Low-voltage halogen lights with electronic transformer	**X**		*
Low-voltage halogen lights with laminated core transformer	**X**		* With transformers of the type “dimmable” and at the minimum load
Low-voltage halogen lights with toroidal mains transformer	**X**		-
Combined operation of low-voltage halogen lights with electronic transformer and 230V~ incandescent lamps	**X**		*
Compact fans (< 50W)	**X**		With pre-selected "fan" load type or L load in the ETS database
metal vapour lamps		**X**	-
Dimmable energy-saving lamps (only ref. no. 4910270)	**X**		Observe minimum and maximum loads. See appendix: Dimming energy-saving lamps (ESL))
Energy-saving lamps not designated as dimmable		**X**	-
Fluorescent lamps	**X**		Only with starter devices that can be dimmed using phase control or reverse phase control.
Lamps with own dimmer		**X**	-
Lamps with other electronic starter devices		**X**	-

* **Electronic and conventional transformers must always operated at the minimum load specified by the manufacturer. Otherwise the dimmer or the transformer may be damaged and the service life of the lamps reduced.**
If no specifications are available, always connect at least 80% of the nominal load for the transformer.

2.3 Important information

1. The voltage supply (at the fuse box) must be switched OFF without fail when replacing lamps.
2. The EIB voltage must be switched OFF when **plugging together or separating modules**.
3. Do not connect dimmers in **series or in parallel**:
   ONLY the booster module can be connected in parallel.
4. The dimmer **must not be bridged**.
5. Do not install **adjustable transformers** ahead of the dimmer.
6. Ripple control pulses from electric power plants may cOFFe temporary flickering of the lighting.

2.4 Power demand (W/VA) and examples of potential module combinations

Table 3

Power demand*	Possible combination
2 x 300 W	DMG 2 S
1 x 350 W and 1 x 150 W	DMG 2 S
1 x 450 W and 1 x 50 W	DMG 2 S
1 x 500 W	DMG 2 S (one channel used on the module, the other channel remains unconnected)
2 x 500 W	DMG 2 S + DME 2 S (one channel each per module)
2 x 600 W	DMG 2 S + DMB 2 (the two DMG 2 S channels are upgraded with one DMB 2 channel each)
4 x 300 W	DMG 2 S + DME 2 S
6 x 300 W	DMG 2 S + DME 2 S + DME 2 S
6 x 600 W	DMG 2 S + DME 2 S + DME 2 S + 3 DMB 2 (both of the DMG 2 S and DME 2 S channels are each upgraded with one DMB 2 channel)
1 x 1000 W	DMG 2 S + DMB 2 (one DMB 2 channel is upgraded with one DMB 2 channel)
3 x 1000 W	DMG 2 S + DME 2 S + DME 2 S + 3 DMB 2 (one channel per device is used)

*With energy-saving lamps: Observe minimum and maximum loads. See appendix: Dimming energy-saving lamps (ESL)

3 The application program "MiX-Series V1.5 switching and dimming"

3.1 Selection in the product database

Manufacturer	THEBEN AG
Product family	Dimmer
Product type	DMG 2 S with dimming and switching
Program name	MiX Series V1.5 switching and dimming

The ETS database can be found on our website: http://www.theben.de

Table 4

Number of communication objects:	64
Number of group addresses:	110
Number of associations:	111

3.2 Parameter pages

Each channel has 2 parameter pages, and all channels have an identical layout.

Table 5

Function	Description
General	Selection of the connected upgrade modules and the general parameter for the cyclical transmission of feedback
DMG 2 S channel 1 S1	First channel on basic module: general dimming parameters
DMG 2 S channel 1 S2	First channel on basic module: soft switching, forced mode etc.
DMG 2 S channel 2 S1	Second channel on basic module: general dimming parameters
DMG 2 S channel 2 S2	Second channel on basic module: soft switching, forced mode etc.
EM 1 DME 2 S channel 1 S1	First channel on upgrade module 1: general dimming parameters
EM 1 DME 2 S channel 1 S2	First channel on upgrade module 1: soft switching, forced mode etc.
EM 1 DME 2 S channel 2 S1	Second channel on upgrade module 1: general dimming parameters
EM 1 DME 2 S channel 2 S2	Second channel on upgrade module 1: soft switching, forced mode etc.
EM 2 DME 2 S channel 1 S1	First channel on upgrade module 2: general dimming parameters
EM 2 DME 2 S channel 2 S2	First channel on upgrade module 2: soft switching, forced mode etc.
EM 2 DME 2 S channel 3 S1	Second channel on upgrade module 2: general dimming parameters
EM 2 DME 2 S channel 4 S2	Second channel on upgrade module 2: soft switching, forced mode etc.

3.3 Communication objects

A maximum of 20 objects are available for each module with the MiX Series.
Object numbers 0...19 are used exclusively for the basic module,
nos. 20...39 for the first upgrade module and
nos. 40...59 reserved for the second upgrade module.
In addition there are the 3 central objects and the scene object, i.e. object nos. 60...63.

The following table contains descriptions of objects 0 ... 19 (basic module) and the central objects.
The object structure and its sequence are identical for the upgrade modules (EM 1 / EM 2) and the basic module (GM).
The central objects apply to the entire system, i.e. basic module + upgrades

3.3.1 Object characteristics

Table 6

	Object	Function	Object name	Type	Response
Basic module	0	Switching ON/OFF	GM DMG 2 S channel 1	1 bit	Receive
	1	brighter/darker	GM DMG 2 S channel 1	4 bits	Receive
	2	Dimming value	GM DMG 2 S channel 1	1 byte	Receive
	3	Soft switch	GM DMG 2 S channel 1	1 bit	Receive
	4	Forced mode ON/OFF Dimming value for forced mode	GM DMG 2 S channel 1	1 bit 1 byte	Receive
	5	Feedback in %	GM DMG 2 S channel 1	1 byte	Send
	6	Feedback ON/OFF	GM DMG 2 S channel 1	1 bit	Send
	7	General error message	GM DMG 2 S channel 1	1 bit	Send
	8	Load failure message Excess temperature message Short circuit message Load type message (R, C/L) Bus/manual operation message	GM DMG 2 S channel 1	1 bit	Send
	9	Status message (bit set)	GM DMG 2 S channel 1	1 byte	Send
	10	Switching ON/OFF	GM DMG 2 S channel 2	1 bit	Receive
	11	brighter/darker	GM DMG 2 S channel 2	4 bit	Receive
	12	Dimming value	GM DMG 2 S channel 2	1 byte	Receive
	13	Soft switch	GM DMG 2 S channel 2	1 bit	Receive
	14	Forced mode ON/OFF Dimming value for forced mode	GM DMG 2 S channel 2	1 bit 1 byte	Receive
	15	Feedback in %	GM DMG 2 S channel 2	1 byte	Send
	16	Feedback ON/OFF	GM DMG 2 S channel 2	1 bit	Send
	17	General error message	GM DMG 2 S channel 2	1 bit	Send
	18	Bus/manual operation message	GM DMG 2 S channel 2	1 bit	Send
	19	Status message (bit set)	GM DMG 2 S channel 2	1 byte	Send
Central	60	Switching ON/OFF	Central continuous ON	1 bit	Receive
	61	Switching ON/OFF	Central continuous OFF	1 bit	Receive
	62	Switching ON/OFF	Central switching	1 bit	Receive
	63	Call/save scene	Scene	1 byte	Receive

3.3.2 Description of objects

- **Objects 0, 10, 20, 30, 40, 50 "Switching ON/OFF"**

A "1" on this object dims up to 100%, and "0" dims to 0%

- **Objects 1, 11, 21, 31, 41, 51 "brighter/darker"**

This object is actuated with 4-bit telegrams (EIS 2 relative dimming).
This function can be used to dim the light up or down in increments (with 1...64 increments).
In the standard application, telegrams are sent with 64 increments.
IMPORTANT: The response to 4-bit telegrams depends on the “Switching ON/OFF with a 4-bit telegram” parameter.
See appendix: 4-bit-telegram (brighter/darkler)

- **Objects 2, 12, 22, 32, 42, 52 "Dimming value"**

This object can be used to select the desired dimmer setting directly.
Format: 1 byte percentage value EIS 2 dimming, value.
0 = 0%
255 = 100%

- **Objects 3, 13, 23, 33, 43, 53 "Soft switching"**

A "1" on this object starts a soft switching cycle, i.e.:
The brightness is gradually increased, starting from the minimum brightness.
The dimming value remains constant for the programmed time and is then gradually reduced after this time has elapsed.
Once the programmed minimum brightness has been reached the dimming value is reset to 0%.
The cycle can be extended or prematurely terminated via telegrams.

This sequence can also be controlled using a **time switch** if the "*Time between soft ON and soft OFF*" parameter is set to "*Until soft OFF telegram*".
The dimming cycle is then started with a 1 and finished with a "0".

See appendix: Use of soft-switch function

- **Objects 4, 14, 24, 34, 44, 54 "Forced mode= 1" / "Forced mode = 0" / "Forced mode via dimming value"**

The function of the forced mode object can be configured as a 1-bit or 1-byte object.

Table 7

Configuration	Forced mode		Response with forced mode	
	Trigger with	End with	Start	Ends
As 1-bit object	1 or 0 (configurable)	0 or 1 (configurable)	Configurable in the application program	
As 1-byte object	1 ... 255	0	The triggering telegram also acts simultaneously as a forced mode dimming value.	The last dimming value before forced mode is restored.

- **Objects 5, 15, 25, 35, 45, 55 "Feedback in %"**

Sends the new dimming value after a change as soon as a dimming procedure is completed, i.e. once the new setpoint value has been reached.
Format: 1 byte, 0 ... 255 i.e. 0 ... 100%

IMPORTANT:
This object must not be placed in the same group address as object 2.

- **Objects 6, 16, 26, 36, 46, 56 "Feedback ON/OFF"**

Sends the current dimming status:
1 = current dimming value is between 1% and 100%
0 = current dimming value is 0%

- **Objects 7, 17, 27, 37, 47, 57 "General error message"**

Used as a malfunction signal:
0 = No error
1 = an error has been detected

This message can be displayed on a screen.
For detailed error analysis refer to Object 9.

- **Objects 8, 18, 28, 38, 48, 58 "Load failure message", "Excess temperature message", "Short circuit message", "Load type message (R, C/L)", "Bus/manual operation message"**

The function of this object depends on the “Diagnosis and feedback” parameter.
This allows a more specific error message.

Table 8

“Diagnosis and feedback” parameter	Function of object 8	Application
Feedback objects, status, general error	-	-
Load failure, feedback objects, status, general error	Load failure message	1= open circuit, failure of light source [1], automatic circuit-breaker tripped or no load connected.
Excess temp., feedback objects, status, general error	Excess temperature message [2]	1= the dimmer is overloaded: • connected power is too high, • ambient temperature is too high, • incorrect installation position, i.e. device cannot dissipate the heat, • booster defective.
Short circuit, feedback objects, status, general error	Short circuit message	1= check connected lines and load
R,C/L load, feedback objects, status, general error	Load type message (R, C/L)	1= Reverse phase control: With a resistive or capacitive loads (R/C), e.g. electronic transformers or incandescent lamps. 0= phase control: With inductive loads, e.g. conventional transformers.
Bus/manual, feedback objects, status, general error	Bus/manual operation message	Indicates whether the switch on the dimmer housing is set to bus operation or not. 1 = manual operation (manual 0 or manual 1 position) 0 = bus (bus position)

[1] Failed light sources can only be detected if the current supply for 230V is effectively interrupted (halogen spot lamps or normal incandescent bulbs). If light sources are connected in parallel or there is a load failure on the 12V secondary side of a transformer then the system does not detect a load failure.

[2] This telegram should not be used to determine the maximum dimmable power in an application.

- **Objects 9, 19, 29, 39, 49, 59 "Bit set status message"**

Diagnosis object for status and error display.
Status information is encoded in one byte according to the following bit pattern.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
n.a.	n.a.	x	x	x	x	x	x

x = value 1 or 0

Table 9

	Bit	Name	Application
Error	0	Load failure	1= open circuit, automatic circuit-breaker tripped or no load connected.
	1	Excess temperature	1= the dimmer is overloaded: • connected power is too high, • ambient temperature is too high, • incorrect installation position, i.e. device cannot dissipate the heat, • booster defective.
	2	Short circuit	1= check connected lines and load
Status	3	Type of load	1= reverse phase control (R, C load connected), electronic transformers or incandescent lamps test 0= phase control (L load connected), conventional transformers
	4	Manual/bus operation	1= manual switch on the device set to manual operation "0" or "1" 0= manual switch set to bus operation
	5	Dimming value	1= dimming value >0% 0= dimming value = OFF

- **Object 60 "Central continuous ON"**

This object is a central object. It can be configured to work on all channels.
If this object is set to "1" all of the channels "participating" in this object are dimmed to 100%.
If this object is set to "0" it does not affect the channels.

- **Object 61 "Central continuous Off"**

This object is a central object. It can be configured to work on all channels.
If this object is set to "1" all of the channels "participating" in this object are dimmed to 0%.
If this object is set to "0" it does not affect the channels.

- **Object 62 "Central switching"**

This object is a central object. It can be configured to work on all channels.
If a "1" or "0" is sent to this object then this is the same as if a "1" or "0" is sent to the switching objects of the channels (Object 0, Object 10, Object 20 ...). The same functionality could also be achieved by connecting all switching objects to the same group.
Accordingly, using this object saves time during the assignment of the group addresses and also saves on the number of associations.

- **Object 63 "Scene"**

This object can be used to save and subsequently call "scenes".
The save process stores the current status of the dimming channel, regardless of how the status was brought about (e.g. via dimming values, switching commands, central objects or the manual switches).
The saved status is thus restored when called up.
Each channel can participate in a maximum of 8 scenes.

The following telegrams need to be sent in order to call or save scenes:

Table 10

Function	Value hexadecimal	Decimal value	Function
Save scene 1	$80	128	Each channel saves its current dimming value in the scene memory with the sent scene number, provided the channel is intended to participate in this scene. This scene memory remains alive even after bus failure or mains failure.
Save scene 2	$81	129	
Save scene 3	$82	130	
Save scene 4	$83	131	
Save scene 5	$84	132	
Save scene 6	$85	133	
Save scene 7	$86	134	
Save scene 8	$87	135	
Call scene 1	$00	0	Each channel adopts the dimming value stored in the scene memory under the sent scene memory, provided the channel is intended to take part in this scene.
Call scene 2	$01	1	
Call scene 3	$02	2	
Call scene 4	$03	3	
Call scene 5	$04	4	
Call scene 6	$05	5	
Call scene 7	$06	6	
Call scene 8	$07	7	

3.4 Parameters

3.4.1 General

Table 11

Designation	Values	Application
Type of basic module	GM is a DMG 2 S	With this application only a DMG 2 S can be used as the basic module.
Number of upgrade modules	**No upgrade** 1 upgrade module 2 upgrade modules	DMG 2 S DMG 2 S + 1 upgrade to the MiX Series DMG 2 S + 2 upgrades to the MiX Series
Type of first upgrade module EM1	EM 1 is a DME 2 S **EM 1 is an RME 4 S or RME 4 C-Load**	Upgrade basic module with 2 dimmer channels Basic module + switching actuator module
Type of second upgrade module EM2	EM 2 is a DME 2 S **EM 2 is an RME 4 S or RME 4 C-Load**	One additional upgrade module is used (see row above)
Time for cyclic sending of the feedback objects (if used)	2 min, 3 min, 5 min, 10 min, **15 min**, 20 min, 30 min, 45 min, 60 min	At what time intervals are the cyclic feedback telegrams to be sent?

3.4.2 DMG 2 S channel 1 S1, DMG 2 S channel 2 S1, EM 1 DME 2 S channel 1 S1, EM 2 DME 2 S channel 1 S1 etc.

Table 12

Designation	Values	Application
Minimum brightness	5%, 10%, 15%, 20%, 25%, 30%, **35%**, 40%, 45%, 50%	Minimum dimming value for all dimming processes (except 0%). Any values (switch-ON brightness, response to bus failure etc.) which are below this threshold are increased to the minimum brightness.
Dimming time from 0% to 100%	1 sec, 2 sec, 3 sec, 4 sec, **5 sec**, 6 sec, 7 sec, 8 sec, 9 sec, 10 sec, 11 sec, 12 sec, 13 sec, 14 sec, 15 sec, 20 sec, 30 sec, 40 sec, 50 sec, 60 sec	This setting determines the dimming speed for 4-bit telegrams (brighter/darker).
Response when receiving a dimming value	**Soft ON** Immediate ON	The dimming time parameter also applies here to the object dimming value. The received dimming value is adopted immediately.
Switch-ON brightness	**Brightness value before previous switch-OFF** Minimum brightness 100 %, 10 %, 20 %, 30 %, 40 %, 50 %, 60 %, 70 % , 80 %, 90 %	The last dimming value before switching OFF is saved and restored. The configured minimum brightness is adopted. The dimmer adopts the selected value after it is switched ON. Here again the configured minimum brightness needs to be taken into account.
Switching ON/OFF with a 4-bit telegram	 No **Yes**	Defines the response if the channel is switched OFF and a 4-bit telegram (brighter/darker) is received. See appendix: Respoionse to 4-bit telegrams Channel remains switched ON or OFF. Channel is switched ON and dimmed or switched OFF.

Continuation:

Designation	Values	Application
Participation in central objects	- **Yes: in all central objects** - No: in no central object - only in central continuous ON - only in central continuous OFF - only in central switching - only in central switching and continuous ON - only in central switching and continuous OFF - only in central continuous ON and continuous OFF	Defines which central objects the channel responds to.
Participation in scenes	**Yes: in scenes 1 - 8** Yes: in scenes 1 - 4 Yes: in scenes 5 - 8 Yes: in scenes 3 - 6 Yes: in scenes 1 - 2 Yes: in scenes 3 - 4 Yes: in scenes 5 - 6 Yes: in scenes 7 - 8 Yes: in scenes 1,2,5,6 Yes: in scenes 1,2,7,8 Yes: in scenes 1 - 6 Yes: in scenes 3 - 8	Which scenes should the relevant channel be used in?
Behaviour after bus failure	**No change** Minimum brightness 100 % Off 10 %, 20 %, 30 %, 40 %, 50 %, 60 %, 70 %, 80 %, 90 %	How should the dimmer respond if the bus voltage fails and controls via the bus are therefore no longer available? Here again the configured minimum brightness needs to be taken into account.
Behaviour after restoration of the bus/mains power	Same as before bus failure Minimum brightness 100 % Off 10 %, 20 %, 30 %, 40 %, 50 %, 60 %, 70 %, 80 %, **90 %**	How should the dimmer react when normal operation is restored (bus and mains supply restored)? Here again the configured minimum brightness needs to be taken into account.

Continuation

Designation	Values	Application
Load selection (R, C or L)	**Automatic load detection (standard)**	The dimmer detects what type of load is connected and automatically selects the appropriate dimming strategy (phase control or reverse phase control).
	R, C load (incandescent bulbs, electronic power units)	Phase control for resistive and capacitive loads (incandescent lamps, halogen high-voltage lamps etc.) For electronic transformers/power units designated for use with RC-mode dimmers (phase control/trailing edge). **CAUTION: Connecting inductive loads (e.g. wound transformer, fan motor) could irreparably damage the dimmer.**
	L load (wound transformers)	Phase control for inductive loads (wound transformers). → With electronic transformers specifically designed for operating L-mode dimmers (phase control/leading edge) this setting can be used to achieve better dimming response.
	Fan (for devices from mid-2006)	Switch ON at 100 % before setting value.
	Dimmable energy saving lamps (for devices from October 2009)	See appendix: Dimming energy-saving lamps (ESL)

3.4.3 DMG 2 S channel 1 S2, DMG 2 S channel 2 S2, EM 1 DME 2 S channel 1 S2, EM 2 DME 2 S channel 2 S2 etc.

Table 13

Designation	Values	Application
Time for Soft ON	0 sec, 1 sec, 2 sec, 4 sec, 6 sec, 8 sec, 12 sec, 15 sec, 24 sec, 30 sec, 45 sec, 1 min, 2 min, 3 min, 4 min, 5 min, 6 min, 7 min, 8 min, 9 min, 10 min, 12 min, 15 min, 20 min, 30 min, 40 min, 50 min, 60 min	Duration of the dimming-up phase (t1) for Soft Switching (see appendix). 0 sec = switch ON immediately. **IMPORTANT**: See appendix for further details: Retriggering and premature switch-OFF
Dimming value after Soft ON	10 %, 20 %, 30 %, 40 %, 50 %, 60 %, 70 % , 80 %, 90 %, **100 %**	Final value at the end of the Soft ON phase (val) Here again the configured minimum brightness needs to be taken into account.
Time between Soft ON and Soft OFF	Until “Soft Off” telegram 1 sec, 2 sec, 3 sec, 4 sec, 5 sec, 6 sec, 7 sec, 8 sec, 9 sec, 10 sec, 15 sec, 20 sec, 30 sec, 40 sec, 50 sec, 1 min, 2 min, 3 min, 4 min, **5 min,** 6 min, 7 min, 8 min, 9 min, 10 min, 12 min, 15 min, 20 min, 30 min, 40 min, 50 min, 60 min	No time restriction; Soft Off phase is initiated by a telegram Delay (t2) to the start of the Soft Off phase
Time for Soft OFF	0 sec, 1 sec, 2 sec, 4 sec, 6 sec, 8 sec, 12 sec, 15 sec, 24 sec, 30 sec, 45 sec, 1 min, 2 min, 3 min, 4 min, 5 min, 6 min, 7 min, 8 min, 9 min, 10 min, 12 min, 15 min, 20 min, 30 min, 40 min, 50 min, 60 min	Duration of the Soft Off phase (t3) 0 sec = switch OFF immediately **IMPORTANT**: See appendix for further details: Retriggering and premature switch-OFF

Continuation:

Designation	Values	Application
Forced mode function	**No forced mode function** Forced mode through dimming value (0 = inactive) Activate forced mode with 1 Activate forced mode with 0	Forced mode object not present Forced mode is triggered by one-byte telegram with dimming value (See Forced mode object) Activation via 1-bit object: 1 = active / 0 = inactive 0 = active / 1 = inactive
Behaviour at start of forced mode	**Minimum brightness** 100 % Off 10 %, 20 %, 30 %,40 %, 50 %, 60 %, 70 %, 80 %, 90 %	Response to the receipt of a forced mode telegram Here again the configured minimum brightness needs to be taken into account.
Behaviour at end of forced mode	**Value before forced mode** Minimum brightness 100 % Off 10 %, 20 %, 30 %, 40 %, 50 %, 60 %, 70 %, 80 %, 90 %	Response to cancellation of forced mode Here again the configured minimum brightness needs to be taken into account.

Continuation:

Designation	Values	Application
Diagnosis and feedback		Function of feedback objects + specific feedback via Object 8
	None	Do not send any diagnosis or feedback telegrams. Objects 5 ... 9 are hidden.
	Feedback object, status, general error	Object 5: Dimming value feedback Object 6: ON/OFF status feedback Object 7: General error message Object 8: Not used Object 9: Status
	Load failure, feedback objects, status, general error	as above, only Object 8: Load failure error telegram
	Excess temperature, feedback objects, status, general error	as above, only Object 8: Excess temp. error telegram
	Short circuit, feedback objects, status, general error	as above, only Object 8: Short circuit error telegram
	R,C/L load, feedback objects, status, general error	as above, only Object 8: Load type feedback
	Bus/manual, feedback objects, status, general error	as above, only Object 8: Bus/manual operation feedback
Sending diagnosis and feedback	**only at change**	Only to be sent when something has changed
	cyclically and at change	To be sent at regular intervals and again after a change

4 Application in a MIX2 system

A **MIX 2 device** (order no. 493…) can accept any number of **MIX upgrade devices** (order no. 491…).

The object numbers and the allocation of parameters can vary from the original MIX applications.

Note:
MIX 2 upgrade devices (order no. 493…) can only work in combination with a MIX 2 basic device (order no. 493…).

4.1 Characteristics of the communications objects

Table 14

Object	Function	Object name	Type	Response
80	*Switching ON/OFF*	*GM DMG2S / SMG2S channel 1*	1 bit	Receive
81	*Brighter / darker*	*GM DMG2S / SMG2S channel 1*	4 bits	Receive
82	*Dimming value*	*GM DMG2S / SMG2S channel 1*	1 byte	Receive
83	*Soft switch*	*GM DMG2S / SMG2S channel 1*	1 bit	Receive
84	*Compulsory operation ON/OFF* *Dimming value for compulsory operation*	*GM DMG2S / SMG2S channel 1*	1 bit 1 byte	Receive
85	*Feedback in %*	*GM DMG2S / SMG2S channel 1*	1 byte	Send
86	*Feedback On/Off*	*GM DMG2S / SMG2S channel 1*	1 bit	Send
87	*General error message*	*GM DMG2S / SMG2S channel 1*	1 bit	Send
88	*Load failure message* *Excess temperature message* *Short circuit message* *Load type message (R, C/L)* *Bus/manual operation message*	*GM DMG2S / SMG2S channel 1*	1 bit	Send
89	*Status message (bit set)*	*GM DMG2S / SMG2S channel 1*	1 byte	Send
90-99 and 160-179: For all additional channels including second DME 2 S / SME 2 S upgrade module				
Central objects				
240	*Switching ON/OFF*	*Central continuous ON*	1 bit	Receive
241	*Switching ON/OFF*	*Central continuous OFF*	1 bit	Receive
242	*Switching ON/OFF*	*Central switching*	1 bit	Receive
243	*Call/save scene*	*Scene*	1 byte	Receive

4.2 Description of objects

- **Objects 80, 90, 160, 170** *"""" Switching ON/OFF"*

A 1 on this object dims up to 100%,
and 0 dims to 0%

- **Objects 81, 91, 161, 171** *"brighter/darker"“*

This object is actuated with 4-bit telegrams (EIS 2 relative dimming).
This function can be used to dim the light up or down in increments (with 1...64 increments)
.
In the standard application, telegrams are sent with 64 increments.
IMPORTANT: The response to 4-bit telegrams depends on the
“Switching On/Off with a 4-bit telegram” parameter.

- **Objects 82, 92, 162, 172** *"Dimming value"*

This object can be used to select the desired dimmer setting directly.
Format: 1 byte percentage value EIS 2 dimming, value.
0 = 0%
255 = 100%

- **Objects 83, 93, 163, 173** *"Soft switching"*

A “1” on this object starts a soft switching cycle, i.e.:
The brightness is gradually increased, starting from the minimum brightness.
The dimming value remains constant for the programmed time and is then gradually reduced after this time has elapsed.
Once the programmed minimum brightness has been reached the dimming value is reset to 0%.
The cycle can be extended or prematurely terminated via telegrams.

This sequence can also be controlled using a **time switch** if the "*Time between soft ON and soft OFF*" parameter is set to "*Until soft OFF telegram*".
The dimming cycle is then started with a “1” and finished with a “0”.

- **Objects 84, 94, 164, 174** *"Compulsory operation = 1" / "Compulsory operation = 0" / "Compulsory operation via dimming value"*

The function of the compulsory operation object can be configured as a 1-bit or 1-byte object.

Table 15

Configuration	Compulsory operation		Response with compulsory operation	
	Trigger with	End with	Start	Ends
As 1-bit object	1 or 0 (configurable)	0 or 1 (configurable)	Configurable in the application program	
As 1-byte object	1 ... 255	0	The triggering telegram also acts simultaneously as a compulsory operation dimming value.	The last dimming value before compulsory operation is restored.

- **Objects 85, 95, 165, 175** *"Feedback in %"*

Sends the new dimming value after a change as soon as a dimming procedure is completed, i.e. once the new set point value has been reached.
Format: 1 byte, 0 ... 255 i.e. 0 ... 100%

IMPORTANT:
This object must not be placed in the same group address as object 82.

- **Objects 86, 96, 166, 176** *" Feedback On/Off"*

Sends the current dimming status:
1 = current dimming value is between 1% and 100%
0 = current dimming value is 0%

- **Objects 87, 97, 167, 177** *"General error message"*

Used as a malfunction signal:
0 = No error
1 = an error has been detected

This message can be displayed on a screen.
For detailed error analysis, see Object 89.

- **Objects 88, 98, 168, 178** *"Load failure message", "Excess temperature message", "Short circuit message"", "Load type message (R, C/L)", "Bus/manual mode operation"*

The function of this object is dependant on the "Diagnosis and feedback" parameter and the device type (DME 2 S or SME 2 S).
This allows a more specific error message.

Table 16: DME 2 S

"Diagnosis and feedback" parameter	Function of object 88	Application
Feedback objects, status, general error	-	-
Load failure, feedback objects, status, general error	Load failure message	1= open circuit, failure of light source,[1], automatic circuit-breaker tripped or no load connected.
Excess temp., feedback objects, status, general error	Excess temperature message[2]	1= the dimmer is overloaded: • connected power is too high, • ambient temperature is too high, • incorrect installation position, i.e. device cannot dissipate the heat, • booster defective.
Short circuit, feedback objects, status, general error	Short circuit message	1= check connected lines and load
R,C/L load, feedback objects, status, general error	Load type message (R, C/L)	1= Reverse phase control: With a resistive or capacitive loads (R/C), e.g. electronic transformers or incandescent lamps. 0= phase control: With inductive loads, e.g. conventional transformers.
Bus/manual, feedback objects, status, general error	Bus/manual operation message	Indicates whether the switch on the dimmer housing is set to bus operation or not. 1 = manual operation (manual 0 or manual 1 position) 0 = bus (bus position)

[1] Failed light sources can only be detected if the current supply for 230V is effectively interrupted (halogen spot lamps or normal incandescent bulbs). If light sources are connected in parallel or there is a load failure on the 12V secondary side of a transformer then the system does not detect a load failure.

[2] This telegram should not be used to determine the maximum dimmable power in an application.

Table 17: SME 2 S

"Diagnosis and feedback" parameter	Function of object 88	Application
Feedback objects, status, general error	-	-
Load failure, feedback objects, status, general error	Load failure message	No voltage supply to terminals 1-2
Excess temp., feedback objects, status, general error	Excess temperature message	Overload of 1-10 V connection. The channel is dimmed up to 100% and the status LED flashes rapidly.
Short circuit, feedback objects, status, general error	Short circuit message	SMG 2 / SME 2: Internal error. The status LED flashes rapidly and slowly in turn.
R,C/L load, feedback objects, status, general error	Load type message (R, C/L)	No mains connection or no load connected to relay, no measurable voltage between terminals 3-4 or 7-8. The status LED flashes slowly (once a second).
Bus/manual, feedback objects, status, general error	Bus/manual operation message	Indicates whether the switch on the dimmer housing is set to bus operation or not. 1 = manual operation (manual 0 or manual 1 position) 0 = bus (bus position)

• **Objects 89, 99, 169, 179** *"Bit set status message"*

Diagnosis object for status and error display.
The relevance of the individual bits is dependent on the device type (DME 2 S or SME 2 S).

Status information is encoded in one byte according to the following bit pattern.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
n.a.	n.a.	x	x	x	x	x	x

x = value 1 or 0

Table 18: DME 2 S

	Bit	Name	Application
Error	0	Load failure	1= open circuit, automatic circuit-breaker tripped or no load connected.
	1	Excess temperature	1= the dimmer is overloaded: connected power is too high, ambient temperature is too high, incorrect installation position, i.e. device cannot dissipate the heat, booster defective.
	2	DME 2 S Short circuit	1= check connected lines and load
Status	3	Type of load	1= reverse phase control (R, C load connected), electronic transformers or incandescent lamps test 0= phase control (L load connected), conventional transformers
	4	Manual/bus operation	1= manual switch on the device set to manual operation “0” or “1” 0= manual switch set to bus operation
	5	Dimming value	1= dimming value >0% 0= Dimming value = off

Table 19: SME 2 S

	Bit	Name	Application
Error	0	Load failure	No voltage supply to terminals 1-2
	1	Excess temperature	Overload of 1-10 V connection
	2	Short circuit	Internal error
Status	3	Type of load	No mains connection or no load connected to relay, no measurable voltage between terminals 3-4 or 7-8. The channel LED flashes slowly
	4	Manual/bus operation	1= manual switch on the device set to manual operation “0” or “1” 0= manual switch set to bus operation
	5	Dimming value	1= dimming value >0% 0= Dimming value = off

- **Object 240** *"Central continuous On"*

This object is a central object. It can be configured to work on all channels.
If this object is set to "1" all of the channels "participating" in this object are dimmed "Participate" object to 100%.
If this object is set to "0" it does not effect the channels.

- **Object 241** *"Central continuous Off"*“

This object is a central object. It can be configured to work on all channels.
If this object is set to "1" all of the channels "participating" in this object are dimmed "Participate" object to 0%.
If this object is set to "0" it does not effect the channels.

- **Object 242** *"Central switching"*

This object is a central object. It can be configured to work on all channels.
If a "1" or "0" is sent to this object then this is the same as if a "1" or "0" is sent to the switching objects of the channels (Object 80, Object 90, ...). The same functionality could also be achieved by connecting all switching objects to the same group as that of this object. Accordingly, using this object saves time during the assignment of the group addresses and also saves on the number of associations.

- **Object 243** *"Call/save central scenes"“*

This object can be used to save and subsequently call "scenes".
The save process stores the current status of the dimming channel, regardless of how the status was brought about (e.g. via dimming values, switching commands, central objects or the manual switches).
The saved status is thus restored when called up.
Each channel can participate in a maximum of 8 scenes.

The following telegrams need to be sent in order to call or save scenes:

Table 20

Function	Value hexadecimal	Decimal value	Function
Save scene 1	$80	128	Each channel saves its current dimming value in the scene memory with the sent scene number, provided the channel is intended to participate in this scene. This scene memory remains alive even after bus failure or mains failure.
Save scene 2	$81	129	
Save scene 3	$82	130	
Save scene 4	$83	131	
Save scene 5	$84	132	
Save scene 6	$85	133	
Save scene 7	$86	134	
Save scene 8	$87	135	
Call scene 1	$00	0	Each channel adopts the dimming value stored in the scene memory under the sent scene memory, provided the channel is intended to take part in this scene.
Call scene 2	$01	1	
Call scene 3	$02	2	
Call scene 4	$03	3	
Call scene 5	$04	4	
Call scene 6	$05	5	
Call scene 7	$06	6	
Call scene 8	$07	7	

4.3 Parameter overview

Each channel has up to 7 parameter pages, and all channels have an identical layout.

Table 21

Function	Description
DMG 2S / SMG 2 S C1: Function selection	Set basic functions of channel.
Dimming response	Load selection, dimming times etc.
Soft dimming	Soft dimming times
Compulsory operation	Response for compulsory operation
Scenes	Participation in scenes
Feedback	Diagnosis and feedback messages
Loss of power and restoration	Response for loss of bus power and restoration of power.

4.3.1 The parameter page *"DMG 2S / SMG 2 S C1: Function selection"*

Table 22

Designation	Values	Description
Activate soft dimming	*No* *Yes*	No soft dimming Fade in soft dimming parameter page
Activate compulsory operation function	*No* *Yes*	No compulsory operation function Fade in compulsory operation parameter page
Participation in scenes	*No* *Yes*	No scenes Fade in scenes parameter page
Participation in central objects	***Yes: in all central objects*** *No: in no central object* *only in central continuous ON* *only in central continuous OFF* *only in central switching* *only in central switching and continuous ON* *only in central switching and continuous OFF* *only in central permanent On and permanent OFF*	Defines which central objects the channel responds to.
Activate feedback messages	*No* *Yes*	No feedback messages Fade in feedback parameter page

4.3.2 The *"Dimming response"* parameter page

Table 23

Designation	Values	Description
Load selection (R, C or L) ONLY for DME 2	***Automatic load detection (standard)***	The dimmer detects what type of load is connected and automatically selects the appropriate dimming strategy (phase control or reverse phase control).
	R, C load (incandescent bulbs, electronic power units)	Phase control for resistive and capacitive loads (incandescent lamps, halogen high-voltage lamps etc.) For electronic transformers/power units designated for use with RC-mode dimmers (phase control/ trailing edge). **CAUTION: Connecting inductive loads (e.g. wound transformer, fan motor) could irreparably damage the dimmer.**
	L load (wound transformers)	Phase control for inductive loads (wound transformers). → With electronic transformers specifically designed for operating L-mode dimmers (phase control/leading edge) this setting can be used to achieve better dimming response.
	Fan (for devices from mid-2006)	Switch on at 100 % before setting value.
	Dimmable Energy saving lamps (device no. 491 0 271)	Only for dimmable energy saving lamps. See DMG 2 S KNX manual.
Minimum brightness	*5%, 10%, 15%, 20% , 25%, 30%, **35%**, 40%, 45%, 50%*	Minimum dimming value for all dimming processes (except 0%). Any values (switch-on brightness, response to bus failure etc.) which are below this threshold are increased to the minimum brightness.

Continuation:

Designation	Values	Description
Dimming time from 0% to 100%	*1 sec., 2 sec., 3 sec.* *4 sec.,* ***5 sec.****, 6 sec.* *7 sec., 8 sec., 9 sec.* *10 sec., 11 sec., 12 sec.* *13 sec., 14 sec., 15 sec.* *20 sec., 30 sec., 40 sec.* *50 sec., 60 sec.*	This setting determines the dimming speed for 4-bit telegrams (brighter/darker).
When receiving a dimming value/scene no.	***Soft on with above set dimming time*** *Immediate on*	The dimming time parameter also applies here to the object dimming value. The received dimming value is adopted immediately.
Switch-on brightness	***Brightness value before previous switch-off*** *Minimum brightness* *100 %, 10 %, 20 %* *30 %, 40 %, 50 %* *60 %, 70 % , 80 %,* *90 %*	The last dimming value before switching off is saved and restored. The configured minimum brightness is adopted. The dimmer adopts the selected value after it is switched on. Here again the configured minimum brightness needs to be taken into account.
Switching on/off with a 4-bit telegram	 *No* ***Yes***	Defines the response if the channel is switched off and a 4-bit telegram (brighter/darker) is received. Channel remains switched on or off. Channel is switched on and dimmed or switched off.

4.3.3 The *"Soft dimming"* parameter page

Table 24

Designation	Values	Description
Time for Soft ON	*0 sec., 1 min., 2 min.* *3 min., 4 min., 5 min.* *6 min., 7 min., 8 min.* *9 min., 10 min., 12 min.* *15 min., 20 min., 30 min.* *40 min., 50 min., 60 min.*	Duration of the dimming-up phase (t1) for Soft switching (see appendix). 0 sec. = switch on immediately. **IMPORTANT**: See appendix for further details: Retriggering and premature switch-off
Dimming value after Soft ON	*10 %, 20 %, 30 %, 40 %* *50 %, 60 %, 70 % , 80 %* *90 %,* ***100 %***	Final value at the end of the Soft on phase (val) Note: Here again the configured minimum brightness needs to be taken into account.
Time between Soft ON and Soft OFF	*Until “Soft Off” telegram*	No time restriction; Soft Off phase is initiated by a telegram
	1 sec., 2 sec. *3 sec., 4 sec., 5 sec.* *6 sec., 7 sec., 8 sec.* *9 sec., 10 sec., 15 sec.* *20 sec., 30 sec., 40 sec.* *50 sec., 1 min., 2 min.* *3 min., 4 min.,* ***5 min.*** *6 min., 7 min., 8 min.* *9 min., 10 min., 12 min.* *15 min., 20 min., 30 min.* *40 min., 50 min., 60 min.*	Delay (t2) to the start of the Soft Off phase
Time for Soft OFF	*0 sec., 1 min., 2 min.* *3 min., 4 min., 5 min.* *6 min., 7 min., 8 min.* *9 min., 10 min., 12 min.* *15 min., 20 min., 30 min.* *40 min., 50 min., 60 min.*	Duration of the Soft Off phase (t3) 0 sec. = switch off immediately **IMPORTANT**: See DMG 2 S KNX manual for further details.

4.3.4 The *"Compulsory operation* parameter page

Table 25

Designation	Values	Description
Compulsory operation function	*Compulsory operation through dimming value (0 = inactive)* *Activate compulsory operation with 1* *Activate compulsory operation with 0*	Compulsory operation is triggered by one-byte telegram with dimming value (See Compulsory operation object) Activation via 1-bit object 1 = active / 0 = inactive 0 = active / 1 = inactive
Behaviour at start of compulsory operation	*Minimum brightness* *100 %* *Off* *10 %, 20 %, 30 %* *40 %, 50 %, 60 %* *70 %, 80 %, 90 %*	Response to the receipt of a compulsory operation telegram Here again the configured minimum brightness needs to be taken into account.
Behaviour at end of compulsory operation	*Value before compulsory operation* *Minimum brightness* *100 %* *Off* *10 %, 20 %, 30 %* *40 %, 50 %, 60 %* *70 %, 80 %, 90 %*	Response to cancellation of compulsory operation Here again the configured minimum brightness needs to be taken into account.

4.3.5 The *"Scenes"* parameter page

Table 26

Designation	Values	Description
Participation in scene 1	***No*** *Yes*	Which scenes numbers should the channel react to (save/restore)?
Participation in scene 2	***No*** *Yes*	
Participation in scene 3	***No*** *Yes*	
Participation in scene 4	***No*** *Yes*	
Participation in scene 5	***No*** *Yes*	
Participation in scene 6	***No*** *Yes*	
Participation in scene 7	***No*** *Yes*	
Participation in scene 8	***No*** *Yes*	

4.3.6 The *"Feedback"* parameter page

Table 27: DME 2 S

Designation	Values	Description
Diagnosis and feedback		Function of the feedback objects + specific feedback via Object 88
	none	Do not send any diagnosis or feedback telegrams. Objects 85 .. 89 are hidden.
	Feedback object, status, general error	Object 85: Dimming value feedback Object 86: ON/OFF status feedback Object 87: General error message Object 88: Not used Object 89: Status
	Load failure, feedback objects, status, general error	as above, only Object 88 Load failure error message
	Excess temperature, feedback objects, status, general error	as above, only Object 88 Excess temperature error message
	Short circuit, feedback objects, status, general error	as above, only Object 88 Short circuit error message
	R,C/L load, feedback objects, status, general error	as above, only Object 88 Load type feedback
	Bus/manual, feedback objects, status, general error	as above, only Object 88 Bus/manual operation feedback
Send diagnosis and feedback cyclically	*only at change*	Only to be sent when something has changed
	cyclically and at change	To be sent at regular intervals and again after a change. The cycle time is set on the first parameter page (→*General)*: *Time for cyclical sending of feedback object (MIX series, order no.491...)*

Table 28: SME 2 S

Designation	Values	Description
Diagnosis and feedback		Function of the feedback objects + specific feedback via Object 88
	none	Do not send any diagnosis or feedback telegrams. Objects 85 .. 89 are hidden.
	Feedback object, status, general error	Object 85: Dimming value feedback Object 86: ON/OFF status feedback Object 87: General error message Object 88: Not used Object 89: Status
	Load failure, feedback objects, status, general error	as above, only object 88 error message: Failure of power unit
	Excess temperature, feedback objects, status, general error	as above, only Object 88 Error message overload of 1-10 V connection
	Short circuit, feedback objects, status, general error	as above, only Object 88 error message: Internal error
	R,C/L load, feedback objects, status, general error	as above, only object 88 error message: No mains supply or no load connected to relay. The channel LED flashes slowly.
	Bus/manual, feedback objects, status, general error	as above, only Object 88 Bus/manual operation feedback
Send diagnosis and feedback cyclically	***only at change***	Only to be sent when something has changed
	cyclically and at change	To be sent at regular intervals and again after a change

4.3.7 The *power loss and restoration* parameter page

Table 29

Designation	Values	Description
Dimming value after loss of bus power	***No change*** *Minimum brightness* *100 %* *Off* *10 %, 20 %, 30 %* *40 %, 50 %, 60 %* *70 %, 80 %, 90 %*	How should the dimmer respond if the bus voltage fails and controls via the bus are therefore no longer available? Here again the configured minimum brightness needs to be taken into account.
Dimming value after restoration of bus or mains power	*Same as before bus failure* *Minimum brightness* *100 %* *OFF* *10 %, 20 %, 30 %* *40 %, 50 %, 60 %* *70 %, 80 %,* ***90 %***	How should the dimmer react when normal operation is restored (bus and mains supply available)? Here again the configured minimum brightness needs to be taken into account.

5 APPENDIX

5.1 Dimming energy-saving lamps (ESL)

5.1.1 General

Standard energy-saving lamps are not dimmable unless specifically denoted as dimmable.
There are also manufacturer- and type-related differences.
In particular, there are variations in switch-ON brightness and performance with cold lamps.

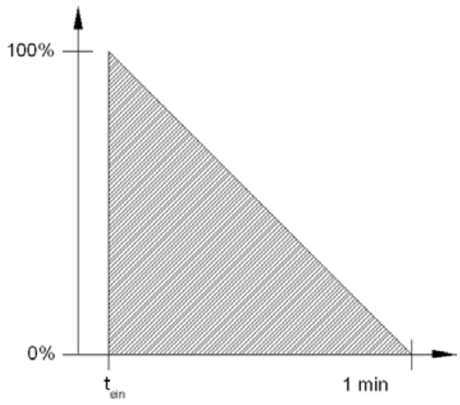
Although the ESL mode of the Theben dimmer takes account of the characteristic features of dimmable energy-saving lamps, attention should be to the following points.

- ESL can be connected in parallel but it is recommended to only use the same type of lighting on each channel
- The maximum load per device is 2 x 60 W or 1x 100 W
- The minimum output per channel is 7 W
- Rapid dimming (e.g. immediate ON configured, dimming value of 100% to 15 %) can cause flickering even with "warm" lights.
- Brightness values below 15% can cause flickering and have a negative effect on the lifespan of the lamp similar to being switched ON and OFF.
- When used with automatic switches (motion/presence detectors) the minimum switch-ON time of an ESL must not be < 5 minutes indoors or < 10 minutes outdoors in order to avoid reducing the lifespan of the lamp

**In order to avoid problems in dimming an ESL the Theben dimmer has a special mode that is selected via the *Load selection* → *Dimmable energy-saving lamp* parameter.
This mode also takes account of the varying characteristic curve in comparison with the incandescent lamp, i.e. the relationship of the set percentage value to the emitted brightness in relation to maximum brightness.**

5.1.2 Switch-ON with cold lamp

To avoid dimmable ESLs flickering or not coming ON, it is always switched ON to 100% and then reduced to the desired brightness within a minute.
This produces the following relation between the time elapsed since switch-ON and the minimum possible dimming value:



No values are permitted in the hatched area independent of the requested dimming value.

Example:
Desired brightness = 50 %.

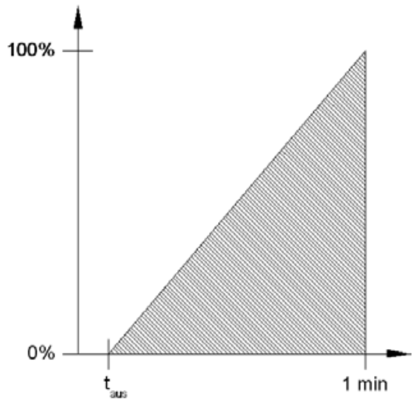
The ESL is first switched ON at 100 % and the brightness is continually reduced.
Based on the dimming rate of 100 % per minute, the desired dimming value is achieved after approx. 30 sec.

On the one hand, this has a balancing effect as cold ESLs usually have a lower switch-ON brightness (depending on manufacturer, type, and ambient temperature it can take up to five minutes to reach maximum brightness.), while, on the other hand, many dimmable ESLs go out or start to flicker if they are dimmed too quickly.

5.1.3 Switch-ON with warm lamp

If the lamp is turned ON again less than a minute after switched OFF, there is no need for minimum switch ON brightness of 100% as the lamp can still be considered as warm.

A lamp can therefore be turned ON with a low dimming value if it is switched ON again immediately.
The permitted values then rise within a minute at the rate that the switched OFF lamp cools down.
After being switched OFF for 30 seconds, the minimum switch-ON value is approx. 50 %.



After being turned OFF for a minute, the lamp has to be switched ON again with a dimming value of 100 % (as described above).

5.2 Use of soft switching function

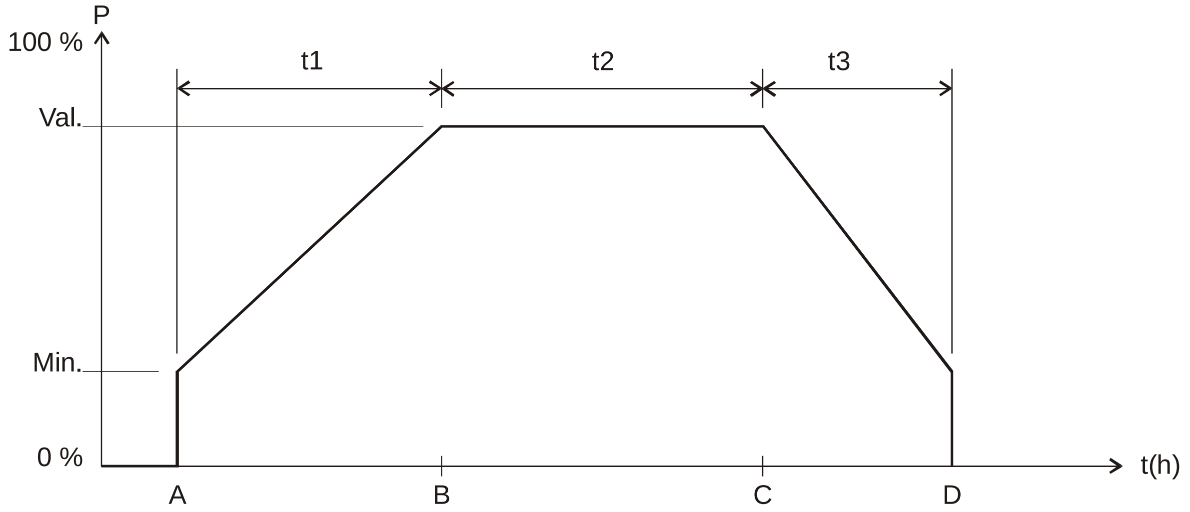
5.2.1 General

The Soft switch function is a cycle consisting of switch-ON, dimming up, maintain target brightness, dimming down and switch-OFF.

5.2.2 Simulation of a daily routine

Using a timer, it is possible to simulate an entire daily routine with sunrise and sunset. To do this, the "Time between Soft ON and Soft OFF" parameter needs to be set to "Until Soft OFF telegram" (See object 3, Soft switching).

The time switch sends a Soft ON telegram (=1) in the morning and a Soft OFF telegram (=0) in the evening to object 3.



Sequence:

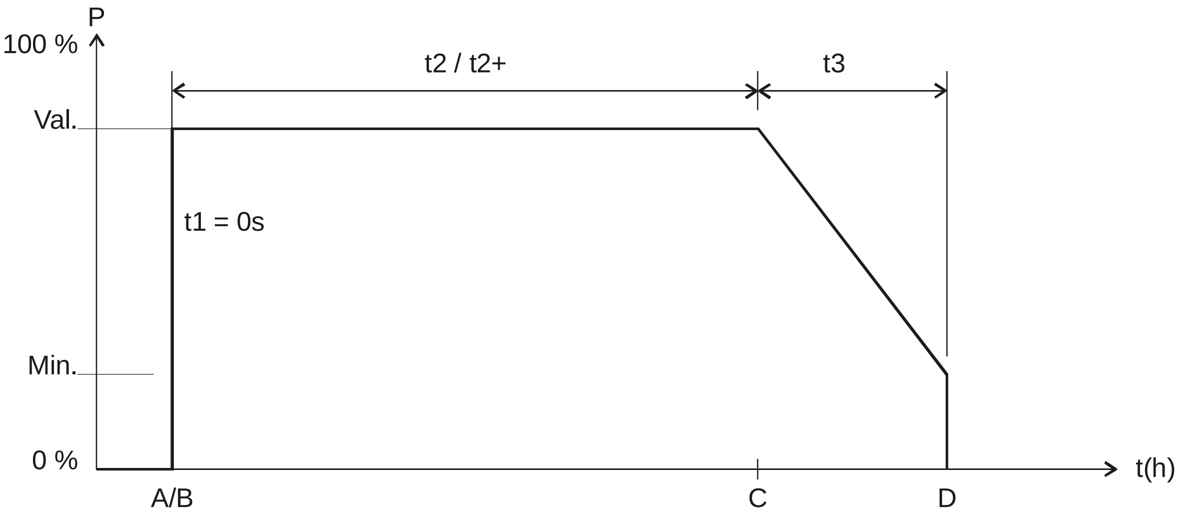
A	*Soft ON* sent by the timer: The brightness is adjusted to the configured *minimum brightness*
t1	The brightness is gradually increased within the configured time for *Soft ON*
B	Configured value after *Soft ON* is reached
t2	In the timer programmed time between *Soft ON* (1) and *Soft OFF* telegram (0)
C	*Soft OFF* telegram has been received: Start of the *Soft OFF* phase
t3	The brightness is gradually reduced within the configured time for *Soft OFF*
D	t3 has elapsed, the configured *minimum brightness* has been reached and the system dims to 0%

Key

Min	Configured *Minimum brightness*
Val.	Target brightness, i.e.configured *Dimming value after Soft ON*
t(h)	Time

5.2.3 Soft ON for staircase lighting

The following function is recommended for staircase lighting:
When the light switch is operated: Full brightness.
After expiry of the desired time: Lighting is slowly dimmed down and then switched OFF.



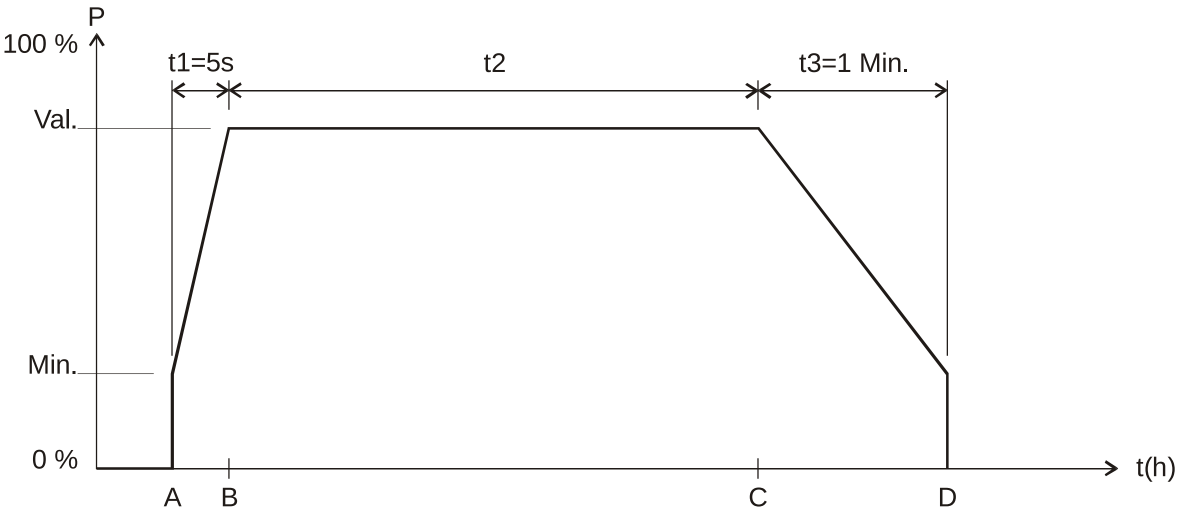
A	Switch sends *Soft ON* telegram.
t1	The *Soft ON* time is equal to 0, i.e. the “Dim up slowly“ function is deactivated.
B	The brightness is immediately adjusted to the configured value after *Soft ON*
t2	Configured time between *Soft ON* and *Soft OFF** elapses
t2+	It is possible for t2 to be extended with another *Soft ON* telegram
C	t2 or t2+ has elapsed, or a *Soft OFF* telegram was received: Start of the *Soft OFF* phase
t3	the brightness is gradually reduced within the configured time for *Soft OFF*
D	t3 has elapsed, the configured *minimum brightness* has been reached and the system dims to 0%

* *Soft OFF* via configured time or via *Soft OFF* telegram.

The light can be turned OFF with a Soft OFF telegram or retriggered with a Soft ON telegram.

5.2.4 Entrance lighting

A motion detector activates the dimmer via the soft switching object.
The lighting is dimmed up within 5 seconds if a movement is detected.
This delay gives the eyes enough time to adjust to the light without being dazzled.
The lighting is gradually dimmed down within a minute and then switched OFF after the configured time has elapsed or a Soft OFF telegram is received via the switch or via the motion detector (cyclic).



Sequence:

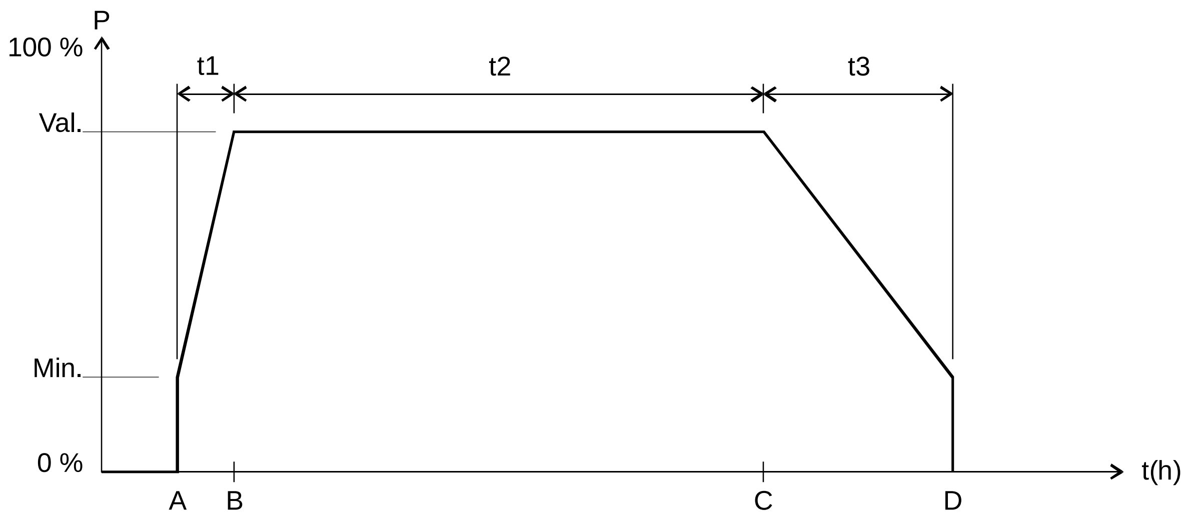
A	*Soft ON* is sent by the motion detector: The brightness is adjusted to the configured *minimum brightness*
t1	The brightness is gradually increased within the configured time for *Soft ON* (5 s)
B	Configured value after *Soft ON* is reached
t2	Time between *Soft ON (1) and Soft OFF (0)*
C	*Soft OFF* telegram was received or configured time has elapsed: Start of the *Soft OFF* phase
t3	The brightness is gradually reduced within the configured time for *Soft OFF*
D	t3 has elapsed, the configured *minimum brightness* has been reached and the system dims to 0%

5.2.5 Retriggering and premature switch-OFF

It is also possible to influence the soft switching process while it is still active. Depending on which phase is currently being executed, the following responses can be triggered by Soft ON and Soft OFF telegrams.

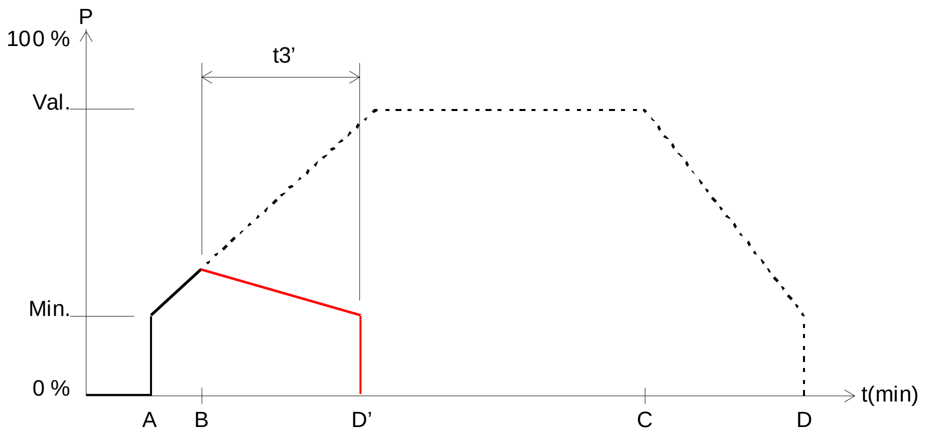
Table 30

Telegram	Response
Soft ON during t1	None
Soft ON during t2	t2 is restarted
Soft ON during t3	A new Soft ON process is started. See below.
Soft OFF during t1	The Soft ON process is stopped and the Soft OFF phase started immediately. See below.
Soft OFF during t2	The Soft OFF phase starts immediately.
Soft OFF during t3	None

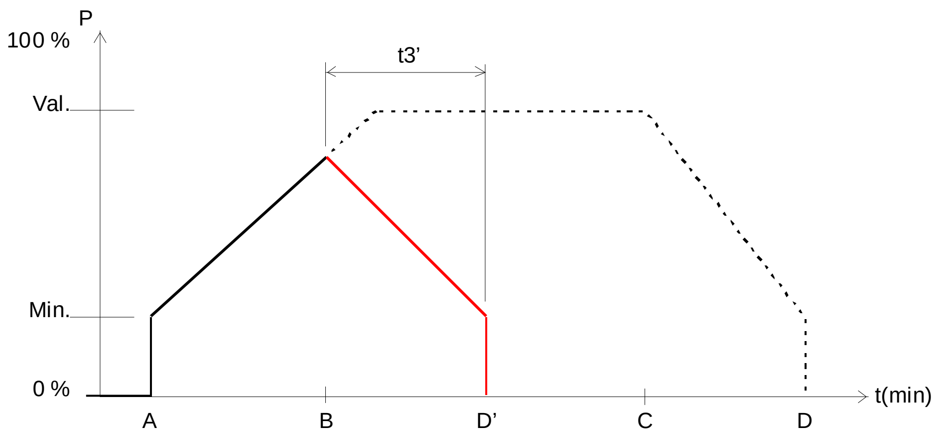


5.2.5.1 Soft OFF telegram during a Soft ON process

The duration of the Soft OFF phase (t3’) is also equivalent to the configured time, independent of the current dimming value.



Example 1: Soft OFF at the start of the Soft ON phase.



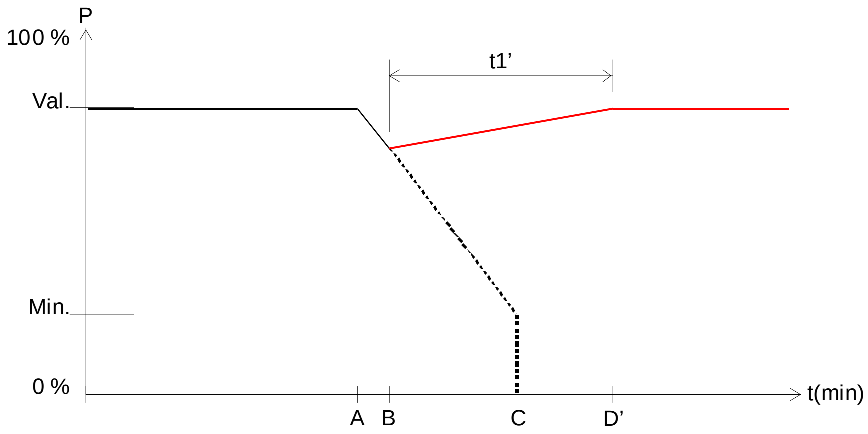
Example 2: Soft OFF at the end of the Soft ON phase.

Sequence:

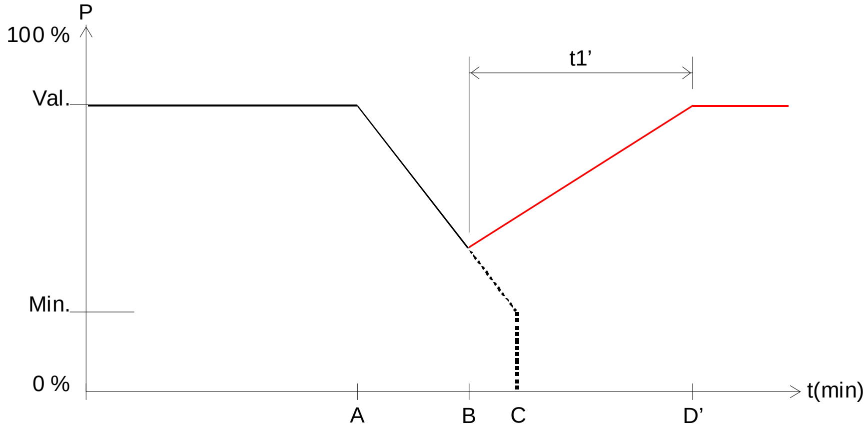
A	A Soft ON process is started.
B	A Soft OFF telegram is received: The Soft ON phase is interrupted and a Soft OFF phase starts.
t3	Duration of the Soft OFF phase = configured Soft OFF time
D	End of the Soft OFF phase

5.2.5.2 Soft ON telegram during a Soft OFF process

The duration of the Soft ON phase (t1') is always equivalent to the configured time, regardless of the current dimming value.



Example 3: Soft ON at the start of the Soft OFF phase.



Example 4: Soft ON at the end of the Soft OFF phase.

Sequence:

A	A Soft OFF process is started.
B	A Soft ON telegram is received: The Soft OFF phase is interrupted and a Soft ON phase starts.
t1	Duration of the Soft ON phase = configured Soft ON time
D	End of the Soft ON phase

5.3 4-bit telegrams (brighter/darker)

5.3.1 4-bit EIS 2 telegram format for relative dimming:

Table 31

Bit 3	Bit 2	Bit 1	Bit 0
Direction	Dimming range divided into increments		
	Code	Increments	
Dim up: 1	000	**Stop**	
Dim down: 0	001	1	
	010	2	
	011	4	
	100	8	
	101	16	
	110	32	
	111	64*	

*typical application

Examples: 1111 = increase brightness by 64 increments
0111 = darken by 64 increments
1101 = increase brightness by 16 increments

5.3.2 Parameter: "Switching ON/OFF with a 4-bit telegram"

In general, the setting "Yes" is required.
The setting "No" is available for use with special customer requests, e.g. in conference rooms. The situation is described below.
A whole group of dimmer channels is operated from a switch (4-bit).
A certain lighting situation has been adjusted by a scene or through other means – e.g. channel 1: OFF, channel 2: 40%, channel 3: 50%. The requirement is to now dim up and increase the brightness of the entire scene, but the channels which are switched OFF should remain OFF.
Parameter: "Switching ON/OFF with a 4-bit telegram" blocks the usual ON/OFF function of the 4-bit telegram.

Table 32

Parameter: "Switching ON/OFF with a 4-bit telegram"	4-bit telegram	Dimmer output status	Response
Yes	Brighter / darker	Switched ON (1%...100%)	Channel is dimmed normally (to 0%* or 100% if applicable).
	Brighter	Off	Channel is switched ON and dimmed
No	Brighter / darker	Off	Dimmer stays switched OFF
	Brighter / darker	Switched ON (1%...100%)	Channel is dimmed in range from min. to 100%

* With the 4-bit telegram "Darker", the channel is switched OFF if the switch/button is kept depressed for longer than approximately 2s when the minimum brightness is reached.

5.4 Conversion of percentages to hexadecimal and decimal values

Table 33

Percentage value	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Hexadecimal	00	1A	33	4D	66	80	99	B3	CC	E6	FF
Decimal	00	26	51	77	102	128	153	179	204	230	255

All values from 00 to FF hex. (0 to 255 dec.) are valid.

5.5 Application of the forced mode function

Example: Lighting with brightness control during the daytime and minimum lighting during the night.

The brightness controller continuously measures the brightness of the room and actuates the dimmer as required to keep the brightness constant. A dimming value of 20% is parameterized for forced mode.
In the evening at the close of work, the time switch activates forced mode, as a result of which the brightness is dimmed down to 20%. During the night, the lighting is switched ON for a certain period of time by the night-watchmen via the central continuous ON function. In the morning at the start of work, the time switch cancels the forced mode again and the dimmer is actuated via the brightness control.

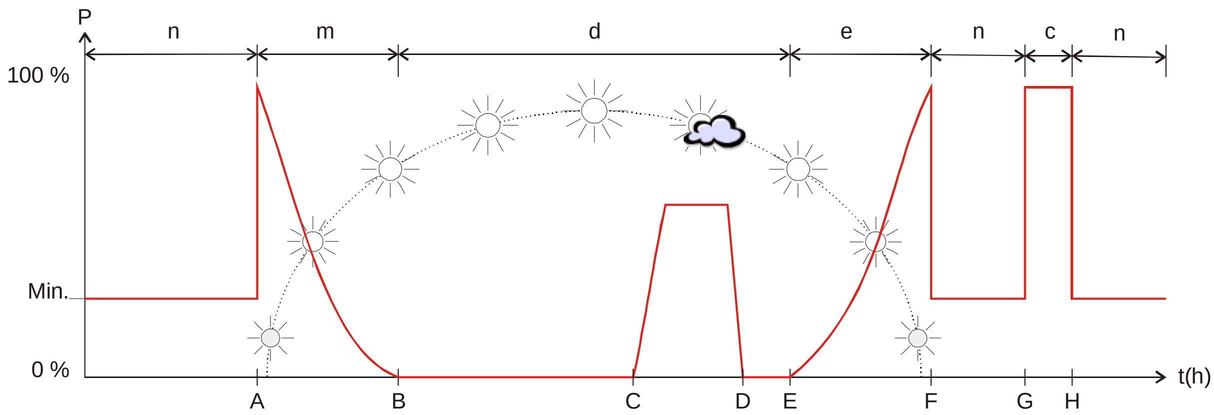


Table 34

A	Forced mode is cancelled by the timer. As the daylight is not yet bright enough the brightness control actuates the dimmer.
B	The daylight is now bright enough to illuminate the room and the dimmer is switched OFF.
C	Heavy cloud cover, the dimmer compensates for the lack of bright daylight.
D	Clear sunshine, the dimmer is turned back down.
E	Late afternoon, the dimmer gradually replaces the receding daylight.
F	Forced mode is activated by the timer. The dimmer reduces the light to 20%.
G	Central continuous ON = 1
H	Central continuous ON = 0
n	During the night time, the parameterized value for forced mode applies.
c	For the walk around of the night-watchmen: The lighting is switched ON via central continuous ON.
m	Mornings: Daylight increases and the brightness control slowly reduces the dimming value.
e	Evening: Daylight decreases and the brightness control slowly increases the dimming value.
d	During the daytime, the dimmer is actuated by the brightness control according to the brightness of the sunlight.

5.6 *Store light scenes in one switch*

Scenes are normally stored in the DMG 2 S. Object 63 (scenes) is used for this.

However, if the light scenes are to be stored **externally** , for example with a scene-capable switch (e.g. Busch&Jäger Triton), the following steps should be taken:
The DMG2 has one dimming object (dimming value) and one feedback object (feedback in %) per channel.
2 group addresses are used here; hereafter referred to as “Gr.adr.1” and “Gr.adr.2”.

5.6.1 Assignment of group addresses and setting for the object flag

	Object	Connect with	set to sending	Flags*				
				C	R	W	T	A
PUSH BUTTON	Brightness value telegrams	Gr.adr.1	Yes	✓	-	✓	✓	x
		Gr.adr.2	No					
DIMMER	Dimming value	Gr.adr.1	x	✓	-	✓	x	x
	Feedback in %	Gr.adr.1	No	✓	✓	-	x	x
		Gr.adr.2	Yes					

* Object flags: Communication, read, write, transfer, update.
x = user-defined

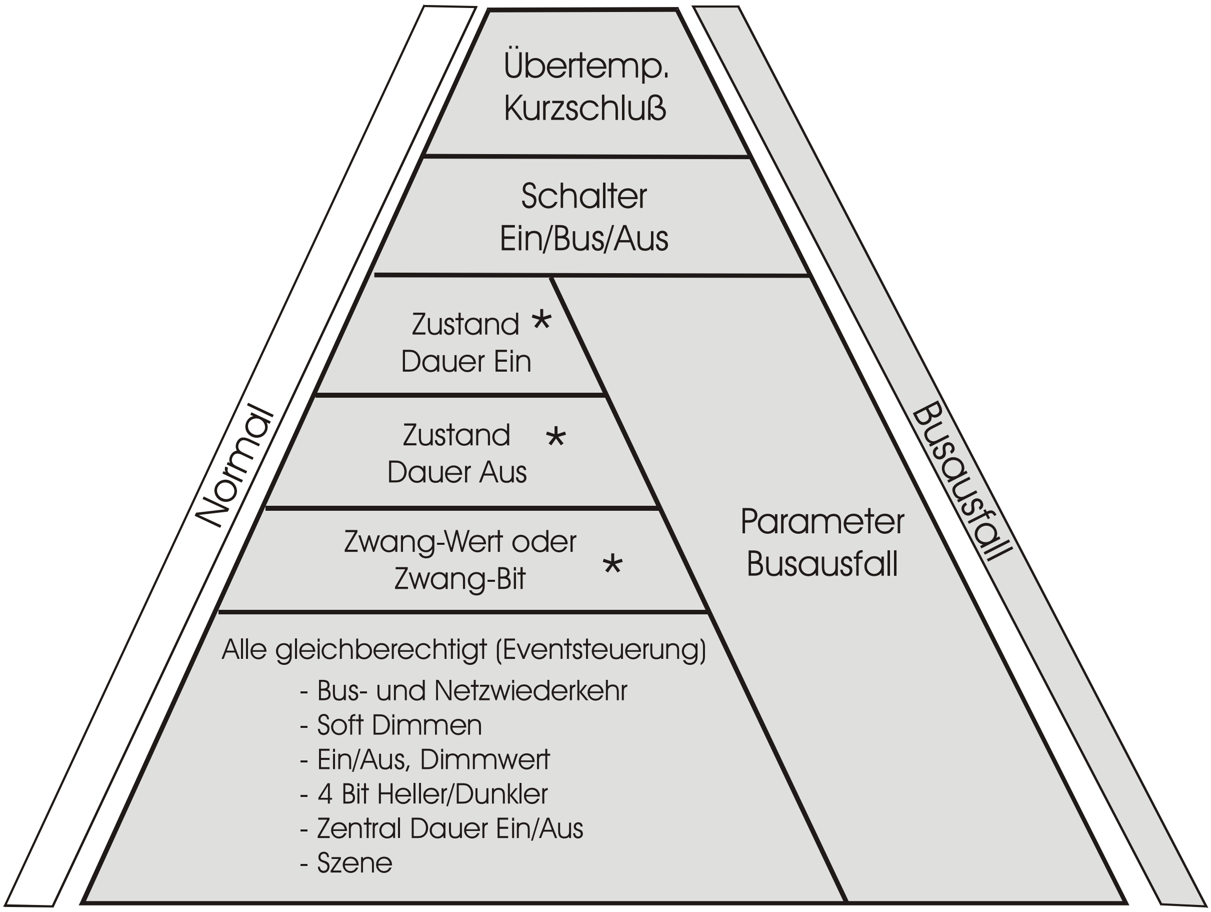
Feedback to the dimmer should **not** be configured for cyclical sending.

5.6.2 Functional description

Saving a scene:
The touch sensor sends a read request to Gr.adr.1 which is only answered by "Feedback in %" object and with Gr.adr.2.
Gr.adr.2 is not processed by the object "dimming value".
In contrast, the touch sensor receives the value and saves it for the appropriate scene.

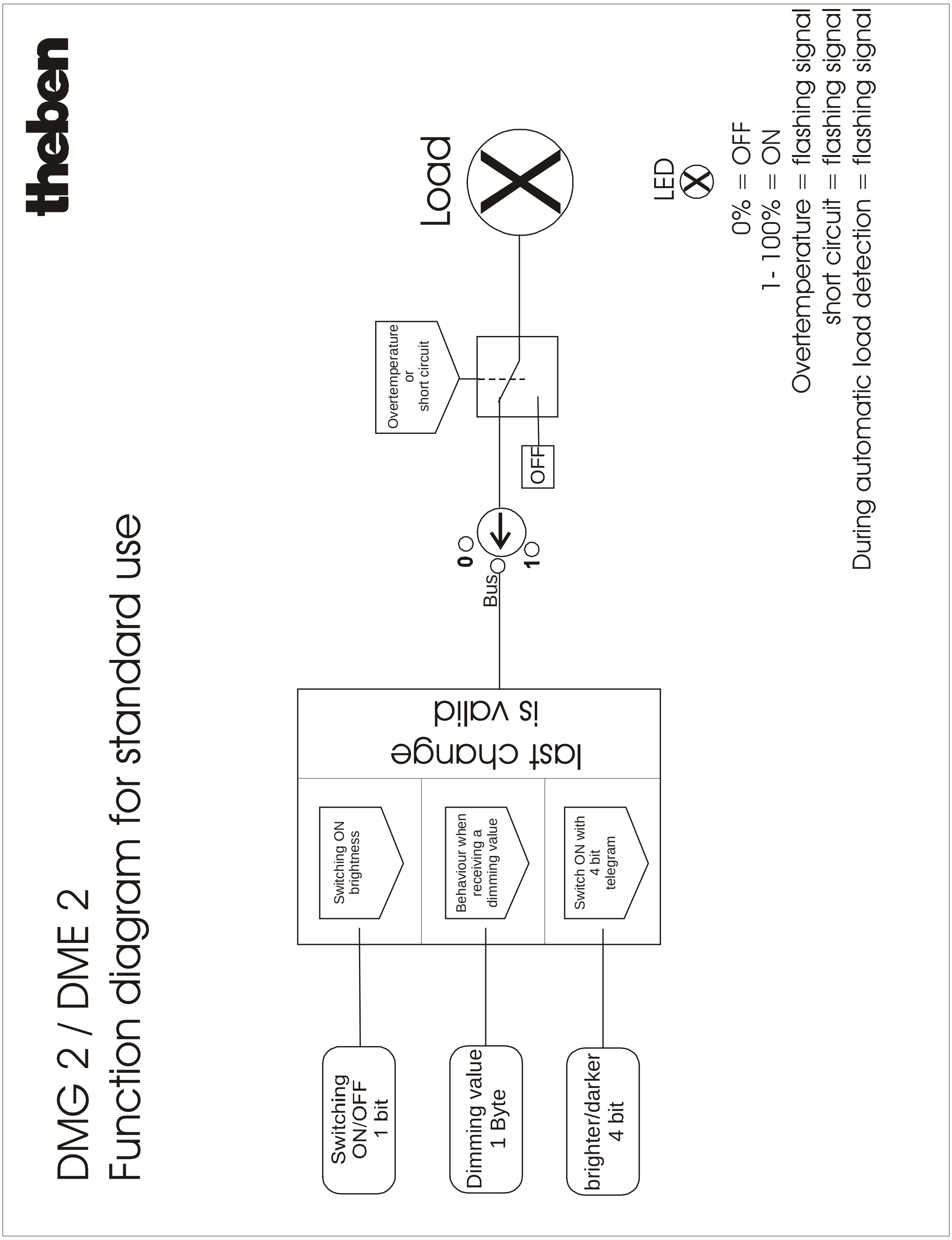
Calling a scene:
The touch sensor sends the value saved for the scene to the % object with the sending address Gr.adr.1.
The value of the object “dimming value” is further processed to set the output brightness.
Once the dimmer has set the requested value, it sends feedback to the object “Feedback in %” depending on the configuration.

5.7 Dimmer actuator priority sequence



* if parameterized

5.8 Function diagram for standard applications



5.9 General function diagram