User Manual

LON I/O Module DR-N DIM 500-UNI

Art. No.: MTN881011

Directory

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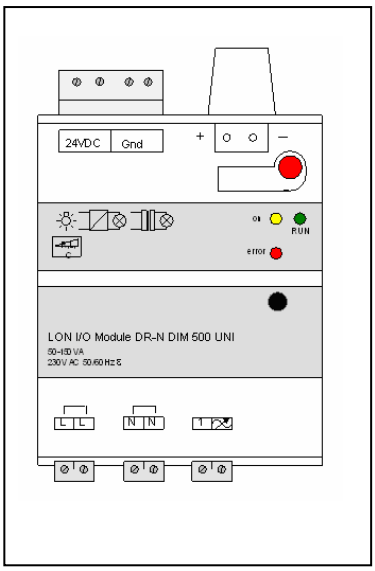
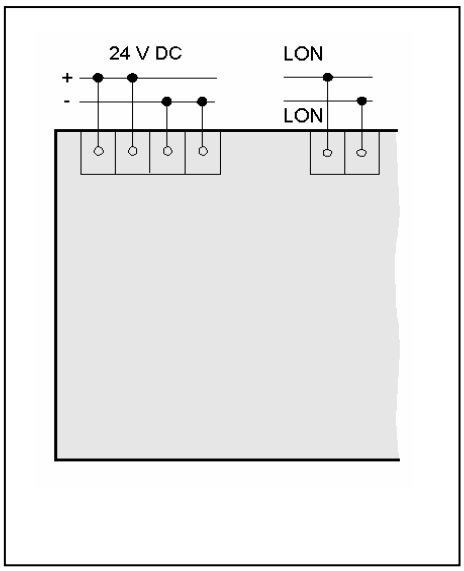
1. Description

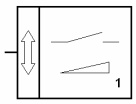




FTT 24V

- universal dimmer for switching and dimming of incandescent, HV-halogen and LV-halogen lamps with dimmable wound or electronic transformers
- connected load: max. 500 VA
- automatic load detection
- combinations of ohmic and inductive or ohmic and capacitive loads are possible, combinations of inductive and capacitive loads are not allowed
- electronic short-circuit and overload proof
- power down detection
- status LED and manual switch for ON/OFF
- supply volage: DC 24 V
- pluggable screw-type terminals
- DIN rail mounting according to EN 50 022
- width of device: approx. 72 mm (4 pitch)
- software application for dimming the light including timers, prioritised control and configurable reaction to power-up/bus reset. Furthermore, the application provides constant light, scene and occupancy control according to LonMark profile “Lamp Actuator (3040)”, “Constant Light Controller (3050)”, “Scene Controller (3251)” and “Occupancy Controller (3071)”

2. Function



According to the configured properties, the output module translates the messages received via the network into switching and dimming actions. The device automatically detects the connected load. If the device detects resistive load (incandescent lamps, 230V halogen lamps) or inductive load (low-voltage halogen lamps with conventional transformers), then phase forward dimming occurs. If a capacitive load is detected (low-voltage halogen lamps with electronic transformers), then phase backward dimming occurs.

Combinations of ohmic and inductive or ohmic and capacitive loads may be connected, combinations of inductive and capacitive loads are not allowed.
For commissioning (sending Neuron-ID) the device has a service button and a red service LED. In a proper state when the software application starts/runs the green RUN LED will light up. This indicator has to be considered independent of the channel error indication – short or open circuit or overload does not switch off this indicator.

The device has a yellow status indicator for the output channel, which indicates if the channel is on or off, and red error indicator, which indicates open or short circuit or overload on the output.
The channel has a manual control button. Function of this button is dependent of presence of the DC 24V system power.
The channel has external control input to connect external buttons between phase wire and this input. The connection is allowed only to the same phase which also provides power for the channel. Function of external buttons depends of presence of the DC 24V system power.

The Universal dimmer has overload / short-circuit protection. Load current is measured and output stage will be disabled when the current is over max. limit.

When an open circuit is detected (load is not connected), the appropriate channel will be switched off. Error and Status indicators are both ON. After reconnection of the load it is necessary to perform new load detection process (see chapter “Load detection”)

An overheating is indicated by blinking of Run LED. Channels which were switched off, are now disabled and channels which were switched on, operate with minimal brightness (but independent of minimal brightness parameter). If the temperature does not fall below limit within 15 min., channels running with minimal brightness are switched off and disabled too. Incoming updates of network variables are still processed in background, but the results are ignored.

The device is equipped with over-voltage protection. Short over-voltage spikes are suppressed, but long time over-voltage causes destruction of the protection elements.

The software application is based on the LonMark profiles.

3. Load detection

To find out which load is connected to the output, the channel can perform a load detection process. During this process the channel switches fully on for approx. 10 sec, then switches off and dims to maximal brightness. At the same time status and error indicators are off.

There are 3 reasons why load detection is necessary: switching on mains and reconnection after short or open circuit detection. The process starts automatically when “switch on” command is applied to the channel, either manually or via LON.

If open or short circuit is detected and “switch on” will be retried without correction of the wiring error, so there are only 3 retries (via LON) possible. This protects the output stage from overloading.

Load detection must not be performed when a transformer with open circuit on secondary side is connected (risk of destruction).

If mixed loads (R/C or R/L) are connected, then the resistive part shall not exceed 1/3 of the total load. Otherwise load detection works incorrectly and improper load could be detected.

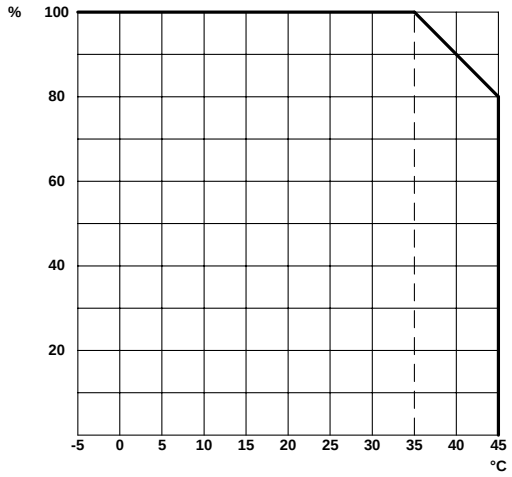
Every channel needs a minimal load to run correctly. If the channel load is below this minimum, function errors could occur.

Do not connect the outputs to power outlets – risk of overload or connection of unsuitable loads. Risk of electric shock: either when the channel is off, mains voltage can be present on output terminals.

During the installation of this device the DIN VDE 0105 safety directives have to be considered.

Power derating

Real dimmable power depends on ambient temperature.



4. Behaviour of the LEDs

	Status LED On (yellow)	Error LED Error (red)	Run LED Run (green)
Normal operation			
Channel off	off	off	on
Channel on	on	off	on
Standby operation (DC 24V voltage off)			
Channel off	off	off	off
Channel on	on	off	off
Emergency operation			
Mains (230V) off	off	off	off
Overload or short-circuit	off	on	on/off
Open-circuit (no load)	on	on	on/off
Load detection	on	off	on
Over temperature	on/off	all on	flashes

Notes

Pos. 1: Normal operation means both mains and DC 24V are present.

Pos. 2: Standby operation means only mains voltage is present.

Pos. 3.2: This indication is in accordance with current status of operation (Normal operation ⇨ on / standby operation ⇨ off).

Pos. 3.3: This indication is in accordance with current status of operation (Normal operation ⇨ on / standby operation ⇨ off).

General: If the load is still unknown, for example after switching on mains voltage, then error indicator lights.

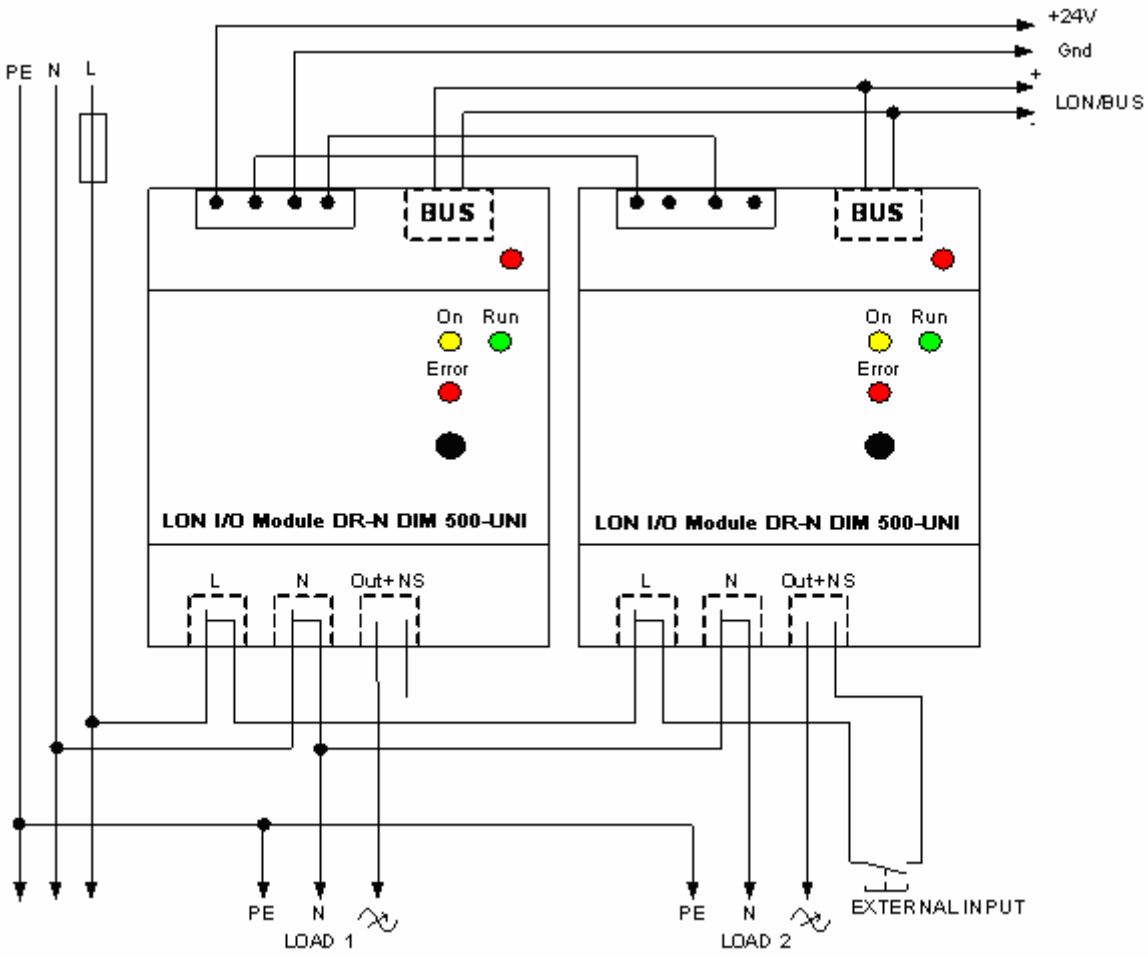
5. Mounting

The I/O Module has been designed as a device for DIN rail mounting according to EN 50 022.

The device requires a supply power of DC 24 V.

The network is connected via a two-pole bus terminal clamp included in delivery which allows up to 4 pairs of wires to be connected. The clamps are suited for conductor cross sections of 0.6 .. 0.8 mm².

All other devices installed next to the universal dimmer must have at least basic insulation. The universal dimmer has to be connected and operated according to the example schematic.



By pushing the service pin, the I/O Module is initiated to propagate its Neuron ID. The service LED indicates the programming state.

To operate the device, an application program is needed. A separate tool is needed to load the application into the device.

Important note:

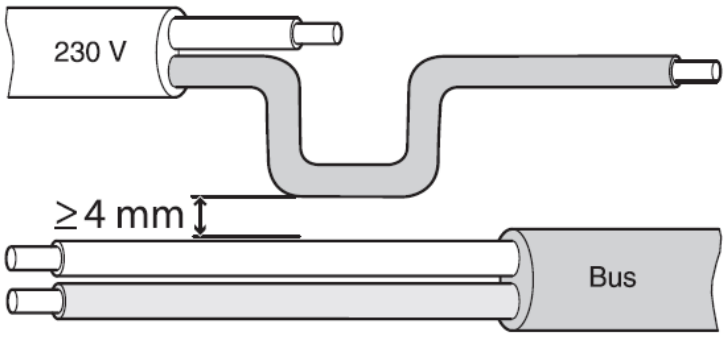
The two L and N connections per channel are each bridged internally. When several devices are connected in series, bridges must also be inserted in the connecting terminals so that when the terminals are removed from one device, the next devices in the series are not damaged by power supply surges.

DC 24V disconnection, mains disconnection, DC 24V reconnection

Behaviour when mains voltage disconnected
All channels switch off. Control is not possible. All indicators are off.
Behaviour when DC 24V disconnected and mains voltage present
Brightness of all channels remains unchanged. Channels can be still controlled manually via appropriate button. The RUN indicator is off.

Behaviour when mains voltage reconnected and DC 24V not present
All channels stay switched off. Manual operation is enabled. As soon as the channel is activated via manual button, load detection process starts.
Behaviour when 24Vdc reconnected and mains voltage present
Behaviour of the device depends on parameter settings, which are described in Functional description (FBS). If during the failure of 24Vdc also the mains failure occurred, then load detection is necessary.
Behaviour when mains reconnected and 24Vdc present
All channels stay switched off. If the channel is activated via manual button or network variable update, load detection will be performed.

!Warning:
Safety clearances according to DIN VDE 0110 Part 1 must be maintained. A clearance of at least 4 mm must exist between individual 230 V conductors and the bus cables.



!Danger to life due to electric current:
Even when the manual switch is in the "OFF" position, a BUS telegram can switch power to the connections at any time. Always deactivate/remove the upstream fuses before working on the device.

Output connections:
! **Danger to life due to electric current:**
Vibration during transport can switch on the outputs. Voltage may appear at the outputs when mains voltage is applied!

To switch off outputs:
After commissioning, use bus telegrams to perform a switching cycle (on/off) or set the manual switch to "OFF".

! **Warning:**
Switching actuators might be damaged. Secure the switching contacts with an upstream 16 A circuit breaker.
Connect the device according to the connection example. The consumer cables and the mains voltage (L1, L2 or L3) are connected using screw terminals rated to a maximum of 16 A.

6. Remarks

Electrical devices may only be fitted and mounted by a skilled person.

For planning and building electrical systems the relevant standards, guidelines, regulations and requirements of the particular country have to be considered. In addition to that, the device-specific instructions have to be considered as well. For project planning, mounting and commissioning, detailed knowledge about the LON technology is assumed.

The device's function depends on the applied software. Only application programs that are released for this device may be loaded.

The builder of the LON system has to assure that the loaded application program and the configured parameters accord to the external circuit elements, especially if several programs for various applications are available for one device.

7. Troubleshooting

The brightness of the connected lamps is reduced to a minimum (the lamps might then switch off automatically)

If the temperature in the device is too high, all the channels which are switched on will be dimmed to minimum power/brightness. You can now only switch the channels off - you can no longer switch them on, or dim them. If the temperature decreases again within approx. 15 minutes, the previous values will be re-established. If the temperature doesn‘t decrease within 15 minutes, the channels will be switched off automatically. You can then only switch the channels on again when the temperature has decreased significantly. Any incoming changes of brightness received in the intervening period over LONWORKS® network are not processed, but stored for later use. Afterwards, you can use the device as normal again.

The connected lamps switch off automatically and can no longer be switched or dimmed

In the case of a short circuit, an overload or open circuit, the corresponding channel switches off and the channel error display lights up. When using inductive transformers, the load connected to the secondary circuit must be at least half the size of the nominal load of the transformer. If the load is too small, the channel may shut down automatically. Have an electrician rectify the cause. The first time the channel is switched after the fault is rectified, load detection will be carried out automatically. Afterwards, you can use the device as normal again. If overload (short circuit) is detected 3 times, you will be unable to change the channel value via network variable. If this happens, you must unplug and plug back supply voltage AC 230 V to re-enable reaction to changes incoming from the network. Reaction on channel button or external push-button to the device via connector is enabled.

All connected lamps switch off automatically and can no longer be switched or dimmed

The supply voltage AC 230 V has failed. Once the mains voltage is switched on again, the channels remain switched off. The first time the channel is switched after the supply voltage is switched on, load detection will be carried out automatically.

8. Technical Data

Power supply	
Supply voltage:	DC 24 V, max. 20 mA
Network interface	
Transceiver type:	LON Free Topology Transceiver (FTT-10)
Output	
Supply voltage:	230 V, 50/60 Hz
Fuse (circuit breaker):	10 A
Minimum load	
Ohmic loads:	10 W
Inductive loads:	50 W / VA
Capacitive loads:	50 W / VA
Maximum cable length	
Mechanical extension units:	20 m
Electronic extension units:	20 m (max. 10 items with max. total cable length 20 m)
Maximum nominal power	
Ohmic, inductive or capacitive loads:	500 W /VA The maximum power values specified presume a mains frequency of 50 Hz and an ambient temperature up to 35°C. When operating with a mains frequency of 60 Hz, the maximum power values are reduced by 15%.
Controls	
Service pin:	Propagates the Neuron- ID
Chanel button:	For manually switching (short press) of dimming (long press) of the output. Manual control can even be performed without the application loaded.
Indicators	
RUN-LED (green):	Behaviour: See table above (chapter 4)
Error-LED (red):	Behaviour: See table above (chapter 4)
ON-LED (yellow):	Behaviour: See table above (chapter 4)
Service LED (red):	lit: network access error flashes: module unconfigured
Connections	
Bus:	2-pole plug-in and branch terminal (Type: WAGO 243)
System power DC 24 V:	4-pin pluggable screw-type terminal for max. 2,5 mm²
Phase input, neutral, output:	2-pin pluggable screw-type terminal for max. 2,5 mm²
Housing	
Dimensions:	68 x 72 x 90 mm (H x W x D), 4 pitch according to DIN 43 880
Protection class:	IP20 (EN 60 529/IEC 144))
Ambient conditions	
Environment:	Up to 2000 m above sea level
Operating temperature:	-5 °C .. +45 °C
Relative humidity:	Max. 93% without moisture condensation
EMC	
EC-directives:	in accordance with EN 50090-2-2 and EN 60950

9. Application description

The application “881011LC01A“ is for dimming and switching of the following loads:

- Ohmic loads (e.g. 230 V incandescent lamps)
- Inductive loads (e.g. inductive transformers with low-voltage halogen lamps)
- Capacitive loads (e.g. electronic transformers with low-voltage halogen lamps)
- A combination of ohmic and inductive loads
- A combination of ohmic and capacitive loads

The connected load is atomatically detected. The automatic load detection is also executed when switching on the lamps after the 230 V had been removed and reconnected.
Supported by a LON brightness sensor a daylight-dependent control can be realised. Furthermore it is possible to save and recall light scenes. Thus, certain light atmospheres can be restored by LON scene panels.
The application contains the LonMark Objects “Lamp Actuator (3040)“ (1x), “Constant Light Controller (3050) (1x), “Scene Controller (3251)“ (1x) and “Occupancy Controller (3071)” (1x).

Function

Lamp Actuator-Object

Switching (with timers)

The hardware output corresponding to the object is usually controlled via the switch input network variable `nviLALampValue[i]`. For this output, an on-delay can be configured in the `UCPTonDelay[i]` parameter, an off-delay in `UCPToffDelay[i]` and an automatic cutoff (staircase lighting timer) in `UCPTautoOffTime[i]`. When the auto-off time is running, the `UCPTrestartAutoOffTimer[i]` parameter defines if the timer can be restarted and `UCPTbreakAutoOffTimer[i]` defines if it can be stopped before the time has expired.

Dimming (with Easy Control)

According to LONMARK the switch input network variable `nviLALampValue[i]` is intended to be also used for dimming.

The Lamp Actuator provides an extra setting input network variable `nviLAEasyControl[i]` for dimmer devices, by which relative changes in brightness and switching-on at a memory value can be realised.

By `.function` = SET_UP or `.function` = SET_DOWN the light is dimmed relatively the amount defined in the corresponding `.setting` field. By `.function` = SET_STOP ongoing fades are stopped.
When the light is switched off by `.function` = SET_OFF, the last light level is saved temporarily and next time `.function` = SET_ON is selected the light is switched on at the memory value. An absolute level setting on a certain brightness value is accomplished by `.function n` = SET_STATE.

When Easy Control is used, the time to fade from 0 to 100 % is configured in the `UCPTdimTime[i]` parameter.
The different fields of the `UCPTvalueChangeMode[i]` parameter determine individual times for fading-on (`.SoftOn`), fading-off (`.SoftOff`) and cross-fading (`.SoftChange`). Cross-fading is needed e.g. to change brightness when a new scene is recalled during scene control.

To reduce bus load, the `UCPTfeedbackDelay[i]` parameter defines a time between receive of an update and transmission of the corresponding feedback value. So, the feedback value is not transmitted via the `nvoLALampValueFb[i]` output until the ongoing fade is finished.

Simultaneous brightness-dependent control of several Lamp Actuators

The Lamp Actuator object can be used to control several switching/dimming actuators simultaneously, in dependence of a light level.

Via the nviLAlampValue[i] inputs a percentile light value is demanded e. g. by a constant light controller or a building management and supervising system. The manual control working relative to this default value is caused by the input nviLAEasyControl[i]. That can be used to manually switch the light off locally resp. to switch it on at the dimming level demanded.

When the light is switched off by nviLAEasyControl[i].function = SET_OFF, the most recent light level is saved temporarily (memory function) and propagated next time the light is switched on by .function = SET_ON. If nviLALampValue[i] is updated by a new light value while the light is switched off, the new value will be adopted as new initial switch value. Next time the light is switched on this new light value is propagated.

If the nviLALampValue[i] input is set at an undefined value (.state = -1), the light is controlled via nviLAEasyControl[i]. And the other way round: If nviLAEasyControl[i].function = SET_NUL (only then!) the light is controlled via nviLALampValue[i].

While the light is switched off, the current value of nviLAlampValue is the same as the memory value. At reset or when nviLALampValue receives an undefined value while the light is off, the memory value is set at 100 %.

The light can be dimmed up (SET_UP) or down (SET_DOWN) locally by nviLAEasyControl[i] causing an offset value to the initial set point. This offset will be reused when a new set point value has been received through nviLALampValue[i].

If a light level that has been adjusted locally shall be maintained (the value setting on nviLALampValue[i] is disabled), the light has to be controlled by nviLAeasyControl[i].function = SET_STATE (e. g. used to recall fixed scene settings).

Prioritised Control

By default configuration, messages received by the nviLAManOverride[i] input control the corresponding output directly (without timers) and disable the nviLALampValue[i] and nviLAEasyControl[i] input. To release the latter, the .state field of nviLAManOverride[i] has to be set at -1 (undefined). The hardware output then adopts the value configured in UCPTlampValueAfterOverride[i].

Safety functions

The position the actuator adopts at reset is defined in the UCPTdefaultLampValue[i] parameter.
The SCPTlaMaxRcvTime[i] parameter is used to monitor communication. If the corresponding Lamp Actuator input has not been updated within the time defined in this parameter, a transmission failure is assumed and the actuator adopts the position configured in UCPTrcvFailureLampValue[i].

Behaviour after power failure and after reset

24VDC	220VAC	Previous lamp state (SNVT_switch)	UCPTdefault LampValue	UCPTpowerFailureLampValue	Next lamp state (SNVT_switch)
ON	ON	A B	XX	XX	A B
Is going down	ON	XX	XX	Y 1	Y 1
Is going down	ON	XX	XX	Y 0	0 0
Is going down	ON	A B	XX	Y -1	A B
Is going up	ON	A B	Y 1	XX	Y 1
Is going up	ON	A B	Y 0	XX	Y 0
Is going up	ON	A B	Y -1	XX	A B
ON	Is going down	A B	XX	XX	0 0
ON	Is going up	A B	XX	XX	A B
Symbol XX means, that value has no meaning. Symbols A,Y substitute values 0 – 100%. Symbol B substitutes states -1,0 or 1.					

Constant Light Controller

Daylight-dependent light control

The Constant Light Controller can control several lighting bands daylight-dependently.
The measuring value of a LON brightness sensor in `nviCLluxLevel[i]` is internally converted according to the illumination-level on the reference area (e. g. on the desk surface) and it is used as current value for the control algorithm.
Both inside and shaded outside light sensors (respectively inside light sensors which are aligned in direction to the windows) can be used for control.
The network variable input `nviCLsetting[i]` switches the controller on and off. Furthermore this input can be used for manual control and temporary adaptation of the setpoint value.
The variable `nviCLluxLevel[i]` contains always the current valid setpoint. After reset the configured value of `SCPTluxSetpoint[i]` is displayed. This one can be changed from extern, e. g. to avoid glare effects in floors while switching on with the day setpoint at night.

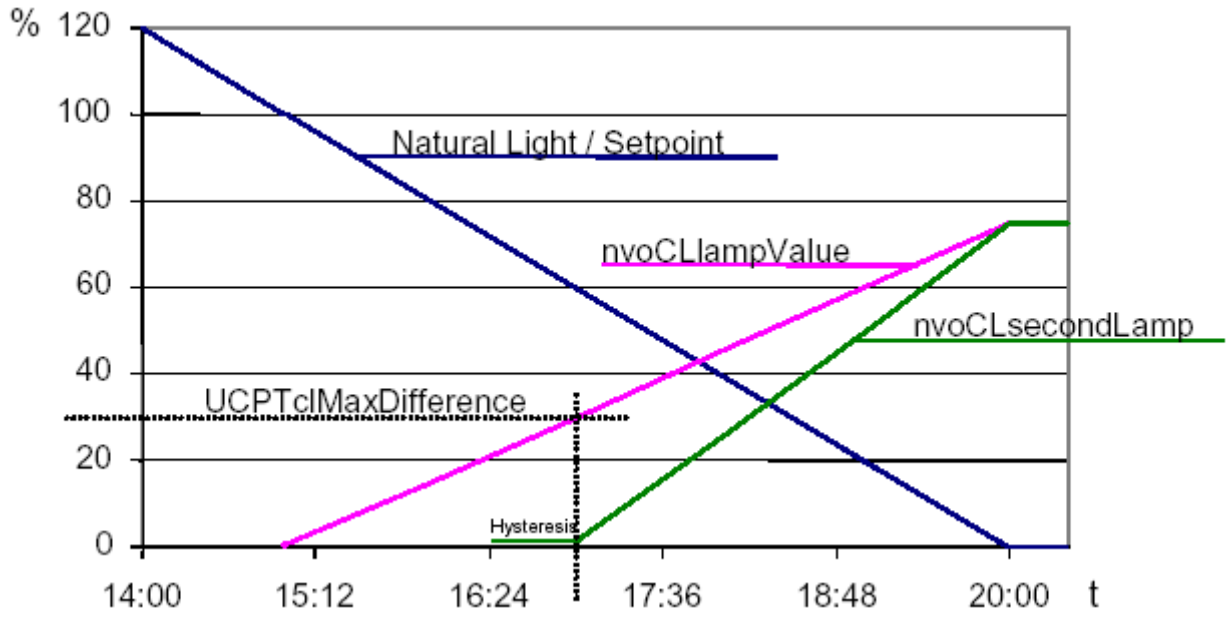
Prioritised control

The input `nviCLmanOverride[i]` has got the highest priority. A value received on this input is passed to the first lamp output directly and to the second output with the configured difference.
Consequently this input can be also used as extension input for a third lighting band.

Several lighting bands

The inner lighting band is controlled through `nvoCLlampValue[i]`, the window site via `nvoCLsecondLamp[i]`. The maximum difference, resulting when the light band at the window is still switched off, can be configured in `UCPTclMaxDifference`. The second lighting band is switched on and off by the controller too according need.

Further lighting bands can be controlled through additional Constant Light Controllers by means of binding from `nvoCLlampValue[i]` of the active controller to `nviCLmanOverride[i]` of these objects.



The controller

The controller is a nonlinear state controller (Fuzzy based) which can be used both for regulation (with measuring of the room illumination) and for control (with use of an outside light sensor or a measuring aligned in direction to the window).

With an enabled controller the object works always as control in order to switch on the lighting by a lux value close to the setpoint. However, cold lighting ballasts may cause a low initial illumination in the room. This is well accepted, because thus the subjective sensitivity of the user is quite compensated. This proceeding avoids a lower dimming operation by the user (after warm up period) due subjective impression.

After switching on and also with setpoint changes the controller holds the adjusted value to force the lamps on operation temperature or that the light sensor can update the lux value before it starts to control. If its switched off and already switched on within these 30 s, the lamps are switched on the same value.

The control speed is dynamically changed according to control tolerance. The maximum step level in `nvoCLlampValue[i]` can be modified through `SCPTstep[i]`. The step level for `nvoCLsecondLamp[i]` results from that and is a little bit higher if necessary. With a control cycle time of 1 s and a step level of 3 % (default value) the total dimming time (0 .. 100 %) amounts to 33 s.

If the calculated lux value remains close to the reference point for the time configured in `SCPTclOffDelay[i]`, thus it is switched off automatically. This is valid as well for automatic switching on and `SCPTclOnDelay[i]`.

The automatic switching can be each disabled by zero delay time.

Note for observing network variables

The controller does not control on `nviCLluxLevel[i]` = `nviCLluxSetpoint[i]`, but it controls on the internal calculated lux value on the reference area.

Commissioning as regulator

1. First all required bindings must be established. The room should be completely fitted out to avoid problems through changing reflection conditions after removal.
2. Calibration of the light sensor by a lux-meter, i. e. the lux value on the reference area (e. g. desk plate) must be determined at daylight. The best result is achieved, if the lux value is very close to the setpoint.
3. If `nvoCLsecondLamp[i]` is bound, the maximum difference (`UCPTclMaxDifference[i]`) between both regulating units can be adapted. For this, `UCPTclMaxDifference[i]` (preferably at cloudy weather) must be changed in the way that the lux value measured by the lux-meter is minimized below of both lighting groups after a received SET_ON at the input in `nviCLsetting[i]`.

In most use cases the previously documented procedure is sufficient for commissioning of the controller and a calibration of the controller is not required (point 3 + 4), since the default settings already achieve good results. However, if there should be any need for further optimization of the control, please follow the next steps.

4. To compensate the light sensor‘s different sensitivity for day and artificial light, the artificial light factor (`UCPTartificialLightFactor`) has to be found out. For that the difference of lux value on the reference area caused by the artificial light and its corresponding change, which is measured by the light sensor on the ceiling, has to be determined. Please follow the next steps:
   Do the natural light darken (if possible) and set all controlled light bands at the maximum value by `nviCLsetting[i].function` = SET_STATE and `.setting` = 100 %. Measure the lux value on the reference area by means of a lux-meter and determine the output value of the LON light sensor after a warm up time for the lighting ballasts (the measured lux value remains constant). Then switch off the lamps by `nviCLsetting[i].function` = SET_STATE and `.setting` = 0 and update both measuring values. Enter the difference of the lux value on the reference area in `.multiplier` and the lux value difference of the light sensor in `.divisor` of the configuration property `UCPTartificialLightFactor[i]`.
5. The configuration is now finished.

With varying weather situations the real value on the reference area may differ from the internally calculated value. If later noticed, that therefore the room is generally too dark, `UCPTartificialLightFactor.divisor` can be a little increased (and vice versa).

Commissioning as controller

1. First all required bindings must be established. The room should be completely fitted out to avoid problems through changing reflection conditions after removal.
2. Please follow the next steps to determine the artificial light factor `UCPTartificialLightFactor`:
   Do the natural light darken (if possible) and set all controlled light bands at the maximum value by `nviCLsetting[i].function` = SET_STATE and `.setting` = 100 %. Measure the lux value on the reference area by means of a lux-meter. Then switch off the lamps by `nviCLsetting[i].function` = SET_STATE and `.setting` = 0 and update the measuring value. Enter the difference of the lux value on the reference area in `.multiplier` and set the `.divisor` = 1.
3. Enter the current lux value in the input gain configuration property (`UCPTinputGain.multiplier`) with switched off lighting (`nviCLsetting[i].function` = SET_STATE und `.setting` = 0) on the reference area. Enter the corresponding lux value of the LON light sensor in `.divisor`. The best result is achieved, if the lux value is very close to the setpoint, e. g. at cloudy weather or during dusk.
4. If `nvoCLsecondLamp[i]` is bound, the maximum difference (`UCPTclMaxDifference[i]`) between both regulating units can be adapted. For this, `UCPTclMaxDifference[i]` (preferably at

cloudy weather) must be changed in the way that the lux value measured by the lux-meter is minimized below of both lighting groups after a received SET_ON at the input in `nviCLsetting[i]`.

5. The operation of light sensor and lamps can be adjusted in 10 % steps to optimize the control characteristic curve. It has to be considered that always a constantly risen characteristic curve must be achieved. Besides of that the sensor type or installation point can influence the control characteristic at different day times and weather situations.
   For rough adjustment without consideration of the sensor properties the bound lamps can be dimmed low by 10 % steps and `nviCLsetting[i].function` = SET_STATE (notice the warm up time). Enter the measured difference as 0 % in the corresponding elements of `UCPTsystemCharacteristic[i]`. For that is i = 0 for 0,5 %; i = 1 for 10 %; i = 2 for 20 % and so on. It has to be considered that always a constant sloping characteristic curve must be achieved.
6. The configuration is now finished.

With varying weather situations the real value on the reference area may differ from the internally calculated value. If later noticed, that therefore the room is generally too dark, `UCPTartificialLightFactor.divisor` can be a little increased (and vice versa).

Scene Controller Object

Recalling Scenes (with time function)

After the Scene Controller has been enabled by `nviSCSetting[i]` (SET_ON), the stored scene settings can be recalled by `nviSCScene[i].function` = SC_RECALL and the corresponding scene number. The settings are then propagated via the outputs `nvoSCSwitch[i]`, `nvoSCSetting[i]`, `nvoSCLux[i]`, `nvoSCTemp[i]`, `nvoSCOccupancy[i]` and if provided `nvoSCOccSchedule[i]` and `nvoSCFanSpeedCmd[i]`. Scenes can be delayed by use of the `UCPTsceneKeeperDlyTime[i]` property.

If an output shall not change when a new scene is recalled, the corresponding parameter has to be set at an undefined value under this particular scene number.
Scene settings, that shall be propagated when the controller is turned off, have to be stored under scene number 20. Next time the controller is turned on the last enabled scene is recalled.

Storing Scenes

There are two ways to configure the scene controller memory:

- The scene memory can be configured directly by use of the `UCPTsceneKeeperXXX[i][j]` property.
- For lighting scenes, the current values of the `nviSCSwitch[i]` and `nviSCLux[i]` input can be stored in the scene memory unit corresponding to the given scene number by a learn command (`nviSCScene[i].function` = SC_LEARN). A long pulse (e.g. initiated by hold of a make-contact element) usually causes this command.

Cross-fading

The `UCPTsceneKeeperDimStepDelay[i]` property determines the time between two consecutively transmitted dim commands and `UCPTsceneKeeperDimStep[i]` defines the step value for cross-fading between two scenes.

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 recognized 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 controllerif 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 illumination 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 illumination level still lies within the interval, the light remains switched off, also if occupancy is detected. It is not switched on again until the illumination level falls below the lower threshold defined.

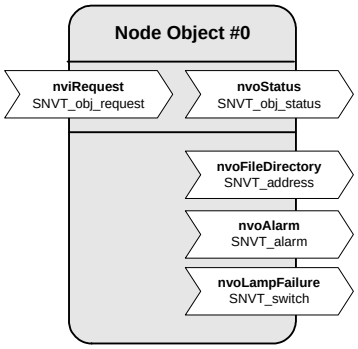
Remark:
The upper illumination threshold value has to be defined so, that it is not exceeded when the light is switched on!

9.1. 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) version 1.50 or higher have to be installed **before (!)** a device template is created. The used LNS must be version 2.0 or higher.

9.2. 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`.

`nvoFileDirectory`

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

Output variables

nvoAlarm

Type:	SNVT_alarm
Valid Range:	.location: 0.0 .. 255.0 .object_id: 0.0 .. 65535.0 .alarm_type: AL_NO_CONDITION, AL_WARNING, AL_ERROR, AL_INFO .priority_level: PR_NUL, PR_LEVEL_0, PR_LEVEL_1, PR_LEVEL_2, PR_LEVEL_3, PR_1, PR_2, PR_3, PR_4, PR_6, PR_8, PR_10, PR_16 .index_to_SNVT: 0.0 .. 65535.0 .value: 0.0 .. 255.0 .year: 0.0 .. 3000.0 .month: 0.0 .. 12.0 .day: 0.0 .. 31.0 .hour: 0.0 .. 23.0 .minute: 0.0 .. 59.0 .second: 0.0 .. 59.0 .millisecond: 0.0 .. 999.0 .alarm_limit: 0.0 .. 255.0
Default Value:	Not defined
Description:	See the following table

Detailed description of nvoAlarm

Field name	Description
nvoAlarm.object_id	Object id of the LA object having a lamp fault. 0 for node object.
nvoAlarm.alarm_type	AL_NO_CONDITION = no alarm condition AL_WARNING = overheat was detected (value[2] = 1), or unknow error (if value[2] = 0) AL_ERROR = short circuit was detected AL_INFO = no load was detected
nvoAlarm.value[0]	Always 0
nvoAlarm.value[1]	Always 0
nvoAlarm.value[2]	0 ... depend on alarm_type 1 ... short circuit or overheat is detected (depend on alarm_type) 2 ... no load is detected
nvoAlarm.value[3]	0 to 200 means 0% to 100%. Show in percent, how match output channels is affected by error.
nvoAlarm.alarm_limit[0]	Alarm counter, counts the emitted messages. It begins at zero after 255 messaged. If nvoAlarm is cyclically polled then this value can be used to define whether alarm messages are recorded.
All other fields	0 or „“.

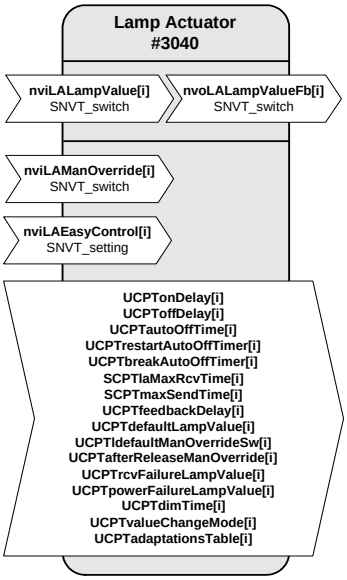
nvoLampFailure

Type:	SNVT_switch
Valid Range:	.value: 0 .. 100 % .state: 0, 1, -1
Default Value:	0.0; 0
Description:	If a short circuit, overheating or no load is detected nvoLampFailure is set to 100.0 1. More detailed information about the failure is given in nvoAlarm.

9.3. Lamp Actuator-Object

(LONMARK® profile #3040)

Dimmer Output



Input Network Variables

`nviLALampValue[i]` – Value input, standard priority

Type:	SNVT_switch
Valid Range:	.value: 0 .. 100 % .state: 0, 1 On: .state = 1 and .value > 0 Off: .state = 0 and .value = any or .state = 1 and .value = 0
Default Value:	Value of `UCPTdefaultLampValue[i]`.
Description:	Standard input, used to control the corresponding hardware output. This input can only switch on the hardware output if the `nviLAEasyControl[i]` input is at SET_NUL. If the light has been switched off via `nviLAEasyControl[i]`, the memory light level can be varied by use of this input. (It cannot be set at 0 so that switching-on always remains possible).

Input Network Variables

`nviLAManOverride[i]` – Prioritized control

Type:	SNVT_switch
Valid Range:	.value: 0 .. 100 % .state: 0, 1, -1 On: .state = 1 and .value > 0 Off: .state = 0 and .value = any or .state = 1 and .value = 0 Disabled: .state = -1
Default Value:	Value of `UCPTdefaultManOverrideSw[i]`
Description:	This input controls the corresponding hardware output with higher priority than `nviLALampValue[i]`. Messages received via this input control the corresponding output directly (without timers). To release the output for other commands, the `.state` field of this input has to be set at -1 (undefined). The output then adopts the position defined in `UCPTafterReleaseManOverride[i]`.

`nviLAEasyControl[i]` – Relative light control

Type:	SNVT_setting
Valid Range:	.function: SET_OFF, SET_ON, SET_UP, SET_DOWN, SET_STATE .setting: 0 .. 100 %
Default Value:	.function = SET_OFF .setting = 0
Description:	This setting input is used to control the corresponding output. It has the same priority as the `nviLALampValue[i]` input but provides a greater functional range. If `.function` =

SET_STATE:	The `.setting` value of this input is interpreted like the `.value` field of a switch input. Depending on further configuration, the light is directly switched or faded at this value.
SET_UP/ SET_DOWN:	The light level of the corresponding output is increased or decreased relatively by the amount defined in the `.setting` field. If `nviLALampValue[i]` is bound, dim commands received at this input cause a temporary offset to the light level demanded there. Next time the light is switched on, this offset is cancelled.
SET_STOP:	Stops an ongoing fade.
SET_OFF:	The output is switched off and the last light level is saved temporarily.
SET_ON:	The output is switched on at the light level saved last resp. the current value of `nviLALampValue[i]`.

When this input is bound, the fade/brightness range is only adjusted by use of the Lamp Actuator object. Configurations in the switch object remain unconsidered.

Output Network Variables

`nvoLAlampValueFb[i]` – Value feedback output

Type:	SNVT_switch
Valid Range:	.value: 0 .. 100 % .state: 0, 1, -1 On: .state = 1 and .value > 0 Off: .state = 0 and .value = any or .state = 1 and .value = 0
Default Value:	Value of `UCPTdefaultLampValue[i]`.
Description:	Propagates the state of the Lamp Actuator and the percentage level of intensity, either directly with every update or with delay which can be defined in `UCPTfeedbackDelayTime[i]`.

Configuration Properties

`UCPTonDelay[i]` – On-delay

Type:	UNVT_time_sec
Valid Range:	0 .. 65,534 s Resolution: 1 s
Default Value:	0 (disabled)
Description:	Time between receive and completion of an ON command. This time starts to run when `nviLALampValue[i]` or `nviLAEasyControl[i]` receives an ON command. Any ON commands following within this time remain unconsidered.

`UCPToffDelay[i]` – Off-delay

Type:	UNVT_time_sec
Valid Range:	0 .. 65,534 s Resolution: 1 s
Default Value:	0 (disabled)
Description:	Time between receive and completion of an OFF command. This time starts to run when `nviLALampValue[i]` or `nviLAEasyControl[i]` receives an OFF command. Any OFF commands following within this time remain unconsidered.

`UCPTautoOffTime[i]` – Auto-off time

Type:	UNVT_time_sec
Valid Range:	0 .. 65,534 s Resolution: 1 s
Default Value:	0 (disabled)
Description:	When this time has expired, the output switches off automatically without receiving an OFF command (staircase lighting timer). The time starts to run when `nviLALampValue[i]` or `nviLAEasyControl[i]` receives an ON command.

`UCPTrestartAutoOffTimer[i]` – Restart auto-off timer

Type:	UNVT_boolean
Valid Range:	TRUE, FALSE
Default Value:	TRUE
Description:	Defines if the auto-off timer (`UCPTautoOffTime[i]`) is restarted with every ON command, even if the light already is on (TRUE), or not (FALSE).

`UCPTbreakAutoOffTimer[i]` – Break auto-off timer

Type:	UNVT_boolean
Valid Range:	TRUE, FALSE
Default Value:	FALSE
Description:	Defines if the timer can be stopped/the output can be switched off by an OFF command, even if the auto-off time (`UCPTautoOffTime[i]`) is running (TRUE), or not (FALSE).

Configuration Properties

`SCPTlaMaxRcvTime[i]` – Maximum receive time

Type:	SNVT_time_sec
Valid Range:	0 .. 6,553 s (Resolution: 0.1s)
Default Value:	0 (disabled)
Description:	The maximum period of time that may expire with no updates on the `nviLALampValue[i]` or `nviLAEasyControl[i]` input before a transmission failure is assumed. The output then adopts the position defined in the `UCPTrcvFailureLampValue[i]` parameter.

`SCPTmaxSendTime[i]` – Maximum send time

Type:	SNVT_time_sec
Valid Range:	0 .. 6,553 s Resolution: 0.1 s
Default Value:	0 (disabled)
Description:	The maximum period of time that does expire before the next recent update value is transmitted through `nvoLALampValueFb[i]`.

`UCPTfeedbackDelay[i]` – Feedback delay

Type:	UNVT_time_msec
Valid Range:	0 .. 65,534 ms Resolution: 1 ms
Default Value:	300 ms
Description:	Defines the time by which the feedback value transmitted via the `nvoLALampValueFb[i]` output is delayed. This time restarts to run with every update received. This parameter is needed to reduce bus load whilst fading. Therefore, the time defined here has to be greater than the time between two dim commands.

`UCPTdefaultLampValue[i]` – Default lamp value

Type:	SNVT_switch
Valid Range:	.value: 0 .. 100 % .state: 0, 1, (partly also -1) On: .state = 1 and .value > 0 Off: .state = 0 and .value = any or .state = 1 and .value = 0 Disabled: .state = -1
Default Value:	.value = 0 .state = 0
Description:	Determines the position the input adopts at power-on, reset or due to the logic operation. If `.state` = -1 this parameter is disabled and the output remains its current state.

Configuration Properties

`UCPTldefaultManOverrideSw[i]` – Standard override lamp value

Type:	SNVT_switch	
Valid Range:	.value:	0 .. 100 %
	.state:	0, 1, -1
	On:	.state = 1 and .value > 0
	Off:	.state = 0 and .value = any or .state = 1 and .value = 0
	Disabled:	.state = -1
Default Value:	.value	= 0
	.state	= -1
Description:	Value the input adopts when the device's power supply does return, a reset does occur, or the logical operation does generate an appropriated result. If `.state` = -1, this parameter is disabled and the output remains its current state.	

`UCPTafterReleaseManOverride[i]` – Override lamp value after release

Type:	UNVT_switch_cfg	
Valid Range:	.function:	SW_NUL, SW_HOLD, SW_VALUE
	.value:	0 .. 100 %
Default Value:	.function	= SW_NUL
	.value	= 0
Description:	Output value when the prioritised Input `nviLAManOverride[i]` has been released.	
	SW_NUL:	Current input value of `nviLALampValue[i]` is adopted
	SW_HOLD:	Current state of the output channel is remained
	SW_VALUE:	The output channel adopts the configured value in `.value`

`UCPTrcvFailureLampValue[i]` – Receive failure lamp value

Type:	SNVT_switch	
Valid Range:	.value:	0 .. 100 %
	.state:	0, 1, -1
	On:	.state = 1 and .value > 0
	Off:	.state = 0 and .value = any or .state = 1 and .value = 0
	Disabled:	.state = -1
Default Value:	.value	= 0
	.state	= -1
Description:	Value the actuator adopts if no update is received within the maximum receive time (`SCPTlaMaxRcvTime[i]`). If `.state` = -1, this parameter is disabled and the output remains its current state.	

Configuration Properties

`UCPTpowerFailureLampValue[i]` – Power failure lamp value

Type:	SNVT_switch	
Valid Range:	.value:	0 .. 100 %
	.state:	0, 1, -1
	On:	.state = 1 and .value > 0
	Off:	.state = 0 and .value = any or .state = 1 and .value = 0
	Disabled:	.state = -1
Default Value:	.value	= 0
	.state	= -1
Description:	Value the actuator adopts at power-down. If `.state` = -1, this parameter is disabled and the output remains its current state.	

`UCPTdimTime[i]` – Total dim time

Type:	SNVT_time_sec
Valid Range:	0 .. 6,553.5 s (Resolution: 0,1 s)
Default Value:	4s
Description:	Defines the time to fade the total range from 0 to 100 % (light level). Needed when the Easy Control function is used in combination with SET_UP/SET_DOWN commands.

`UCPTvalueChangeMode[i]` – Fading times

Type:	UNVT_change_md	
Valid Range:	.SoftOn:	0 .. 6,553.5 s
	.SoftOff:	0 .. 6,553.5 s
	.SoftChange:	0 .. 6,553.5 s
Default Value:	.SoftOn	= 0
	.SoftOff	= 0
	.SoftChange	= 0
Description:	Defines the fading times the output needs to adopt a certain light level.	
	`.SoftOn`:	Defines the time for fading-on when the output is switched on.
	`.SoftOff`:	Defines the time for fading-off when the output is switched off.
	`.SoftChange`:	Defines the time for cross-fading when the output value shall be directed to a new light level (e. g. needed when a new scene setting is recalled).

Configuration Properties

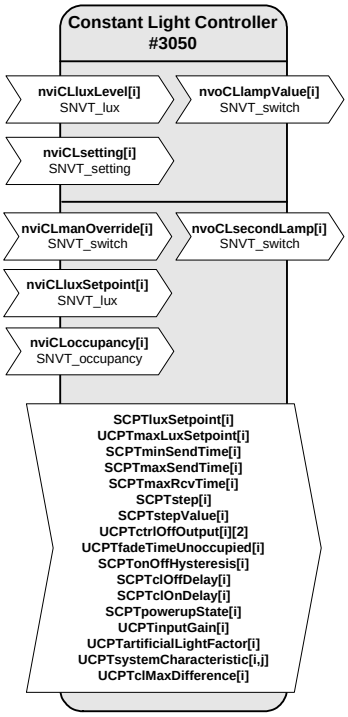
`UCPTadaptationsTable[i]` – Adaptation table

Type:	UNVT_adapt_tbl	
Valid Range:	0 .. 255, for Byte[0] .. Byte[21] each	
Default Value:	for 1 – 10 V electronic ballasts:	Linear correlation of `nviXXX.value` and 1 – 10 V control voltage (characteristic curve already adjusted logarithmically within the electronic ballast).
	for phase controlled dimmers:	Logarithmic characteristic curve of the luminous flux for conventional incandescent and halogen lamps, adjusted to human perception of brightness changes.
	for DALI devices:	Logarithmic characteristic curve of the relative luminous flux and `nviXXX.value`, adjusted to human perception of brightness changes.
Description:	Used to adjust the characteristic curve of the connected hardware to human perception of brightness changes so, that the light level transmitted in the LON message is correlated linearly to human perception of brightness. For DALI devices a plug-in is provided which adjusts the characteristic curve to real device data automatically. Further adjustment is usually not necessary.	

9.4. Constant Light Controller

(LONMARK® profile #3050**)**

Daylight-dependent light control



Input Network Variables

`nviCLluxLevel[i]` – Brightness-level input

Type:	SNVT_lux
Valid Range:	0 .. 65,535 lux
Default Value:	0
Description:	This input provides the current brightness level measured by the light sensor.

Input Network Variables

`nviCLsetting[i]` – Operating mode input

Type:	SNVT_setting
Valid Range:	.function: SET_OFF, SET_ON, SET_UP, SET_DOWN .setting: 0 .. 100 % .rotation: -359,98° .. 360°
Default Value:	`UCPTpowerupState[i]`
Description:	Enables (SET_ON) or disables (SET_OFF) the daylight-dependent light control. SET_OFF turns off the controller and `nvoCLlampValue[i]` and `nvoCLsecondLamp[i]` are set at {0; 0}. SET_ON turns on the controller which then starts to control the lamp value closed to the adjusted setpoint. `nvoCLlampValue[i]` can manually be dimmed by SET_UP and SET_DOWN. The configuration properties `SCPTstepValue[i]` and `SCPTminSendTime[i]` define the process time. During this time, the control is disabled. After the manual operation, the current brightness value is used as temporally setpoint for the restarted control. SET_STATE sets both outputs to the value of .setting. The control is disabled. The next SET_ON command enables the setpoint stored in `SCPTluxSetpoint[i]` corresponding also the value in `nviCLluxSetpoint[i]`.

`nviCLmanOverride[i]` – Manual override input

Type:	SNVT_switch
Valid Range:	.value: 0 .. 100 % .state: 0, 1, -1
Default Value:	.value: 0 .state: -1
Description:	`.state` = -1: control enabled `.value` <= 100, `.state` = 0/1: control disabled The received value is directly passed to the `nvoCLlampValue[i]` output. `nvoCLsecondLamp[i]`is set according to the offset defined in `UCPTclMaxDifference[i]`. By `.state`= -1 the priority control is released.

`nviCLluxSetpoint[i]` – Brightness-level setpoint input

Type:	SNVT_lux
Valid Range:	0 .. 65,535 lux
Default Value:	`SCPTluxSetpoint[i]`
Description:	Determines the current brightness-level setpoint of the controller. A defined value received at this input disables the setpoint of `SCPTluxSetpoint[i]` and replaces it. `nviCLluxSetpoint[i] = 0` enables the setpoint value in `SCPTluxSetpoint[i]` again. After reset `SCPTluxSetpoint[i]` is valid.

Input Network Variables

`nviCLoccupancy[i]` – Occupancy input

Type:	SNVT_occupancy
Valid Range:	OC_NUL, OC_OCCUPIED, OC_UNOCCUPIED; OC_BYPASS; OC_STANDBY
Default Value:	OC_OCCUPIED
Description:	The nviCLoccupancy is another way how to launch the daylight-dependent controller. Besides the nviCLsetting which turns on and off (SET_ON/SET_OFF), the command OC_OCCUPIED and OC_UNOCCUPIED to nviCLoccupancy can be used in similar way. Nevertheless the nviCLsetting has got higher priority than nviCLoccupancy. Once you send SET_ON, SET_OFF, SET_STATE values to nviCLsetting, the nviCLoccupancy is disabled until the next SET_NUL command. The SET_NUL resets the controller to “initial” state, so right after it, the controller could be turned on/off also by OC_OCCUPIED/OC_UNOCCUPIED command sent to nviCLoccupancy. In this case the SET_UP and SET_DOWN could be used in the way described above in nviCLsetting. However the next SET_ON, SET_OFF, SET_STATE commands sent to nviCLsetting force themselves, take over the control and disable nviCLoccupancy. OC_BYPASS, OC_STANDBY and OC_NUL behave as OC_UNOCCUPIED.

Output Network Variables

`nvoCLlampValue[i]` – Lamp value primary output

Type:	SNVT_switch
Valid Range:	.value: 0 .. 100 % .state: 0, 1
Default Value:	.value = 0 .state = -1
Description:	Provides the state and the percentage level of intensity for a dimm or switch actuator (lamp actuator) calculated by the controller or by manual adjustment. The output is usable to interconnect an additional lighting controller for more than two lighting bands.

`nvoCLsecondLamp[i]` – Lamp value secondary output

Type:	SNVT_switch
Valid Range:	.value: 0 .. 100 % .state: 0, 1
Default Value:	.value = 0 .state = -1
Description:	Secondary output to control another lighting band by reduced brighhtness-level (e. g. at the window). `UCPTmaxDifference[i]` defines the value differing from the output value in `nvoCLlampValue[i]`. The difference works dynamically over the total range (high difference by a high part of daylight; low difference by a high part of artificial light).

Configuration Properties

SCPTluxSetpoint[i] – Brightness-level setpoint

Type:	SNVT_lux
Valid Range:	0 .. 65,534 lux
Default Value:	500 lux
Description:	Defines the brightness-level setpoint, which is adopted by `nviCLluxSetpoint[i]` at reset or when the controller is turned on. This value is operated until `nviCLluxSetpoint[i]` is updated.

UCPTmaxLuxSetpoint[i] – Maximum brightness-level setpoint

Type:	SNVT_lux
Valid Range:	0 .. 65,534 lux
Default Value:	0 (no max setpoint defined)
Description:	Maximum brightness-level value which can be manually adjusted via `nviCLluxSetpoint[i]`

SCPTminSendTime[i] – Minimum send time

Type:	SNVT_time_sec
Valid Range:	0 .. 6,553.5 s
Default Value:	0.2 s
Description:	Sets the minimum period of time between output network variable transitions. Reduces the network load. This configuration property is valid for the control only, not for manual dimming.

SCPTmaxSendTime[i] – Maximum send time

Type:	SNVT_time_sec
Valid Range:	0 .. 6,553.5 s
Default Value:	300 s
Description:	Sets the maximum period of time before the associated output network variables are automatically updated. A value of zero (0) disables this function.

SCPTmaxRcvTime[i] – Maximum receive time

Type:	SNVT_time_sec
Valid Range:	0 .. 6,553.5 s
Default Value:	0 (disabled)
Description:	Sets the maximum time that elapses after an update to the bound `nviCLluxSetpoint[i]`. If no update value is received, a failure in the LON network is assumed. A value of zero (0) disables this function.

Configuration Properties

SCPTstep[i] – Maximum step

Type:	SNVT_lev_cont
Valid Range:	0 .. 100 %
Default Value:	3 %
Description:	Sets the maximum step that the controller is allowed to take to approach the target level.

SCPTstepValue[i] – Master fade step value

Type:	SNVT_lev_cont
Valid Range:	0 .. 100 %
Default Value:	5 %
Description:	Maximum fade step value which is used for manual control.

UCPTctrlOffOutput[i] – Output values in OFF state

Type:	UNVT_switch_cfg
Valid Range:	.function: 0, 1, -1 .value: 0 .. 100 %
Default Value:	.function: SW_VALUE .value: 0
Description:	The value the controller output adopts, in off or unoccupied. The first value is related to nvoCLlampValue, the second value is related to nvoCLsecvondLamp.

UCPTfadeTimeUnoccupied[i] – Fade time unoccupied

Type:	SNVT_time_sec
Valid Range:	0.0 .. 6553.5 sec
Default Value:	0.0
Description:	The desired time to fade to zero, when unoccupied.

SCPTonOffHysteresis[i] – On/Off hysteresis

Type:	SNVT_lev_cont
Valid Range:	0 .. 100 %
Default Value:	5 %
Description:	Sets the hysteresis for the illumination-level setpoint to switch on and off the lamp brightness-dependently and automatically. A value of zero (0) disables this function. The lamp output is switched off if the ambient level is higher than setpoint value plus relative hysteresis for over a period defined by `SCPTclOffDelay[i]`. The lamp output is again switched on if the ambient level is below the setpoint value minus relative hysteresis for over a period defined by `SCPTclOnDelay[i]`.

Configuration Properties

SCPTclOffDelay[i] – Controller off-delay

Type:	SNVT_time_sec
Valid Range:	0 .. 6,553.5 s
Default Value:	300 s
Description:	This configuration property is used to determine the delay after which the lamp value output is switched off. The controller is only switched off after this delay if the lamp value output is 0% and the ambient level exceeds the setpoint value plus the relative hysteresis level defined by `SCPTonOffHysteresis[i]`. A value of zero (0) disables this function.

SCPTclOnDelay[i] – Controller on-delay

Type:	SNVT_time_sec
Valid Range:	0 .. 6,553.5 s
Default Value:	0.1 s
Description:	This configuration property is used to determine the delay after which the lamp value output is switched on. The controller is only switched on after this delay if the lamp value output was switched off and the ambient level is now lower than the setpoint value minus the relative hysteresis level defined by `SCPTonOffHysteresis[i]`. A value of zero (0) disables this function.

SCPTpowerupState[i] – Power-up state

Type:	SNVT_setting
Valid Range:	.function: SET_OFF, SET_ON
Default Value:	.function: SET_OFF
Description:	The state of the constant light controller after power-up or reset.

UCPTinputGain[i] – Input gain

Type:	SNVT_muldiv
Valid Range:	.multiplier: 0 .. 65,535 .divisor: 0 .. 65,535
Default Value:	.multiplier: 1 .divisor: 1
Description:	Input gain to adapt the sensor value in `nviCLluxLevel[i]` to the value on the reference area. Is necessary for the use of one sensor for several controllers.

Configuration Properties

`UCPTartificialLightFactor[i]` – Artificial light factor

Type:	SNVT_muldiv
Valid Range:	.multiplier: 0 .. 65,535 .divisor: 0 .. 65,535
Default Value:	.multiplier: 700 .divisor: 350
Description:	Configures the artificial light part of the measured illumination-level. The method of the measuring of this value is exactly described by the functional section in this document.

`UCPTsystemCharacteristic[i][j]` – System characteristic

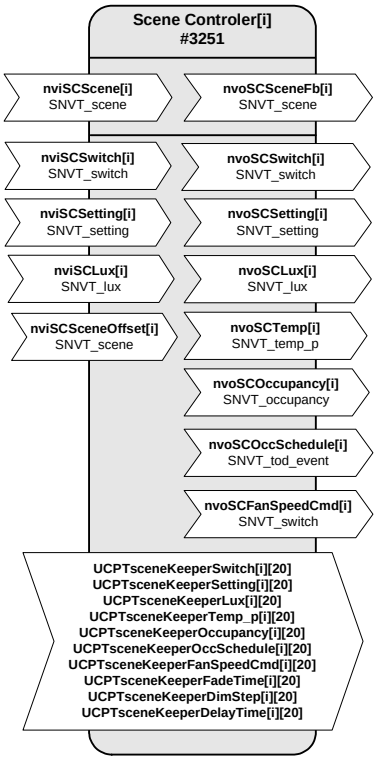
Type:	SNVT_lev_cont
Valid Range:	[0] .. [10]: 0 .. 100 %
Default Value:	[0] = 1 % [1] = 1.5 % [2] = 2.5 % [3] = 4 % [4] = 6.5 % [5] = 10 % [6] = 16 % [7] = 25 % [8] = 40 % [9] = 64 % [10] = 100 %
Description:	Determines the characteristic of the control loop. The method of the finding of these values is exactly described by the functional section in this document.

`UCPTclMaxDifference[i]` – Maximum difference

Type:	SNVT_lev_cont
Valid Range:	0 .. 100 %
Default Value:	30 %
Description:	Maximum difference value between `nvoCLlampValue[i]` and `nvoCLsecondLamp[i]`. The second, outer lighting band is switched on when the inner lighting band has met this set value.

9.5. Scene Controller Object

(LONMARK® profile #3251)



Input Network Variables

`nviSCscene[i]` – Scene trigger input

Type:	SNVT_scene
Valid Range:	.function: SC_RECALL, SC_LEARN .scene_number: 1 .. 20
Default Value:	.function = SC_RECALL .scene_number = 0
Description:	This input triggers a scene (SC_RECALL) or loads the scene-preset memory with current values (SC_LEARN). Memory units for 20 scenes are provided. By SC_RECALL, the scene settings stored under the chosen `.scene_number` are recalled. The recall command can be delayed by the time defined in `UCPTsceneKeeperDlyTime[i]`. An SC_LEARN command stores the current values of `nviSCswitch[i]` and `nviSClux[i]` in the scene memory unit corresponding to the given `.scene_number`. A scene number zero does not cause any control action (only needed for default before commissioning/at reset).

Input Network Variables

`nviSCswitch[i]` – Direct control input

Type:	SNVT_switch
Valid Range:	.value: 0 .. 100 % .state: 0, 1, -1
Default Value:	.value = 0 .state = -1
Description:	Updates of this input are directly passed to the `nvoSCswitch[i]` output. This input overrides other inputs and ongoing fades/delays. Thus, scene settings can be modified e. g. manually. When nviSCscene receives a SC_LEARN command the value in nviSCswitch is stored in the scene memory. Storing is enabled only when the nviSCswitch is connected.

`nviSCsetting[i]` – Controller enabling/disabling input

Type:	SNVT_setting
Valid Range:	.function: SET_ON, SET_OFF
Default Value:	.function = SET_ON .setting = 0 .rotation = 0
Description:	Used to turn the controller on and off. A SET_ON command recalls the last scene. When the controller is turned off (SET_OFF), the scene stored in memory unit no. 20 is propagated without any configured delays.

`nviSCLux[i]` – Brightness input

Type:	SNVT_lux
Valid Range:	0 .. 65,534 lux
Default Value:	0
Description:	Input for a brightness value [lux], which is stored in the scene memory when nviSCscene receives a SC_LEARN command. Storing is enabled only when the nviSCLux is connected.

`nviSCSceneOffset[i]` – Scene offset input

Type:	SNVT_scene
Valid Range:	. function: SC_RECALL . scene_number:1-20
Default Value:	. function =SC_NUL . scene_number=255
Description:	The value stored at `.scene_number` is added to the `.scene_number` values of `nviSCScene[i]`. For invalid values (addition of both scene numbers > 20), a value of 0 is assumed.

Output Network Variables

`nvoSCsceneFb[i]` – Scene feedback value

Type:	SNVT_scene
Valid Range:	.function: SC_RECALL, SC_LEARN .scene_number: 1 .. 20
Default Value:	.function: = SC_NUL .scene_number: = 255
Description:	Propagates the current state of the scene controller to the network.

`nvoSCswitch[i]` – Switch output

Type:	SNVT_switch
Valid Range:	.value: 0 .. 100 % .state: 0, 1, -1
Default Value:	.value = 0 .state = -1
Description:	Provides the value of the `UCPTsceneKeeperSwitch[i][j]` scene memory for an actuator (e. g. a lamp actuator), whenever a scene change is initiated.

`nvoSCsetting[i]` – Setting output

Type:	SNVT_setting
Valid Range:	.function: SET_OFF, SET_ON, SET_DOWN, SET_UP, SET_STOP, SET_STATE, SET_NUL .setting: 0 .. 100 % .rotation: -359.98° .. +360.00°
Default Value:	.function = SET_NUL .setting = 0 .rotation = 0
Description:	Provides the value of the `UCPTsceneKeeperSetting[i][j]` scene memory for a controller (e. g. a sunblind controller). If sunblinds are controlled, information about their position (`.setting`) and panel angle (`.rotation`) can be stored in the scene memory.

`nvoSClux[i]` – Brightness level output

Type:	SNVT_lux
Valid Range:	0 .. 65,534 lux
Default Value:	0
Description:	Propagates the brightness level of the `UCPTsceneKeeperLux[i][j]` scene memory.

Output Network Variables

`nvoSCtemp[i]` – Temperature output

Type:	SNVT_xxx (Default: SNVT_temp_p)
Valid Range:	-273.17 °C .. +327.66 °C
Default Value:	327.67 °C (undefined)
Description:	Propagates the temperature value of the `UCPTsceneKeeperTemp[i][j]` scene memory [°C].

`nvoSCoccupancy[i]` – Occupancy state output

Type:	SNVT_occupancy
Valid Range:	OC_OCCUPIED, OC_UNOCCUPIED, OC_BYPASS, OC_STANDBY, OC_NUL
Default Value:	OC_NUL
Description:	Propagates the occupancy state defined in the `UCPTsceneKeeperOccupancy[i][j]` scene memory.

`nvoSCoccSchedule[i]` – Occupancy schedule output

Type:	SNVT_tod_event	
Valid Range:	.current_state:	OC_OCCUPIED, OC_UNOCCUPIED, OC_BYPASS, OC_STANDBY, OC_NUL
	.next_state:	OC_OCCUPIED, OC_UNOCCUPIED, OC_BYPASS, OC_STANDBY, OC_NUL
	.time_to_next_state:	0 .. 65,534 s
Default Value:	.current_state	= OC_NUL
	.next_state	= OC_NUL
	.time_to_next_state	= 0
Description:	Propagates the occupancy states defined in the `UCPTsceneKeeperOccSchedule[i][j]` scene memory. Uses a different SNVT type than `nvoSCoccupancy[i]`. In this parameter can be defined after which time the occupancy state changes within the current scene. Needed to control a regulator (e.g. for the “start scene” in a conference room: use heating at full level for 5 minutes, then reduce heat).	

`nvoSCfanSpeedCmd[i]` – Relative fan speed output

Type:	SNVT_switch	
Valid Range:	.value:	0 .. 100 %
	.state:	0, 1, -1
Default Value:	.value	= 0
	.state	= -1
Description:	Propagates the relative fan speed (percentile value) defined in the `UCPTsceneKeeperFanSpeedCmd[i][j]` scene memory [%].	

Configuration Properties

`UCPTsceneKeeperSwitch[i][j]` – Scene keeper switch

Type:	SNVT_switch
Valid Range:	.value: 0 .. 100 % .state: 0, 1, -1
Default Value:	.value = 0 .state = -1
Description:	Provides direct access to the scene memory to configure SNVT_switch values for every scene. If the switch output shall not change when a new scene is recalled, this parameter has to be set at an undefined value (`.state` = -1), which is not propagated.

`UCPTsceneKeeperSetting[i][j]` – Scene keeper setting

Type:	UNVT_setting
Valid Range:	.function: SET_OFF, SET_ON, SET_DOWN, SET_UP, SET_STOP, SET_STATE, SET_NO_MESSAGE, SET_NUL .setting: 0 .. 100 % .rotation: -359.98° .. +360.00°
Default Value:	.function = SET_NUL .setting = 0 .rotation = 0
Description:	Provides direct access to the scene memory to configure SNVT_setting values for every scene. If the setting output shall not change when a new scene is recalled, this parameter has to be set at an undefined value (`.function` = SET_NUL), which is not propagated.

`UCPTsceneKeeperLux[i][j]` – Scene keeper lux

Type:	SNVT_lux
Valid Range:	0 .. 65,534 lux
Default Value:	0
Description:	Provides direct access to the scene memory to configure brightness levels for every scene. If the brightness level output lux shall not change when a new scene is recalled, this parameter has to be set at an undefined value (0), which is not propagated.

`UCPTsceneKeeperTemp[i][j]` – Scene keeper temperature

Type:	SNVT_temp_p
Valid Range:	-273.17 °C .. +327.66 °C
Default Value:	327.67 °C (undefined)
Description:	Provides direct access to the scene memory to configure temperatures [°C] for every scene. If the temperature output shall not change when a new scene is recalled, this parameter has to be set at an undefined value (327.67 °C), which is not propagated. Attention: If the type of `nvoSCtemp[i]` has been changed, the type of this parameter has to be adjusted as well.

Configuration Properties

`UCPTsceneKeeperOccupancy[i][j]` – Scene keeper occupancy

Type:	SNVT_occupancy
Valid Range:	OC_OCCUPIED, OC_UNOCCUPIED, OC_BYPASS, OC_STANDBY, OC_NUL
Default Value:	OC_NUL
Description:	Provides direct access to the scene memory to configure occupancy states for every scene. If the occupancy state output shall not change when a new scene is recalled, this parameter has to be set at an undefined value (OC_NUL), which is not propagated.

`UCPTsceneKeeperOccSchedule[i][j]` – Scene keeper occupancy schedule

Type:	SNVT_tod_event	
Valid Range:	.current_state:	OC_OCCUPIED, OC_UNOCCUPIED, OC_BYPASS, OC_STANDBY, OC_NUL
	.next_state:	OC_OCCUPIED, OC_UNOCCUPIED, OC_BYPASS, OC_STANDBY, OC_NUL
	.time_to_next_state:	0 .. 65,534 s
Default Value:	.current_state	= OC_NUL
	.next_state	= OC_NUL
	.time_to_next_state	= 0
Description:	Provides direct access to the scene memory to configure changing occupancy states for every scene. If the occupancy schedule output shall not change when a new scene is recalled, this parameter has to be set at an undefined value {OC_NUL; OC_NUL; 0}, which is not propagated.	

`UCPTsceneKeeperFanSpeedCmd[i][j]` – Scene keeper fan speed command

Type:	SNVT_switch	
Valid Range:	.value:	0 .. 100 %
	.state:	0, 1, -1
Default Value:	.value	= 0
	.state	= -1
Description:	Provides direct access to the scene memory to configure relative fan speeds for every scene. If the relative fan speed output shall not change when a new scene is recalled, this parameter has to be set at an undefined value (`.state` = -1), which is not propagated.	

`UCPTsceneKeeperFadeTime[i][j]` – Scene keeper dim step delay

Type:	UNVT_time_msec
Valid Range:	0 .. 65535 ms
Default Value:	0 (disabled)
Description:	Fade time to scene.

`UCPTsceneKeeperDimStep[i][j]` – Scene keeper dim step

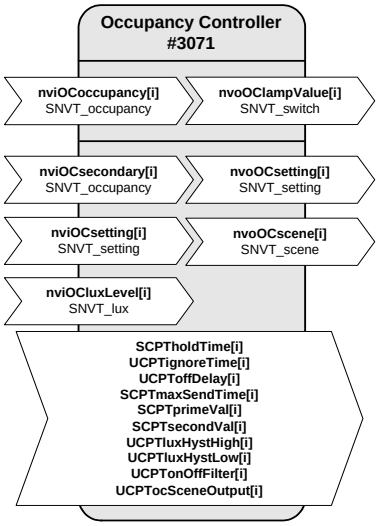
Type:	SNVT_lev_cont
Valid Range:	0 .. 100 %
Default Value:	3.5 %
Description:	Sets the step value of `nvoSCswitch[i].value` for cross-fading.

Configuration Properties

`UCPTsceneKeeperDelayTime[i][j]` – Scene keeper delay

Type:	SNVT_time_sec
Valid Range:	0 .. 6,553.4 s
Default Value:	0 (disabled)
Description:	Defines the time between recall and performance of the corresponding scene. Only affects the `nvoSCswitch [i]`output.

9.6 Occupancy Controller (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