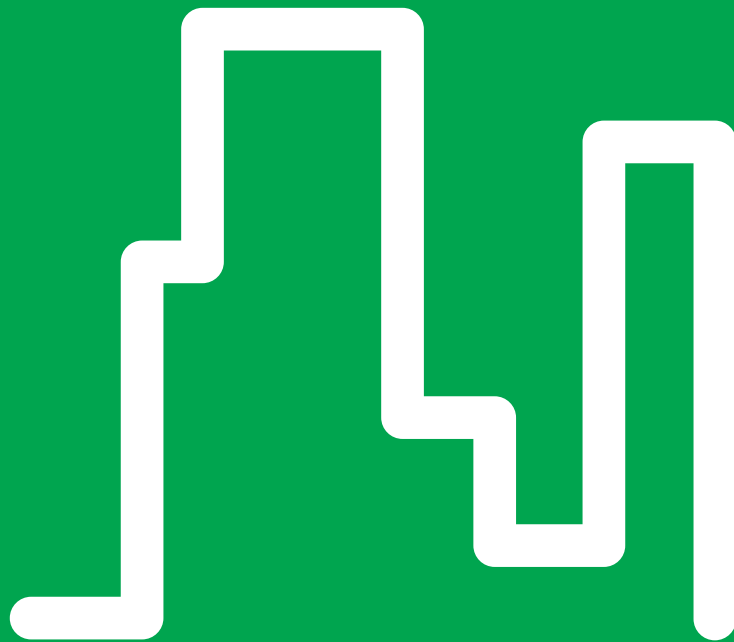# SeeTool - Solutions for KNX

## Office building segment

## Application 8.8.0.0.0.4

Movement dependent automatic light control with light regulation and manual control, temperature control (cooling with thermoelectric valve drive 230V), single room

Schneider Electric

# Lighting and temperature control functions

**Lighting control functions:** The lights are automatically switched ON or OFF dependant on people's movement and existing brightness. When the lights are on, the light controller in the presence detector maintains the decided lux set point by dimming the lamp actuator dependant on the available daylight. In addition three predefined light levels and a permanent OFF can be activated manually by push-button.

**Temperature control functions:** Temperature controller tries to keep room temperature at it's setpoint by controlling thermoelectric valve drives 230V for cooling via a KNX heating actuator. The movement detection will automatically set the temperature control either into comfort or standby mode.
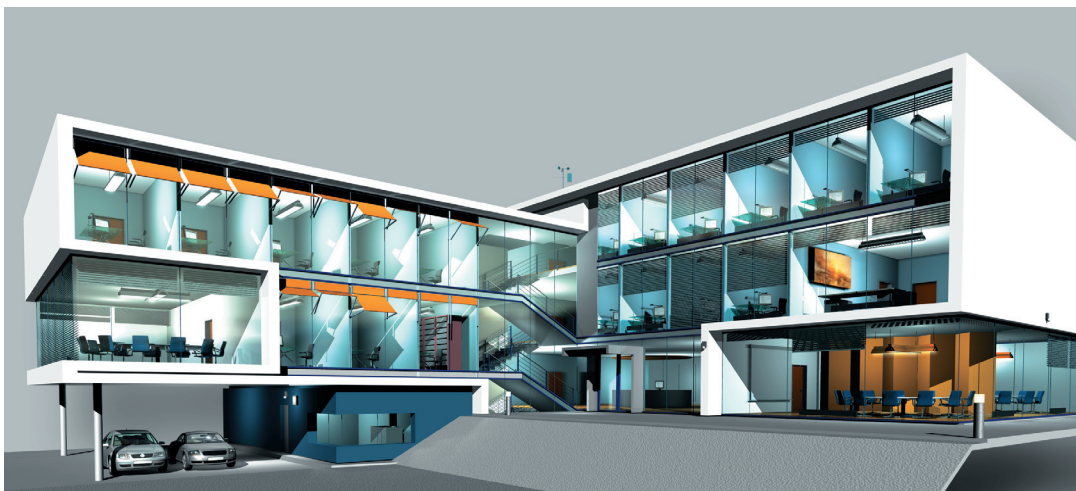


## Application areas

The application is defined to be used in office rooms and/or conference rooms where the level of light will be kept constant taking into account the amount of natural light. The solution offers sophisticated control of the lighting and cooling with an automatic movement detector and additional manual control plus an open window sensing function to set temperature at comfort and standby mode.

### > Energy savings

Combining the presence and daylight function with temperature control to the room application, we are able to utilize the daylight and temperature factors to optimize and save energy during the active period of use throughout the year. Presence dependant lighting control plus daylight harvesting can achieve a 65% electricity saving compared to installations without automatic function. At temperature side presence dependant control can lead to savings of up to 25% yearly in compare to rooms without automatic control functions.

### > Future proof

The application is prepared and defined for integration into a Building Management System if required, through the open technology communication network.

### > Flexibility

For optimized costs the device's functional interaction is predefined. Functionality can be modified or changed at any time in the lifecycle and allows a maximum of flexibility and adaptation when walls are removed and rooms combined.

### > Reliability

Design, planning and installation documents are pre-defined which makes the entire building process faster and more reliable. User documents and descriptions are prepared to assist in user training. The application works as an individual, stand alone room control unit or combined with the entire network.

### Lighting

up to **65%** energy saving

### Temperature

up to **25%** energy saving

**EN 15232**
A class solution

☑

tested & validated

# Technical specifications

## Functions

**Lighting control:** The lights are automatically switched ON when a person enters the room and the brightness value is below the selected brightness threshold. If no movement is detected within a delay time of 25 minutes, the light will be dimmed down to minimum. If no movement is detected for another 5 minutes the light will be switched off.

When the lights are on, the light controller in the presence detector maintains the decided lux set point by sending dimming telegrams to the lamp actuator.

If the daylight will increase, the regulation dims down the artificial light. If it decreases, the regulation will dim up the artificial light.

The lux set point after download and power failure is adjustable by ETS software. The default lux setpoint at the reference surface (e.g. desk) is 500 lux ±20% hysteresis.

The user can also select the lux setpoint by the push-button unit. Button 1 will give high brightness (500 lux), button 2 will give medium brightness (300 lux) and button 3 low brightness (100 lux). With button 4 permanent-OFF can be activated. The light will then be off until one of the other buttons is pressed. When permanent OFF is activated the status LED next to the button is blinking.

**Temperature control:** Temperature controller tries to keep room temperature at it's setpoint by controlling valves. Cooling is controlled by a thermoelectric valve drive 230V via a KNX heating actuator.

Movement detection will automatically set the temperature control into comfort-mode. To save energy this will not happen until a person has been in the room for more than 3 minutes. In this way the temperature control is not affected if someone is present in the room just for a short period of time. If no movement is detected within a delay time of 25 minutes the temperature control is set into standby-mode.

Comfort-mode: default room temperature setpoint 24 °C

Standby-mode: default room temperature setpoint 26 °C

The setpoint can be adjusted by the user +/- 3°C from given setpoint. This is done by pushing „invisible" buttons on both sides of the display frame.
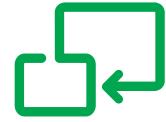
functions

Application 8.8.0.0.0.4
Movement dependent automatic light control with light regulation
and manual control, temperature control (cooling with thermo-
electric valve drive 230V), single room

# Technical specifications

## Components

Application consists of one presence detector, one DIN-rail 0-10V control unit (mounted in the cabinet or close to the room) and one room temperature controller with buttons, one heating actuator and one thermoelectric valve drive 230V.

| | |
|---|---|
| MTN647091 | KNX Control Unit 0-10V REG-K/1-gang with manual mode |
| MTN630919 | KNX ARGUS Presence with light control and IR receiver |
| MTN645129 | KNX Heating actuator REG-K/6x230/0.05A |
| MTN639125 | KNX Thermoelectric valve drive 230V (here for cooling purposes) |

## Design ranges

(Frames not included. Other designs and colours available.)

**EXXACT**

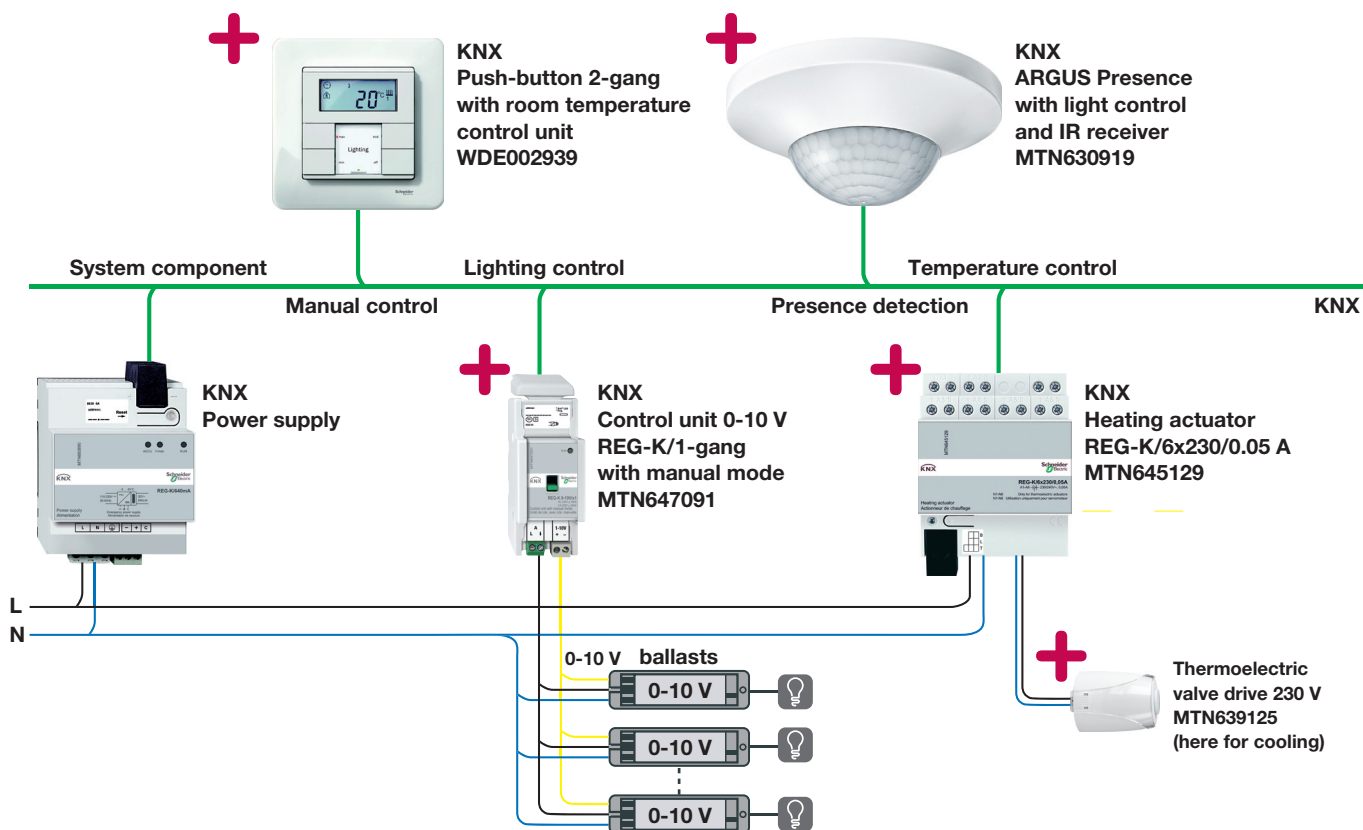| | |
|---|---|
| WDE002939 | KNX PB 2-gang with room temperature control unit |



## Installation

The presence detector is intended for ceiling mounting in a size 60 mounting box. It can also be mounted to ceilings using the surface mounting housing for ARGUS Presence (art.no. MTN550619).

functions

Application 8.8.0.0.0.4
Movement dependent automatic light control with light regulation
and manual control, temperature control (cooling with thermo-
electric valve drive 230V), single room

# Technical specifications

## Wiring diagram

KNX
Push-button 2-gang
with room temperature
control unit
WDE002939

KNX
ARGUS Presence
with light control
and IR receiver
MTN630919

System component

Lighting control

Temperature control

Manual control

Presence detection

KNX

KNX
Power supply

KNX
Control unit 0-10 V
REG-K/1-gang
with manual mode
MTN647091

KNX
Heating actuator
REG-K/6x230/0.05 A
MTN645129

L
N

0-10 V    ballasts

0-10 V

0-10 V

0-10 V

Thermoelectric
valve drive 230 V
MTN639125
(here for cooling)

things work
together

# Technical specifications

## Note

Number of controlled electronic interfaces highly depends on used ones, check with manufacturer recommendations.

An electronic interface takes high inrush current. It is recommended that Type C MCB's (Miniature Circuit Breaker's) are used. Using Type B leads to decreased number of units.

settings

## Configuration

The ETS tool is used to set the parameters for the devices in the application and to define the functional relationship between the devices by group addresses.

The following parameters and group address relations must be set and assigned. The parameters should be set first and in the described order. The parameters which can be changed to fine tune the application are described further on.

### KNX Argus presence with light control

| | | | | |
|---|---|---|---|---|
| 12 | Switch object 1 | Block 2 | 1 bit | –> 2/1/3 |
| 60 | Switch output | Closed-loop | 1 bit | –> 1/1/1 |
| 61 | Dimming output | Closed-loop | 4 bit | –> 1/1/2 |
| 62 | Setpoint 1 | Closed-loop | 1 byte | –> 1/1/3 |
| 64 | Fb. operat. mode | Closed-loop | 1 bit | –> 1/1/9 |
| 70 | Value input | Closed-loop | 1 byte | <– 1/1/8 |
| 71 | Lux value setting | Closed-loop | 2 byte | <– 1/1/7 |
| 107 | Result. act. value | Send | 2 byte | –> 1/1/6 (optional) |
| 109 | Status feedback | Safety pause | 1 bit | <– 1/1/4 |
| 110 | Status feedback | Brightness | 1 byte | <– 1/1/5 |

**General**
Actual value correction:                              enable
Actual value (0-2000 Lux) installation site
 Lamp switched off:                              _____
 Max. brightness of lamp:                   _____
Actual value (0-2000 Lux) reference surface
 Lamp switched off:                              _____
 Max. brightness of lamp:                   _____
[Optional, to check regulation after download]
Send actual value cyclically
reference surface:                              enable
Time base, send lux value:                1 s
Time factor, send lux value:             60

**Block configuration**
Move/presence block 1:                     disable
Move/presence block 2:                     enable
Light control:                                        enable

**Block 2 general –> Movement sensors**
Sector-orientated settings:                enable
Dead time, beginning of movement:   enable
Time base:                                          1 min
Time factor:                                         3

**Block 2 general –> Brightness**
Movement detection is:                       brightness independ.

**Block 2 general –> Time**
Time base for staircase timer:            1 min
Time factor for staircase timer:          25

### KNX Push-button 2-gang with RTC

| | | | | |
|---|---|---|---|---|
| 0 | Object A | PB 1 | 2 byte | –> 1/1/7 |
| 3 | Object A | PB 2 | 2 byte | –> 1/1/7 |
| 6 | Object A | PB 3 | 2 byte | –> 1/1/7 |
| 9 | Value object A | PB 4 | 1 byte | –> 1/1/8 |
| 11 | Status feedb. object | PB 4 | 1 bit | <– 1/1/9 |
| 47 | Comfort input | Control | 1 bit | <– 2/1/3 |
| 65 | Correcting variable cooling (basic level) | Control | 1 byte | –> 2/1/2 |

**Push-button 1**
Select push-button
function:                          Edges with 2 byte
                                          values

**Push-button 1 – edges values**
Value 1 = basis * factor [= 500]
Basis (possible
values in brackets):        0,32 (0 to 655,04)
Factor (0-2047):             1562

**Push-button 2**
Select push-button
function:                          Edges with 2 byte
                                          values

**Push-button 2 – edges values**
Value 1 = basis * factor [= 300]
Basis (possible
values in brackets):        0,16 (0 to 327,52)
Factor (0-2047):             1875

**Push-button 3**
Select push-button
function:                          Edges with 2 byte
                                          values

**Push-button 3 – edges values**
Value 1 = basis * factor [= 100]
Basis (possible
values in brackets):        0,08 (0 to 163,76)
Factor (0-2047):             1250

# Technical specifications

## Configuration

### KNX Argus presence with light control

**General light control**
Automatic: at object value 0
Memory behaviour: parameterised setpoint value
Extended controller parameters: enable

**General light control –>**
**Control response in automatic mode –>**
**Times**
Time base for staircase timer: 1 min
Time factor for staircase timer: 25

**General light control –>**
**Control response in automatic mode –>**
**Brightness**
Nominal value (10-2000 Lux) reference surface: 500
Hysteresis (10%-50%): 20

**General light control –>**
**Switching off in automatic mode**
Time base, dimming down time: 1 min
Time factor, dimming down time: 5

### KNX Control unit 0-10V REG-K/1-gang

| | | | | |
|---|---|---|---|---|
| 1/1/1 –> | 0 | Switch object | Channel 1 | 1 bit |
| 1/1/2 –> | 1 | Dimming object | Channel 1 | 4 bit |
| 1/1/3 –> | 2 | Value object | Channel 1 | 1 byte |
| 1/1/4 <– | 8 | Status feedb. switch | Channel 1 | 1 bit |
| 1/1/5 <– | 9 | Status feedb. value | Channel 1 | 1 byte |

NOTE: The read flag (R) must be set

**1: General**
Status switch: active status resp. object
Status value object: active status resp. object

**1: Dimming time reduction**
Set 0: dimming time reduction
for value telegram at: 6%

### KNX Push-button 2-gang with RTC

**Push-button 4**
Select push-button function: Switching
Object A: 1 byte in steps 0-100%
Value: 0%
Trigger status LED: Flashes when status feedback object equals 1

**Control general**
Use control: Yes
Controller type: Cooling
Duration of comfort extension: None
Setpoint adjustment maintained after change in operation mode: Yes

**Control general –> Actual temperature (resultant)**
Correct internal actual temperature factor [-128...127] * 0,1 K: 0
[NOTE: See description „fine tuning"]

**Control general –> Control cooling**
Select cooling system: Adjustment via control parameter
Proportional range for cooling in 0,1 K [10-255]: 40
Reset time for cooling [1-255 min]: 20

### KNX Heating actuator

| | | | | |
|---|---|---|---|---|
| 2/1/2 –> | 0 | Output 1 | Control value | 1 byte |

**General**
Cyclic time (PWM of outputs): 2 minutes

**Output 1**
Type of control value: 1 byte

settings

# Technical specifications

## Group addresses

| Address | Name (proposal) | Function |
|---|---|---|
| 1/1/1 | Room 001 Light On/Off | Light on/off by the light controller |
| 1/1/2 | Room 001 Light Dimming | Light dimming up/down by the light controller |
| 1/1/3 | Room 001 Light Value | Light absolute value by the light controller |
| 1/1/4 | Room 001 Light Status switch | Feedback from actuator, On/Off |
| 1/1/5 | Room 001 Light Status value | Feedback from actuator, 0-100% |
| 1/1/6 | Room 001 Light Resulting actual value | Measured lux value by light controller (corrected value) |
| 1/1/7 | Room 001 Light Lux value setting | Different lux values from push-button |
| 1/1/8 | Room 001 Light Permanent OFF (0%) | Permanent OFF, movement detector disabled |
| 1/1/9 | Room 001 Light Feedb. operation mode | Indication permanent off (0) and automatic regulation (1) |
| 2/1/2 | Room 001 Cooling control value | Cooling 0-100%, sent by the room temperature controller to the heating actuator |
| 2/1/3 | Room 001 Comfort/Standby mode | Change between comfort (1) and standby (0) mode |

settings

Application 8.8.0.0.0.4
Movement dependent automatic light control with light regulation
and manual control, temperature control (cooling with thermo-
electric valve drive 230V), single room

# Technical specifications

## Actual value correction

The measured brightness value (actual value) can be corrected. A distinction is drawn here between the installation location of the presence detector and the reference area (a desk surface, for example). The brightness value of the reference area is determined with the aid of actual value correction and taking the brightness value measured by the presence detector at the installation location and an internal adjustment curve into account. In the case of light regulation it is not the brightness value at the installation location which is important but the brightness value at the reference area (desk).

For actual value correction you will need a luxmeter (example: Roline TES-1335 or equivalent).

Four measurements are required for actual value correction:
• With the artificial lighting switched OFF, brightness is measured at the presence detector installation location.
• With the artificial lighting switched OFF, brightness is measured at the reference area (desk, for example).
• With the artificial lighting switched ON (maximum brightness), brightness is measured at the presence detector installation location.
• With the artificial lighting switched ON (maximum brightness), brightness is measured at the reference area (desk, for example).

The measurements can be done in daylight but not in clear sunshine, best condition is cloudy weather.

To switch ON to maximum brightness a value telegram 100% can be sent from ETS to the value object of the control unit, for example. Note: the presence detector should not be in operation at this time.

The four lux values measured must be entered as parameters in ETS.

| Parameter page | Parameter | Value |
|---|---|---|
| General | Actual value installation site, Lamp switched OFF | 0…2000 lux |
| General | Actual value installation site, Max brightness of lamp (100%) | 0…2000 lux |
| General | Actual value reference surface, Lamp switched OFF | 0…2000 lux |
| General | Actual value reference surface, Max brightness of lamp (100%) | 0…2000 lux |

settings

Application 8.8.0.0.0.4
Movement dependent automatic light control with light regulation
and manual control, temperature control (cooling with thermo-
electric valve drive 230V), single room

# Technical specifications

## Fine tuning

Some parameters can be changed to fine tune the solution to the building and specific requirements. Parameter which may need to be adjusted are listed below, our recommendation in brackets.

**KNX ARGUS presence detector with light control and IR receiver:**
The staircase timer (delay time) will be retriggered by every detected movement when the light is on. The light will be dimmed down to minimum if no movement has been detected within the specified time.

If no movement is detected the light will stay on minimum level for a time period specified by the parameter „dimming down time". After this time the light will be switched off.

| Parameter page | Parameter | Value |
|---|---|---|
| General light control –> Control response in automatic mode –> Times | Time base for staircase timer | 1s/1 min/1h (1 min) |
| General light control –> Control response in automatic mode –> Times | Time factor for staircase timer | 1-255 (25) |
| General light control –> Switching off in automatic mode | Time base, dimming down time | 1 s/1 min/1 h (1 min) |
| General light control –> Switching off in automatic mode | Time factor, dimming down time | 1-255 (5) |

Delay time = Time base x Time factor
Dimming down time = Time base x Time factor

Lux level setpoint in reference area

| Parameter page | Parameter | Value |
|---|---|---|
| General light control –>l Control response in auto. mode –> Brightness | Nominal value reference surface | 10-2000 lux (500 lux) |
| General light control –>l Control response in auto. mode –> Brightness | Hysteresis | 10%-50% (20%) |

The actual brightness value (corrected measured value) can be sent cyclically to the bus via communication object 107. This can be used for test purpose together with ETS. If it is used for other purposes, the value should not be sent too often for bus load reasons. If there is no receiver to display the value in the project, the function should be disabled after the test phase.

| Parameter page | Parameter | Value |
|---|---|---|
| General | Send actual value cyclically, reference surface | enable/disable (disable) |
| General | Time base, send lux value | 1s/1 min/1 h (1 min) |
| General | Time factor, send lux value | 1-255 (30) |

Cycle time = Time base x Time factor

# Technical specifications

## Fine tuning

The delay time for changing between standby-comfort is dependent on presence activity in a room. To save energy the switch-over from standby to comfort is done when movement is detected after a specified dead time. Then a staircase timer is started which will be retriggered by every detected movement. If no movement is detected the staircase timer will run out and standby mode is activated again.

| Parameter page | Parameter | Value |
|---|---|---|
| Block 2 general –> Movement sensors | Dead time, Time base | 1s/1 min (1 min) |
| Block 2 general –> Movement sensors | Dead time, Time factor | 1-255 (3) |
| Block 2 general –> Times | Time base for staircase timer | 1s/1 min/1h (1 min) |
| Block 2 general –> Times | Time factor for staircase timer | 1-255 (25) |

**KNX Push-button 2-gang with room temperature control unit:**
Push-buttons:
The end user can select brightness level (lux value) with push-button 1, 2 and 3. These values can be changed with the parameters of the push-buttons.

| Parameter page | Parameter | Value |
|---|---|---|
| Push-button 1 – edges values | Value 1 = basis * factor (500 lux) Basis | 0,01-327,68 (0,32) |
| Push-button 1 – edges values | Factor | 0-2047 (1562) |
| Push-button 2 – edges values | Value 1 = basis * factor (300 lux) Basis | 0,01-327,68 (0,16) |
| Push-button 2 – edges values | Factor | 0-2047 (1875) |
| Push-button 3 – edges values | Value 1 = basis * factor (100 lux) Basis | 0,01-327,68 (0,08) |
| Push-button 3 – edges values | Factor | 0-2047 (1250) |

**Note: Temperature controller parameter pages uses the unit Kelvin's (K) for relative temperatures and Celsius (°C) degrees for absolute temperatures 1K = 1°C**

**Room temperature controller:**
Default setpoints for cooling (depends on presence in a room)

| Parameter page | Parameter | Value |
|---|---|---|
| Control general –> Setpoints | Cooling, setpoint for comfort | 5-40°C (24°C) |
| Control general –> Setpoints | Cooling, setpoint for standby | 5-40°C (26°C) |

The user is allowed to adjust the default setpoint +/- within specified limits

| Parameter page | Parameter | Value |
|---|---|---|
| Control general | Max. upper setpoint adjustment | 0-10 K (3 K) |
| Control general | Max. lower setpoint adjustment | 0-10 K (3 K) |

Application 8.8.0.0.0.4
Movement dependent automatic light control with light regulation
and manual control, temperature control (cooling with thermo-
electric valve drive 230V), single room

# Technical specifications

## Fine tuning

Value correction of measured temperature:
The temperature in the room is measured by the internal temperature sensor in the room temperature controller.
The actual temperature is shown in the display. If the value is not representative for the room it is possible to
adjust it by parameter. Actual temperature = measured temperature + adjustment value.

| Parameter page | Parameter | Value |
| --- | --- | --- |
| Control general –> Actual temperature (resultant) | Correct internal actual temperature factor (-128…127) * 0,1 K | 0 |

Parameters for tuning cooling control (Xp and Ti)

| Parameter page | Parameter | Value |
| --- | --- | --- |
| Control general –> Control cooling | Proportional range for cooling in 0.1K | 10-255 (40) |
| Control general –> Control cooling | Reset time for cooling in min | 1-255 min (20) |

## Power failure behaviour

Behaviour when bus voltage fails: relay no (Light is OFF).

Behaviour when bus voltage returns: switch off relay (Light is OFF).

fine tuning

# Technical specifications

## User manual

The user manual provided for the application is an end users training material and can be installed at site when final submission is made.

**Please do no forget to cut out this quick guide for the user and attach to the wall next to the entrance to the room. Also, make sure the customer is aware of the installed applications function.**

## Quick guide

This room is equipped with a movement dependent automatic light control with light regulation and manual control, temperature control.

**Automatic mode operation**
**Lighting control**
The lights are automatically switched ON when a person enters the room and the brightness value is below the selected brightness threshold.
If no movement is detected within a delay time of 25 minutes, the light will be dimmed down to minimum. If no movement is detected for another 5 minutes the light will be switched off. When the lights are on, the light controller in the presence detector maintains the decided lux set point by sending dimming telegrams to the lamp actuator. If the daylight will increase, the regulation dims down the artificial light. If it decreases, the regulation will dim up the artificial light.

**Manual mode operation**
The user can also select the lux set point by the pushbutton unit. Button 1 will give high brightness (500 lux), button 2 will give medium brightness (300 lux) and button 3 low brightness (100 lux). With button 4 permanent-OFF can be activated. The light will then be off until one of the other buttons is pressed. When permanent OFF is activated the status LED next to the button is blinking.
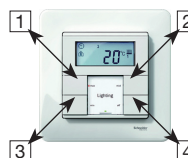
06-10 Application 8.8.0.0.0.4

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service
for your
customer

# Technical specifications

## User manual

# Quick guide

This room is equipped with a movement dependent automatic light control with light regulation and manual control, temperature control.

**Automatic mode operation**
**Temperature control, cooling**
Movement detection will automatically set the temperature control into comfort-mode. To save energy this will not happen until a person has been in the room for more than 3 minutes. In this way the temperature control is not affected if someone is present in the room just for a short period of time. If no movement is detected within a delay time of 25 minutes the temperature control is set into standby-mode.
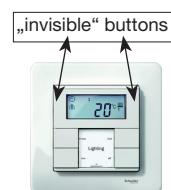
**Comfort-mode:**
default room temperature set point 24 °C
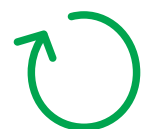
**Standby-mode:**
default room temperature set point 26 °C

The set point can be adjusted by the user +/- 3°C from given set point. This is done by pushing „invisible" buttons on both sides of the display frame.

„invisible" buttons



06-10 Application 8.8.0.0.0.4

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