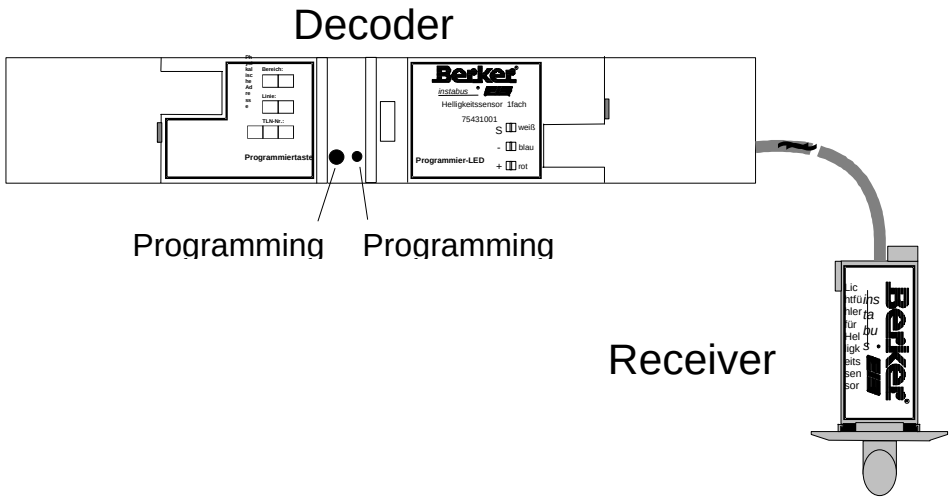
Brightness sensor 1gang, Built-in (Eb)
75431001

Technical Documentation



Brightness sensor 1gang

The brightness sensor consists of a decoder and a receiver. The decoder receives the recorded brightness value from the receiver and, depending on the application, regulates or controls the lighting through the *instabus EIB*.

Order no.: 75431001

Product family:	**Physical sensors**
Product type:	**Brightness**

Database search path

General technical data

For the decoder:

Distribution voltage ***EIB***:	24V DC (+6V/-4V) through BCU
Power consumption:	approx. 120 mW
Current consumption:	5 mA
Brightness setting range:	depends on application, 150 to 1950 Lux
Connection:	
Bus:	through the supply terminal
Receiver:	0.25 to 0.75 mm², single wire
Protection class:	IP 20
Ambient temperature:	-5°C to +45°C

For the receiver:

Distribution voltage:	through the decoder
Connection to decoder (right side)	S=white; -=blue; +=red The 2 m long connection lead must not be extended.
Ambient temperature:	-5°C to +45°C

The brightness sensor must be calibrated independently of the application.

Notes on startup

Application overview:

Calibration A00401
Constant light regulationA00501
Send Lux value A00701
Two position regulation A00601

Application description

Brightness

sensor 1gang

Calibration A00401

Calibration:
The brightness value found at the measuring point and the brightness value directly at the receiver are harmonised with one another.
This application is only for the startup of the brightness sensors. Calibration ensures that the appliance combination decoder and receiver is aligned optimally to the brightness situation in the rooms.

Associations, group addresses and objects

No. of associations:	max. 2		
No. of group addresses:	max. 2		
No. of objects:	1 result object	send/recv.	1 byte
	1 lux value object	send 2 byte	

Parameter window

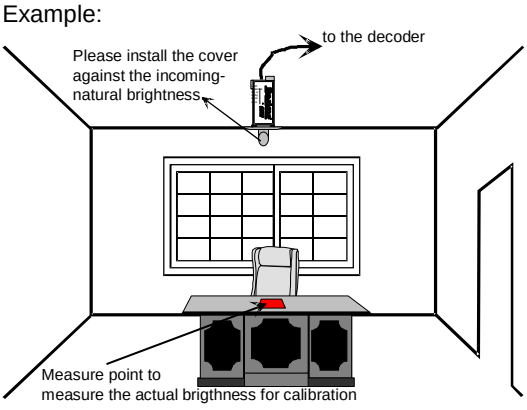
Calibration	
Enter the measured brightness value (200..1900 Lux)	**0**

Enter illuminance

Parameter description
This parameter is used to inform the brightness sensor of the brightness value that was measured with an illumination meter.
The calibration process starts when the application software is loaded into the device with the ETS startup.

Information on calibration sequence

Example:



The receiver is installed directly above the measuring point. The measuring point is the illuminance e.g. on the top of a desk. For the calibration the lux meter is placed directly underneath the receiver. The parameter is the lux value that is adjusted to the desk top.
The illuminance must not be read off directly from the receiver!

Checking the calibration results

Calibration results:
it is important that the calibration results are checked, because the calibration value is entered in the respective parameter windows for the applications "*Constant light regulation*", "Send *Lux value*" and "*Two position regulation*".

This is done through the ETS command "Read group ". Calibration is correct if the value is **between** 0 and 255.

Parameter description

How is the calibration result checked?

Read out group addresses

After calibration is concluded the brightness sensor describes the calibration object (1 byte). The group address that is allocated to this object can be read out as follows on ETS startup:

1. Select the group address created for the calibration object.
2. Select the item "Diagnosis" in the menu bar.
3. Display the value of the selected group address with the command "Read group".

Valid values

The value selected must be **between** 0 and 255.

If the value = 0: the brightness sensor has not been calibrated.
If the value = 255: a successful calibration was not possible with the illuminance that was set as the parameter.

Invalid values

Why does the brightness sensor supply two completely results with the same lighting situation?
Because the 1 byte value of the calibration object is coded. After decoding, the values are found close together.

e.g.:	Result: 176 (coded)	Decoded: 13
	Result: 48 (coded)	Decoded: 12

The calibration result is coded

What procedures are possible if a valid calibration was not achieved after the first startup of the brightness sensor?
The brightness sensor can be calibrated without new lux values being continuously entered in the parameter window and the appliance reprogrammed.
For this purpose the menu item "Startup" with the command "Send telegram" must be used in the ETS startup.

Application: Calibration Calibration with the command "Send telegram"

1st possibility:
A 2 byte value with the group address for the brightness value is sent.
The value is read off from the lux meter and entered directly into the window for the command "Send telegram". The value is then transmitted.
The calibration result is then checked for validity.

Transmission of the 2 byte value

2nd possibility:
A 1 byte value is transmitted through the group address of the calibration results through the command "Send telegram". The 1 byte value is arbitrary, because the calibration procedure is only triggered through the reception in the brightness sensor. After calibration the communications object "Calibration" is overwritten with the newly measured value.

Caution:
This method can only be applied if the brightness sensor has already been calibrated successfully once before.

Checking the results!

The calibration results must now be checked.

If valid results are not obtained in spite of several calibration attempts, one of the following may be responsible...

- the receiver is incorrectly installed (e.g. direct sunshine);
- during the calibration process there were light fluctuations in the receiver's detecting range. *This fault can be eliminated by carrying out the calibration in artificial light, in other words without any daylight.*
  This can be done by making the room darker or by calibrating in the dark.
- The value entered for the illuminance (at the measuring position) differs greatly from the actual illuminance value.

Possible causes of faults during calibration

Calibration must be repeated if the room's furnishings are changed significantly. A significant change is

- e.g. a light-coloured floor covering is replaced by a one with a dark colour,
- large pieces of furniture are moved or brought in.

Application description

Brightness sensor 1gang

In this application the brightness sensor provides a constant light control. Dimming telegrams are sent to dimmer actuators and control units to create the brightness set value that is to be adjusted.

No. of associations: max. 15
No. of group addresses: max. 15

Constant light regulation A00501

Associations, group addresses and objects

No. of objects:	1 constant light regul.	send	4 bit
	2 set values recv.	4 bit / 1 byte	
	1 release/locking	recv.	1 bit
	3 locking	recv.	1 bit, 4 bit, 1 byte

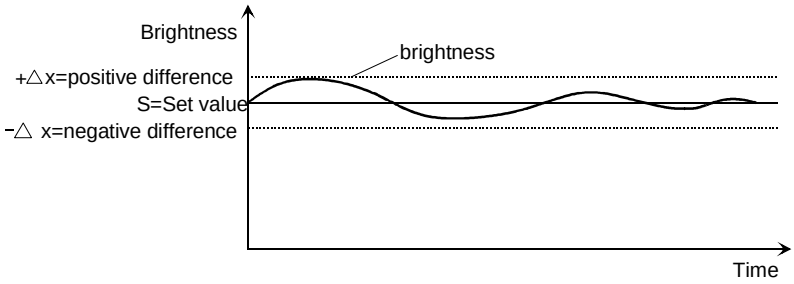
Parameter window

Constant light regulation	
Set value to be adjusted	200..**600**..1900 lux
Permissable deviation from set value deviation = 8 lux × (2..20)	2..**4**..20
Dimming brighter/darker by	**1.5%**, 3%
Time between two telegrams time = 130 msec × (2..20)	2..**5**..20
Release / Interlock	
Behaviour after installation	**Send telegrams** Send no telegrams
Calibration	
Enter here the calibration result (please calibrate again at 0 or 255)	**0**..254

Parameter description

Set value to be adjusted

The value to be adjusted can be set in 50-lux steps. The lighting is dimmed to the basis brightness if the set value is covered by the daylight share. If the value to be adjusted cannot be achieved with the given lighting, the brightness sensor sets the step-up dimming of the lighting after max. 128 telegrams.



R = regulated area; R = S ±△x

Fig. 1: Configurable deviations

Oscillations !

The permitted deviation can be set between ±16 and ±160 lux. If the control range is exceeded or undershot for approx. 0.65s, the brightness sensor sends 4 bit telegrams for dimming or stepping up the brightness of the lighting.
If the deviation is set to the minimum value of ±16 or to ±32 lux, there may be "transient response". In this case, the brightness sensor jumps between two values until a fixed brightness value is set. This response can be avoided by setting a larger deviation.

Fine setting of the dimming

The brightness sensor operates the dim actuators and control units through object 0 with a 4 bit telegram. For this reason, a continuous dimming process is not possible, and the lights are

operated with brightness changes in steps of 1.5% or 3%. The fine setting of 1.5% most closely approaches a constant light control.

the dimming process

To reach the set value the telegrams for brightening or dimming are sent cyclically. The standard set time equals the fixed setting for the monitoring time. The rule here is:
the longer the time between two telegrams, the "slower" the reaction of the brightness sensor.

Reaction speed of the brightness sensor

If other bus components that belong to the lighting installation are programmed after the brightness sensor, the sensor attempts to set the set value brightness with the appliances that have already been programmed. An inhomogeneous lighting situation is created.
For this reason it is possible to set whether telegrams are to be sent or not after startup. Locking the brightness sensors after startup can be done if in addition to the brightness sensor other bus components are programmed that stand in relation to the lighting installation.
With the option "Send telegram" the sensor starts constant light control directly after programming.
The setting under this parameter also determines behaviour after a RESET or a bus voltage failure.

Behaviour after installation

Graphical representation of the function "constant light regulation" with the standard settings in the parameter window:

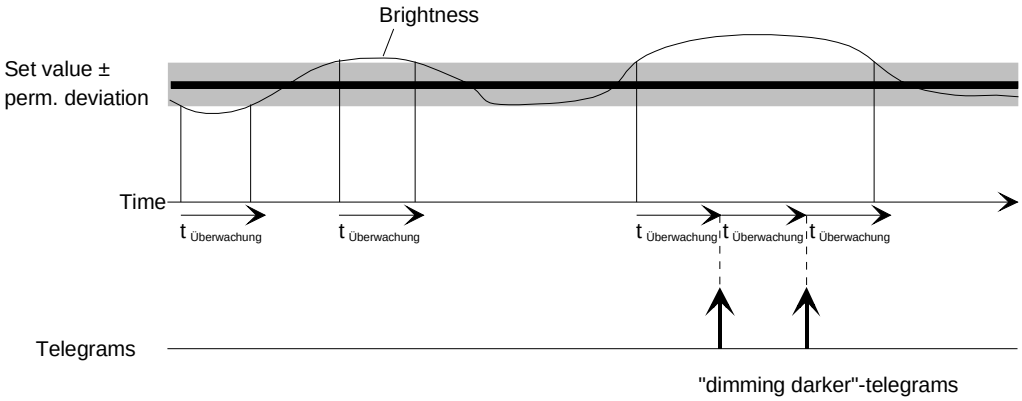


Fig. 2 Normal function: Constant light Regulation

If the actual value for the duration of the monitoring time deviates from the set value ± permitted deviation, dimming telegrams are sent in the rhythm of the time monitoring.

Changing the set value independently of the parameter window

The set value to be adjusted can be changed with two other methods through the bus, along with the entry in the parameter window:

1) With communications object 1:
Set set value (value transmitter):
The set values can be written to the brightness sensor through the function "value transmitter" (1 byte). The value set in the parameter window is then invalid.
All bus components can be used for this that can send 1 byte telegrams. These are push buttons and some binary inputs.

Applications: value transmitter

- Two set values can be set with a push button 1gang.
- Four set values can be set with a push button 2gang or with the binary input 230 V 2gang Eb.
- Eight set values can be set with a push button 4gang or with 4 gang 230 V and 24 V DC/AC binary inputs.

Brightness sensor

The required set value must be entered in the value transmitter applications in accordance with the following conversion formula:

$$\text{New target value} \bullet \left(\frac{255}{2000} \right) = \text{"Value transmitter" value}$$

Example :

The new target value is to be 400 lux

$$400\ \text{lux} \bullet \left(\frac{255}{2000} \right) = 51$$

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Converting the set values into 1 byte value transmitter values

This shows that for a lux value of 400 the value 51 must be entered in the application "value transmitter".

The following conversion table cane be used to simplify the procedure:

Set value table

Conversion table	
approx. 50 lux = 6	approx. 1050 lux = 134
approx. 100 lux = 13	approx. 1100 lux = 140
approx. 150 lux = 19	approx. 1150 lux = 147
approx. 200 lux = 26	approx. 1200 lux = 153
approx. 250 lux = 32	approx. 1250 lux = 159
approx. 300 lux = 38	approx. 1300 lux = 166
approx. 350 lux = 45	approx. 1350 lux = 172
approx. 400 lux = 51	approx. 1400 lux = 179
approx. 450 lux = 57	approx. 1450 lux = 185
approx. 500 lux = 64	approx. 1500 lux = 191
approx. 550 lux = 70	approx. 1550 lux = 197
approx. 600 lux = 77	approx. 1600 lux = 204
approx. 650 lux = 83	approx. 1650 lux = 210
approx. 700 lux = 90	approx. 1700 lux = 216
approx. 750 lux = 96	approx. 1750 lux = 223
approx. 800 lux = 102	approx. 1800 lux = 229
approx. 850 lux = 109	approx. 1850 lux = 235
approx. 900 lux = 115	approx. 1900 lux = 242
approx. 950 lux = 121	approx. 1950 lux = 248
approx. 1000 lux = 128	approx. 2000 lux = 255

Parameter description

Brightness sensor 1gang

TIP:

The following approximation can be used to simplify the conversion of brightness values to the corresponding 1 byte values for the application "value transmitter":

$$\text{Value transmitter - value} = \frac{\text{New brightness value}}{8}$$

The errors in this approximation lie in the range of 50 lux to 200 lux at 4%. With greater values the errors fluctuate around 2%.

Constant light regulation A00501

The following diagram shows the mode of operation of the constant light control when a new set value is set through the bus:

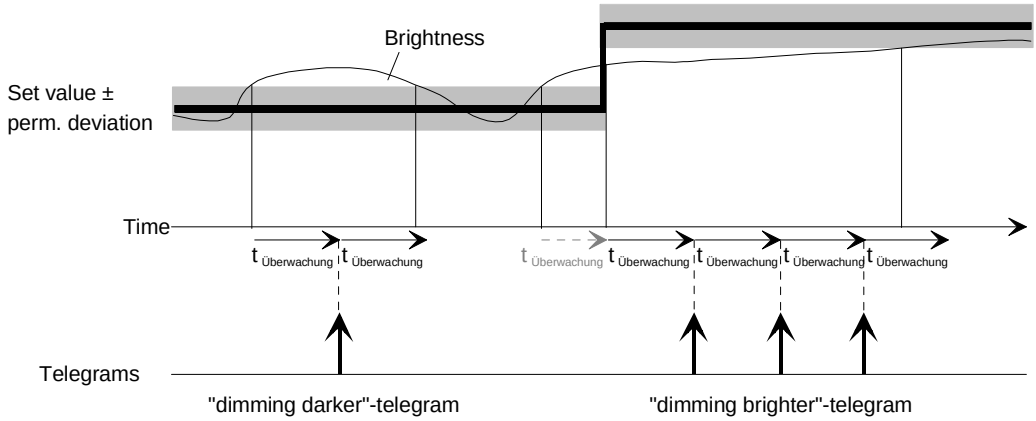

Fig. 3

Function sequence and effects of setting the set value

When a new set value is determined through the bus the current monitoring time is interrupted. If the brightness value is outside the tolerance limits after the set value is reset (1 byte telegram), the new monitoring time starts and dimming telegrams are sent where applicable.
The telegram counter, which prevents the sensor from being overridden, is **not** initialised again when the set value is reset.

2) Using communications object 6: Shift (dimming):

Shifting the set value through a 4 bit telegram

By writing to this object, for example with a push button in dimming function, the momentary set value can be shifted continuously. Here a push button accesses the 6th object (shift set value). This 4 bit value is "passed through" internally in the brightness sensor to the sending object 0 (constant light control dimming), so that the dim actuators and control units receive their dimming command through this object.
Following this, it takes approx. 2 seconds until the brightness sensor has saved to new set value.

Monitoring the set value on unauthorised shifts

Set value monitoring ensures that the manual process "shift set value" does not enable any unauthorised values to be set. Monitoring provides for 2000 lux as the highest set value and automatically sends telegrams for dimming if this value is exceeded. In the same way, telegrams for brightening are sent if the value falls below the lowest set value of approx. 140 lux.

Fig. 4 makes the process of set value shifts clear:

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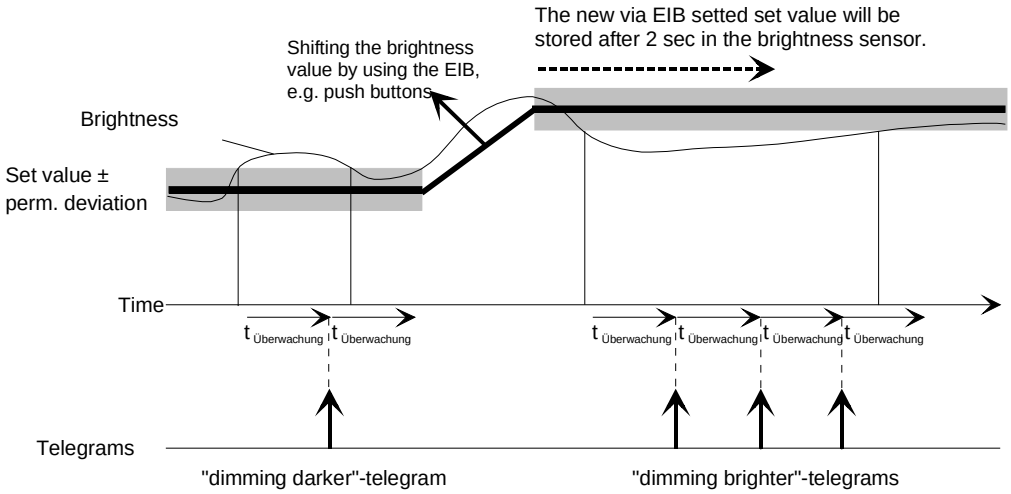

Constant light regulation A00501

Fig. 4

Function sequence and effects of a shift in set values

A shift in the set value interrupts the current monitoring time as well. The time loops for set value monitoring are restarted after the set value shift if the brightness value lies outside the tolerance limits.
The telegram counter, which prevents the sensor from being overridden, is initialised again when the set value is reset.

A sensor override (e.g. through direct sunshine) may lead to it being impossible to adjust the set value. To prevent the bus from being overloaded in such cases through the cyclical transmission of dimming telegrams the brightness sensor discontinues telegram transmission after 128 telegrams.

Counter measures on sensor override

The telegram counter is reset through the following functions:

- after a RESET.
- after the 2nd communications object is released with a "1" telegram
- after a set value shift.

During a set value shift only 128 consecutive dimming telegrams are permitted in accordance with the telegram counter. For this reason it may not be possible to move through the complete dimming range by holding the push-button, depending on the parameters that were set in the brightness sensor, the dimmer actuators and the control units.

Activating the push button for shifting a set value

Release and locking:

The brightness sensor has four communication objects for releasing and locking the function "constant light regulation".

Object 2: Release/locking 1 bit *Active lock*

Object 2 (Release/Interlock) is the object that locks the brightness sensor **actively** with a "0" telegram and releases it with a "1" telegram.

The other 3 locking objects (1 bit switching, 4 bit dimming and 1 byte value setting) set the release/locking object internally to the value 0. The contents of the telegrams for locking objects 3 to 5 are unimportant, only the reception of a telegram is evaluated.
For this reason, these locks can be regarded as **passive** locks.

Objects 3,4, and 5: locking *Passive lock*

The brightness sensor moves to the passive state and can be released through a "1" telegram to the release/locking object.

Releasing the passively locked brightness sensors

Function of the constant light regulation including the locking object (communications object 2):

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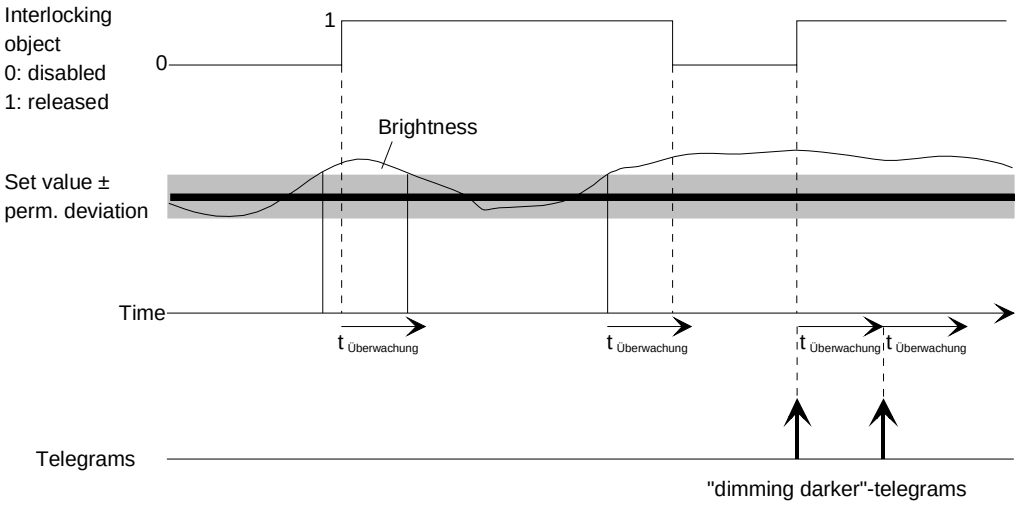


Constant light regulation A00501

Fig. 5

Constant light regulation in connection with the locking object

If the locking object is locked with the value 0, the brightness sensor does not work. If the set value ± the permitted deviation is exceeded, the monitoring time is **not** controlled. If the locking object is released with the value 1, the brightness sensor works as shown under Fig. 2.

If the calibration result is not entered in the parameter window the brightness sensor does not carry out any functions. The result that is to be entered must be between 1 and 254. If calibration results are not yet available they must be determined with the help of application "Calibration A00401".

Is there a calibration result

The following parameters and functions are influenced by initialising: initialising occurs, e.g., after programming or after bus voltage reconnection.

Initialising

Set value:
After initialising, a set value that was set manually is overwritten through setting or shifting with the assigned set value from the parameter window.

Appliance function:
The function of the appliance after initialising depends on the setting under the parameter "Behaviour after installation":

Send telegrams:	Function is directly available again.
Send no telegrams:	The appliance does not carry out the function until it is released through the release/locking object (object 2).

Application description

This application enables the current brightness values in e room to be sent to the bus system. This function can be used to trigger other light control systems that work on the basis of 2 byte brightness values.

No. of associations: max. 18
No. of group addresses: max. 18
No. of objects:

1 Transm. of brightn. val.	send	2 byte	
1 Release/Interlock	recv.	1 bit	
3 Interlocking		recv.	1 bit
			4 bit
			1 byte

Brightness sensor 1gang

Send Lux value A00701 Associations, group addresses and objects

Parameter window

Transmission of brightness value	
Transmit conditions	**Cycl. transmission only on change** Transmission on change Transmission on request Cyclic transmission
Send at a deviation more than 8 lux × (1..20)	1..**4**..20
Cyclic transmission, base	130; 260; 520 ms 1.0; 2.1; 4.2; 8.4; **17**; 34 **sec** 1.1; 2.2; 4.5; 9; 18; 35 min 1.2 h
Cyclic transmission, factor (2..127)	2..**5**..127
Telegram rate limitation	enabled **disabled**
Telegram rate	30 telegrams per 17 sec 60 telegrams per 17 sec 100 telegrams per 17 sec **127 telegrams per 17 sec**
Release / interlock	
Behaviour after installation	**Send telegrams** Send no telegrams
Calibration	
Enter here the calibration result (if 0 or 255, recalibrate)	**0**..254

Brightness sensor 1gang

Send Lux value A00701

Parameter description

The application "Send Lux value" offers four different possibilities for transmitting the brightness value measured by the sensor to the bus system. Three of these possibilities transmit actively, while the fourth only reacts to a request from the bus system.

Transmit condition: Cyclic transmission only on change

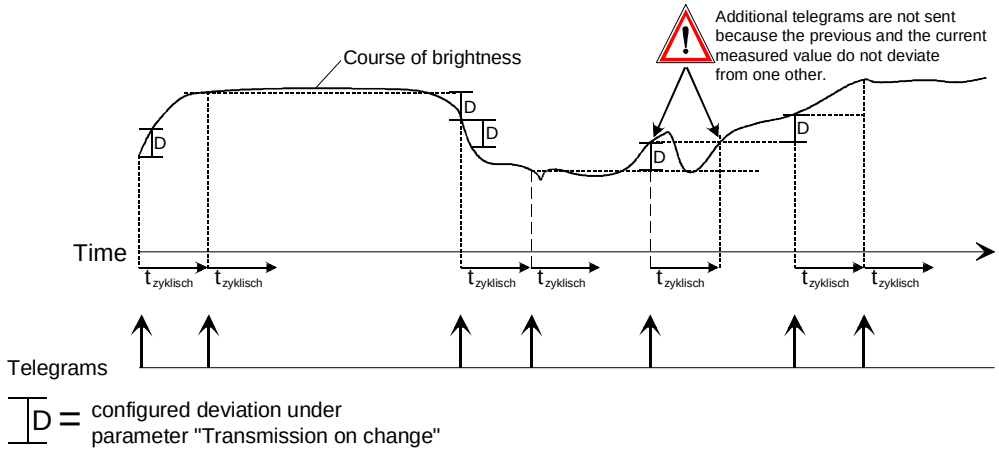
Cyclic transmission only on change

If the currently measured brightness value deviates from the last value transmitted by a variable difference, the new value is transmitted. The values are transmitted at intervals that are determined by the time setting for cyclic transmission.

Fig. 6 shows the evaluation and transmission of telegrams where the parameter "Cyclic transmission only on change " is setted.

Fig. 6

Transmission criteria for the application "Cyclic transmission only on change "



Cycle time

Changes that occur within a cycle time are not taken into account. If the measured value is within the deviation after expiry of the cycle time, the bus is not loaded with telegrams.

Sensor as transmitter

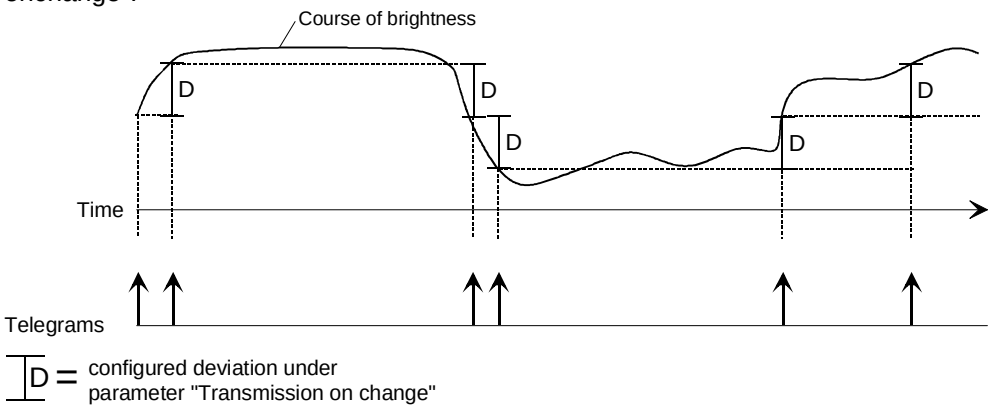
If the brightness sensor is used as a transmitter for a constant light regulation, set the parameter "Transmission on change" with the factor "1".

Transmit condition: "Transmission on change":

If the currently measured brightness value deviates from the last value transmitted by a variable difference, the new value is transmitted automatically.
Fig. 7 shows the mode of operation of the sensor in the parameter setting "Transmission onchange".

Fig. 7

Transmission criteria for the application "Transmission on change"



If telegram transmission is not defined as to time but is only dependent on changes to brightness,

the telegram rate limit should be released.

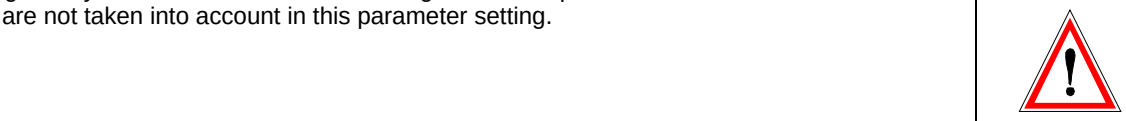
Note: Telegram loads

Transmit condition: "Transmission on request "

In reaction to a request telegram the brightness sensor sends the current measured value as a reply to the bus. If the "read" flag is set in the communications object, the momentary brightness measured value can be read out at any time.

Request for a 2 bytes brightness value

The settings for cyclic transmission and the changes are unimportant. The release/interlock functions are not taken into account in this parameter setting.



Transmit condition: "Cyclic transmission"

The momentary measured value is transmitted cyclically in a defined time grid independently of the changes to the brightness value. As Fig. 8 shows, brightness changes between the cycle intervals are not evaluated.

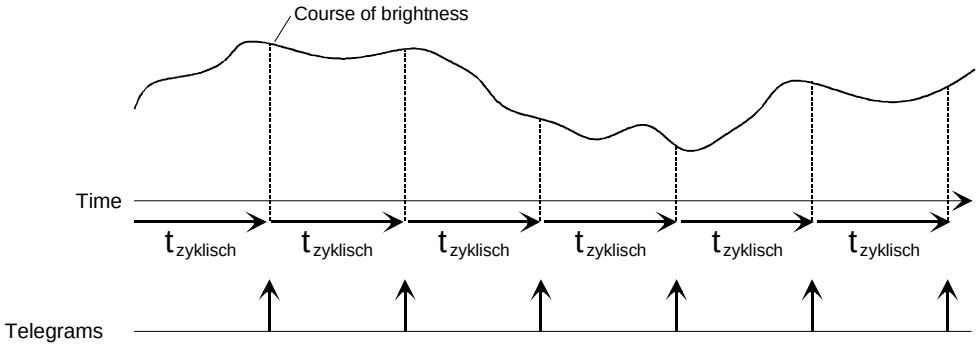


Fig. 8

Behaviour of the brightness sensors on "cyclical transmission "

The time settings for cyclic transmission are defined through factor and base. These settings are only important with the methods "Cyclic transmission" and "Cyclic transmission only on change ".

Time = Base x Factor

The permitted deviation from the last measured value can be set between 8 and 160 lux. If this deviation is exceeded or undershot, the sensor transmits the new brightness value in accordance with the transmission condition.
Settings for this parameter are only effective if the transmission conditions "Cyclic transmission on change" or "Transmission on change" were selected.

Sensitivity setting for:

"Cyclic transmission on change " and "Transmission on change"

The telegram rate limit prevents unauthorised telegram loads through an excessive number of telegrams. If the number of telegrams in a 17 second period exceeds the set parameter value, transmission is locked. A new monitoring period starts after expiry of the locking time.

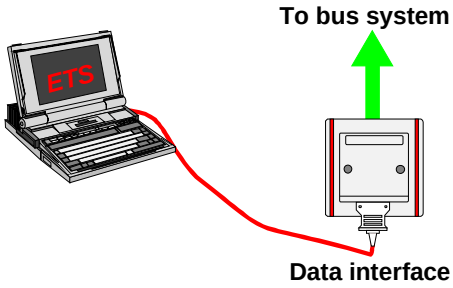
Telegram rate limit

Note: when the telegram rate limit is activated, the send function is locked for 17 seconds after initialising.
The telegram rate limit should always be activated!

Initialising behaviour

Parameter description

Brightness sensor 1gang



Send Lux value A00701

This parameter can be used to set whether telegrams are to be sent or not after installation.

Behaviour after installation

With the option "Send telegrams" the sensor starts to transmit the current brightness values directly after programming, depending on the setting for the transmission conditions.

The settings under this parameter also determine behaviour after initialising.

Release and locking

The application "Send Lux value" has a total of four communications objects for releasing and locking the function "send lux value".

***Active* lock**

Here, object 2 (release/interlock) is the object that locks the brightness sensor directly with a "0" telegram and releases it with a "1" telegram. This communication object can be used to lock **actively**.

Fig. 9 shows how locking the sensor affects the transmission of telegrams.

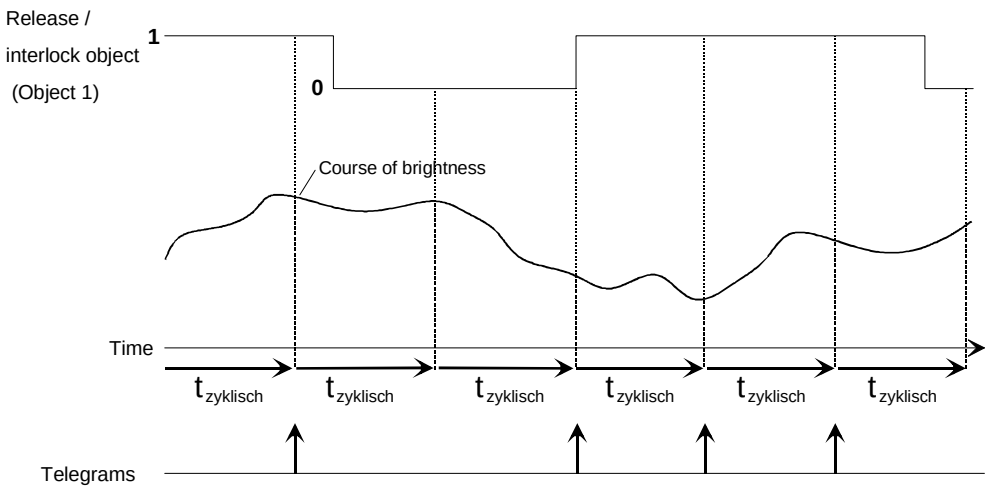


Fig. 9 Parameter setting: cyclical transmission in dependence on the release/interlock object

If the value of the locking object is "0", the brightness sensor is locked, and telegrams are not sent. The sensor continues to work internally, so that after release (object value 1 = "1") the process of cyclic transmission starts directly.

Direct transmission after lock cancelled

The other three locking objects (1 bit switching, 4 bit dimming and 1 byte value setting) set the release/interlock object internally to the value 0. The contents of the telegrams for locking objects 3 to 5 are unimportant, only the reception of a telegram is evaluated. For this reason, these locks are regarded as **passive** locks.
The brightness sensor moves to the locked state and can be released through a "1" telegram to the release/interlock object.
Practical examples:

Brightness sensor 1gang

Send Lux value A00701

The brightness sensor sends the brightness value to the bus system with the application "Send lux value". This 2 bytes value can be displayed e.g. with the help of a display unit.

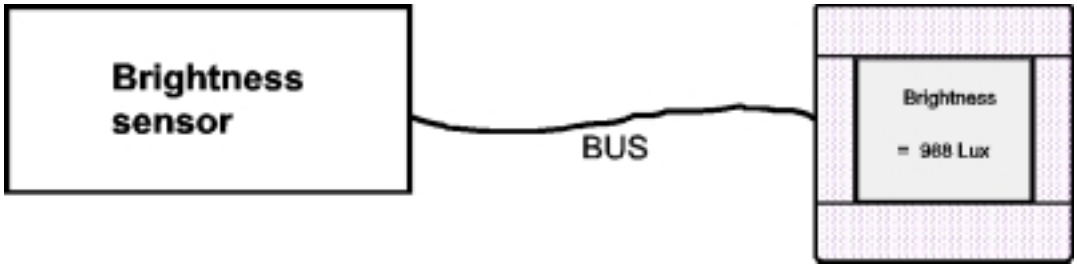


Fig. 10 Display or evaluate brightness value

Because of the code, the 2 bytes value cannot be read out with ETS. The value is decoded in the display unit and is made visible in this way. **The bus coupling unit under the display unit is only an "interface" to the bus and only has to be programmed with the software for the display unit. The corresponding data type in the BAS is "floating point".**

Programming the display unit

In addition, the brightness sensor makes this 2 bytes value available to all bus devices that can process a value with this format.

If the calibration result is not entered in the parameter window the brightness sensor does not carry out any functions. The result that is to be entered must be between 1 and 254. If calibration results are not yet available they must be determined with the help of application "Calibration A00401".

If there is a calibration result

The following parameters and functions are influenced by initialising: initialising occurs, e.g., after programming or after bus voltage reconnection..

Initialising

Appliance function:
The function of the appliance after initialising depends on the setting under the parameter "Behaviour after startup":

Send telegrams:	Function is directly available again.
Send no telegrams:	The appliance does not carry out the function until it is released through the release/locking object (object 2).

Note: when the telegram rate limit is activated, the send function is locked for 17 seconds after initialising.
The telegram rate limit should always be activated!

Application description

Brightness sensor 1gang

If the brightness sensor is loaded with the application "Two position regulation", switch actuators are switched through switching telegrams. The sensor can be configured optionally as an on-off switch

or as a two position controller.

Two position regulation A00601

No. of associations: max. 15
No. of group addresses: max. 15

No. of objects: 1 Two position regulation send 1 bit
1 Time lim. interlock received 1 bit
1 Release/interlock received 1 bit
1 Interlock received 1 bit
1 Set (Value transm.) received 1 byte

Associations group addresses and objects

Two position regulation	
Lower limiting value (ON telegram on falling below)	No switch ON function 150..**300**..1950 lux
Upper limiting value (OFF telegram on exeeding)	150..**800**..1950 lux No switch OFF function
Cyclic transmission , base	130; 260; 520 ms 1.0; 2.1; 4.2; 8.4; **17**; 34 **s** 1.1; 2.2; 4.5; 9; 18; 35 min 1.2 h
Cyclic transmission at ON telegram factor (5...127)	5..**106**..127
Cyclic transmission at OFF telegram factor (5...127)	5..**53**..127
Release / interlock	
Behaviour after installation	Send no telegrams **Send telegrams**
Time limited interlock	
Interlock time, base	130; 260; 520 ms 1,0; 2,1; 4,2; 8,4; 17; **34 s** 1,1; 2,2; 4,5; 9; 18; 35 min 1,2 h
Interlock time, factor (5..127)	5..**106**..127
Calibration Enter here the calibration result (please calibrate again at 0 or 255))	**0**..254

Parameter window

Parameter description

Depending on the parameter settings for the lower and upper limiting values the brightness sensor can be set up optionally as an On/Off switch or as a two position controller.

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- **OFF switch:**
  The parameter "No ON switch function" is selected for the lower limiting value.
  If the brightness value exceeds the limiting value an OFF telegram is sent.

- **ON switch:**
  The parameter "No OFF switch function" is selected for the upper limiting value.
  If the brightness value undershoots the threshold value an ON telegram is sent.

- **Two position regulation:**
  A brightness value is assigned to each limiting value.
  If the limiting value is undershot the appliance sends an ON telegram, and if it is exceeded an OFF telegram is sent.

Two position regulation A00601 ON/OFF switch or two position controller

The limiting values for the brightness can be set independently of each other through the ETS or the bus.
Telegrams are sent if the measured brightness value exceeds or undershoots the limiting values for a variable period. If this condition is maintained, the telegrams are sent cyclically.

Meaning of the limiting values

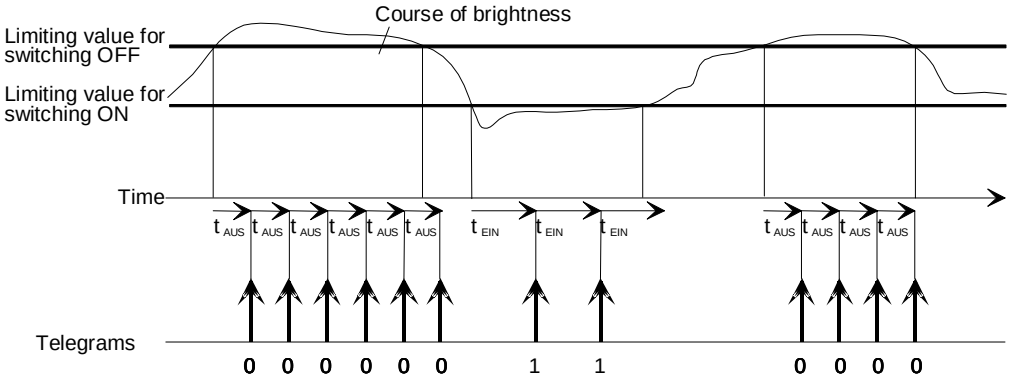

Fig. 11

Mode of operation of the two position controller

The transmission times can be set separately through the factor with regard to a joint basis. In Fig. 11, the switch-off time is set at less than the switch-on time.

Note:
The upper limiting value must always be set greater than the lower limiting value.

As shown in Fig. 11, a joint basis can be set for cyclic transmission of the ON and OFF telegrams. The factors can be configured differently so that the switching times for switching ON and OFF can be set individually.
The usual method is to use a short switch-off time and a long switch-on time. In this way, the lights would switch off a short time after the set brightness value is exceeded. If the actual value falls undershoots the set brightness value, there is a longer period before the lights are switched on again.
This application highlights the energy-saving effect that can be achieved with this appliance.

Saving energy through cyclic transmission

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Two position regulation with tolerances

If both threshold values are activated, a two position regulation is realised that does not exercise a switching function within the two limiting values.
There is no need to operate the lights manually.

OFF switch with manual control facility

The OFF telegram is sent cyclically in accordance with the parameter setting. In this way, for example, lights that were switched into the system manually can be switched off in the framework of the cycle time, where there is sufficient daylight.

ON switch with manual control facility

The ON telegram is sent cyclically in accordance with the parameter setting. The lights are then always then switched into the system if there is insufficient daylight. In this case the lights must be switched off manually.

Set set value

In the application "Constant light regulation A00501" it is possible to shift the set values entered in the parameter window or set to other set values. In contrast, the application "Two position regulation A00601" only contains the communications object "Set set value". The procedure is identical to the application "Constant light regulation", so that the sensor receives the set values through the 1 byte data type. For example, they can be generated through push buttons or binary inputs that are programmed with the application "Value transmitter".

The required set value must be entered in the value transmitter applications in accordance with the following conversion formula:

Converting the new set values into the 1 byte format for the value transmitter application

$$\text{New target value} \bullet \left(\frac{255}{2000}\right) = \text{"Value transmitter" value}$$

Additional example:

The new target value for the lower threshold value is to be 750 lux

$$750\ \text{Lux} \bullet \left(\frac{255}{2000}\right) \approx 96$$

TIP:
The following approximation can be used to simplify the conversion of brightness values to the corresponding 1 byte values for the application "value transmitter":

$$\text{Value transmitter - value} = \frac{\text{New brightness value}}{8}$$

The errors in this approximation lie in the range of 50 lux to 200 lux at 4%. With greater values the errors fluctuate around 2%.

The following conversion table can be used to simplify the procedure:

Set value table

Conversion table	
approx. 50 lux = 6	approx. 1050 lux = 134
approx. 100 lux = 13	approx. 1100 lux = 140

approx. 150 lux = 19	approx. 1150 lux = 147	
approx. 200 lux = 26	approx. 1200 lux = 153	
approx. 250 lux = 32	approx. 1250 lux = 159	
approx. 300 lux = 38	approx. 1300 lux = 166	
approx. 350 lux = 45	approx. 1350 lux = 172	
approx. 400 lux = 51	approx. 1400 lux = 179	
approx. 450 lux = 57	approx. 1450 lux = 185	
approx. 500 lux = 64	approx. 1500 lux = 191	
approx. 550 lux = 70	approx. 1550 lux = 197	
approx. 600 lux = 77	approx. 1600 lux = 204	
approx. 650 lux = 83	approx. 1650 lux = 210	
approx. 700 lux = 90	approx. 1700 lux = 216	
approx. 750 lux = 96	approx. 1750 lux = 223	
approx. 800 lux = 102	approx. 1800 lux = 229	
approx. 850 lux = 109	approx. 1850 lux = 235	
approx. 900 lux = 115	approx. 1900 lux = 242	
approx. 950 lux = 121	approx. 1950 lux = 248	
approx. 1000 lux = 128	approx. 2000 lux = 255	

Effect of the new set value

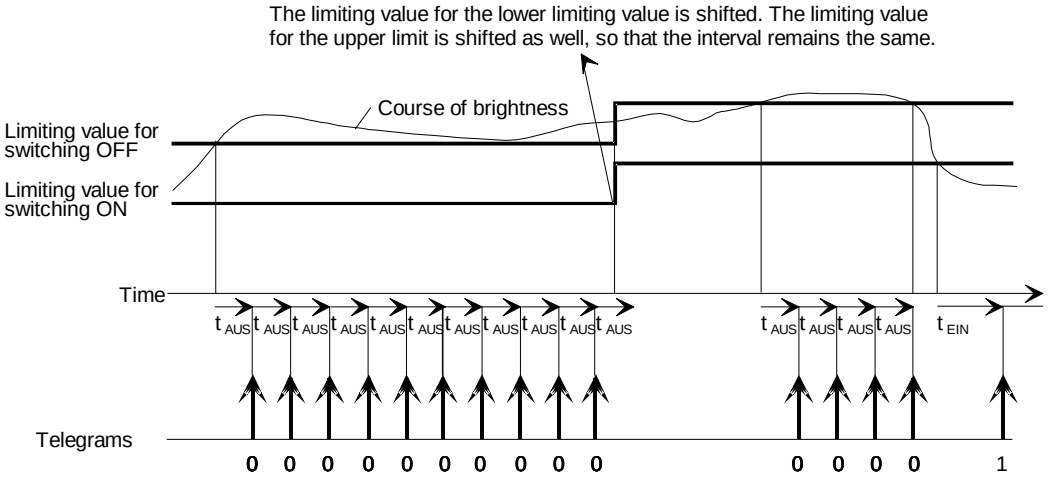
The newly set set value always refers to the set value set in the parameter window or to the last set value set for the **lower** limiting value. The upper limiting value is calculated automatically in accordance with the existing clearance.

If the new set value is set so unfavourably that the possible limiting value is exceeded or undershot, the values shown in the parameter window are set.

Fig. 12 shows the setting of a set value when the brightness sensor is programmed as two position controller.

Fig. 12

Two position regulation with set value setting

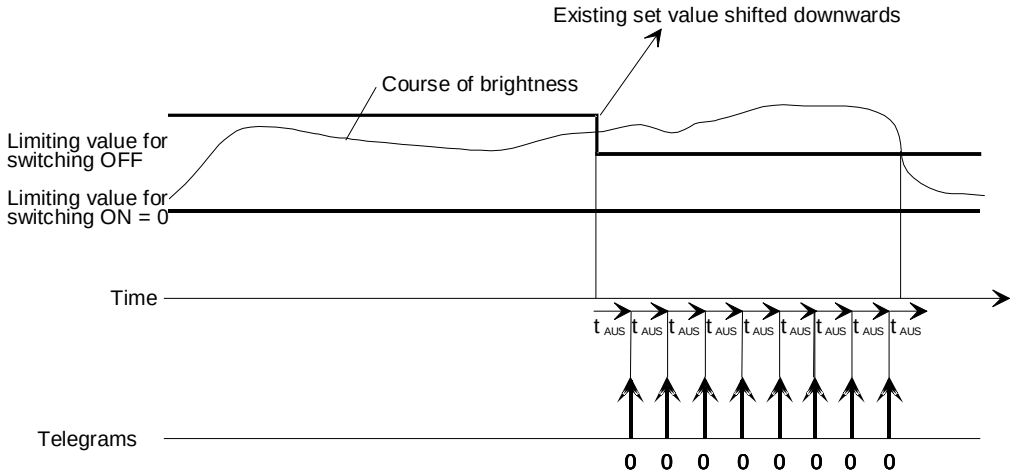


Time delay monitoring time

If the brightness value remained above the upper limit after the set values are set, additional OFF telegrams would be sent without a time delay. The monitoring time is not interrupted or reset through the setting of a new set value.

Fig. 13 shows set value setting where no switch-on function has been assigned to the lower limiting value. At the moment, the setting of the set value refers to the upper limiting value.

Exception



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Two position regulation A00601 Fig. 13

Switch-OFF with set value setting

If the limiting value for the switch-off has no function, the sensor works as an ON-switch switch. The setting of the set value then refers directly to the lower limiting value.

The application "Two position regulation" has a total of three communications objects for releasing and locking the function "Two position regulation".
Object 2 (Release/interlock) is the object here which locks the brightness sensor directly with a "0" telegram and releases it with a "1" telegram. For this reason, locking through the second object can be regarded as **active** locking.

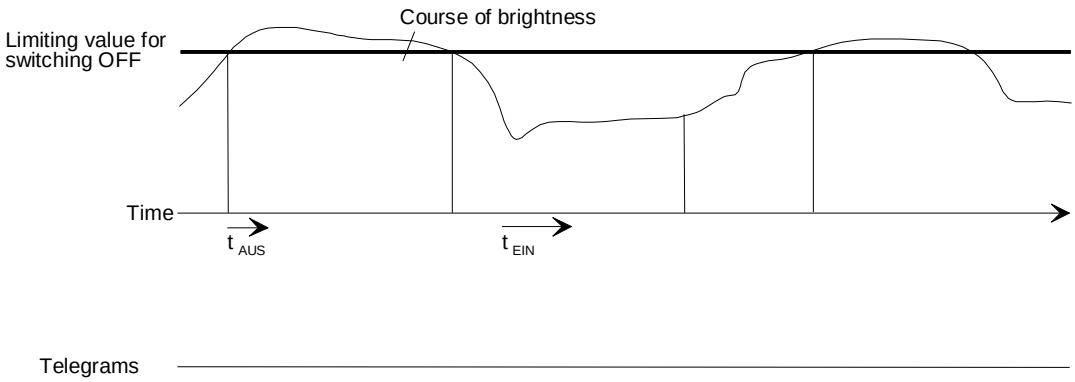
In accordance with the previous applications there is a locking object (communications object 4) that simply reacts to the reception of a telegram with data type 1 bit. Independently of the content of the telegram the release/interlock object is set internally to "0", so that the sensor is locked. The appliance's function is restored when object 2 is released by an ON telegram. This is a **passive** method for locking the sensor.

Release and locking: *Active* lock: Obj. 2 and *passive* lock: Obj. 3

The effect of active or passive locking through communications object 2 is made clear in Fig. 14. If the release/locking object is written with "0", the sensor is locked. The function of the sensor is restored when object 2 is overwritten with "1".

Fig. 14

Two position regulation with locking through the release/ interlock object



Internal further processing during locking

All locks set object 2 to "0" (lock) or "1" (release). If the sensor is locked, it continues to work internally and processes the existing brightness value at the receiver. For this reason, after release the current status is always available.

With the help of another locking object (communications object 1) locking can be realised with a time limit. Reception of a telegram at object 1 is sufficient to start the locking time. The content of the telegram is unimportant here as well. The locking time can be set in the parameter through "basis" and "factor".

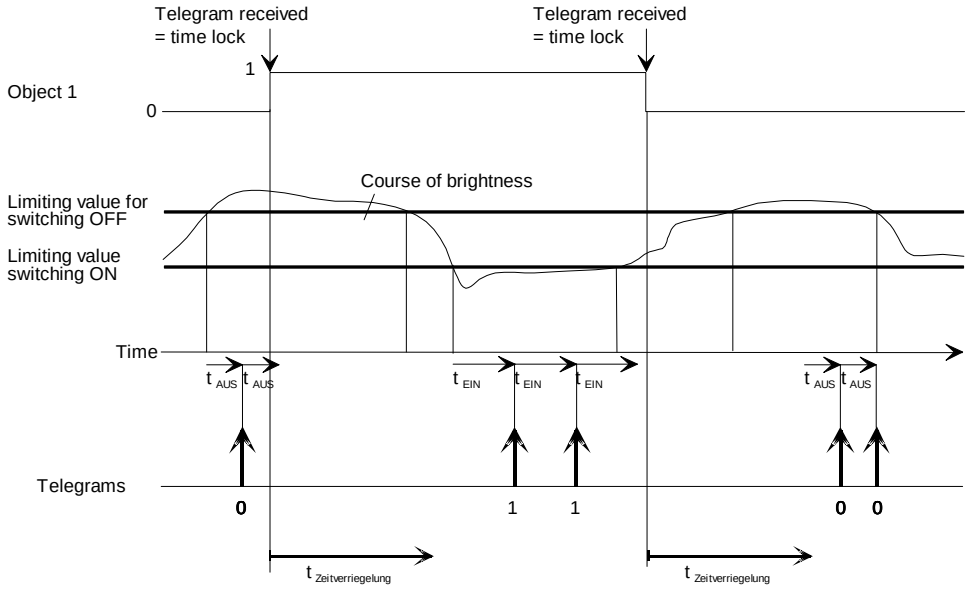
Time-dependent locking of the sensor for manual operating

This method is particularly suitable for locking the sensor for a limited time so that the actuators can be switched independently of the brightness. This lock can be applied, for example, if there is sufficient daylight in a room for a period of four hours.

Fig. 15 shows the effects of a time lock that starts when a telegram is received by this object.

Fig. 15

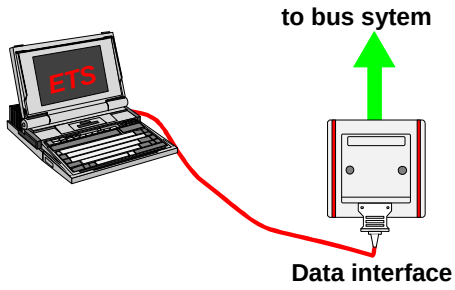
Two position regulation controller with time locking



The locking time is a fixed setting in the parameter window.

If a calibration result

If the calibration result is not entered in the parameter window the brightness sensor does not carry out any functions. The result that is to be entered must be between 1 and 254. If calibration results are not yet available they must be determined with the help of application "Calibration A00401".



Behaviour after installation

This parameter can be used to set whether telegrams are to be sent or not after startup.

With the option "Send telegram" the sensor starts to transmit the current brightness values directly after programming, depending on the setting for the transmission conditions.

The settings under this parameter also determine behaviour after initialising.

Initialising

The following parameters and functions are influenced by initialising: initialising occurs, e.g., after programming or after bus voltage reconnection..

Appliance function:
The function of the appliance after initialising depends on the setting under the parameter "Behaviour after startup":

Send telegrams:	Function is directly available again.
Send no telegrams:	The appliance does not carry out the function until it is released through the release/locking object (object 2).