

## Software Application mds1204 (Sensing, Constant Light Controller, Space Comfort Controller)

For sensor model MDS-L2

Application for room occupancy detection, measuring of light intensity (0 - 1000 lux), measuring of temperature (0 - 50 °C) and evaluation of two digital inputs for potential-free contacts. The basic functions required by the LonMark® functional profiles 1010 (**Light Sensor**), 3071 (**Occupancy Controller**), 3050 (**Constant Light Controller**), 8500 (**Space Comfort Controller**) and 3200 (**Switch**) are supported. For extended adjustment possibilities, the application uses user-defined configuration parameters (UCPT). The UCPTs used here, are defined in the **Thermokon Device Recource Files** from version 1.3 or higher defined.



### Space Comfort Controller Object:

**Temperature detection:** Temperature detection is either made by means of the internal temperature sensor or by an external LON-sensor via the input variable nviSpaceTemp. For a subsequent calibration of the internal sensor the configuration parameter SCPTOffsetTemp is available.

**Setpoint prescription:** The effective setpoint (basic setpoint value) nvoSetptEffect is calculated in reliance of the input variable to the room occupancy (nviOccManCmd and nviOccSensor) out of the setpoint prescriptions via SCPTsetPnts respectively nviSetpoint and the Offsetwert nviSetptOffset (see table 1).

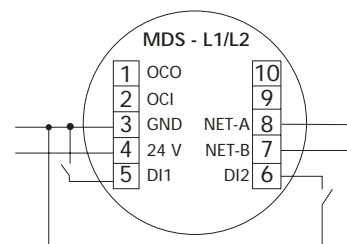
For evaluation of the internal occupancy sensor, the output variable nvoOccOccup of the „Occupancy Controller Object “ has to be connected to the input variable nviOccSensor.

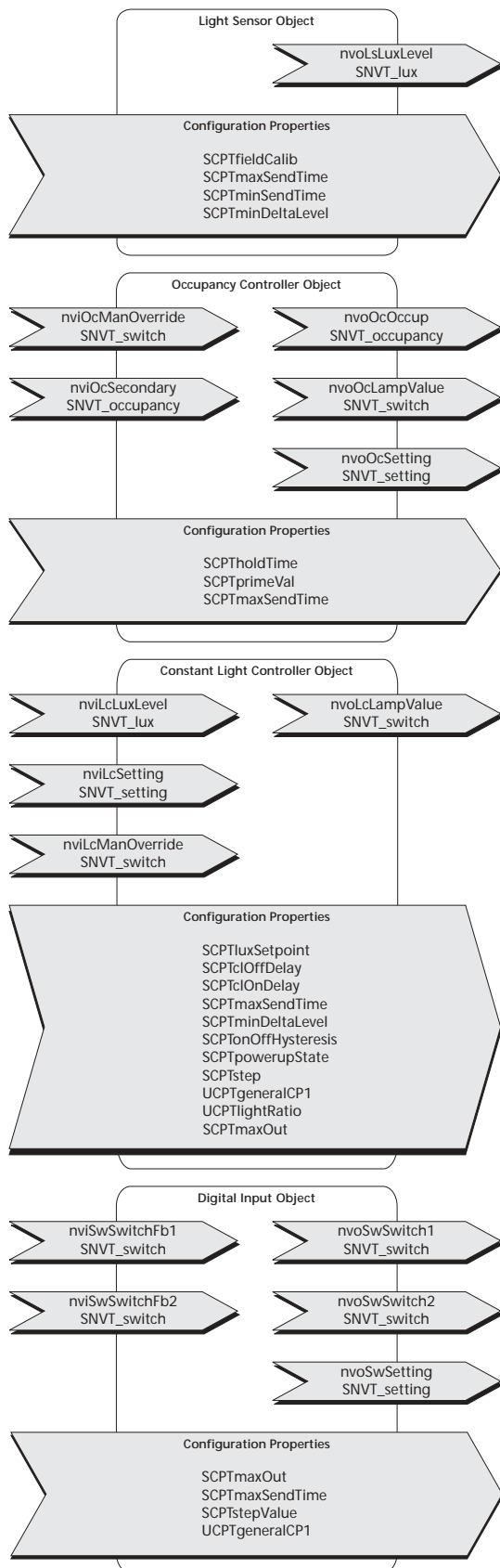
**Temperature control:** The basic setpoint used by the algorithm is determined by the nvi- or SCPTsetPnts, as described above. The neutral (energy-free) zone around the basic setpoint is automatically adapting to the current room occupancy and is also parameterable via SCPTsetPnts.

The control variables of the PID-controller for heating and cooling are output by the variables tpye SNVT\_lev\_percent. The control parameter „proportional band“ , „integral action time“ and „derivate action time“ can be adjusted according to the dimensional requirements of a room. The monitoring of window contacts and dew point detector is made by means of the input variables nviEnergyHoldOff and nviDewPtSensor.

If the control switches are directly locked on the digital inputs of the multisensor, the output variables nvoSwSwitch1/2 of the „Digital Input Objects“ have to be connected to the input variables nviEnergyHoldOff and nviDewPtSensor.

### Terminal Connection Plan MDS:





**Light Sensor:** The measured light value is output by the variables nvoLsLuxLevel of type SNVT\_lux.

For calibration of the light sensor, the exact light intensity can be determined by means of an external luxmeter and input via the parameter SCPTfieldCalib. The reflection factor is automatically calculated and the measuring value as well as the measuring range end value is corrected, accordingly.

**Occupancy Controller:** The Occupancy Controller can either be used as occupancy sensor (with nvoOcOccup), a light switch (with nvoOcLampValue) depending on occupancy or for switch-on/switch-off of a connected Constant Light Controller (with nvoOcSetting). The reset of the output variables after detected motion is made time delayed (adjustable via SCPTholdTime).

Upon detected occupancy in the room, light is switched-on to the value SCPTprimeVal. If the input variable nviOcSecondary is connected to a related occupancy sensor, the light is also set to the value SCPTprimeVal by means of nviOcSecondary = OCCUPIED. By means of nviOcManOverride it is possible to override the controller from outside.

**Constant Light Controller:** For controlling constant light, the input variable nviLcLuxLevel has to be connected to the output variable nvoLcLuxLevel des „Light Sensor Object“. The output variable nvoLcLampValue serves for control of an illumination actuator. By means of nviLcSetting the controller can be switched-on respectively switched-off and the setpoint can be temporarily changed.

An additional switch to nviManOverrideLC can deactivate the Constant Light Controller and overwrites the output variable nvoLcLampValue.

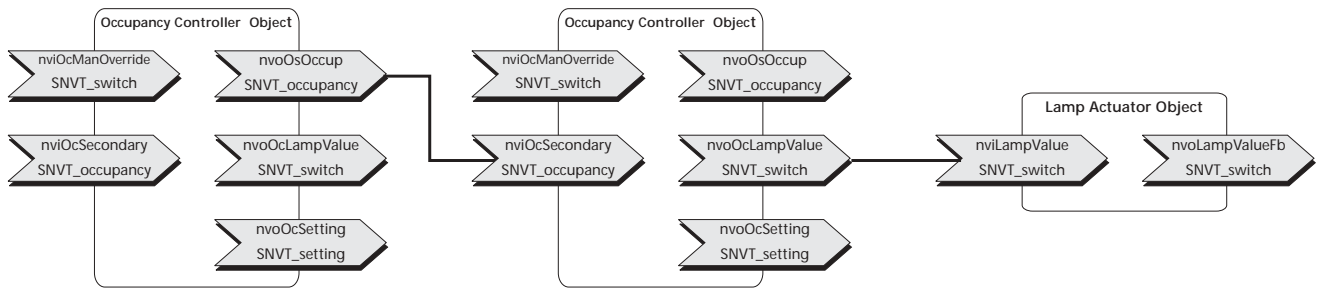
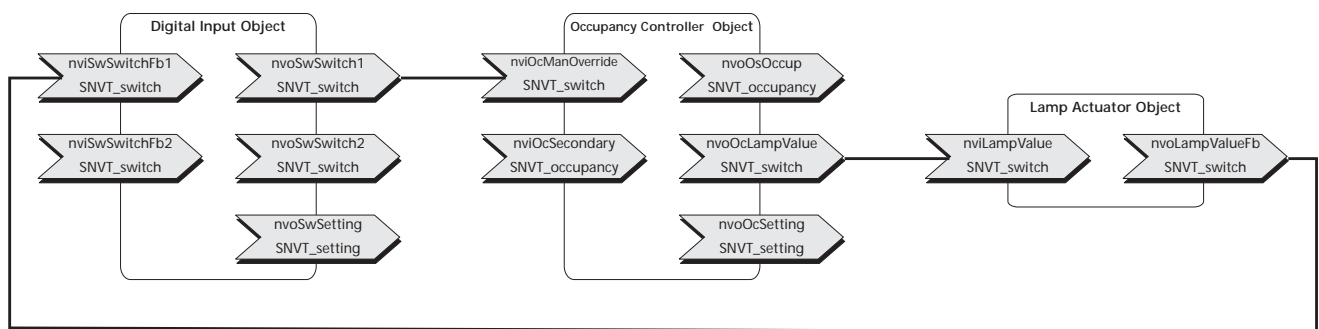
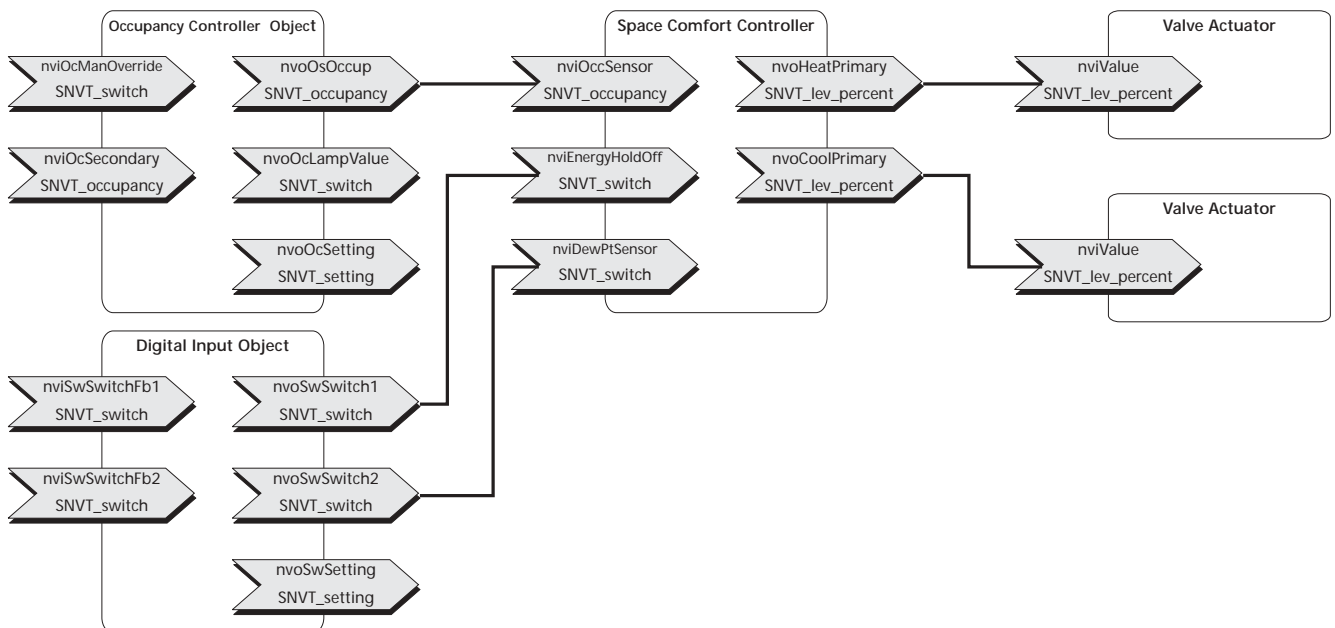
Via UCPT\_generalCP1 the function of the Constant Light Controller can be switched over for light control to the function of a light-dependent occupancy sensor (please refer to the description UCPT\_generalCP1 and the corresponding function diagrams).

**Digital Input Object:** The status of the potential-free digital inputs are captured. Depending on the respective configuration, (UPCTgeneralCP1) they are output via the output variables of type SNVT\_switch and SNVT\_setting.

The digital inputs can be used for evaluation of window contact and dew point detector or light switches.

By means of SNVT\_switch an absolute light value for manual override is sent. By means of SNVT\_setting the Occupancy Controller or the Constant Light Controller can be activated respectively deactivated.

The functions Standard I/O, toggle, dimming or „manual override“ can be taken over by the digital inputs. By means of SCPTmaxOut the maximum output value of the SNVT\_switch variables can be limited.

**Application examples:****Occupancy Controller (OR-connection of 2 occupancy detectors for light control):****Occupancy Controller (Switching of light with manual override depending on occupancy):****Space Comfort Controller:***(Setpoint selection depending on occupancy, window contact and dew point detector)*

**Constant Light Controller:**
**Constant light control with manual overriding and switch-on/switch-off via occupancy controller**
**Remark for calibration and installation:**

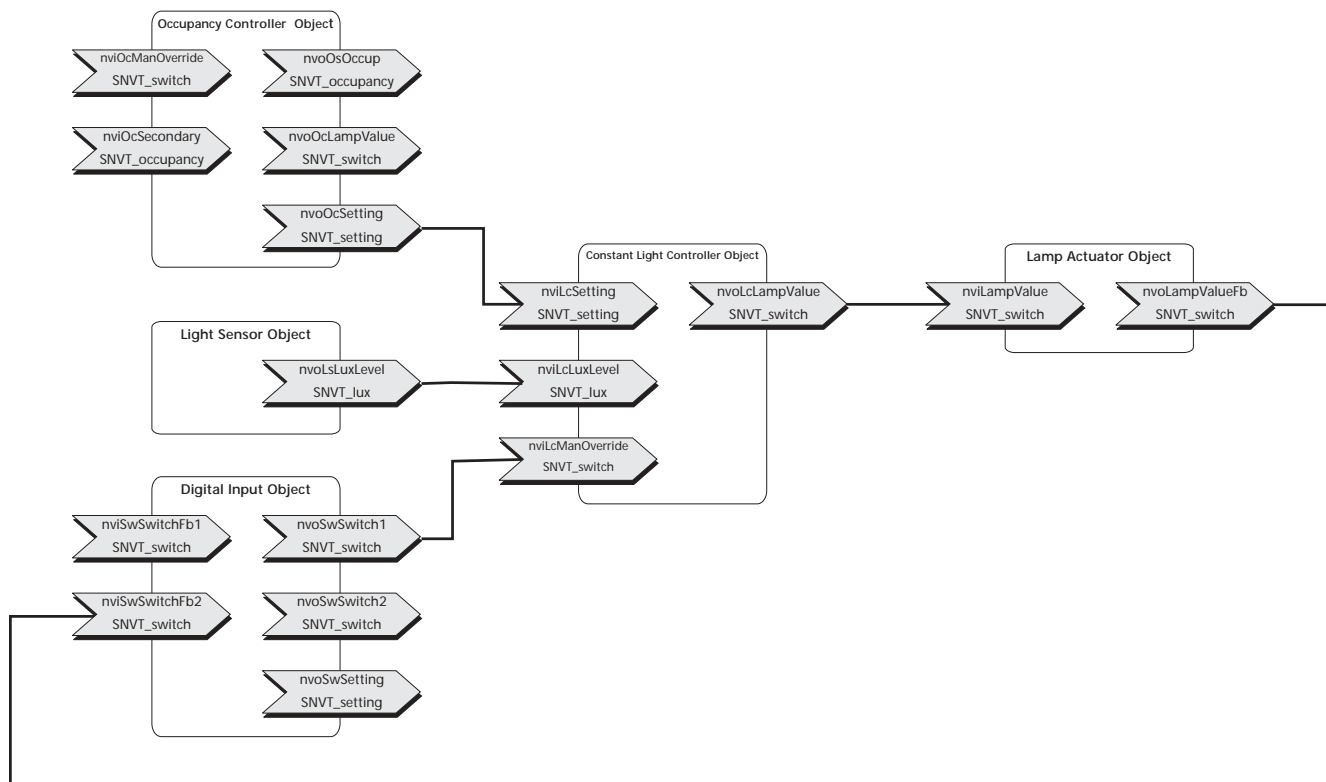
**1. Light Sensor:** The calibration of the light sensor should be made without any artificial light and with a room typical shutter position. Therefore, the light intensity is measured by a reference device at the working surface and is then registered as configuration value in the parameter **SCPTfieldCalib**.

**2. Constant Light Controller:** As the sensitivity of the light sensor against artificial light depends among others on the light source used, the position of the sensor and the reflection characteristics of the room, the sensitivity has to be determined by the configuration parameter **UCPTlightRatio** for installation of the light control.

UCPTlightRatio.multiplier: Light intensity with 100 % artificial light, measured at the working surface by a reference device.

UCPTlightRatio.divisor: Light intensity with 100 % artificial light, measured by the multi sensor MDS L2.

The determination of the values has to be effected in a well darkened room, if possible without any daylight. The artificial light should be switched to its maximum value by 100%.



## Node Object

The Node Object supervises and controls the functions of the individual objects within the device. The basic functions byLonMark® are supported.

### Network Variable Node Object:

#### nviRequest

SNVT Type: SNVT\_obj\_request, Index 92

Function: Input variable with the functions RQ\_NORMAL, RQ\_UPDATE\_STATUS and RQ\_REPORT\_MASK.

#### nvoStatus

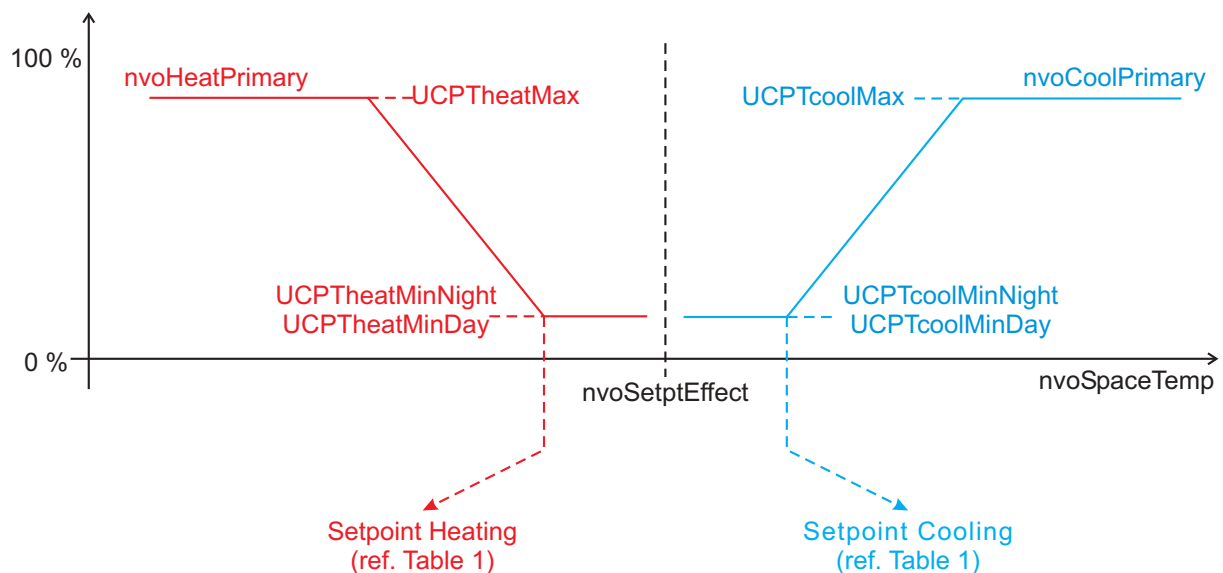
SNVT Type: SNVT\_obj\_status, Index 93

Function: Output variables with required status bits „invalid\_id“ and „invalid\_request“.

## Space Comfort Controller Object

The object contains temperature measuring, setpoint adjustment and PID-controller for heating and cooling. Output of control variables is made via the network variables. The scanning time for calculation of control variables corresponds to the sending interval (SCPTmaxSendTime) of the output variables.

### Function Diagram PID-Controller Heating/Cooling :



### Input Variables Space Comfort Controller Object

#### nviSpaceTemp

SNVT Type: SNVT\_temp\_p, Index 105

Function: Input variable for connection of an external LON-temperature sensor. The external value is taken over if the initialization value 0x7FFF (=327,67 °C) has been changed by a NV-Update, after reset. As long as the initialization value remains unchanged after reset, the internal temperature sensor remains active!

#### nviApplicMode

SNVT Type: SNVT\_hvac\_mode, Index 108

Function: Input variable for selection of operation module for controller.

- HVAC\_AUTO ==> automatic switch over to heating and cooling
- HVAC\_HEAT ==> only heating
- HVAC\_COOL ==> only cooling
- HVAC\_OFF ==> automatic control is switched-off

Initialization value after reset: HVAC\_AUTO

**nviCoolPriSlave**

SNVT Type: SNVT\_lev\_percent, Index 81

Function: Control variable for network variable nvoCoolPrimary.

nviCoolPriSlave = 0x7FFF (163,835 %) ==&gt; internal controller cooling ON (initialization value)

nviCoolPriSlave = 0 ... 100 % ==&gt; internal controller cooling OUT

==&gt; nviExtCoolOut determines the output quantities (0 - 100%)

**!! The external override has top priority. Thus also a parallel triggering of heating and cooling valve !! is possible.****nviHeatPriSlave**

SNVT Type: SNVT\_lev\_percent, Index 81

Function: Control variable for the network variable nvoHeatPrimary.

nviHeatPriSlave = 0x7FFF (163,835 %) ==&gt; internal controller heating ON (initialization value)

nviHeatPriSlave = 0 ... 100 % ==&gt; internal controller heating OFF

==&gt; nviExtHeatOut determines output quantities (0 - 100%)

**!! The external override has top priority. Thus, also a parallel triggering of heating and cooling valve !! is possible.****nviOccManCmd and nviOccSensor**

SNVT Type: SNVT\_occupancy, Index 109

Function: Input variable for default of room occupancy. The current room occupancy determines the values of the control parameter „effective setpoint“ and „neutral zone“ and thus the setpoints for heating and cooling (see table 1). Initialization value for both variables: OC\_NUL

nviOccManCmd: Default via building control by: OC\_OCCUPIED, OC\_STANDBY, OC\_UNOCCUPIED

nviOccSensor: Presence detection: OC\_OCCUPIED, OC\_UNOCCUPIED

nviOccManCmd	nviOccSensor	>>>	room occupancy	nvoSetptEffect	Sollwert Heizen	Sollwert Kühlen
OC_NUL	OC_NUL	>>>	OCCUPIED	( SCPTsetPnts.occupied_heat + SCPTsetPnts.occupied_cool ) / 2 + nviSetptOffset	SCPTsetPnts.occupied_heat + nviSetptOffset	SCPTsetPnts.occupied_cool + nviSetptOffset
OC_OCCUPIED	****	>>>		or nviSetptOffset + nviSetpoint	or nviSetptOffset + nviSetpoint	or nviSetptOffset + nviSetpoint
****	OC_OCCUPIED	>>>		or nviSetpoint + nviSetptOffset	- ( SCPTsetPnts.occupied_cool - SCPTsetPnts.occupied_heat ) / 2	+ ( SCPTsetPnts.occupied_cool - SCPTsetPnts.occupied_heat ) / 2
OC_STANDBY	OC_NUL OC_UNOCCUPIED	>>>	STANDBY	( SCPTsetPnts.standby_heat + SCPTsetPnts.standby_cool ) / 2 + nviSetptOffset or nviSetpoint + nviSetptOffset	SCPTsetPnts.standby_heat + nviSetptOffset or nviSetptOffset + nviSetpoint - ( SCPTsetPnts.standby_cool - SCPTsetPnts.standby_heat ) / 2	SCPTsetPnts.standby_cool + nviSetptOffset or nviSetptOffset + nviSetpoint + ( SCPTsetPnts.standby_cool - SCPTsetPnts.standby_heat ) / 2
OC_UNOCCUPIED	OC_NUL OC_UNOCCUPIED	>>>	UNOCCUPIED	( SCPTsetPnts.unoccupied_heat + SCPTsetPnts.unoccupied_cool ) / 2	SCPTsetPnts.unoccupied_heat	SCPTsetPnts.unoccupied_cool

**Table 1: Control parameter depending on room occupancy****nviSetpoint**

SNVT Type: SNVT\_temp\_p, Index 105

Function: Input variable for default of room occupancy.

It is not obligatory necessary to bind these network variables with a higher node. If no update is effected for nviSetpoint, the initialization value 0x7FFF (=327,67°C) is maintained and for the calculation of the effective setpoint (basic setpoint + Offset), the values of the configuration parameter **SCPTsetPnts** is used. If nviSetpoint gets an update with a valid setpoint, the effective setpoint is calculated by the value of the input variables.



**nviSetptOffset**

SNVT Type: SNVT\_temp\_p, Index 105

Function: Input variable for default of an offset value for relocation of the basic setpoint temperature in the mode OCCUPIED or STANDBY (see table 1).

**nviEnergyHoldOff**

SNVT Type: SNVT\_switch, Index 95

Function: Input variable for e.g. window or door contacts to activate Energy-Hold-Off function. By means of nviEnergyHoldOff = 100.0 1 the function is activated and the correcting variables heating/cooling are reset to their minimum values. Upon active energy saving function, the antifreeze function is switched-on (see UCPTspAntiFreez). After deactivation of the Energy-Hold-Off function, temperature control is re-started.

**nviDewPtSensor**

SNVT Type: SNVT\_switch, Index 95

Function: Input variable for evaluation of dew point detector in operation mode cooling. By means of nviDewPtSensor = 100.0 1 the correcting variable cooling is reset to its minimum value. After deactivation of this function, temperature control is re-started.

**Output Variables Space Comfort Controller Object****nvoSpaceTemp**

SNVT Type: SNVT\_temp\_p, Index 105

Function: Output variable for measured temperature value. Measuring range 0 - 50°C, resolution 1/100 °C. Data output is made depending on SCPTmaxSendTime and approx. 5 s after reset.

**nvoUnitStatus**

SNVT Type: SNVT\_hvac\_status, Index 112

Function: Output variable for operation status and correcting variables heating/cooling of controller.

.mode =	HVAC_AUTO	==>	automatic toggling between heating and cooling
	HVAC_HEAT	==>	only heating
	HVAC_COOL	==>	only cooling
	HVAC_OFF	==>	controller switched-off
.heat_output_primary	0...100 %	==>	correcting value heating
.cool_output_primary	0...100 %	==>	correcting value cooling

**nvoHeatPrimary**

SNVT Type: SNVT\_lev\_percent, Index 81

Function: Output variable with the correcting values of PID-controller for heating. Data transmission is made analog to SCPTmaxSendTime and approx. 5 s after module reset.

**nvoCoolPrimary**

SNVT Type: SNVT\_lev\_percent, Index 81

Function: Output variable with correcting value of PID controller for cooling. Data transmission is made analog to nvoHeatPrimary.

**nvoSetptEffect**

SNVT Type: SNVT\_temp\_p, Index 105

Function: Output variable for effective setpoint.

The effective setpoint is calculated depending on nviSetpoint, nviOccManCmd, nviOccSensor, SCPTsetPnts and nviSetptOffset (see table 1). Data output is made depending on SCPTmaxSendTime, upon value change and approx. 5 s after module reset.

**nvoSetptOffset**

SNVT Type: SNVT\_temp\_p, Index 105

Function: Output variable for setpoint correction, which can be fixed by nviSetptOffset. Data transmission is made analog to nvoSetptEffect.

### ***nvoOccupEffect***

SNVT Type: SNVT\_occupancy, Index 109

Function: Output variable for effective room occupancy (see table 1). Data transmission is made depending on SCPTmaxSendTime, upon value change and approx. 5s after module reset.

### ***nvoEnergyHoldOff***

SNVT Type: SNVT\_switch, Index 95

Function: Output variable for status detection of Energy-Hold-Off function.

nvoEnergyHoldOff = 0.0 0 ==> window contact deactivated

nvoEnergyHoldOff = 100.0 1 ==> window contact activated

Data transmission is made after value change, depending on SCPTmaxSendTime and approx. 5 s after module reset.

### ***nvoDewPtSensor***

SNVT Type: SNVT\_switch, Index 95

Function: Output variable for status detection of dew point detector.

nvoDewPtSensor = 0.0 0 ==> dew point detector deactivated

nvoDewPtSensor = 100.0 1 ==> dew point detector activated

Data transmission is made after value change, depending on SCPTmaxSendTime and approx. 5 s after module reset.

## ***Configuration Variable Space Comfort Controller Object - in general:***

### ***SCPTHvacType***

Index: 169, SNVT\_hvac\_type

Function: Configuration parameter for identifying of controller type.

Adjusted value: nciHvacType = HVT\_GENERIC

### ***SCPTmaxSendTime***

Index: 49, SNVT\_time\_sec

Function: Heartbeat function. Stipulates the interval time, after which the output variables are sent. By means of the input values =0 the heartbeat function is deactivated (Preset value: 30 s)

### ***SCPToffsetTemp***

Index: 70, SNVT\_temp\_p

Function: Offset for temperature value. By means of this parameter, a software calibration is possible.

### ***SCPTnumValves***

Index: 59, SNVT\_count

Funktion: Configuration parameter for selecting 2-Pipe- or 4-Pipe-System. If 2-pipe System is choosen (1 valve), the output variables for heating and cooling are set to the same value.

***SCPTnumValves = 1: ==> 2-Pipe-System***

Heating-Mode: nvoHeatPrimary = nvoCoolPrimary = value for heating

Cooling-Mode: nvoHeatPrimary = nvoCoolPrimary = value for cooling

***SCPTnumValves = 2: ==> 4-Pipe-System (default)***

Heating-Mode: nvoHeatPrimary = value for heating

Cooling-Mode: nvoCoolPrimary = value for cooling

## ***Configuration Parameter Space Comfort Controller Object - Setpoint:***

### ***SCPTsetPnts***

Index: 60, SNVT\_temp\_setpt

Function: Configuration parameter for default of setpoint for heating and cooling depending on room occupancy. By means of nviSetpoint the values can be overwritten by nvoOccupEffect = OCCUPIED respectively STANDBY. As for nvoOccupEffect = UNOCCUPIED nviSetpoint is not considered however.

Preset value:	.occupied_heat	21,00 °C	.occupied_cool	23,00 °C
	.standby_heat	19,00 °C	.standby_cool	25,00 °C
	.unoccupied_heat	16,00 °C	.unoccupied_cool	28,00 °C



**UCPTspAntiFreez**

Index: 18, SNVT\_temp\_p

Function: Setpoint heating for antifreeze function with opened window contact, that is to say with active energy saving function. (Preset value: 10 °C)

**Configuration Parameter Space Comfort Controller Object - PID-Controller Heating:****UCPTheatXp**

Index: 19, SNVT\_temp\_p

Function: Parameter for adjustment of proportional range. By means of UCPTheatXp = 0 the controller for heating is deactivated. (Preset value: 4 K, range: 0-10 K)

**UCPTheatTn**

Index: 20, SNVT\_time\_min

Function: Parameter for adjustment of reset time (scanning time Ta = SCPTmaxSendTime). By means of the input value UCPTheatTn = 0, I is deactivated. (Preset value: 100 min)

**UCPTheatTv**

Index: 21, SNVT\_time\_min

Function: Parameter for adjustment of lead time (scanning time Ta = SCPTmaxSendTime). By means of the input values = 0, D is deactivated. (Preset value: 0 min)

**UCPTheatMinNight**

Index: 26, SNVT\_lev\_percent

Function: Limit of correcting variables downwards in operation mode UNOCCUPIED. (Preset value: 0 %)

**UCPTheatMinDay**

Index: 27, SNVT\_lev\_percent

Function: Limit of correcting variables downwards in operation mode OCCUPIED and STANDBY. (Preset value: 0 %)

**UCPTheatMax**

Index: 28, SNVT\_lev\_percent

Function: Limit of correcting variables upwards. (Preset value: 100 %)

**Configuration Parameter Space Comfort Controller Object - PID-Controller Cooling:****UCPTcoolXp**

Index: 22, SNVT\_temp\_p

Function: Parameter for adjustment of proportional range. By means of UCPTheatXp = 0 the controller for heating is deactivated. (Preset value: 4K, range 0-10K)

**UCPTcoolTn**

Index: 23, SNVT\_time\_min

Function: Parameter for adjustment of after-running time (scanning time Ta = SCPTmaxSendTime). By means of the input values = 0, I is deactivated. (Preset value: 100 min)

**UCPTcoolTv**

Index: 24, SNVT\_time\_min

Function: Parameter for adjustment of lead time (scanning time Ta = SCPTmaxSendTime). By means of the input values = 0, D is deactivated. (Preset value: 0 min)

**UCPTcoolMinNight**

Index: 29, SNVT\_lev\_percent

Function: Limit of correcting variables downwards in operation mode UNOCCUPIED. (Preset value: 0 %)

**UCPTcoolMinDay**

Index: 30, SNVT\_lev\_percent

Function: Limit of correcting variables downwards in operation mode OCCUPIED and STANDBY. (Preset value: 0 %)

**UCPTcoolMax**

Index: 31, SNVT\_lev\_percent

Function: Limit of correcting variables upwards (Preset value: 100 %)

**Light Sensor Object**

Object includes measuring of light intensity and data output.

**Network Variables Light Sensor Object:****nvoLsLuxLevel**

SNVT Type: SNVT\_lux, Index 79

Function: Output variable for measured light intensity in Lux. Data output is made depending on the configuration parameter SCPTminSendTime, SCPTmaxSendtime and SCPTminDeltaLevel and 5 s after reset.

**Configuration Parameter Light Sensor Object:****SCPTfieldCalib**

Index: 90, SNVT\_lux

Function: Configuration parameter for self-calibration of light sensor. By means of an external Luxmeter, the exact light intensity can be determined and recorded. The reflection factor is automatically calculated and the measured value as well as the measured end value are corrected, accordingly.

**!! The calibration should be made without artificial light and with a room typical shutter position**  
(Preset value 0 Lux ==> Field Calibration deactivated)**SCPTmaxSendTime**

Index: 49, SNVT\_time\_sec

Function: Heartbeat function. Stipulates interval period after which output variables are sent indepently of a value change. Heartbeat function is deactivated by the input value =0. (Preset value: 60 sec.)

**SCPTminSendTime**

Index: 52, SNVT\_time\_sec

Function: Stipulates the smallest update interval. An update is made after expriation of SCPTminSendTime, if the light value had changed by more than SCPTminDeltaLevel. By means of the input variables = 0, the „Minsend“-function is deactivated. (Preset value: 60 sec.)

**SCPTminDeltaLevel**

Index: 88, SNVT\_lev\_cont

Function: If the light intensity changes by the set value SCPTminDeltaLevel (% of current measuring value) the new light values are transfered. The function depends on the adjustment SCPTminSendTime. (Range: 0 % - 100 %; Preset value: 2,5 %)

**Occupancy Controller Object**

The Occupancy Controller can be used as an occupancy detector (with nvoOcOccup), as a light switch indepently of occupancy (by nvoOcLampValue) or for switching on/-off of a connected Constant Light Controller (by nvoOcSetting).

**Network Variables Occupancy Controller Object:****nviOcManOverride**

SNVT Type: SNVT\_switch, Index 95

Function: Input variable for manual control of light. An update of nviOcManOverride locks the controller and the output variable nvoOcLampValue takes over the values of nviOcManOverride.

nviOcManOverride.state = 0 ==&gt; nvoOcLampValue = 0.0 0

nviOcManOverride.state = 1 ==&gt; nvoOcLampValue = nviOcManOverride

If the Occupancy Controller is deactivated by nviOcManOverride, the controller is switched back to the automatic mode, after having changed from UNOCCUPIED to OCUUPIED to nviOcOccupancy. (Initialization value after reset: 0.0 -1)

**nviOcSecondary**

SNVT Type: SNVT\_occupancy, Index 109

Function: Input variable of a contiguous occupancy detector with current room occupancy of contiguous area.  
(Initialization value after reset: OC\_NUL)

**nvoOcOccup**

SNVT Type: SNVT\_occupancy, Index 109

Function: Output variable occupancy detection. Is set as soon as an internal or external movement is detected. Reset is made after expiration of delay period SCPTholdTime. Data transmission is made upon value change and depending on configuration parameters SCPTholdTime.

**Module-Reset:** No data transmission is made within the first 30 sec after reset (initialization phase of occupancy detector) and nvoOcOccup receives the value OC\_UNOCCUPIED.

**nvoOcLampValue**

SNVT Type: SNVT\_switch, Index 95

Function: Output variable for control of light (see function diagram Occupancy Controller)

nvoOcLampValue.state = 0 ==> Light OFF

nvoOcLampValue.state = 1 ==> Light ON

nvoOcLampValue.value = light intensity (0 - 100 %)

Data output is made depending on configuration parameter SCPTmaxSendTime, up value change and 5 sec. after reset.

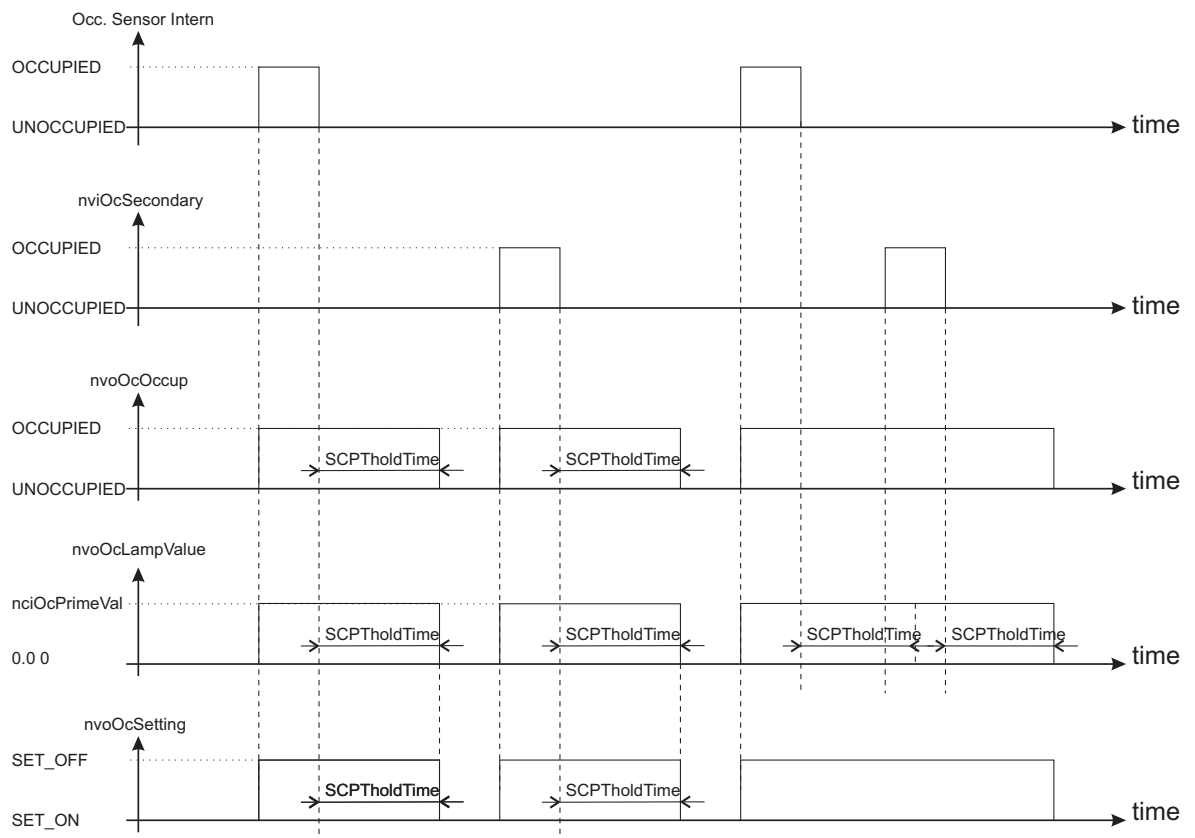
**nvoOcSetting**

SNVT Type: SNVT\_setting, Index 117

Function: Output variable for control of a secondary controller, e.g. Constant Light Controller (see function diagram Occupancy Controller). Data output is made analog to nvoOcLampValue.

nvoOcOccup = OC\_OCCUPIED ==> nvoSettingOC.function = SET\_ON

nvoOcOccup = OC\_UNOCCUPIED ==> nvoSettingOC.function = SET\_OFF

**Function Diagram Occupancy Controller:**

**Configuration Parameter Occupancy Controller Object:****SCPTHoldTime**

Index: 91, SNVT\_time\_sec

Function: Time delay for reset of output variable nvoOcOccup, nvoOcLampValue and nvoOcSetting after detected movement by the internal sensor or by nviOcSecondary. The delay timer is restarted after each change of status „OCCUPIED ==> UNOCUPIED“.  
(Preset value: 600,0 sec = 10 min)

**SCPTprimeVal**

Index: 155, SNVT\_switch

Function: The configuration parameter SCPT\_primeVal defines the output value of nvoLampValueOC if nvoOcOccup = OCCUPIED. (Preset value: 100.0 1)

**SCPTmaxSendTime**

Index: 49, SNVT\_time\_sec

Function: Heartbeat function. Stipulates interval period after which the output variables are sent independently of a result change.  
By means of the input variable = 0 the heartbeat function is deactivated. (Preset value: 120 sec)

## Constant Light Controller Object

Configuration parameter for preset of setpoint for light control. Via UCPTgeneralCP1 the function of the Constant Light Controller can be toggled to the function of an occupancy sensor depending on brightness (switching on/off of light depending on room occupancy and brightness).

### Network Variables Constant Light Controller Object:

#### nviLcLuxLevel

SNVT Type: SNVT\_lux, Index 79

Function: The input variable contains current light intensity in a room and is connected with the output variable nvoLsLuxLevel of the light sensor.

#### nviLcSetting

SNVT Type: SNVT\_setting, Index 117

Function: The input variable determines the operation status of the controller (ON or OFF) and can additionally be used for a temporary setpoint adjustment.

nviLcSetting.function = SET\_ON: Controller = ON, i.e. the output value for light control (nvoLcLampValue) is changed in that way, that the room light intensity corresponds to the adjusted setpoint.

nviLcSetting.function = SET\_OFF: Controller = OFF and light OFF (nvoLcLampValue = 0.0 0)

If Configured as constant light controller (UCPTgeneralCP1.bit14 = 0 and UCPTgeneralCP1.bit15 = 0):

nviLcSetting.function = SET\_UP: Increase of output variables nvoLcLampValue.value by the value nviLcSetting.setting. The new light value is automatically becoming new light setpoint.

nviSettingLC.function = SET\_DOWN: Decrease of output variable nvoLcLampValue.value by the value nviLcSetting.setting. The new light value is automatically becoming new light setpoint.

By an update to SET\_ON the setpoint is reset again to the basis setpoint SCPTluxSetpoint.

#### nviLcManOverride

SNVT Type: SNVT\_switch, Index 95

Function: Input variable for manual light control. Initialization value after reset: 0.0 -1

Configuration as constant light controller (**UCPTgeneralCP1.bit14 = 0, UCPTgeneralCP1.bit15 = 0**) or as occupancy sensor for light control depending on brightness (**UCPTgeneralCP1.bit14 = 0, UCPTgeneralCP1.bit15 = 1**):

An update of nviLcManOverride locks the controller and the output variable nvoLcLampValue overrides the values of nviLcManOverride. By means of nviLcManOverride.state = -1 the controller is reactivated.

nviLcManOverride.state = -1 ==> Light controller ON

nviLcManOverride.state = 0, 1 und .value = 0 - 100 % ==> Light controller OFF

==> nvoLcLampValue = nviLcManOverride

Configuration as occupancy sensor depending on brightness, switch-off of light:

(**UCPTgeneralCP1.bit14 = 1 and UCPTgeneralCP1.bit15 = 0**):

By an update of nviLcManOverride = 100.0 1 light is switched on by nvoLcLampValue = 100.0 1  
Light is switched-off depending on the light intensity measured in the room.(See function diagram).

#### nvoLcLampValue

SNVT Type: SNVT\_switch, Index 95

Function: Output variable for light control.

nvoLcLampValue.state = 0 ==> Light ON

nvoLcLampValue.state = 1 ==> Light OFF

nvoLcLampValue.value = light intensity (0 - 100 %)

Data output is made depending on the configuration parameter SCPTminDeltaLevel, SCPTmaxSendTime and approx. 5 s after reset.

## Configuration Parameter Constant Light Controller Object:

### SCPTluxSetpoint

Index: 82, SNVT\_lux  
 Function: Configuration parameter for preset of setpoint for light control.  
 (Preset value: 500 lux)

### SCPTclOffDelay

Index: 85, SNVT\_time\_sec  
 Function: Switching-off delay for light (nvoLcLampValue.state = 0).  
 If the limit (SCPTluxSetpoint + SCPTonOffHysteresis/2) is exceeded for a time being SCPTclOffDelay, light will be switched off (with SCPTonOffHysteresis = 0 ==> no automatic switch-off is made)  
 (Preset value: 300,0 sec = 5 min)

### SCPTclOnDelay

Index: 86, SNVT\_time\_sec  
 Function: Switching-on delay for light (nvoLcLampValue.state = 1).  
 If the limit (SCPTluxSetpoint - SCPTonOffHysteresis/2) is not reached for a time being clOnDelay, the light is switched-on (with nciLcOnOffHyster = 0 ==> no automatic switch-on is made). (Preset value: 0 sec)

### SCPTmaxSendTime

Index: 49, SNVT\_time\_sec  
 Function: Heartbeat function. Stipulates interval period, after which the output variables are sent independently of result changes. By means of the input value = 0, the heartbeat function is deactivated.  
 (Preset value: 300 sec = 5 min)

### SCPTminDeltaLevel

Index: 88, SNVT\_lev\_cont  
 Function: If the output value changes by the adjusted value SCPTminDeltaLevel (% of current value), nvoLcLampValue is sent. (Range: 0 % - 100 %; Preset value: 0,5 %)

### SCPTonOffHysteresis

Index: 84, SNVT\_lev\_cont  
 Function: Relative hysteresis value (% of SCPTluxSetpoint) for calculation of switch thresholds, at which light should be switched-on/-off depending on time delays SCPTclOnDelay and SCPTclOffDelay. By means of the value SCPTonOffHysteresis = 0 % the automatic switching-on/-off is deactivated. (Preset value: 0 %).  
 Automatic switching-on:  $nviLcLuxLevel < SCPTluxSetpoint - SCPTonOffHysteresis/2$   
 Automatic switching-off:  $nvoLcLampValue.value = 0$   
 and  
 $nviLcLuxLevel > SCPTluxSetpoint + SCPTonOffHysteresis/2$

### SCPTpowerupState

Index: 87, SNVT\_setting  
 Function: Initialization value for operation status of controller after reset.  
 (Preset value: {SET\_OFF,0,0} )

### SCPTstep

Index: 83, SNVT\_lev\_cont  
 Function: Maximum stepping width by which the output variable nvoLcLampValue.value is allowed to be changed by the light controller to achieve the pre-adjusted setpoint. (Preset value: 10 % )

### SCPTmaxOut

Index: 93, SNVT\_lev\_cont  
 Function: Configuration parameter for limiting output values of output variables nvoLcLampValue.value.  
 (Preset value: 100 % )



## UCPTlightRatio

Index: 11, SNVT\_muldiv

Function: Configuration parameter for determination of sensitivity of the light sensor against artificial light.  
Preset value: 1000, 100

UCPTlightRatio.multiplier: Light intensity upon 100 % artificial light, measured on the working surface by means of a reference device.

UCPTlightRatio.divisor: Light intensity upon 100 % artificial light, measured by the multi sensor MDS-L2 via nvoLsLuxLevel.

**!! Determination of value must be made within a well darkend room, if possible without any daylight !!The artificial light should be switched by 100% to its maximum value.**

daylight

## UCPTgeneralCP1

Index: 7, SNVT\_state

Function: By means of nciLcMode it is possible to select between different light control functions.  
(Preset value: UCPTgeneralCP1 = 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0 i.e..constant light control)

UCPTgeneralCP1.bit14	UCPTgeneralCP1.bit15	Function
0	0	Constant light control ( <i>Constant LC</i> )
0	1	<p>Occupancy sensor for light control depending on brightness (<i>ON/OFF LC</i>)</p> <p><b>Function diagram:</b></p>
1	0	<p>Switching-off the illumination depending on brightness (<i>OFF LC</i>). Switching-on of light is made by nviLcManOverride = 100 1</p> <p><b>Function diagram:</b></p>

## Digital Input Object (DI1, DI2)

The status of the potential-free digital inputs DI1 and DI2 are captured. Depending on the configuration (UCPTgeneralCP1) they are output via the output variables of type SNVT\_switch and SNVT\_setting, whereas with SNVT\_switch an absolute light value for manual overriding is sent. By means of SNVT\_settin the occupancy controller or constant light controller can be activated respectively deactivated.

### Network Variable Digital Input Object:

#### nviSwSwitchFb1, nviSwSwitchFb2

SNVT Type: SNVT\_switch, Index 95

Function: Input variable for current status of light groups controlled by nvoSwSwitch1 respectively nvoSwSwitch2

#### nvoSwSwitch1 (DI1), nvoSwSwitch2 (DI2)

SNVT Type: SNVT\_switch, Index 95

Function: Depending on the configuration (UCPTgeneralCP1), the output variables are sending the current switch status of the digital inputs (contact open/closed) or values for manual light control.

**DI1:** *Closer-Contact* = UCPTgeneralCP1.bit0 = 0, *Opener-Contact* = UCPTgeneralCP1.bit0 = 1

**DI2:** *Closer-Contact* = UCPTgeneralCP1.bit1 = 0, *Opener-Contact* = UCPTgeneralCP1.bit1 = 1

#### Standard I/O:

Potential-free contact closed ==> nvoSwSwitch1/2.state = 1  
nvoSwSwitch1/2.value = SCPTmaxOut

Potential-free contact opened ==> nvoSwSwitch1/2 = 0.0 0

#### Toggle:

Change open ==> closed ==> Any button actuation results in a change of the variables between the variables ON and OFF.

Light ON nvoSwSwitch1/2.state = 1  
nvoSwSwitch1/2.value = SCPTmaxOut

Light OFF nvoSwSwitch1/2 = 0.0 0

#### Dimming:

Change open ==> closed ==> Short-term actuation of buttons (< 1 s) results in a change of present light status. By long-term actuation of button(>1s) the dimming function is activated, i.e. based on the current light status, the .value-wert of the variables is increased or decreased by SCPTstepValues, as long as the button is pressed.

Light ON (max.) nvoSwSwitch1/2.state = 1  
nvoSwSwitch1/2.value=SCPTmaxOut

Light ON (50%) nvoSwSwitch1/2 = 50.0 1

Light OFF nvoSwSwitch1/2 = 0.0 0

#### Manual Overriding:

Change open ==> closed ==> If DI1 has been configured for Toggle or Dimming and DI2 for manual overriding, nvoSwSwitch1 can be connected to nviLcManOverride and can be used for overriding of constant light controller. DI1 works with normal Toggle- or Dimming function and sends by nvoSwSwitch1 the values for light control. DI2 (configured for manual overriding) will set the output variable nvoSwSwitch1 = 0.0 -1 when actuating the button and thereby the light control is set free again.

The output variables are output upon change of output value, after expiration of heartbeat time (SCPTmaxSendTime) and approx. 5 s after module reset.

**nvoSwSetting (DI1 und DI2)**

SNVT Type: SNVT\_setting, Index 117

Function: Output variable for manual control of operation status of a constant light controller. It is possible to switch the controller on or off and to change the setpoint. The function can also be configured via UCPTgeneralCP1.

**Toggle:**

Change open ==> closed ==> Any button actuation results in a change of the variables  
between the values

nvoSwSetting.function = SET\_ON Controller ON

nvoSwSetting.function = SET\_OFF Controller OFF

**Dimming:**

Change open ==> closed ==> Short-term actuation of button (< 1 s) leads to a change between  
SET\_ON and SET\_OFF. By long-term actuation of buttons (> 1s),  
the dimming function is activated and the setpoint of the  
controller is changed by SCPTstepValue (Sending interval 400 ms):

DI1, increase of setpoint: nvoSwSetting.function = SET\_UP

nvoSwSetting.setting = SCPTstepValue

DI2, decrease of setpoint: nvoSwSetting.function = SET\_DOWN

nvoSwSetting.setting = SCPTstepValue

**Configuration Parameter Digital Input Object:****SCPTmaxOut**

Index: 93, SNVT\_lev\_cont

Function: Configuration parameter for limiting the output values of the output variables nvoSwSwitch1.value and nvoSwSwitch2.value. (Preset value: 100 %)

**SCPTmaxSendTime**

Index: 49, SNVT\_time\_sec

Function: Heartbeat interval. After expiration of time SCPTmaxSendTime the digital inputs are inquired and the output variables are updated. By means of the input values = 0, the heartbeat function is deactivated.

**SCPTstepValue**

Index: 92, SNVT\_lev\_cont

Function: By means of SCPTstepValue, the stepping width of the output variables nvoSwSwitch1.value and nvoSwSwitch2.value are defined, by which the values of the dimming function are changed. When using SNVT\_setting, SCPTstep determines the value of nvoSettingSW.setting. (Preset value: 5 %)

**UCPTgeneralCP1**

Index: 7, SNVT\_state

Function: Via UCPTgeneralCP1 the digital inputs for the functions Standard I/O, Toggle, Dimming or „manual overriding“ are configured.

(Preset value: DI2 = manual overriding, DI1 = Dimming ==> 0,0,0,0,0,0,0,0,0,0,0,0,1,1,1,0 )  
bit0,... ..,bit15

DI1: Closer-Contact = UCPTgeneralCP1.bit0 = 0, Open-Contact = UCPTgeneralCP1.bit0 = 1

DI2: Closer-Contact = UCPTgeneralCP1.bit1 = 0, Open-Contact = UCPTgeneralCP1.bit1 = 1

	DI2		DI1	
	bit 12	bit 13	bit 14	bit 15
Standard I/O	0	0	0	0
Toggle	0	1	0	1
Dimming	1	0	1	0
manuell override	1	1	1	1

**General Remarks:****Wink - Event**

Service LED is tripped and blinks two times.

**Service Pin Message**

As long as the device is still unconfigured, the Service Pin Message can be generated without initialization of Service Pin. Thus, an installed and wired device can be easily commissioned. If the unconfigured light sensor detects three changes from dark to light following each other, the Service Pin Message is sent. Limit for change dark/light is 800 Lux. Change of status dark==>light can be created by a flashlight, impulse for light respectively dark is approx. 2 sec. each status.