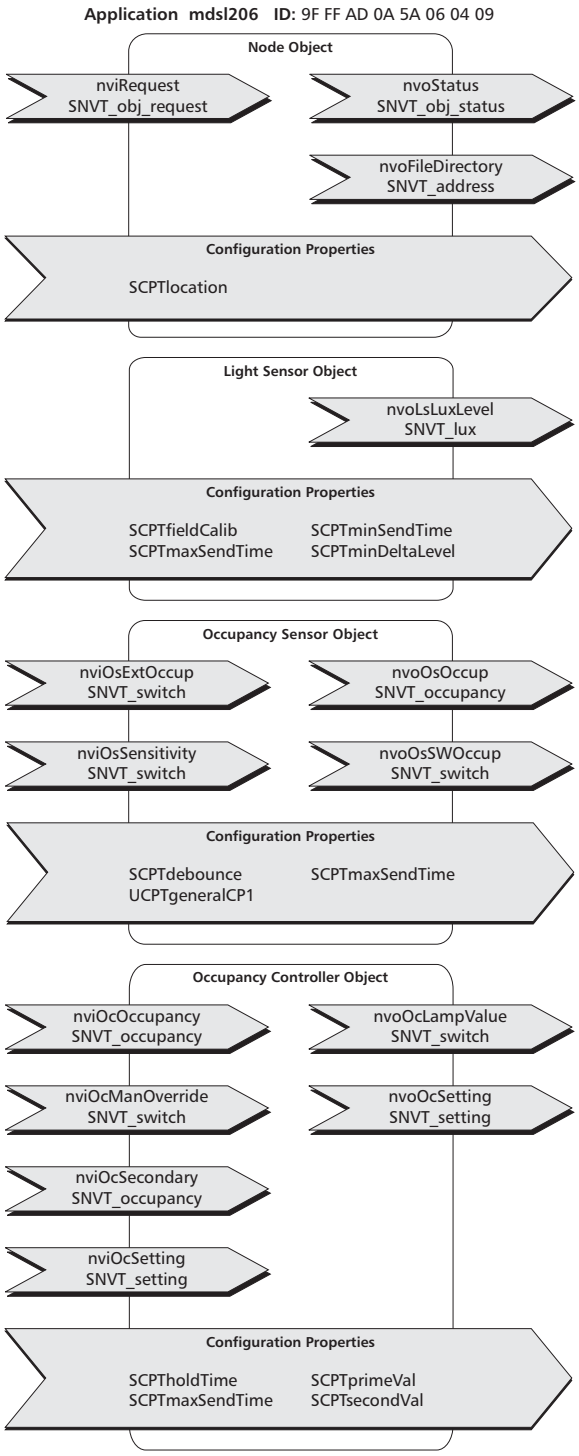
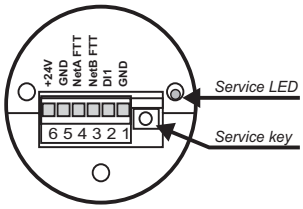
Software Application mdsl206 (Sensors, Constant Light Controller, Space Comfort Controller)

For sensors model MDS-LON2 new version

The ceiling multi-sensor type MDS is designed for occupancy detection, light measuring (0 - 1000 Lux) and temperature detection in room and office spaces. Additionally, the device has a potential-free digital input, e.g. for connecting a light switch or a window contact.
The defaults of the LonMark® function profiles ***1010*** „Light Sensor“, ***1060*** „Occupancy Sensor“, ***3071*** „Occupancy Controller“, ***3050*** „Constant Light Controller“, ***8500*** „Space Comfort Controller“ and ***3200*** „Switch“ are considered. The application has two identical objects 3050, so that two lighting groups can be controlled independently of each other in a room. The application uses standard network variable types(SNVT) and standard configuration property types (SCPT). For extended adjustment options, user defined configruation property types (UCPT) are used. The UCPTs used are definded in the ***Thermokon Device Recource Files*** from ***version 1.6*** or higher and should be installed to the PC before making up device defaults by the installationt tool.

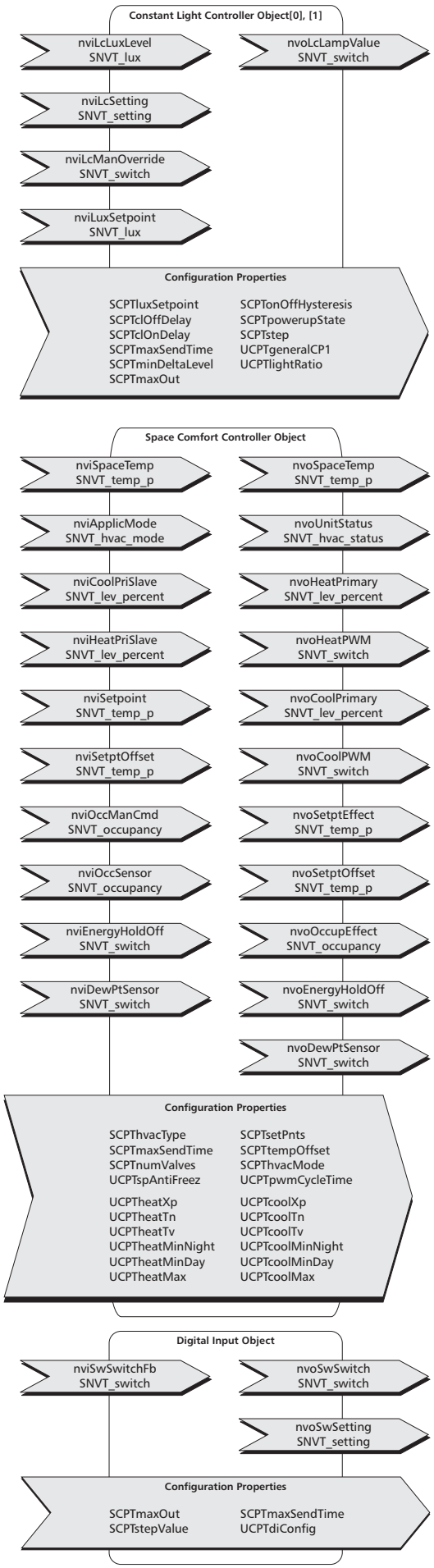




Light Sensor: The light value measured is output by the variable ***nvoLsLuxLevel***. For the calibration of a light sensor, the exact light intensity can be detected by an external luxmeter and can be entered by the paramete ***SCPTfieldCalib.*** The reflection factor is automatically calculated and both, the measuring value and the measuring range end value are corrected, accordingly.

Occupancy Sensor: The current room occupancy is output by variables of the type SNVT_occupancy and SNVT_switch.The setting back of the output variables after detected movement is made delayed (adjustable via ***SCPTdebounce***). By means of the input-/output variables of type SNVT_switch the occupancy sensor offers additionally the option to connect several occupancy detectors or to directly control a lighting depending on movement. By ***nviOsSensitivity*** the sensitivity of the occupancy sensor can be reduced. The integrated occupancy sensor LED always lights up for the time of the initialization phase. The light up of the LED with recognized movement can be adjusted by ***UCPTgeneralCP1.***

Occupancy Controller: The occupancy controller can be used as a light switch depending on movement (by ***nvoOcLampValue***) or for switching-on/-off a connected Constant Light Controller (by ***nvoOcSetting***). The reset of the output variable is made delayed after detected movement (adjustable by ***SCPTholdTime***). The input variable ***nviOcOccupancy*** can be connected to the output variable ***nvoOsOccup*** of the ***Occupancy Sensor Object*** (internal occupancy detector). By ***nviOcOccupancy = OCCUPIED*** the lighting is switched-on to the value ***SCPTprimeVal.*** The input variable ***nviOcSecondary*** can be connected to a neighbour occupancy detector. By ***nviOcSecondary = OCCUPIED*** the lighting is switched-on to the value ***SCPTsecondVal.*** By ***nviOcSetting*** the controller can be activated respectively deactivated. By ***nviOcManOverride*** it is possible to override the controller externally.



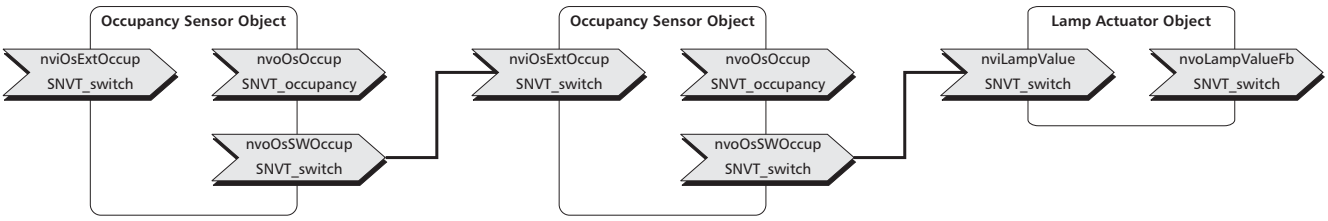
Constant Light Controller Objects [0] and [1]:
Two identical objects for light control respectively light regulation. By ***UCPTgeneralCP1*** the configuration of the controller is made. They can be used as a constant light controller as well as an occupancy detectors depending on brightness. Configured as an occupancy sensor depending on brightness, two lighting groups in a room can be controlled and switched independently of each other by these two objects. The input variable ***nviLcLuxLevel*** must be connected to the light sensor and the output variable ***nvoLcLampValue*** must be connected to an actuator for light control. By ***nviLcSetting*** the controller can be swichted-on respectively switched-off and the set point can be changed temporarily. The input variable ***nviLcManOverride*** is designed for manual override of the light value.

Space Comfort Controller Object:
Temperature detection is either made by an internal temperature sensor or via the input variable ***nviSpaceTemp*** by an external LON-sensor. For an afterwards calibration of the internal sensor the configuration parameter ***SCPTtempOffset*** is available.The effective set point (basic set point) ***nvoSetptEffect*** is calculated depending on the input variables for room occupancy (***nviOccManCmd*** and ***nviOccSensor***), of the set point defaults via ***SCPTsetPnts*** respectively ***nviSetpoint*** and the offset value ***nviSetptOffset*** (see table 1 on page 13).
For the evaluation of the internal occupancy detectors the output variable ***nvoOsOccup*** of the „Occupnacy Sensor Objects“ must be connected to the input variable ***nviOccSensor.***
For the temperature control the control algorithm uses the basic set point described above. The neutral (energy-free) zone around the basic set point adapts itself automatically to the current room occupancy and is also parameterizable via ***SCPTsetPnts.***
The control variables of the PID controller for heating and cooling are output by the variables of type ***SNVT_lev_percent*** for continuous actuators and by the variables of type ***SNVT_switch*** for thermionic two-step actuators (PWM-control). The control parameters proportional range, reset time and rate time can be individually adapted to room layouts. The monitoring of the window contact and the dew point detector is made by the input variables ***nviEnergyHoldOff*** and ***nviDewPtSensor***.

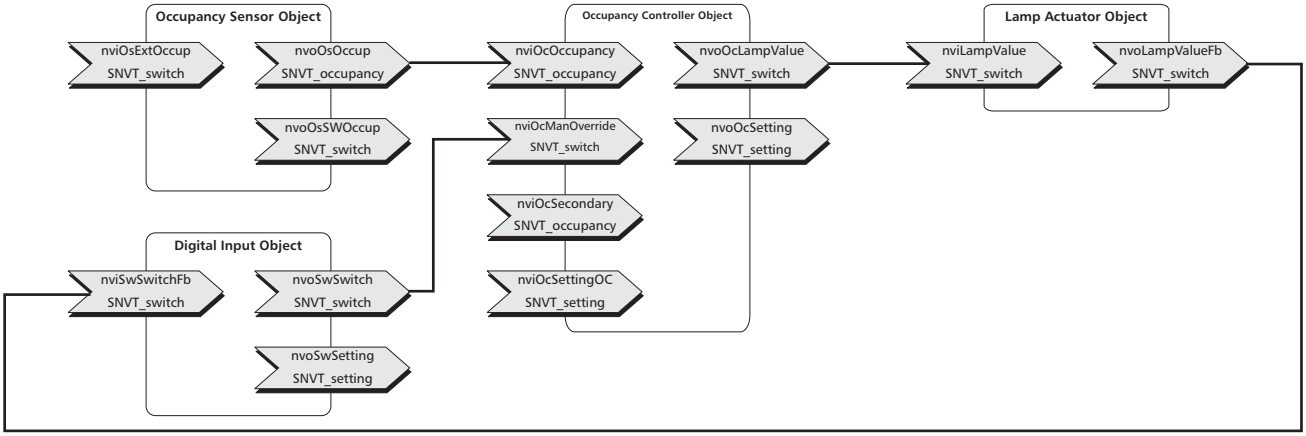
Digital Input Object:
The switching status of the potential-free digital inputs is detected and output via the variables of type SNVT_switch and SNVT_setting, depending on the configuration (UCPTdiConfig).
The ***SNVT_switch***-variable can make an absolute light value available to the light controller for manual override or transmit the status of a window contact respectively a dew point detector to the temperature controller. By ***SNVT_setting*** the Occupancy Controller or the Constant Light Controller can be activated respectively deactivated. The digital inputs can take over the functions standard I/O, toggle, dim or automatic. By ***SCPTmaxOut*** the maximum output value of the SNVT_switch variable can be limited.

Application Examples:

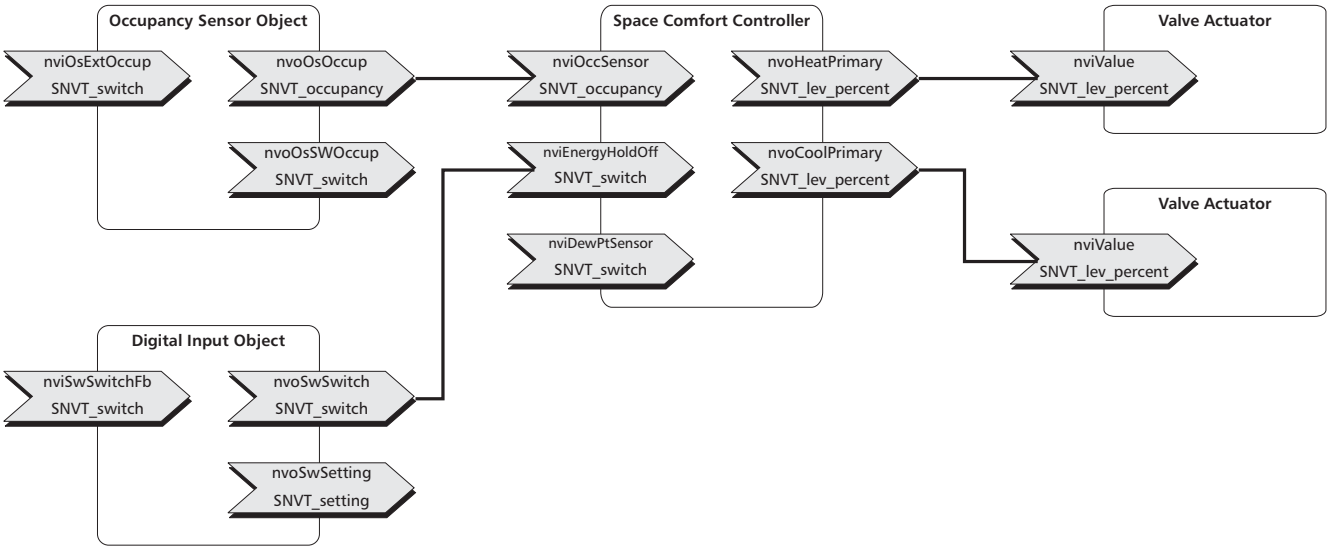
Occupancy Sensor:
Logical OR-circuit link of 2 occupancy detections and a direct light control



Occupancy Controller:
Switching of the lighting depending on movement by manual override via buttons with toggel function



Space Comfort Controller:
Set point selection depending on the room occupancy and evaluation of a window contact at the digital input



Constant Light Controller:

Notice for calibration and installation:

1. Light Sensor: The calibration of the light should be made without any artificial light and with a blind position typical for the room. The light intensity is thus measured at the working surface by a reference device and entered as a configuration property value in the parameter ***SCPTfieldCalib.***

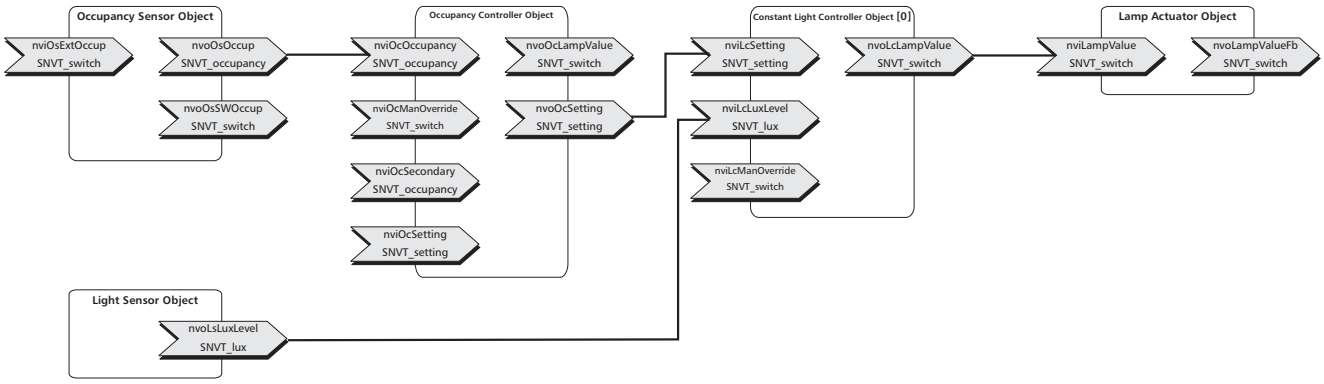
2. Constant Light Controller: As the sensitiviy of the light sensor compared to artificial light is among others depending on the light source, the location of the sensor and the reflection characteristics of a room, the sensitivity of the configuration parameter must be dertermined by the configuration parameter ***UCPTlightRatio.***

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

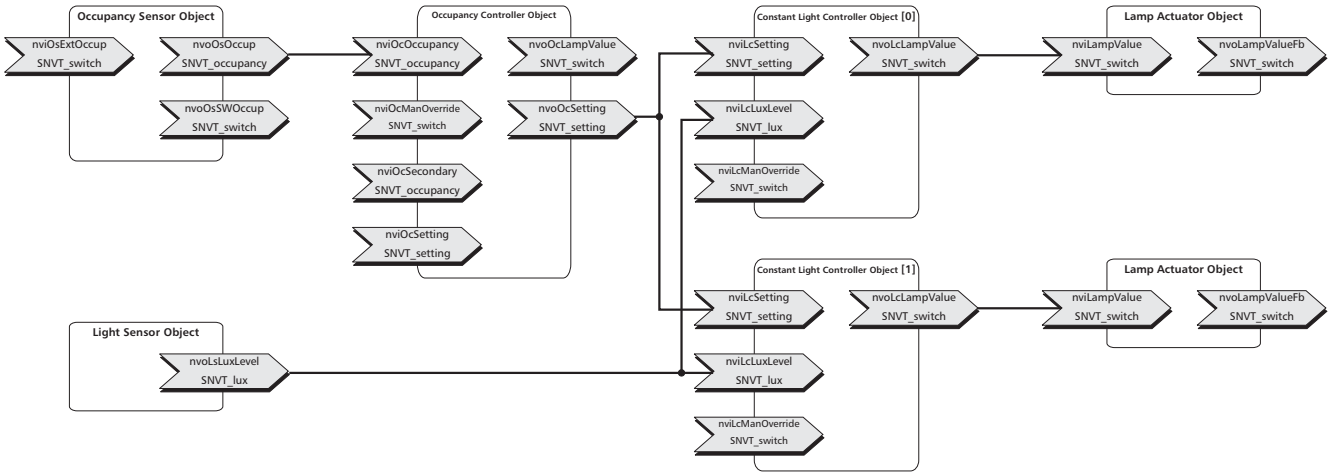
UCPTlightRatio.divisor: Light intensity with 100 % artificial light, measured by the multi-sensor MDS LON1.

The determinations of the values must be made with a well darkened room, if possible without any daylight. The artificial light should be switched to its maximum value with 100%.

Constant light control of a lighting group with activation via occupancy controller



Occupancy detector depending on brightness for switching two lighting groups with activation via occupancy controller



Node Object

The Node Object supervises and controls the functions of the individual objects in a device. The basic functionality required by the LonMark® is supported.

Variables Node Object:

nviRequest

SNVT Type: SNVT_obj_request, Index 92
Function: Input variable including the functions RQ_NORMAL, RQ_UPDATE_STATUS and RQ_REPORT_MASK.

nvoStatus

SNVT Type: SNVT_obj_status, Index 93
Function: Output variable including the requested status bits „invalid_id“ and „invalid_request“.

nvoFileDirectory

SNVT Type: SNVT_address, Index 114
Function: The output variable makes the address data of the configuration parameter in the device available to the LON integration tool.

Configuration Property Node Object:

SCPTlocation

SCPT Index: 17, SNVT_str_asc
Function: Additional input option to store information on the location of the device.

Light Sensor Object

The object includes the functions for measuring the light intensity and data output.

Output Variables Light Sensor Object:

nvoLsLuxLevel

SNVT Type: SNVT_lux, Index 79
Function: Output variable for the measured light intensity in lux. Data output is made depending on the configuration property ***SCPTminSendTime***, ***SCPTmaxSendTime*** and ***SCPTminDeltaLevel*** and 1,5s- 4s after reset.

Configuration Properties Light Sensor Object:

SCPTfieldCalib

SCPT Index: 90, SNVT_lux
Function: Configuration property for self-calibration of the light sensor. By means of an external luxmeter the precise light intensity can be determined and input. The reflection factor is automatically calculated and the measuring value as well as the measuring range end value are corrected, accordingly.
!! Calibration should be made without artificial light and in a blind position typical for the room.
!! The calibration value is only allowed to be input if the sensor is directly connected to the network,
!! as otherwise the correction value won't be calculated.
(Preset value Wert: 0 Lux ==> Field Calibration deactivated)

SCPTmaxSendTime

SCPT Index: 49, SNVT_time_sec
Function: Heartbeat function. Stipulates the interval time, after which the output variables are sent indendently of a value change. By the input value = 0 the heartbeat function is deactivated. (Preset value: 60 sec.)

SCPTminSendTime

SCPT Index: 52, SNVT_time_sec
Function: Stipulatest the smallest update interval of the output variable. An update is made after expiration of ***SCPTminSendTime***, if the light value has changed by at least ***SCPTminDeltaLevel***. By input values = 0, the „Minsend“-function is deactivated. (Preset value: 1 sec.)

SCPTminDeltaLevel

SCPT Index: 88, SNVT_lev_cont
Function: If the light intensity has changed by the adjusted value ***SCPTminDeltaLevel*** (% of the measuring range), the new light values are transmitted. The function is depending on the adjustment ***SCPTminSendTime***. (Value range: 0 % - 100 %; Preset value: 2,5 %)

Occupancy Sensor Object

Input Variables Occupancy Sensor Object:

nviOsExtOccup

SNVT Type: SNVT_switch, Index 95
Function: Input variable for external occupancy detector (e.g. logical OR circuit link of several occupancy sensors). By nviOsExtOccup =100.0 1 the output variables are set to OC_OCCUPIED respectively 100,0 1. With other values, the output variables are set back after expiration of the delay time ***SCPTdebounce.*** The internal IR-occupancy sensor is logical OR circuit linked with the control via ***nviOsExtOccup.***

nviOsSensitivity

SNVT Type: SNVT_switch, Index 95
Function: By ***nviOsSensitivity*** = 0,0 0 the sensitivity of the occupancy detector can be reduced. Initialization value after reset: ***nviOsSensitivity*** = 100,0 1, i.e. high sensitivity.

Output Variable Occupancy Sensor Object:

nvoOsOccup

SNVT Type: SNVT_occupancy, Index 109
Function: Output variable occupancy detector. It is set as soon as an internal or external movement is recognised. The reset is made after expiration of the delay time ***SCPTdebounce***. Data output is made depending on the configuration properties ***SCPTdebounce*** and ***SCPTmaxSendTime***.
Modul-Reset: For the first 60 sec. after reset (initialization phase of the occupancy detector) no data transmission is made and nvoOccup receives the value OC_UNOCCUPIED.

nvoOsSWOccup

SNVT Type: SNVT_switch, Index 95
Function: Output variable occupancy detection. Is sent parallel with nvoOsOccup. This variable can be evaluated by another occupancy detector as an „external occupancy detection“, or can directly drive a lighting group.

Configuration Property Occupancy Sensor Object:

SCPTmaxSendTime

SCPT Index: 49, SNVT_time_sec
Function: Heartbeat function. Stipulates the interval time after which the output variables are sent independently of a result change. By the input value = 0, the heartbeat function is deactivated. (Preset value: 120 sec)

SCPTdebounce

SCPT Index: 139, SNVT_time_sec
Function: Time delay for the resetting the output variables after recognized movement. The delay timer is started after status change „movement ==> no movement“. (Preset value: 0 sec.)

UCPTgeneralCP1

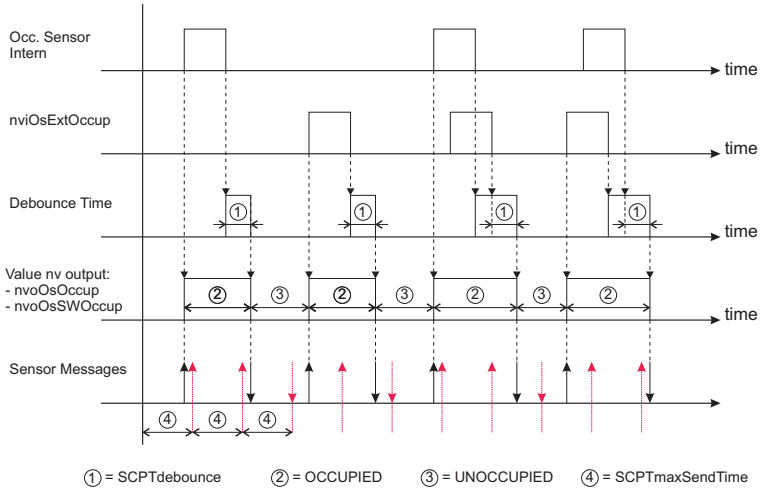
UCPT Index: 7, SNVT_state
Function: The integrated occupancy detector LED, always lights up for the time of the initialization phase. The shining of the LED with detected movement can be adjusted by ***UCPTgeneralCP1***.
UCPTgeneralCP1.bit0 = 0 ==> LED only shines in the initialisation phase of the device
UCPTgeneralCP1.bit0 = 1 ==> LED blinks additionally with detected movement

UCPTgeneralCP1 (continue)

Function: Parameter to configure the output variable nvoOcSetting of the Occupancy-Controller-Object.

UCPTgeneralCP1.bit15 = 0 ==> nvoOcSetting.function transmit SET_ON and SET_OFF (default)
UCPTgeneralCP1.bit15 = 1 ==> nvoOcSetting.function transmit only SET_OFF

Function Diagram Occupancy Sensor:



Occupancy Controller Object

By ***nvoOcLampValue*** the occupancy controller can be used as a light switch depending on movement or for switching-on/-off a connected constant light controller by ***nvoOcSetting.***

Input Variables Occupancy Controller Object:

nviOcOccupancy

SNVT Type: SNVT_occupancy, Index 109
Function: The input variable ***nviOcOccupancy*** makes the current room occupancy available to the controller and is connected with the output variable ***nvoOsOccup*** of the occupancy sensor. (Initialisation value after reset: OC_NUL)

nviOcManOverride

SNVT Type: SNVT_switch, Index 95
Function: Input variable for manual control of the lighting, independent of the variable value ***nviOcSetting***. An update of ***nviOcManOverride*** locks the controller and the output variable ***nvoOcLampValue*** takes over the values of ***nviOcManOverride***.

nviOcManOverride.state = 0 ==> nvoOcLampValue = 0.0 0
nviOcManOverride.state = 1 ==> nvoOcLampValue = nviOcManOverride

If the Occupancy Controller is deactivated by nviOcManOverride, the controller is reset again into the automatic mode after receipt of UNOCCUPIED to ***nviOcOccupancy*** and expiration of the delay time SCPTholdTime. (Initialisation value after reset: 0.0 -1)

nviOcSecondary

SNVT Type: SNVT_occupancy, Index 109
Function: Input variable of a neighbour occupancy sensor with the current room occupancy of a neighbour area. (Initialisation value after reset: OC_NULL).

nviOcSetting

SNVT Type: SNVT_setting, Index 117
Function: The input variable nviOcSetting activates respectively deactivates the controller. Initialisation status after reset: nviSettingOC.function = SET_ON

nviOcSetting.function = SET_OFF ==> Controller = OFF; nvoOcLampValue = 0.0 0 (light OFF)
nviOcSetting.function = SET_ON ==> Controller = ON;

Output Variable Occupancy Controller Object:

nvoOcLampValue

SNVT Type: SNVT_switch, Index 95
Function: Output variable for control of lighting. (see function diagram Occupancy Controller).
nvoOcLampValue.state = 0 ⟹ Lighting OFF
nvoOcLampValue.state = 1 ⟹ Lighting ON
nvoOcLampValue.value = light intensity (0 - 100 %)

Data output is made depending on the configuration property ***SCPTmaxSendTime***, upon change of the output value and 1,5s-4s after reset.

nvoOcSetting

SNVT Type: SNVT_setting, Index 117
Function: Output variable for control of a down-stream controller, e.g. constant light controller (see function diagram occupancy controller). Data output is made analog to ***nvoOcLampValue***.

nviOccupancy or nviSecondary = OCCUPIED ==> nvoSettingOC.function = SET_ON
nviOccupancy and nviSecondary = UNOCCUPIED ⟹ nvoSettingOC.function = SET_OFF

Configuration Property Occupancy Controller Object:

SCPTholdTime

SCPT Index: 91, SNVT_time_sec
Function: Time delay for setting back the output variables***nvoOcLampValue*** and ***nvoOcSetting*** after ***nviOcOccupancy*** and ***nviOcSecondary*** have taken over the status UNOCCUPIED. The delay timer is started after the status change „OCCUPIED ==> UNOCCUPIED“. (Preset value: 600,0 sec = 10 min)

SCPTprimeVal

SCPT Index: 155, SNVT_switch
Function: The configuration property ***SCPTprimeVal*** defines the output value of ***nvoLampValueOC*** if nviOcOccupancy = OC_OCCUPIED. (Preset value: 100.0 1)

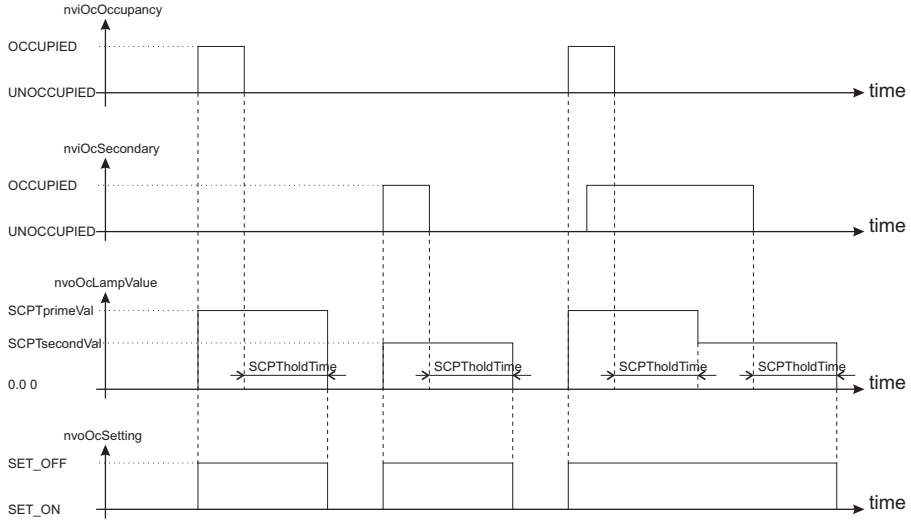
SCPTsecondVal

SCPT Index: 156, SNVT_switch
Function: The configuration property ***SCPTsecondVal*** defines the output value ***nvoLampValueOC*** if nviOccupancy = UNOCCUPIED and nviSecondary = OCCUPIED. (Preset value: 0.0 0)

SCPTmaxSendTime

SCPT Index: 49, SNVT_time_sec
Function: Heartbeat function. Stipulates the interval time after which the output variables are sent independently of a result change. By an input value = 0, the heartbeat function is deactivated. (Preset value: 120 sec.)

Function Diagram Occupancy Controller:



Constant Light Controller Object [0], [1]

Two identical objects for the control of the light intensity of a prescribed set point. By ***UCPTgeneralCP1*** the function of the constant light controller can be converted into the function of an occupancy detector depending on brightness (switching-on/-off of the lighting depending on the room occupancy and the brightness).

!! Configured as an occupancy sensor depending on brightness, both light controller objects can control and switch !! along with the light sensor of the MDS two lighting groups in a room independently of each other. !! Configured as a constant light controller, the second light controller object requires an additional light !! sensor for control.

Input Variable Constant Light Controller Object:

nviLcLuxLevel[0], [1]

SNVT Type: SNVT_lux, Index 79
Function: The input variable includes the current light intensity in the room and is connected to the output variable ***nvoLsLuxLevel*** of the light sensor.

nviLcSetting[0], [1]

SNVT Type: SNVT_setting, Index 117
Function: The input variable determines the operating status of the controller (ON or OFF) and can additionally be used for a temporary set point adjustment.

nviLcSetting.function = SET_ON: Controller = ON,i.e the output quantity for light control (nvoLcLampValue) is changed in that way, that the light intensity in the room corresponds to the set point adjusted.

nviLcSetting.function = SET_OFF: Controller =OFF and lighting OFF (nvoLcLampValue = 0.0 0)

Configuration as a constant light controller (UCPTgeneralCP1***.bit14 = 0*** and UCPTgeneralCP1***.bit15 = 0***):

nviLcSetting.function = SET_UP: Increasing of the output variable nvoLcLampValue.value by the value nviLcSetting.setting. The new light value is automatically becoming the new lighting set point.

nviSettingLC.function = SET_DOWN: Reducing of the output variable nvoLcLampValue.value by the value nviLcSetting.setting. The new light value is automatically becoming the new lighting set point.

By an udate to SET_ON the set point is reset to the basic set point SCPTluxSetpoint.

nviLcManOverride[0], [1]

SNVT Type: SNVT_switch, Index 95
Function: Input variable for manual control of the lighting. Initialization value after reset: 0.0-1.

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

An update of nviLcManOverride locks the controller and the output variable nvoLcLampValue takes over the values nviLcManOverride. By nviLcManOverride.state = -1 the controller is activated again.

nviLcManOverride.state = -1 ⟹ Light Controller ON
nviLcManOverride.state = 0, 1 and .value = 0 - 100% ==> Light Controller OFF
==> nvoLcLampValue = nviLcManOverride

Configuration for a brightness-depending switching-off of the lighting (UCPTgeneralCP1***.bit14 = 1*** and UCPTgeneralCP1***.bit15 = 0):***

By an update of nviLcManOverride = 100.0 1 the lighting is switched-on by nvoLcLampValue = 100.0 1. The lighting is switched-off depending on the measured light intensity in the room (see function diagram on page 10).

Automatic reset to value 0.0 -1, only if UCPTgeneralCP1.bit1 = 1
If ***nviLcSetting.function*** changes to ***SET_OFF*** the output variable nviLcManOverride is set to 0.0 -1.

nviLuxSetpoint[0], [1]

SNVT Typ: SNVT_lux, Index 79
Funktion: Input variable for default of a set point for light control. nviLuxSetpoint is initialized by ***SCPTluxSetpoint***.

Output Variable Constant Light Controller Object:

nvoLcLampValue[0], [1]

SNVT Type: SNVT_switch, Index 95
Function: Output variable for light control.

nvoLcLampValue.state = 0 ==> Lighting OFF
nvoLcLampValue.state = 1 ==> Lighting ON
nvoLcLampValue.value = Light intensity (0 - 100 %)

Data output is made depending on the configuration properties ***SCPTminDeltaLevel***, ***SCPTmaxSendTime*** and 1,5s- 4s after reset.

Configuration Property Constant Light Controller Object:

SCPTluxSetpoint

SCPT Index: 82, SNVT_lux
Function: Initialisation value of nviLuxSetpoint after reset. (Preset value: 500 lux)

SCPTclOffDelay

SCPT Index: 85, SNVT_time_sec
Function: Switch-off delay for lighting (nvoLcLampValue.state = 0).
If the light value exceeds the limit (SCPTluxSetpoint + SCPTonOffHysteresis/2) for the time SCPTclOffDelay, the lighting is switched-off. With a configuration as a light controller, the automatic switching-off is deactivated by ***SCPTonOffHysteresis*** = 0. (Preset value: 300,0 sec = 5 min)

SCPTclOnDelay

SCPT Index: 86, SNVT_time_sec
Function: Switching-on dealy for lighting (nvoLcLampValue.state = 1).
If the limit value (SCPTluxSetpoint - SCPTonOffHysteresis/2) is under-run for the time SCPTclOnDelay the lighting is swtiched-on. (Preset value: 0 sec)

SCPTmaxSendTime

SCPT Index: 49, SNVT_time_sec
Function: Heartbeat function. Stipulates the interval time after which the output variables are sent independtly of a result change. By the input value =0, the heartbeat function is deactivated. (Preset value: 300 sec=5).

SCPTminDeltaLevel

SCPT Index: 88, SNVT_lev_cont
Function: If the output value changes by the adjusted value SCPTminDeltaLevel, nvoLcLampValue is sent. (Value range: 0 % - 100 %; preset value: 0,5 %)

SCPTonOffHysteresis

SCPT Index: 84, SNVT_lev_cont
Function: Relative hysteresis (% of SCPTluxSetpoint) for calculation of the switching tresholds on which the lighting is switched-on respectively switched-off depending on the delay times ***SCPTclOnDelay*** and ***SCPTclOffDelay.*** With a configuration as a constant light controller, the automatic switching-off is deactivated by ***SCPTonOffHysteresis*** = 0. (Preset value: 0 %).

Automatic switching-on: nviLcLuxLevel < SCPTluxSetpoint - SCPTonOffHysteresis/2

Automatic switching-off: nvoLcLampValue.value = 0
and
nviLcLuxLevel > SCPTluxSetpoint + SCPTonOffHysteresis/2

SCPTpowerupState

SCPT Index: 87, SNVT_setting
Function: Initialisation value for operating mode of the controller after reset. (Preset value {SET_OFF,0,0})

UCPTlightRatio

UCPT Index: 11, SNVT_muldiv

Function: Configuration property for determination of the sensitivity of the light sensor compared to artificial light.
Preset value: 1000, 100

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

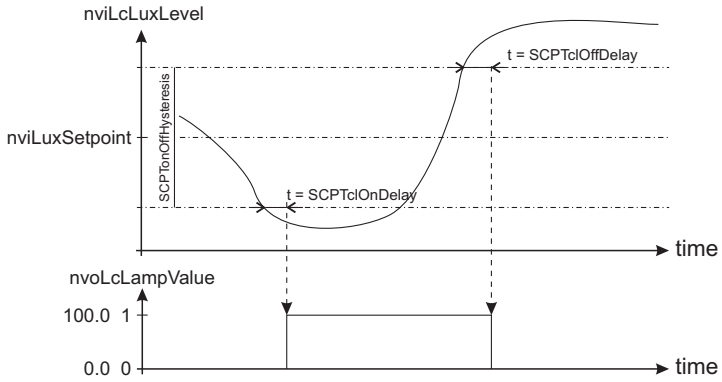
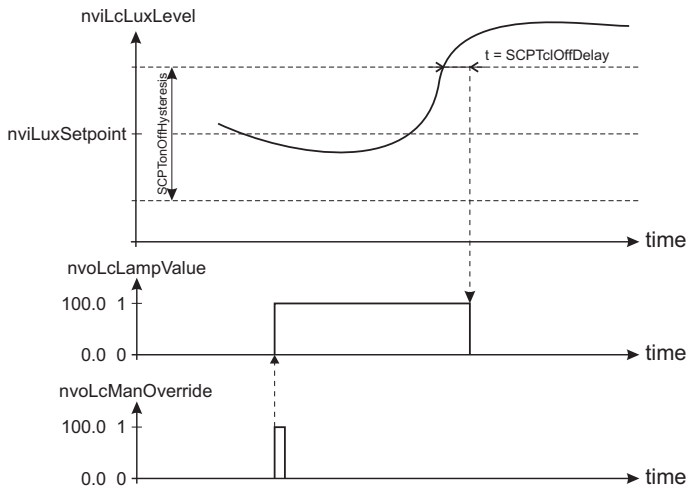
UCPTlightRatio.divisor: Light intensity with 100 % artificial light, measured by the multi-sensor MDS via ***nvoLsLuxLevel***.

!! The determination of the values must be made in a well darkened room, preferably without daylight.
!! The artificial light should be switched to its maximum value of 100%.

UCPTgeneralCP1

UCPT Index: 7, SNVT_state

Function: Configuration property for adjusting the controller functionality.
(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 (***Constant LC***) UCPTgeneralCP1.bit0 = 0: Start value nvoLcLampValue = SCPTmaxOut UCPTgeneralCP1.bit0 = 1: Start value nvoLcLamp Value=0%
0	1	Occupancy detector for light control depending on the brightness (***ON/OFF LC***) ***Function diagram:*** 
1	0	Switching-off of lighting depending on the brightness (***OFF LC***). The switching-on of the lighting is made by nviLcManOverride = 100.0 1. ***Function diagram:*** 

UCPTgeneralCP1 (continue)

Additional funtionality with UCPTgeneralCP1.bit1 (default value = 0)
UCPTgeneralCP1.bit1 = 1: nviLcManOverride is set to 0.0 -1 id nviLcSetting.function changes to SET_OFF.
UCPTgeneralCP1.bit1 = 0: nviLcManOverride can only be modified by the network.

SCPTstep

SCPT Index: 83, SNVT_lev_cont
Function: Maximum step size by which the output variable ***nvoLcLampValue.value*** is allowed to be changed by the light controller to achieve the set point adjusted. (Preset value: 10 %)

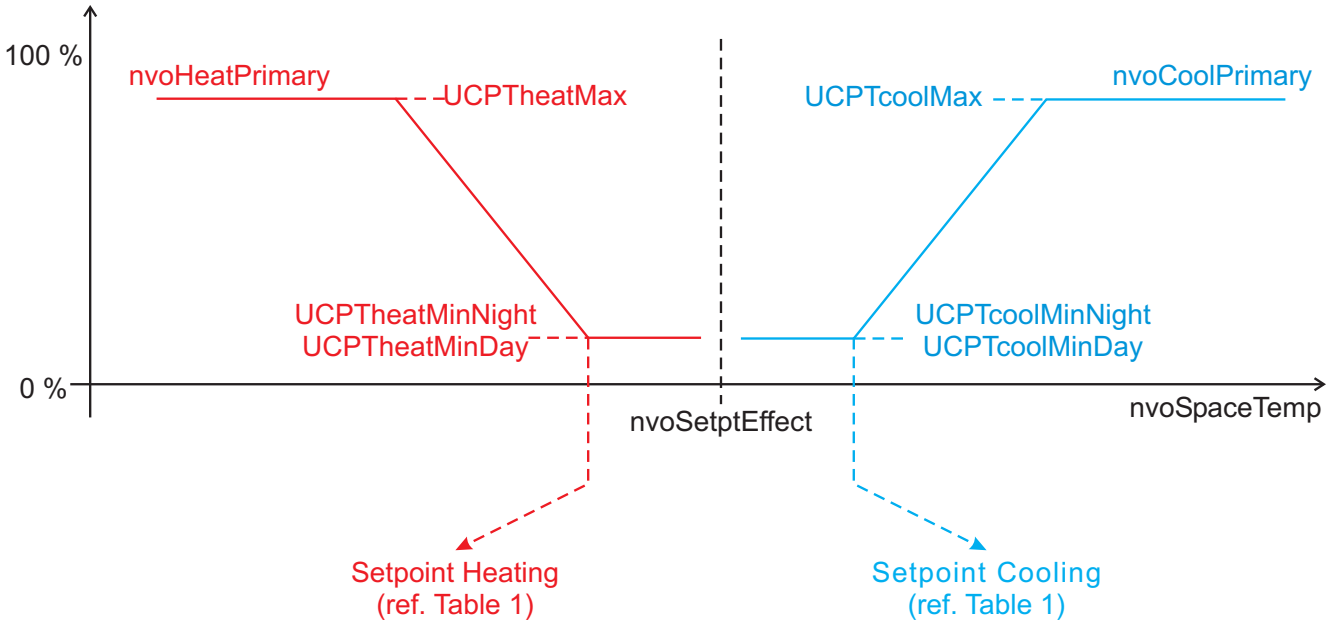
SCPTmaxOut

SCPT Index: 93, SNVT_lev_cont
Function: Configuration property for limiting the output variable ***nvoLcLampValue***, if the controller automatically changed. When having an external default via ***nviLcManOverride*** the output value of ***nvoLcLampValue*** is not limited. (Preset value: 100 %)

Space Comfort Conroller Object

The object includes the functions temperature detection and PID-control for heating and cooling. The output of the control variables is made via the network variables. The scanning time for the control variable calculation corresponds to the sending interval (SCPTmaxSendTime) of the output variables.

Function Diagram PID-Controller Heating/Cooling:



Input Variable 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 initialisation value 0x7FFF (=327,67 °C) was changed after reset by a NV-update. As long as the initialisation value is not changed after reset, the internal temperature sensor remains active!

nviApplicMode

SNVT Type: SNVT_hvac_mode, Index 108
Function: Input variable for selection of the controller operating mode.

HVAC_AUTO ⇒ automatic toggling between heating and cooling
HVAC_HEAT ⇒ only heating
HVAC_COOL ⇒ only cooling
HVAC_OFF ⇒ control switched-off

The initialization status after reset is determined by the configuration property ***SCPThvacMode.***

nviCoolPriSlave

SNVT Type: SNVT_lev_percent, Index 81
Function: Control variable for network variables ***nvoCoolPrimary*** and ***nvoCoolPWM***.
nviCoolPriSlave = 0x7FFF (163,835 %) ==> internal controller cooling ON (initialisation value after reset).
nviCoolPriSlave = 0...100 % ==> internal controller cooling OFF
==> nviCoolPriSlave determines the output variables.

!! The external override has top priority, thus also a concurrent control of the heating and cooling !! valve is possible.

nviHeatPriSlave

SNVT Type: SNVT_lev_percent, Index 81
Function: Control variable for network variable ***nvoHeatPrimary*** and ***nvoHeatPWM***.
nviHeatPriSlave = 0x7FFF (163,835 %) ==> internal controller heating ON (Initialisation value after reset)
nviHeatPriSlave = 0 ... 100 % ==> internal controller heating OFF
==> nviHeatPriSlave determines the output quantities

!! The external override has top priority, thus also a concurrent control of the heating and cooling !! valve is possible.

nviOccManCmd and nviOccSensor

SNVT Type: SNVT_occupancy, Index 109
Function: Input variable for default of the room occupancy. The current room occupancy determines the variables of the control parameters “effective set point“ and “neutral zone“ and thus the set point values for heating and cooling (see table 1). Initialisation value for both variables: OC_NUL

nviOccManCmd: Default via BCT by: OC_OCCUPIED, OC_STANDBY, OC_UNOCCUPIED

nviOccSensor: Presence message in the room by: OC_OCCUPIED, OC_UNOCCUPIED

nviOccManCmd	nviOccSensor	>>>	room occupancy nvoOccupEffect	Setpoint Heat nvoSetptEffect (nvoUnitStatus.mode = HVAC_HEAT)	Setpoint Cool nvoSetptEffect (nvoUnitStatus.mode = HVAC_COOL)
OC_NUL	OC_NUL	>>>	OCCUPIED	SCPTsetPnts.occupied_heat + nviSetptOffset **or** nviSetptOffset + nviSetpoint - (SCPTsetPnts.occupied_cool - SCPTsetPnts.occupied_heat) / 2	SCPTsetPnts.occupied_cool + nviSetptOffset **or** nviSetptOffset + nviSetpoint + (SCPTsetPnts.occupied_cool - SCPTsetPnts.occupied_heat) / 2
OC_OCCUPIED	****	>>>			
****	OC_OCCUPIED	>>>			
OC_STANDBY	OC_NUL OC_UNOCCUPIED	>>>	STANDBY	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

Table 1: Controller parameter depending on the room occupancy

nviSetpoint

SNVT Type: SNVT_temp_p, Index 105
Function: Input variable for default of the basic set point temperature .
It is obligatory necessary to bind these network variables with a higher node. If no update is made for nviSetpoint, the initialisation value 0x7FFF (=327,67°C) is maintained and the values of the configuration properties SCPTsetPnts are used for the calculation of the effective set point (basic set point + Offset). If ***nviSetpoint*** receives an udate with a valid set point, the effective set point 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 the offset of the basic set point temperature in the mode OCCUPIED or STANDBY (see table 1).

nviEnergyHoldOff

SNVT Type: SNVT_switch, Index 95
Function: Input variable of e.g. window or door contact for activation of the energy-saving function. By nviEnergyHoldOff = 100.0 1 the function is activated and the control variables heating/cooling are set back to their minimum values. With an active energy-saving function the antifreeze function is switched-on (seeUCPTspAntiFreez). After deactivation of the energy-hold-off function the temperature control is started new.

nviDewPtSensor

SNVT Type: SNVT_switch, Index 95
Function: Input variable for evaluation of a dew point detector in the operating mode cooling. By nviDewPtSensor = 100.0 1 the control variable cooling is reset to its minimum value. After deactivation of this function, the temperature control is started anew.

Output Variable Space Comfort Controller Object

nvoSpaceTemp

SNVT Type: SNVT_temp_p, Index 105
Function: Output variable for the measured temperature value. Measuring range 0-50°C, resolution 1/100 °C. Data output is made depending on ***SCPTmaxSendTime*** and 1,5s- 4s after reset.

nvoUnitStatus

SNVT Type: SNVT_hvac_status, Index 112
Function: Output variable for operating mode and the control variables heating/cooling of the controller.

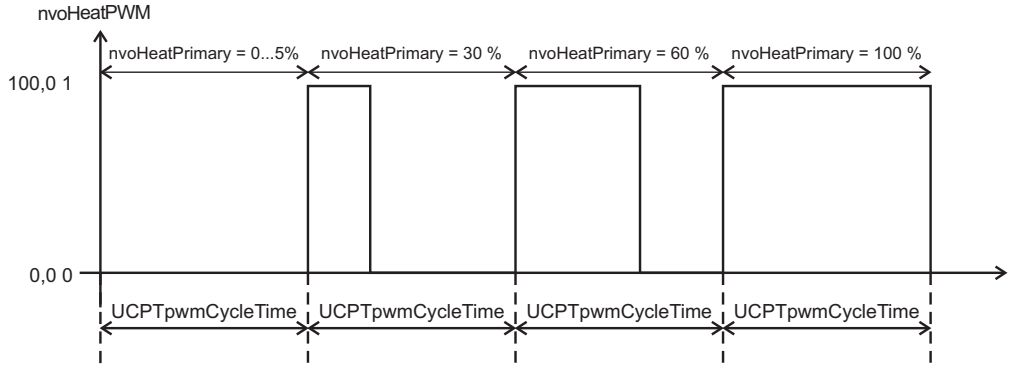
.mode =	HVAC_HEAT	==>	heating
	HVAC_COOL	==>	cooling
	HVAC_OFF	⟹	controller switched-off
.heat_output_primary	0...100 %	⟹	control variable heating
.cool_output_primary	0...100 %	⟹	control variable cooling

nvoHeatPrimary

SNVT Type: SNVT_lev_percent, Index 81
Function: Output variable including the control variable of the PID-controller for heating to control a continuous actuator. Data output is made depending on ***SCPTmaxSendTime*** and 1,5s- 4s after reset.

nvoHeatPWM

SNVT Type: SNVT_switch, Index 95
Function: Output variable including the control variable of the PID-controller for heating to control a thermic two-point actuator pulse width modulated. Data output is made immediately with a waiting switch command and otherwise depending on ***SCPTmaxSendTime*** and 1,5s- 4s after reset.



nvoCoolPrimary

SNVT Type: SNVT_lev_percent, Index 81
Function: Output variable including the control variable of the PID-controller for cooling. Data output is made analog to ***nvoHeatPrimary***.

nvoCoolPWM

SNVT Type: SNVT_switch, Index 95
Function: Output variable including the control variable of the PID-controller for heating for a pulse width modulated control of a thermic two-point actuator. Data output is made analog to ***nvoHeatPWM***.

nvoSetptEffect

SNVT Type: SNVT_temp_p, Index 105
Function: The output variable sends the set point used by the control algorithm. Output is depending on the operating mode of the controller:
nvoUnitStatus.mode = HVAC_HEAT ==> nvoSetptEffect = setpoint heating
nvoUnitStatus.mode = HVAC_Cool ==> nvoSetptEffect = set point cooling

The effective set point is calculated depending on ***nviSetpoint***, ***nviOccManCmd***, ***nviOccSensor***, ***SCPTsetPnts*** and ***nviSetptOffset*** (see table 1). Data output is made depending on ***SCPTmaxSendTime***, upon value change and 1,5s- 4s after reset.

nvoSetptOffset

SNVT Type: SNVT_temp_p, Index 105
Function: Output variable for set point correction, which can be prescribed by ***nviSetptOffset.*** Data output is made analog to ***nvoSetptEffect***.

nvoOccupEffect

SNVT Type: SNVT_occupancy, Index 109
Function: Output variable for effective room occupancy (see table 1). Data output is made depending on ***SCPTmaxSendTime***, upon value change and 1,5s- 4s after reset.

nvoEnergyHoldOff

SNVT Type: SNVT_switch, Index 95
Function: Output variable for status message of the energy-saving function.

nvoEnergyHoldOff = 0.0 0 ⇒ window contact inactive
nvoEnergyHoldOff = 100.0 1 ⇒ window contact active

Data output is made depending on ***SCPTmaxSendTime***, upon value change and 1,5s- 4s after reset.

nvoDewPtSensor

SNVT Type: SNVT_switch, Index 95
Function: Output variable for status message of the dew point detector.

nvoDewPtSensor = 0.0 0 ⇒ dew point detector inactive
nvoDewPtSensor = 100.0 1 ⇒ dew point

Data output is made depending on ***SCPTmaxSendTime***, upon and 1,5s- 4s after reset.

Configuration Parameter Space Comfort Controller Object - General:

SCPThvacType

Index: 169, SNVT_hvac_type
Function: Configuration property for identification of a controller type.
Preset value: nciHvacType = HVT_GENERIC

SCPThvacMode

Index: 74, SNVT_hvac_mode
Function: The configuration property determines the initialisation status of the input variable *nviApplicMode* and thus also the start configuration of the temperature controller. Preset value: HVAC_AUTO

SCPTmaxSendTime

Index: 49, SNVT_time_sec
Function: The configuration property defines the interval time for the calculation of new control variables for the temperature control and the sending time of the output variable. By input values = 0, data output is deactivated. (Preset value: 30 s)

SCPTtempOffset

Index: 272, SNVT_temp_diff_p
Function: Offset for the temperature value. By this parameter a software calibration is possible.

SCPTnumValves

Index: 59, SNVT_count
Function: The configuration property is designed for the selection of 2 or 4 tube systems. If a 2 tube system is operated (1 valve), the output variables including the control variables for heating and cooling receive the same values.

SCPTnumValves = 1: ==> 2-tube-system
Mode heating: nvoHeatPrimary = nvoCoolPrimary = control variable heating
Mode cooling: nvoHeatPrimary = nvoCoolPrimary = control variable cooling

SCPTnumValves = 2: ==> 4-tube-system (standard value)
Mode heating: nvoHeatPrimary = control variable heating
Mode cooling: nvoCoolPrimary = control variable cooling

UCPTpwmCycleTime

Index: 35, SNVT_time_min
Function: The configuration property determines the cycle time for a pulse width modulated control of the control variables by ***nvoHeatPWM*** and ***nvoCoolPWM***. (Preset value: 15 min)

Configuration Property Space Comfort Controller Object - Set Point:

SCPTsetPnts

Index: 60, SNVT_temp_setpt
Function: Configuration property for default of the set points for heating and cooling depending on the room occupancy. By nviSetpoint the values can be overwritten by nvoOccupEffect = OCCUPIED respectively STANDBY.
When having nvoOccupEffect = UNOCCUPIED, nviSetpoint is not considered, however.

Preset values:

.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: Set point for heating for antifreeze function with window contact opened, i.e. with an active energy-saving function. (Preset value: 10°C).

Configuration Property Space Comfort Controller Object - PID-Controller Heating:

UCPTheatXp

Index: 19, SNVT_temp_p
Function: Parameter for adjusting the proportional range. By UCPTheatXp = 0 the controller for heating is deactivated. (Preset value: 4K, range: 0-10 K)

UCPTheatTn

Index: 20, SNVT_time_min
Function: Parameter for adjusting the reset time of I-proportion (scanning time Ta= SCPTmaxSendTime). By input values = 0, the I-proportion is deactivated. (Preset value: 100 min)

UCPTheatTv

Index: 21, SNVT_time_min
Function: Parameter for adjusting the lead time of the D-proportion (scanning time Ta = SCPTmaxSendTime). By input values = 0 the D-proportion is deactivated. (Preset value: 0 min)

UCPTheatMinNight

Index: 26, SNVT_lev_percent
Function: Control variable limit downwards in the operation mode UNOCCUPIED. (Preset value: 0 %)

UCPTheatMinDay

Index: 27, SNVT_lev_percent
Function: Control variable limit downwards in the operation mode OCCUPIED and STANDBY. (Preset value: 0 %)

UCPTheatMax

Index: 28, SNVT_lev_percent
Function: Control variable limit upwards.(Preset value: 100 %)

Configuration Property Space Comfort Controller Object - PID-Controller Cooling:

UCPTcoolXp

Index: 22, SNVT_temp_p
Function: Parameter adjusting the proportional range. By UCPTheatXp = 0 the controller for heating is deactivated. (Preset value: 4 K, range: 0-10 K)

UCPTcoolTn

Index: 23, SNVT_time_min
Function: Parameter for adjusting the reset time of the I-proportion (scannin time Ta = SCPTmaxSendTime). By input values = 0, the I-proportion is deactivated. (Preset value: 100 min)

UCPTcoolTv

Index: 24, SNVT_time_min
Function: Parameter for adjusting the lead time of the D-proportion (scanning time Ta = SCPTmaxSendTime). By input values= 0, the D-proportion is deactivated. (Preset value: 0 min)

UCPTcoolMinNight

Index: 29, SNVT_lev_percent
Function: Control variable limit downwards in the operation mode UNOCCUPIED. (Preset value: 0 %)

UCPTcoolMinDay

Index: 30, SNVT_lev_percent
Function: Control variable limit downwards in the operation mode OCCUPIED and STANDBY. (Preset value: 0 %)

UCPTcoolMax

Index: 31, SNVT_lev_percent
Function: Control variable limit upwards.(Preset value: 100 %)

Digital Input Object

The status of the potential-free digital input is detected and output by the output variables type SNVT_switch and SNVT_setting, depending on the configuration (UCPTdiConfig), whereas with SNVT_switch an absolute light value for manual override is sent and the occupancy controller or the constant light controller is activated respectively deactivated by SNVT_setting.

Input Variable Digital Input Object: nviSwSwitchFb

SNVT Type: SNVT_switch, Index 95
Function: Input variable for current status of the light groups controlled by nvoSwSwitch.

Output Variable Digital Input Object: nvoSwSwitch

SNVT Type: SNVT_switch, Index 95
Function: Depending on the configuration ***UCPTdiConfig*** the output variables send the current switch status of the digital input (active/inactive) or values for manual light control.

Standard I/O:

Potential-free contact ***active***	⇒	nvoSwSwitch.state = 1 nvoSwSwitch.value = SCPTmaxOut
Potential-free contact ***inactive***	⇒	nvoSwSwitch = 0.0 0

Toggle:

Toggle ***inactive*** ==> ***active***	⇒	Each button actuation results in toggling of the variables between ON and OFF. Lighting ON: nvoSwSwitch.state = 1, nvoSwSwitch.value = SCPTmaxOut Lighting OFF: nvoSwSwitch1/2 = 0.0 0

Dim:

Toggle ***nicht aktiv*** ==> ***aktiv***	==>	Short button actuations (< 1 s) lead to a toggling of the current light status. By longer button acutations (> 1 s) the dim function is activated, i.e. based on the current light status, the.value-value of the variable is increaded or reduced in ***SCPTstepValue*** - steps, as long as the button is pressed. Lighting ON (max.): nvoSwSwitch.state = 1, nvoSwSwitch.value=SCPTmaxOut Lighting ON (50%): nvoSwSwitch1/2 = 50.0 1 Lighting OFF: nvoSwSwitch1/2 = 0.0 0

Command Automatic:

Toggle ***inactive*** ==> ***active***	==>	Upon button actuation the output variable nvoSwSwitch is sent with the value 0.0 -1. Thus, a connected light controller can be switched into the automatic mode.

The output variables are output after change of the output values, after expiration of the heartbeat time (SCPTmaxSendTime) and 1,5s- 4s after module reset.

nvoSwSetting

SNVT Type: SNVT_setting, Index 117
Function: Output variable for manual controll of the operating status of a light controller. It is possible to switch the controller on or off and to change the set point. This function can also be configured by ***UCPTdiConfig.***

StandardI/O:

Potential-free contact ***active***	⇒	nvoSwSetting.function = SET_ON controller ON
Potential-free contact ***inactive***	⇒	nvoSwSetting.function = SET_OFF controller OFF

Toggle:

toggle ***inactive*** ==> ***active*** ==> Each button actuation results in a toggling of the variables between the values

nvoSwSetting.function = SET_ON controller ON
nvoSwSetting.function = SET_OFF controller OFF

Dim:

Change open ==> close ==> Short button actuations (< 1 s) lead to a toggling between SET_ON and SET_OFF. By longer button acutations (> 1 s) the dim function is deactivated and the set point of the controller is changed to ***SCPTstepValue*** (sending interval 400 ms):

nvoSwSetting.function = SET_UP / SET_DOWN
nvoSwSetting.setting = nciSwStepValue

Configuration Property Digital Input Object:

SCPTmaxOut

SCPT Index: 93, SNVT_lev_cont
Function: Configuration property for limiting the output value of the output variable nvoSwSwitch.value. (Preset value: 100 %)

SCPTmaxSendTime

SCPT Index: 49, SNVT_time_sec
Function: Heartbeat interval. After expiration of the time SCPTmaxSendTime the digital input is inquired and the output variables are up-dated.
By input values = 0 the heartbeat function is deactivated. (Preset value: 0)

SCPTstepValue

SCPT Index: 92, SNVT_lev_cont
Function: By ***SCPTstepValue*** the step size of the output variable ***nvoSwSwitch.value*** by which the values of the dim function can be changed. When using SNVT_setting, ***SCPTstepValue*** determines the value of nvoSettingSW.setting. (Preset value: 5 %)

UCPTdiConfig

UCPT Index: 44, UNVT_str_hex4
Function: By ***UCPTdiConfig*** the digital inputs can be configured for the functions Standard I/O, Toggle, Dim or „Command Automatic“. (Preset value: 0,0,0,0)

Konfiguration des digitalen Eingangs mit UCPTdiConfig			
Funktion		Öffner / Schließer	
Byte[0]	Beschreibung	Byte[1]	Beschreibung
0	aktiv / nicht aktiv	0	Schließer-Kontakt
1	Licht Toggle	1	Öffner-Kontakt
2	Licht Toggle mit Dimmen		
3	Befehl Automatik (= 0.0 –1)		

General Notice:

Service Pin Message

As long as the device is unconfigured, the Service Pin Message can be generated without actutation of the service pin. Thus, it is possible to comfortably commission an installed and connected device. If the light sensor recognises 3 times in a row a change from dark ==> bright in the status unconfigured, the service pin message is sent. The limit dark/bright amounts to 800 lux. The status change dark ==> bright can be produced by means of a pocket lamp, whereas the impulse time for bright respectively dark amounts to approx. 3 s. each.