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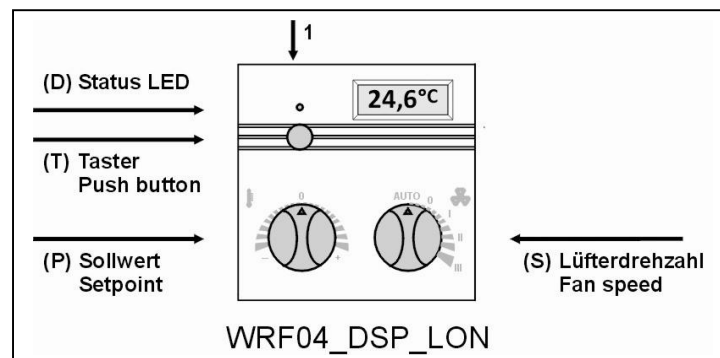# EN – Software Description
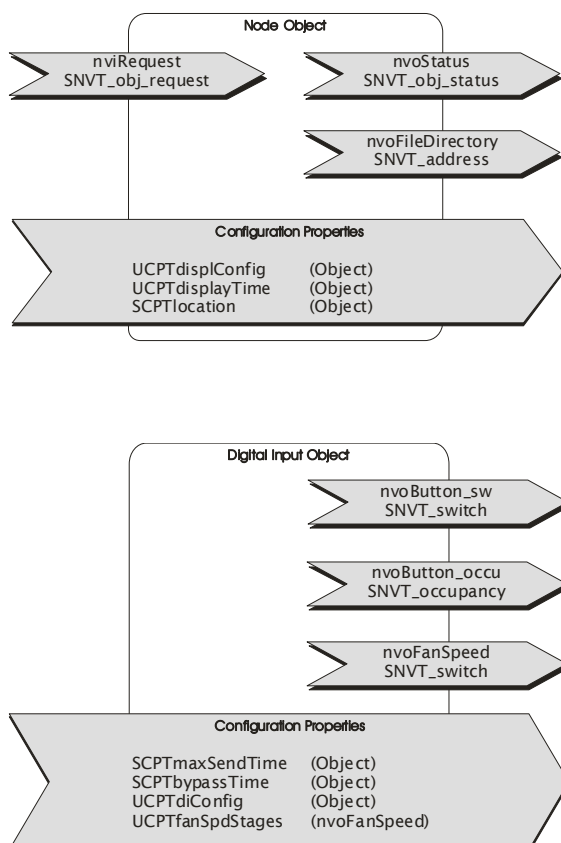Subject to technical alteration
Version 02.02.09

379298   WRF04_LCD_FTT_LON
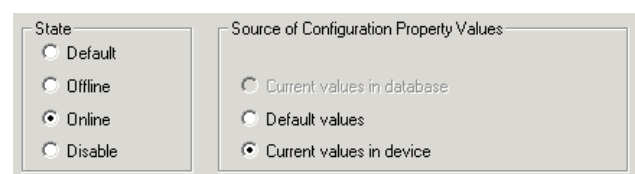# with operating elements and display

WRF04_DSP_LON

(D) Status LED
(T) Taster Push button
(P) Sollwert Setpoint
(S) Lüfterdrehzahl Fan speed

1 Overview

Application wrf04_lcd_01   ID: 9F FF AD 0A 00 06 04 16

Node Object

nviRequest SNVT_obj_request

nvoStatus SNVT_obj_status

nvoFileDirectory SNVT_address

Configuration Properties

UCPTdisplConfig	(Object)
UCPTdisplayTime	(Object)
SCPTlocation	(Object)

Digital Input Object

nvoButton_sw SNVT_switch

nvoButton_occu SNVT_occupancy

nvoFanSpeed SNVT_switch

Configuration Properties

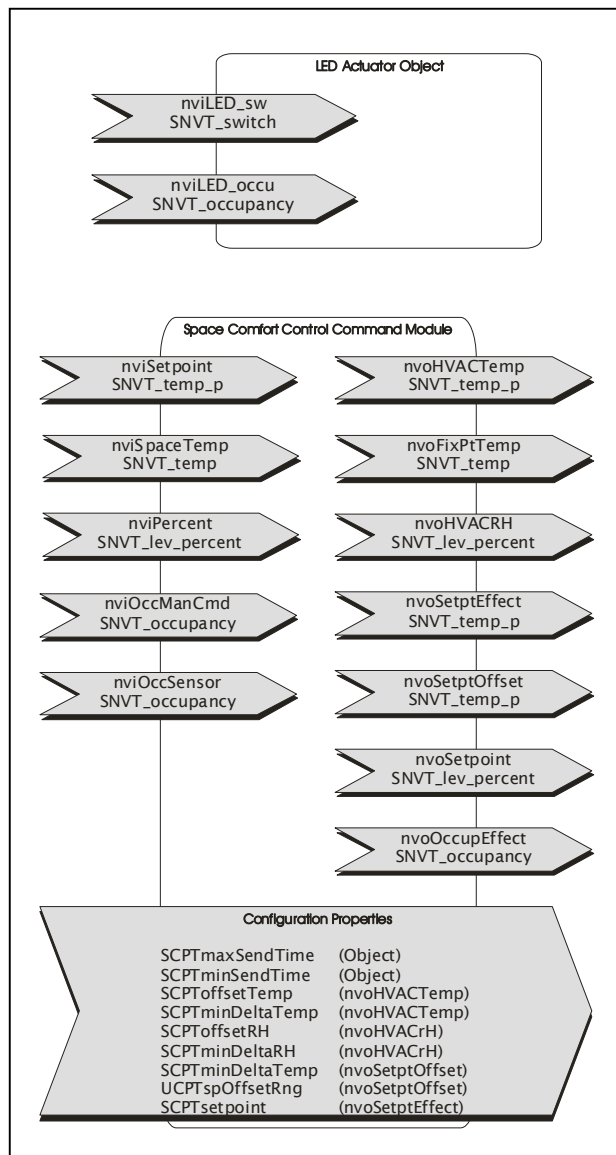|	
SCPTmaxSendTime	(Object)
SCPTbypassTime	(Object)
UCPTdiConfig	(Object)
UCPTfanSpdStages	(nvoFanSpeed)

The standard application for the sensors type WRF04_LCD_FTT_LON with operating elements includes functions for the interpretation of the operating elements and control of LEDs. The application considers the latest LonMark® defaults.

The application uses standard network variables (SNVT) and standard configuration properties (SCPT). For extended adjustment possibilities user configuration properties (UCPT) are used. The UCPTs used are defined in the **Thermokon Device Resource Files from Version 1.6** or higher and should be installed to the PC before making up the device defaults by the installation tool.

Temperature detection: The measurement is made by an inside sensor. Alternatively, the temperature can be defined via *nviSpaceTemp* by an external LON temperature sensors. The values are output by the network variables *nvoHVACTemp* and *nvoFixPtTemp*.

‼ **The temperature sensor is calibrated by the**
‼ **parameter SCPTtempOffset during production.**
‼ **Thus, the device specific values adjusted**
‼ **must be taken over when integrating the**
‼ **device into the LON network.**

Example LonMaker:

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LED Actuator Object

nviLED_sw
SNVT_switch

nviLED_occu
SNVT_occupancy

Space Comfort Control Command Module

nviSetpoint SNVT_temp_p	nvoHVACTemp SNVT_temp_p
nviSpaceTemp SNVT_temp	nvoFixPtTemp SNVT_temp
nviPercent SNVT_lev_percent	nvoHVACRH SNVT_lev_percent
nviOccManCmd SNVT_occupancy	nvoSetptEffect SNVT_temp_p
nviOccSensor SNVT_occupancy	nvoSetptOffset SNVT_temp_p
	nvoSetpoint SNVT_lev_percent
	nvoOccupEffect SNVT_occupancy

Configuration Properties

SCPTmaxSendTime	(Object)
SCPTminSendTime	(Object)
SCPToffsetTemp	(nvoHVACTemp)
SCPTminDeltaTemp	(nvoHVACTemp)
SCPToffsetRH	(nvoHVACrH)
SCPTminDeltaRH	(nvoHVACrH)
SCPTminDeltaTemp	(nvoSetptOffset)
UCPTspOffsetRng	(nvoSetptOffset)
SCPTsetpoint	(nvoSetptEffect)

Humidity Measurement (if available): Humidity detection is made by an inside sensor. Alternatively, the humidity can be defined via *nviPercent* by an external LON humidity sensor. The corresponding value is output by the network variable *nvoHVACRH* .

Setpoint adjustment: The set point correction can be raised or lowered in a range of *UCPTspOffsetRng* by the regulator. The output of the offset value is made by *nvoSetptOffset*.
The effective set point *nvoSetptEffect* is calculated in reliance of the input variable to the room occupancy (*nviOccManCmd* and *nviOccSensor*) and of the set point defaults via *SCPTsetpoint* respectively *nviSetpoint* and the adjusted set point offset.
Additionally, the position of the regulator is output in percent (0-100%) along with the output variable *nvoSetpoint* .

LED: One LED can be controlled via the input variables SNVT_switch, SNVT_occupancy or SNVT_state.

Button: Depending on the device type one button can be output via the output variables SNVT_switch, SNVT_occupancy or SNVT_state. The functions of the button can be configured and adjusted by the property *UCPTdiConfig* and *SCPTbypassTime* .

Adjustment of fan speed stages: The position of the regulator is output by the variables *nvoFanspeed* . The adaption to an one-/two-/ three stage rotary switch is made by the configuration property *UCPTfanSpdStages*.

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2 Node Object

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

2.1 Input Variable 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.

2.2 Output Variable Node Object

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 property in the device available for the LON integration tool.

2.3 Configuration Property Node Object

UCPTdisplayTime
UCPT Index: 16, SNVT_time_sec
Function: This configuration property defines the time of a display or the update interval of the display. (Preset value: 10,0 sec.)

UCPTdisplConfig
UCPT Index: 46, SNVT_state
Function: By UCPTdisplConfig the display can be configured. If several measuring values are shown, the display toggles between the measuring values in the time interval *UCPTdisplayTime.*
UCPTdisplConfig.bit[0] = 1* ==› display **room temperature**
UCPTdisplConfig.bit[0] = 0 ==› do not display **room temperature**
UCPTdisplConfig.bit[1] = 1 ==› display **humidity value**
UCPTdisplConfig.bit[1] = 0* ==› do not display **humidity value**
UCPTdisplConfig.bit[2] = 1 ==› display **humidity set point****
UCPTdisplConfig.bit[2] = 0* ==› do not display **humidity set point**
UCPTdisplConfig.bit[3] = 1 ==› display **temperature set point**
UCPTdisplConfig.bit[3] = 0* ==› do not display **temperature set point**
UCPTdisplConfig.bit[4] = 1 ==› display **set point temperature absolute**
UCPTdisplConfig.bit[4] = 0* ==› display **set point temperature offset**
UCPTdisplConfig.bit[5] = 1 ==› display **change of set point temperature absolute**
UCPTdisplConfig.bit[5] = 0* ==› display **change of set point temperature offset**
UCPTdisplConfig.bit[6] = 1* ==› **°C is the unit of measure** for the temperature display
UCPTdisplConfig.bit[6] = 0 ==› **°F is the unit of measure** for the temperature display
UCPTdisplConfig.bit[7] = 1* ==› **humidity display** with %RH
UCPTdisplConfig.bit[7] = 0 ==› **humidity display** only with %, without RH

   * = preset values

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** If the display of the humidity set point is activated, the poteniometer is automatically assigned to the humidity set point. nvoSetptEffect is only determined by nviSetpoint or SCPTsetpoint and the setting property UCPTdisplConfig.bit[5] (change of set point temperature…) has no meaning.

SCPTlocation
SCPT Index: 17, SNVT_str_asc
Function: Additional input option to save information about the location in the device.

3 Space Comfort Control Command Module
Object for temperature detection, set point adjustment and for detection of the effective room occupancy.

3.1 Input Variable Space Comfort Control Command Module

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) is changed by a NV-update after reset. As long as the initialization vale is not changed after reset, the internal temperature sensor remains active.

nviPercent
SNVT Type: SNVT_lev_percent, Index 81
Function: Via this input variable a percentage can be predefined, e.g. the relative humidity of the ambient air. The external value is taken over, if the initialization value 0x7FFF (=163,830%) is changed by a NV-update after reset. As for the type with integrated humidity sensor, the internal sensor remains active, as long as the initialisation value is not changed after reset.

nviSetpoint
SNVT Type: SNVT_temp_p, Index 105
Function: Input variable for default of the set point temperature. It is not obligatory necessary to bind this network variable with a superior node. If no update is made for *nviSetpoint*, the initialization value 0x7FFF (=327,67°C) is maintained and the value of the configruation property *SCPTsetpoint* is used for the calculation of the effective set point. If no update with a valid set point is made for *nviSetpoint*, the effective set point can be calculated by the value of the input variable.

nviOccManCmd and nviOccSensor
SNVT Type: SNVT_occupancy, Index 109
Function: Input variable for default of the room occupancy. The current room occupancy affects the calculation of the effective set point *nvoSetptEffect* (see table 1) and is made available to an external temperature controller by *nvoOccupEffect* initialization value for both variables: OC_NUL

  nviOccManCmd (default via Operator Work Station): OC_OCCUPIED, OC_STANDBY, OC_UNOCCUPIED

nviOccSensor (presence detection in rooms): OC_OCCUPIED, OC_UNOCCUPIED

nviOccManCmd	nviOccSensor	>>>	nvoOccupEffect	nvoSetptEffect
OC_NUL	OC_NUL	>>>	OCCUPIED	SCPTsetpoint + nvoSetptOffset* or nviSetpoint + nvoSetptOffset*
OC_OCCUPIED	****	>>>		
****	OC_OCCUPIED	>>>		
OC_STANDBY	OC_NUL OC_UNOCCUPIED	>>>	STANDBY	SCPTsetpoint + nvoSetptOffset* **or** nviSetpoint + nvoSetptOffset*
OC_UNOCCUPIED	OC_NUL OC_UNOCCUPIED	>>>	UNOCCUPIED	SCPTsetpoint or nviSetpoint

Table 1: Occupancy and effective set point

* nvoSetptOffset is only added if the potentiometer is assigned to the temperature set point.

3.2 Output Variable Space Comfort Control Command Module

nvoHVACTemp
SNVT Type: SNVT_temp_p, Index 105
Function: Output variable for the measured temperature value (resolution 1/100 °C). Data output is made depending on the properties *SCPTmaxSendTime*, *SCPTminSendTime* and *SCPTminDeltaTemp*, 1,5 to 4 s after reset.

nvoHVACRH
SNVT Type: SNVT_lev_percent, Index 81
Function: Output variable for measured or externally predefined humidity value (if sensor is available) with resolution 1/100. Data output is made depending on the properties *SCPTmaxSendTime*, *SCPTminSendTime* and *SCPTminDeltaRH* 1,5 to 4 s after reset.

nvoFixPtTemp
SNVT Type: SNVT_temp, Index 39
Function: Output variable for the measured temperature value (resolution 1/10 °C). Data output is made analogue to *nvoHVACTemp*.

nvoSetptEffect

SNVT Type: SNVT_temp_p, Index 105
Function: Output variable for the effective set point. The effective set point is calculated via the defaults of *nviSetpoint* respectively *SCPTsetpoint* and the set point offset adjusted at the device (see table 1). Data output is made depending on the properties SC*PTmaxSendTime*, *SCPTminSendTime*, *SCPTminDeltaTemp* as well as with a change of the room occupancy and 1,5 to 4 s after reset.

nvoSetptOffset

SNVT Type: SNVT_temp_p, Index 105
Function: Output variable for set point correction, which can be set by the set point adjuster. When using a potentiometer for set point default, the adjusting range must be set with *UCPTspOffsetRng.* Data output is made analog to *nvoSetptEffect*.

nvoSetpoint

SNVT Type: SNVT_lev_percent, Index 81
Function: Output variable for the position of the set point regulator (0-100%). Data output is made analog to *nvoSetptEffect*.

nvoOccupEffect

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

3.3   Configuration Property Space Comfort Control Command Module

SCPTmaxSendTime, Sending interval

SCPT Index: 49, SNVT_time_sec
Function: *SCPTmaxSendTime* defines the interval time after which all output variables of the object are sent independently of a value change (heartbeat). By input values = 0, the heartbeat function is deactivated. (Standard value: 300,0 s).

SCPTminSendTime, Minimum sending interval for temperature and set point

SCPT Idex: SNVT_time_sec
Function: *SCPTminSendTime* defines the smallest sending interval of the output variables for temperature and set point. An update is made after expiration of *SCPTminSendTime*, if the temperature value of the output variables changes by more than *SCPTminDeltaTemp*. By input values = 0, the function is deactivated (Standard value: 5 sec)

SCPToffsetTemp (nvoHVACTemp), Calibraton temperature sensor

SCPT Index: 70, SNVT_temp_p
Function: By this property a software calibration of the inside temperature sensor is possible. Please note the remarks for flush-mounting room sensors with transmitter.
              ‼ **The sensor is calibrated during production. A change of the value overwrites**
              ‼ **the manufacturer's settings.**

SCPTminDeltaTemp (nvoHVACTemp), Minimum value for temperature changes

SCPT Index: 64, SNVT_temp_p
Function: If the temperature respectively the set point is changed by the adjusted value *SCPTminDeltaTemp*, the new temperature values are transmitted. The function is depending on the adjustment of the property *SCPTminSendTime*. (range >= 0 °C; standard value: 0,30 °C)

SCPToffsetRH (nvoHVACRH), Calibration humidity sensor
SCPT Index: 69, SNVT_lev_percent
Function: By means of this property a software calibration of the insinde humidity sensor is feasible. Therefore, please note the notice for flush-mounting room temperature sensor with transmitter.

SCPTminDeltaRH (nvoHVACRH), Minimun value for humidity changes
SCPT Index: 62, SNVT_lev_percent
Function: If the humidity changes by the set value *SCPTminDeltaRH*, the new humidity values are transmitted. This function is depending on the setting of the property *SCPTminSendTime*. (range >= 0 %; standard value: 1 %)

SCPTsetpoint (nvoSetptEffect), Basic set point
SCPT Index: 213, SNVT_temp_p
Function: Default of the basic set point for calculation of the effective set point (table 1). (Standard value: 22,00 °C)

SCPTminDeltaTemp (nvoSetptOffset), Minimum value for set point changes
SCPT Index: 64, SNVT_temp_p
Function: If the set point temperature is changed by the adjusted value *SCPTminDeltaTemp* the new set points are transmitted. The function is depending of the adjusted property *SCPTminSendTime*.
(Range >= 0 °C; standard value : 0,10 °C)

UCPTspOffsetRng (nvoSetptOffset), Adjustable range set point
UCPT Index: 12, SNVT_temp_p
Function: Configuration property for the value range of the adjustable set point correction, i.e. the given set point can be changed by the temperature range *+/- UCPTspOffsetRng* by the user. (standard value: 0,00)

4 LED Actuator Object

The object includes the functions for the control of the LED by different network variables.

4.1 Input Variable LED Actuator Object

nviLED_sw
SNVT Type: SNVT_switch, Index 95
Function: Input variable of type SNVT_switch for control of the LED.

	LED nviLED_sw
ON	100.0 1
OFF	0.0 0

nviLED_occu
SNVT Type: SNVT_occupancy, Index 109
Function: Input variable of type SNVT_occupancy for control of the LED.

	LED nviLED_occu
ON	OC_OCCUPIED
OFF	OC_UNOCCUPIED

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5 Digital Input Object

The object includes the functions for the interpretation of button and rotary switch.

5.1 Output Variable Digital Input Object

nvoButton_sw

SNVT Type: SNVT_switch, Index 95

Function: Output variables of the button type SNVT_switch. The function of the button is configurable by *UCPTdiConfig* .

Configuration Status Output:

	Button nvoButton_sw[0]
pressed	100.0 1
not pressed	0.0 0

Configuration Toggle-Button:

With each button actuation the output value changes between 0.0 0 and 100.0 1

The output variables are sent after change of button status, after expiration of the sending interval (*SCPTmaxSendTime*) and 1,5 - 4 s after module reset.

nvoButton_occu

SNVT Type: SNVT_occupancy, Index 109

Function: Output variable of the button of type SNVT_occupancy. The interpretation logic can be affected by the configuration property *SCPTbypassTime* .

nvoFanSpeed

SNVT Type: SNVT_switch, Index 95

Function: The output variable *nvoFanSpeed* is used for the interpretation of the rotary switch for the fan speed adjustment, whereas the number of fan speed stages is adapted by *UCPTfanSpdStages.*

UCPTfanSpdStages = 1			UCPTfanSpdStages = 2			UCPTfanSpdStages = 3		
Fan-Stage	nvoFanSpeed .value	nvoFanSpeed .state	Fan-Stage	nvoFanSpeed .value	nvoFanSpeed .state	Fan-Stage	nvoFanSpeed .value	nvoFanSpeed .state
AUTO	0 %	-1	AUTO	0 %	-1	AUTO	0 %	-1
0	0 %	0	0	0 %	0	0	0 %	0
I	100 %	1	I	50 %	1	I	33,0 %	1
			II	100 %	1	II	66,5 %	1
						III	100,0 %	1

Table 2 Fan-Coil with Auto

UCPTfanSpdStages = 11			UCPTfanSpdStages =21			UCPTfanSpdStages = 31		
Fan-Stage	nvoFanSpeed .value	nvoFanSpeed .state	Fan-Stage	nvoFanSpeed .value	nvoFanSpeed .state	Fan-Stage	nvoFanSpeed .value	nvoFanSpeed .state
0	0 %	0	0	0 %	0	0	0 %	0
I	100 %	1	I	50 %	1	I	33,0 %	1
			II	100 %	1	II	66,5 %	1
						III	100,0 %	1

Table 2 Fan-Coil without Auto

5.2 Configuration Property Digital Input Object

SCPTmaxSendTime, Sending interval
SCPT Index: 49, SNVT_time_sec
Function: *SCPTmaxSendTime* defines the interval time, after which all output variables of the object are sent independently of a value change (heartbeat). By input values = 0, the heartbeat function is deactivated. (Standard value: 0,0 s)

UCPTfanSpdStages (nvoFanSpeed), Number of fan speed stages of rotary switch
UCPT Index: 13, SNVT_count
Function: Configuration property for default of the fan speed stages
    1 – Single stage Fan-Coil **with** automatic operation
    2 – Two stage Fan-Coil **with** automatic operation
    3 – Three stage Fan-Coil **with** automatic operation
    11 – Single stage Fan-Coil **without** automatic operation
    21 – Two stage Fan-Coil **without** automatic operation
    31 Three stage Fan-Coil **without** automatic operation
    (Standard value: 3 ==> OFF, 33,0 %, 66,5 %, 100,0 %, AUTO)

SCPTbypassTime, Tracking time and configuration of nvoButton_occu
SCPT Index: 34, SNVT_time_min
Function: Configuration property for output variable *nvoButton_occu* of the button.

By **SCPTbypassTime = 0** the value OC_OCCUPIED is sent with each button actuation. A reset to OC_UNOCCUPIED is not made.

By **SCPTbypassTime = 1** the button status is output:
button pressed ==> OC_OCCUPIED, button not pressed ==> OC_UNOCCUPIED

By **SCPTbypassTime = 2** the toggle function is activated. Each button actuation leads to a toggling between the output values OC_OCCUPIED and OC_UNOCCUPIED.

By **SCPTbypassTime >= 3** the overtime function is activated. By button actuation the ouptut variable receives the value OC_OCCUPIED. After expiration of the delay time *SCPTbypassTime* it is reset to the value OC_UNOCCUPIED. Each button actuation restarts the timer. (Standard value: 90min)

UCPTdiConfig , Configuration of Button for nvoButton_sw

UCPT Index: 44, UNVT_str_hex4

Function: By UCPTdiConfig the function of the output variable for each button can be adjusted.

	Button UCPTdiConfig.Byte[0]
Button Status	1
Button Toggle	0