User Manual

LON System-M Motion Detector 2.2m

Content

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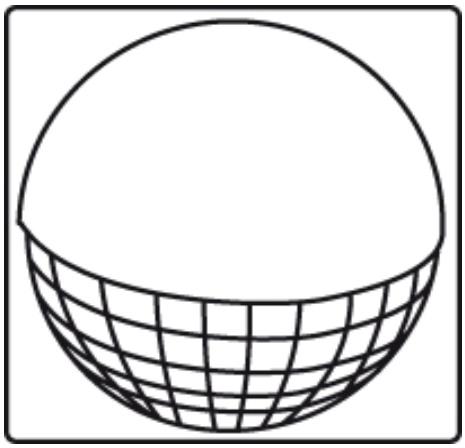
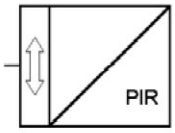
MTN881251



1. Description

- Indoor motion detector in System-M design in polar white colour
- To be mounted at a height of 2.2 m
- To be used in combination with a LON Bus Coupling Unit MTN880451
- Detection of movements within a horizontal angle of 180 degrees
- Range motion detector: eight meters right/left, twelve meters forward.
- Motion-dependent control of room functions
- Integrated and individually adjustable threshold value switch for brightness-dependent light control
- Software application to translate the detected movements (according to LonMark profile “Occupancy Sensor (1060)” and “Occupancy Controller (3071)”) into LON messages for occupancy-dependent lighting control

2. Function

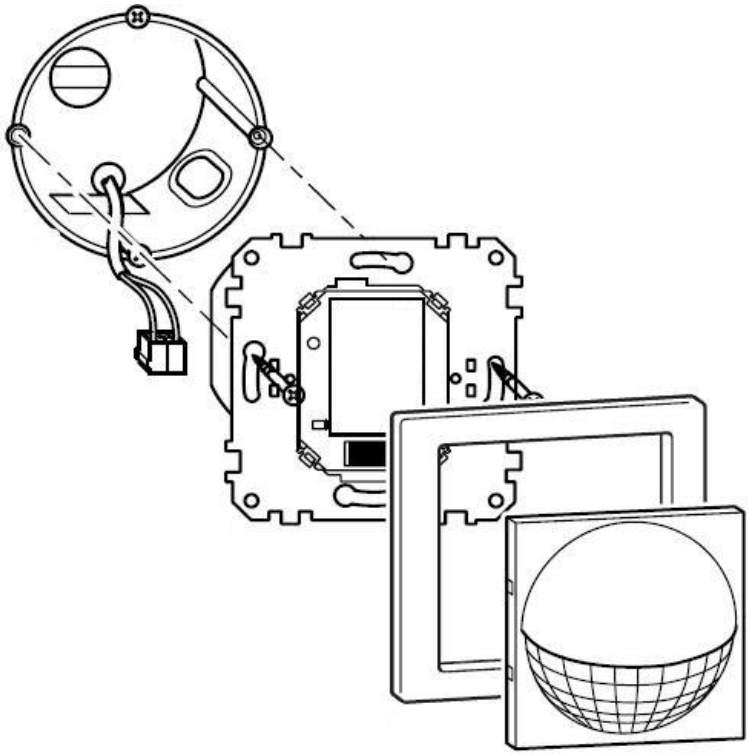


Registered movements are translated into LON telegrams.
The motion detectors are provided with a light sensor, whose brightness tie can be appointed from 5 to 1000 lux.
The motion detector links the light sensor with the detection of movements.
In a system it is allowed to combine one sensor with other motion detectors.

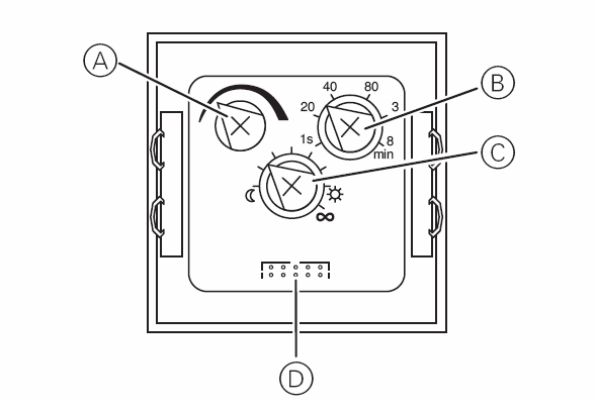
3. Mounting

To realise a proper function of the motion detector the assembly site should be accurately selected.

The application module is plugged onto the LON BCU and completed with a frame.
The LON BCU and the frame have to be ordered separately.
The LON BCU represents the mechanical, electrical and data technical connection between a LON TP/LP network and the application module.
To prevent the connector of the application module from spoiling, the application module has to be stuck upright onto the BCU.

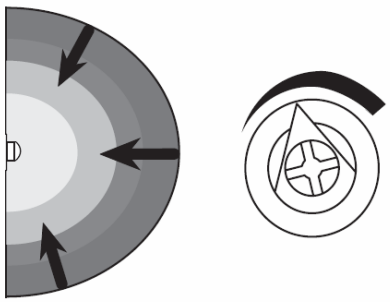


4. Operating elements



Ⓐ Setting the range
Ⓑ Setting the overshoot time
Ⓒ Setting detection brightness
Ⓓ Connectionpin (for bus coupler)

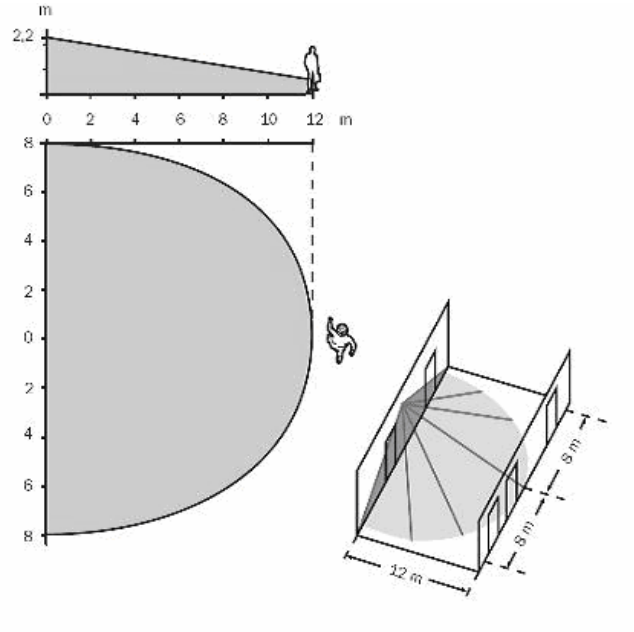
Setting the range
Here you can infinitely set the distance up to which the detector detects movements (up to max. 8 m).



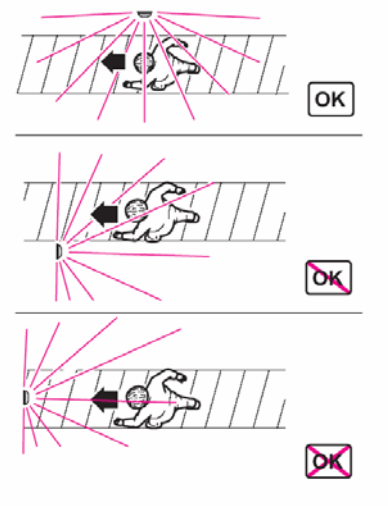
Setting the detection brightness
Here you can infinitely set the ambient brightness level at which the detector movements and triggers a switching procedure.
– Moon symbol (left stop): The detector will only detect movements during the hours of darkness (approx. 10 lux).
– Sun symbol: The detector detects movements up to approx. 1000 lux.
– Infinity symbol (right-hand- stop): The detector detects movements regardless of the ambient brightness.

Setting the overshoot time
With the overshoot time you specify how long the connected load will remain switched on after the last movement has been detected.

5. Monitored area



All details of the range relate to average measurements and are therefore only standard values.



Install the detector laterally with respect to the direction of movement so that the beam paths are intersected as vertically as possible.

6. Remarks

Installation and assembly of electrical devices may take place only by an electrical specialist. When planning and installing an electrical system the relevant standards, guidelines and regulations of the respective country are to be considered. Beyond that the device specifications are to be kept. For project engineering, assembly and line-up detailed expertise of the LonWorks technology is presupposed.
The function of the device is software dependent. Only application programs may be loaded, which are approved for this device.
The system integrator has to carry ensuring that the loaded application program and the configured parameters in it correspond with the outside wiring of the device. This applies in particular if for different use several application programs for a device are available.

7. Technical Data

Power supply	By bus coupling unit
Power consumption:	1 LPUL (285mW), 6.2mA @ 42V, 25 mA @ 5 V
Including BCU (max.):	DC 42,8V (supplied by the network)
Detection movement	
Angle of detection:	180°
Number of levels:	6
Number of zones:	46
Detection range:	Approx. 8 m right / left, 12 meters to the front; infinite setting (rotary switch)
Brightness measurement	
Detection brightness:	Infinite setting from approx. 10 lux to approx. 1,000 lux (rotary switch)
Controls, application module	
adjusting screws:	Adjusts the brightness threshold and the device-internal hold time
Site conditions	
Operating temperature:	-5°C .. +45°C
Type of Protection:	IP20
Connection	
Physical External Interface (PEI):	10 pole interface (PEI)
EC guidelines	
Low-Voltage guideline:	2006/95/EC
EMC guideline:	2004/108/EC

8. Application description

The application “880451MS21A“ enables motion-dependent control through the LON Bus Coupling Unit and appropriated actuators via the LON network. It contains the LonMark Objects “Light Sensor (1010)“ (1x), “Occupancy Sensor (1060)“ (1x) and “Occupancy Controller” (3071) (1x).
The information delivered by this motion detector can be used for lighting control, e. g. in large floors or rooms to only switch on the light, if motion is detected.

Function

Light Sensor

Measuring Brightness Levels

The `nvoLSluxLevel` output propagates the current ambient brightness level, whenever that value changes. The output value can also be transmitted cyclically by the time defined in the `SCPTmaxSendTime` parameter.
To tailor the transmission rate, a minimum period of time between two consecutive output transmissions can be defined in the `SCPTminSendTime` parameter and a minimum change of the ambient brightness level can be demanded in `SCPTminDeltaLevel`.

Sensor Calibration

To simplify the copying of sensor objects for several rooms of similar type, a deviation of the sensor output from the value measured at the reference point is corrected as follows:
The brightness level at the reference point is measured exemplarily in one room with an external lux meter. The measured value has to be entered into the `nciLSfieldCalib` configuration variable. At the same time, the sensor (which e.g. has been installed in the ceiling) measures its own ambient brightness level deviating from the value at the reference point. These values form the conversion factor `SCPTgain`:

$$\frac{\text{Brightness level at reference point (}\texttt{nciLSfieldCalib}\text{)}}{\text{Brightness level measured by sensor (}\texttt{nvoLSluxLevel}\text{)}}$$

Corrected by the conversion factor, the light sensor propagates the lux value corresponding to the reference point during the following measurements.

Occupancy Sensor

The Occupancy Sensor is used to detect if a room is occupied or unoccupied and to propagate the status to the LON network.

When motion is detected, the output changes to “occupied” and propagates this value at least for the time parameterised in `SCPTdebounce[i]`, whether further motion is detected or not. The output changes to “unoccupied” when no motion has been detected for longer than the debounce time.

The current occupancy status of the controlled area is transmitted every time it changes. It can also be transmitted cyclically by the time defined in the `SCPTmaxSendTime[i]` parameter.

To meet the requirements of various applications, it has to be possible to adjust the command transmitted when the area is “unoccupied”. Therefore, the `UCPTunoccupiedOccCmd[i]` parameter is provided (e. g. OC_UNOCCUPIED can be used for light control and OC_STANDBY for HVAC control).

Occupancy Controller-Object

The occupancy controller can be enabled / disabled externally via nviOCsetting[i].

Occupancy-dependent control

The controller provides two occupancy input variables. Via nviOCoccupancy[i], the occupancy status of the monitored area is received. If somebody is present, the value defined in SCPTprimeVal[i] is transmitted via the nvoOClampValue[i] output, e. g. to a Lamp Actuator.
The nviOCsecondary[i] input can be used optionally to analyse the occupancy status of a neighbouring area and use it for control. If no motion is detected within the monitored area, the controller normally switches off. If occupancy is still detected within the neighbouring area, the value of SCPTsecondVal[i] is propagated via the nvoOClampValue[i] output. Thus, the light level of an area can be lowered (without switching off completely), while someone still lingers in an adjoining office, in order to provide a low light level around an occupied area (security feeling).

If the values of nvoOClampValue[i], nvoOCsetting[i] and nvoOCscene[i] shall be propagated regularly also if the current value has not changed, the period of time between consecutive messages has to be defined in the SCPTmaxSendTime[i] parameter.

Brightness changes due to switching-off are possibly recognised as motion. To avoid that the light is switched on again, the occupancy inputs of the controller ignore every incoming message during the time defined in UCPTignoreTime[i].

The additional outputs nvoOCsetting[i] and nvoOCscene[i] can be used to control another controller if required, e. g. a Constant Light Controller or Scene Controller.

Off-delay

An off-delay can be defined in the SCPTholdTime[i] configuration property (hold time). If no motion is detected within the monitored area, the light is not switched off until this time has expired. Thus, unnecessary switching operations during short-term absence are avoided.

Operation mode filter

By use of the UCPTonOffFilter[i] parameter, on and off commands of the controller can be suspended/filtered. Thus, the connected load can be switched on occupancy-dependently and switched off manually. Or the user switches on himself and the controller switches off automatically when absence is detected (energy saving function). Without any enabled filter the controller switches both on and off automatically.

Brightness-dependent control

In addition to the features described before, the occupancy controller can control the light in dependence of the ambient illumination level if a Light Sensor is bound to the nviOCluxLevel[i] input.
A switching hysteresis can be created using an upper and lower illumination threshold, defined in UCPTluxHystHigh[i] resp. UCPTluxHystLow[i].
Below the lower threshold, the light is switched on and off occupancy-dependently. When someone enters the room, the light is switched on. The illumination level then exceeds the lower threshold value. If the upper threshold is exceeded as well (e. g. due to the weather conditions), the controller switches off.
To avoid that the light is switched off immediately at short-term increase of brightness (e. g. caused by a few sunrays coming through the cloud cover), the UCPToffDelay[i] parameter determines an off-delay time. The light is not switched off until the brightness level exceeds the upper threshold for longer than this time. The nvoOClampValue[i] output than propagates {0; 0}, nvoOCsetting[i] propagates SET_OFF and nvoOCscene[i] propagates the configured value in UCPTocSceneOutput[i].oc_off.

If the light has been switched off (because nobody was present or the upper threshold value was exceeded) but the brightness level still lies within the interval, the light remains switched off, also if occupancy is detected. It is not switched on again until the brightness level falls below the lower threshold defined.

Remark: The upper brightness threshold value has to be defined so, that it is not exceeded when the light is switched on!

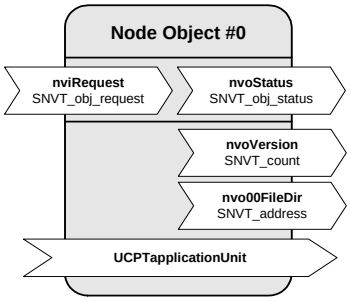
8.1. System requirements

For the configuration of the application a LNS-compatible commissioning tool is needed! All properties are used as “User-defined Configuration Property Types” (UCPT’s) by Direct-Memory-Access. For use of these properties, the Device Resource Files” (DRF’s) have to be installed **before (!)** a device template is created.

The used LNS must be version 2.0 or higher.

8.2. Node Objekt

(LONMARK® profile #0)



Input Network Variables

`nviRequest`

Type:	SNVT_obj_request
Valid Range:	Valid Object-ID: RQ_NORMAL, RQ_UPDATE_STATUS, RQ_REPORT_MASK
Default Value:	RQ_NORMAL
Description:	Input, which is used to initiate status messages from the node.

Output Network Variables

`nvoStatus`

Type:	SNVT_obj_status
Valid Range:	The supported Status-Bits are: .report_mask, .invalid_id, .invalid_request
Default Value:	All bits = 0
Description:	Is sent, when an update occurs in `nviRequest`.

`nvoVersion`

Type:	SNVT_count
Valid Range:	0 .. 65,535
Default Value:	Not defined
Description:	Not in use!

Output Network Variables

nvo00FileDir

Type:	SNVT_address
Valid Range:	16,384 .. 64,767
Default Value:	Not defined
Description:	For internal function only!

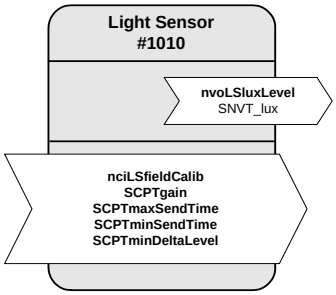
Configuration Properties

UCPTapplicationUnit

Type:	UNVT_u8
Valid Range:	0 .. 255
Default Value:	0
Description:	Not in use!

8.3. Light Sensor

(LONMARK® profile #1010)



Output Network Variables

`nvoLSluxLevel` – Sensor output value

Type:	SNVT_lux
Valid Range:	0 .. 65,535 lux
Default Value:	0
Description:	Via this output, the sensor propagates the measured brightness level. *Remark: The Motion Detector modules don't have an integrated light sensor, but a brightness depending threshold switch adjustable by a potentiometer.* *The light sensor will send out a value of 1,000 lux if the measured brightness is higher and 0 lux if the value is lower than the configured threshold.*

Configuration Properties

`nciLSfieldCalib` – Field calibration

Type:	SNVT_lux
Valid Range:	0 .. 65,535 lux
Default Value:	0
Description:	To correct the deviation of the sensor output value from the lux value measured at the reference point, the conversion factor `SCPTgain` has to be calculated. Therefore, the brightness level measured at the reference point is entered here and `SCPTgain` is updated: `SCPTgain.multiplier = nciLSfieldCalib` and `SCPTgain.divisor =` value measured currently by the sensor.

Configuration Properties

SCPTgain – Gain for sensor calibration

Type:	SNVT_muldiv
Valid Range:	.multiplier: 0 .. 65,535 .divisor: 0 .. 65,535
Default Value:	.multiplier = 1 .divisor = 1
Description:	Memory of the conversion factor for calibration: `.multiplier` (= `nciLSfieldCalib`) : `.divisor` (= current value of `nvoLSluxLevel`). In this parameter, the conversion can also be adjusted manually.

SCPTmaxSendTime[i] – Maximum send time

Type:	SNVT_time_sec
Valid Range:	0 .. 6,553.5 s
Default Value:	120 s
Description:	Defines the maximum period of time between consecutive transmissions of the current value. When this time expires, the current lux value is transmitted automatically/cyclically via `nvoLSluxLevel`. A zero value disables this function.

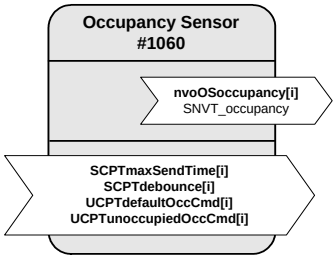
SCPTminSendTime[i] – Minimum send time

Type:	SNVT_time_sec
Valid Range:	0 .. 6,553 s
Default Value:	2 s
Description:	Defines the minimum period of time between two consecutive transmissions of the current value. Provides a way to tailor the transmission rate to reduce bus load, e. g. when the current brightness level often changes within a short time.

SCPTminDeltaLevel[i] – Send on delta

Type:	SNVT_lev_cont
Valid Range:	0 .. 100 %
Default Value:	2.5 %
Description:	Determines the amount by which the current brightness level must change before the corresponding `nvoLSluxLevel[i]` is transmitted (to reduce bus load).

8.4. Occupancy Sensor
(LONMARK® profile #1060)



Output Network Variables

nvoOSoccupancy[i] – Occupancy Output

Type:	SNVT_occupancy
Valid Range:	OC_OCCUPIED, OC_UNOCCUPIED, OC_BYPASS, OC_STANDBY, OC_NUL
Default Value:	Value of `UCPTdefaultOccCmd[i]`.
Description:	Provides the qualified state of the hardware sensor. OC_OCCUPIED is transmitted when a motion is detected. The value transmitted in an unoccupied status can be defined in the `UCPTunoccupiedOccCmd[i]` property.

Configuration Properties

SCPTmaxSendTime[i] – Maximum send time

Type:	SNVT_time_sec
Valid Range:	0 .. 6,553 s
Default Value:	120 s
Description:	Defines the maximum period of time between consecutive transmissions of the current value. When this time expires, the current value of `nvoOSoccupancy[i]` is transmitted automatically/cyclically. A zero value disables this function. This parameter is needed especially if several sensors are bound to one controller input.

SCPTdebounce[i] – Debounce time

Type:	SNVT_time_sec
Valid Range:	10 .. 6,553 s
Default Value:	15 s
Description:	The debounce time is restarted with every occupancy signal. During this time, the output value of `nvoOSoccupancy[i]` constantly remains OC_OCCUPIED.

Configuration Properties

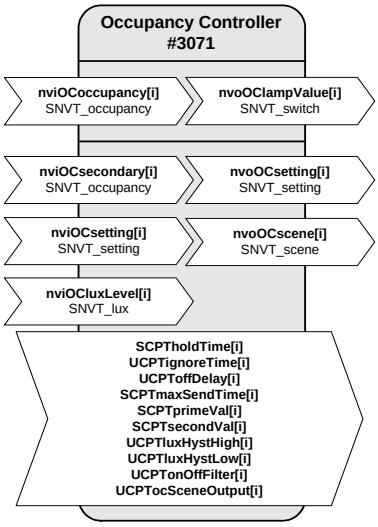
`UCPTdefaultOccCmd[i]` – Default occupancy command

Type:	SNVT_occupancy
Valid Range:	OC_OCCUPIED, OC_UNOCCUPIED, OC_BYPASS, OC_STANDBY, OC_NUL
Default Value:	OC_NUL
Description:	Defines the occupancy command transmitted at power-up or reset and during the initiation of the sensor head. As soon as the hardware sensor is ready for detection, the real measured values are propagated.

`UCPTunoccupiedOccCmd[i]` – Command for unoccupied state

Type:	SNVT_occupancy
Valid Range:	OC_UNOCCUPIED, OC_BYPASS, OC_STANDBY, OC_NUL
Default Value:	OC_UNOCCUPIED
Description:	Sets the output value the occupancy sensor adopts in an unoccupied state. Thus, the occupancy sensor can be adjusted to various applications (e. g. OC_UNOCCUPIED for light control and OC_STANDBY for HVAC control).

8.5. Occupancy Controller-Object
(LONMARK® profile #3071)



Input Network Variables

`nviOCoccupancy[i]` – Occupancy status input value for the primary area

Type:	SNVT_occupancy
Valid Range:	OC_OCCUPIED, OC_UNOCCUPIED
Default Value:	OC_NUL
Description:	Provides the occupancy status of the main/primary control area received from the Occupancy Sensor.

`nviOCsecondary[i]` – Occupancy status input value for a secondary area

Type:	SNVT_occupancy
Valid Range:	OC_OCCUPIED, OC_UNOCCUPIED
Default Value:	OC_NUL
Description:	Provides the occupancy status of a neighbouring/secondary area received from another Occupancy Sensor. This input has lower priority than `nviOCoccupancy[i]` so its current value is only processed if the value received via `nviOCoccupancy[i]` is OC_UNOCCUPIED.

`nviOCsetting[i]` – Setting input for the occupancy controller mode

Type:	SNVT_setting
Valid Range:	.function: SET_OFF, SET_ON, SET_DOWN, SET_UP, SET_STOP
Default Value:	.function = SET_ON
Description:	Selects the operation mode, enables/disables the Occupancy Controller.

Input Network Variables

nviOCluxLevel[i]- brightness value input

Type:	SNVT_lux
Valid Range:	0 .. 65,534 lux
Default Value:	0
Description:	Used to receive a brightness value, e. g. of a Light Sensor.

Output Network Variables

nvoOClampValue[i] – Lamp value output for actuators

Type:	SNVT_switch
Valid Range:	.value: 0 .. 100 % .state: 0,1, -1
Default Value:	.value = 0 .state = 0
Description:	Provides the state and the percentage level of intensity to control an actuator. If nviOCoccupancy[i] receives “occupied”, the value defined in SCPTprimeVal[i] is propagated. If nviOCoccupancy[i] receives “unoccupied” the output switches off automatically {0; 0} after the time parameterised in SCPTholdTime[i] has expired, except for when nviOCsecondary[i] receives “occupied”. Then, the value of SCPTsecondVal[i] is transmitted.

nvoOCsetting[i] – Setting output for controllers

Type:	SNVT_setting
Valid Range:	.function: SET_ON, SET_OFF
Default Value:	.function = SET_OFF
Description:	This output is mainly used to enable/disable another controller, e. g. a Constant Light Controller. SET_ON is transmitted once when the current value of nviOCoccupancy[i] or nviOCsecondary[i] changes to “occupied” and the value of this output has been SET_OFF. This output transmits SET_OFF if nviOCoccupancy[i] as well as nviOCsecondary[i] receive “unoccupied” and the time parameterised in SCPTholdTime[i] has expired.

nvoOCscene[i] – Scene output for scene controllers

Type:	SNVT_scene
Valid Range:	.function: SC_RECALL .scene_number: 1 .. 255
Default Value:	.function = SC_RECALL .scene_number = 255
Description:	This output is mainly used to drive a scene controller. The output values are configured in UCPTocSceneOutput[i].

Configuration Properties

`SCPTholdTime[i]` – Hold time value

Type:	SNVT_time_sec
Valid Range:	1 .. 6,553 s
Default Value:	900 s
Description:	If the monitored area becomes “unoccupied”, the `nvoOClampValue[i]` output transmits {0; 0} resp. the value specified by `SCPTsecondVal[i]` (if `nviOCsecondary[i]` = OC_OCCUPIED) when this time has expired. The hold time is restarted with every OC_UNOCCUPIED received.

`UCPTignoreTime[i]` – Ignore time

Type:	SNVT_time_sec
Valid Range:	1 .. 6,553 s
Default Value:	0
Description:	When the light has been switched off, every command received by `nviOCoccupancy[i]` or `nviOCsecondary[i]` during this time is ignored. Needed because the change in brightness might be wrongly interpreted as motion by the sensor.

`UCPToffDelay[i]` – Off-delay

Type:	UNVT_time_sec
Valid Range:	0 .. 65,534 s
Default Value:	300 s
Description:	When the detected brightness level exceeds the upper threshold of the lux hysteresis, the light is not switched off until this time has expired.

`SCPTmaxSendTime[i]` – Maximum send time

Type:	SNVT_time_sec
Valid Range:	0 .. 6,553 s
Default Value:	0 (disabled)
Description:	Defines the maximum period of time between consecutive transmissions of the current value. When this time expires, the current values of `nvoOClampValue[i]` and `nvoOCsetting[i]` are transmitted automatically/cyclically.

Configuration Properties

SCPTprimeVal[i] – Output value primary area

Type:	SNVT_switch
Valid Range:	.value: 0… 100 % .state: 0, 1
Default Value:	.value = 100 % .state = 1
Description:	Used to set the default value transmitted via nvoOClampValue[i] when the monitored area becomes occupied (nviOCoccupancy[i] = OC_OCCUPIED).

SCPTsecondVal[i] – Output value secondary area

Type:	SNVT_switch
Valid Range:	.value: 0… 100 % .state: 0, 1
Default Value:	.value = 50 % .state = 1
Description:	Used to set the default value transmitted via nvoOClampValue[i] when the neighbouring area becomes occupied (nviOCsecondary[i] = OC_OCCUPIED), cp. SCPTholdTime[i].

UCPTluxHystHigh[i] – Lux high level limit (hysteresis)

Type:	SNVT_lux
Valid Range:	0 .. 65,534 lux
Default Value:	700 lux
Description:	Determines the upper brightness threshold for the lux hysteresis. If the detected brightness level exceeds the value defined here, the light is switched off (nvoOClampValue[i] = {0; 0} and nvoOCsetting[i] = SET_OFF) after the time set in UCPToffDelay[i] has expired (cp. functional description). Remark: The upper brightness threshold value has to be defined so, that it is not exceeded when the light is switched on!

UCPTluxHystLow[i] – Lux low level limit (hysteresis)

Type:	SNVT_lux
Valid Range:	0 .. 65,534 lux
Default Value:	500 lux
Description:	Determines the lower brightness threshold for the lux hysteresis. If the detected brightness level falls below the value defined here, the controller is enabled. The connected load is switched on and off occupancy-dependently.

Configuration Properties

`UCPTonOffFilter[i]` – On off output filter

Type:	UNVT_on_off_fil
Valid Range:	FL_NO_FILTER, FL_NO_ON_CMD, FL_NO_OFF_CMD
Default Value:	FL_NO_FILTER
Description:	By use of this parameter, switching commands can be filtered:

FL_NO_FILTER:	Disables the filter. The controller switches on and off in dependence of the occupancy status detected.
FL_NO_ON_CMD:	On commands of the controller are not transmitted (e. g. manual switching-on/automatic switching-off, energy saving function).
FL_NO_OFF_CMD:	Off commands of the controller are not transmitted (e. g. automatic switching-on/manual switching-off).

`UCPTocSceneOutput[i]` – Scene Output

Type:	UNVT_oc_scene
Valid Range:	.oc_off: 0 .. 255 .oc_secondary: 0 .. 255 .oc_primary: 0 .. 255
Default Value:	.oc_off = 1 .oc_secondary = 2 .oc_primary = 3
Description:	By use of this parameter, switching commands of the conroller can be configured to drive a Scene Controller. The configured scene numbers are propagated, depent on the controller state.

.oc_off:	This scene number is propagated, when the timer in `SCPTholdTime[i]` has expired
.oc_secondary:	This scene number is propagated, when the secondary area has been occupied and the primary area has not been occupied
.oc_primary:	This scene number is propagated, when the primary area has been occupied