

RHR-MOD Combined Room Temperature and Humidity Sensors (Controllers) with Modbus

The RHR-MOD sensors are designed to detect relative humidity and temperature in the room spaces and have built-in RS485 Modbus communication interface. The RHR-MOD sensors have linear 0..10V signals outputs relating to humidity and temperature.

The RHR-MOD have a built-in resistive and a digital input for integrating local measurements such as window contacts or external temperature sensors. The sensor has also 2 built-in digital outputs.

The RHR-MOD sensors can be installed on a wall surface or on a wall mounting box in dry indoor environment. The RHR sensors come with a number of additional options such as display, active setpoint, extra digital/resistive input, occupancy detection, lux level measurement and push button.

The RHR-MOD sensors can also operate as Temperature, Light Level or Humidity controllers.



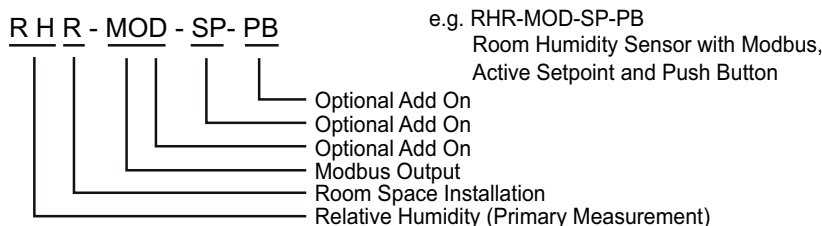
Model Type	Model	Description
	RHR-MOD	RHR Room Humidity and Temperature Sensor with Modbus Communications, 1 DI, 1RI, 3AO (0..10Vdc), 2DO
	-LCD	Display and Alarm Indication Option
	-SP	Active Setpoint Option (Over Modbus)
	-SPB	Active Setpoint Push Button Option <small>See Note 3</small>
	-LL	Light Level and Occupancy Detection Option <small>See Note 1</small>
	-PB	Push Button Interface Option with Timer
	-PB2	2 Momentary Push Buttons with Timer
	-DI2	Digital Input Option for 2 Digital Inputs
	-RI2	Resistive Input Option for 2 Resistive Inputs <small>See Note 2</small>
Accessories	Model	Description
	SW-DCT-USB	Windows Device Configuration Tool Software with Serial USB Interface, 1.8m USB Lead

Note 1: If -LL Option is selected the Resistive Input 1 measurement is no longer available.

Note 2: -RI2 Option is not available if -SP option is selected. If both are required please contact SyxthSense for active setpoint options.

Note 3: -SPB and -PB/PB2 options cannot be fitted at the same time.

Order Codes

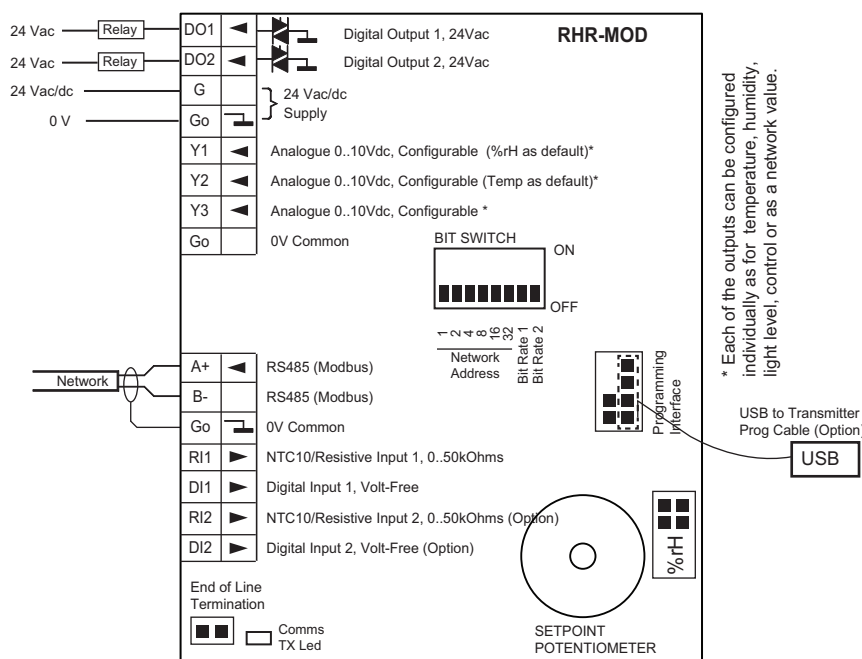


Technical Data

Power Supply	Power supply	24Vac/dc -10%/+15%, max 1VA
Displays and Interfaces	Option -LCD	LCD Display for Showing Humidity, Temperature, Light Level and Alarm Condition using Backlight (configurable through the tool or Modbus)
	Option -SP	Active Setpoint Potentiometer - Knob (network or control; adjustable min/max limits) <i>Note: If this option is selected RI2 Option (resistive input 2) is no longer available.</i>
	Option -SPB	Setpoint with 2 Push Buttons (network or control; adjustable min/max limits) <i>Note: If this option is selected PB/PB2 options are no longer available. Please also select/order LCD option to visualise the setpoint.</i>
	Option -PB	Push Button with Delay Timer; status available through DO1, DO2 or via Network
	Option -PB2	2 x Push Buttons with Delay Timer; status available through DO1, DO2 or via Network
Signal Outputs	Analogue Outputs	3 x 0..10Vdc < 5mA; 100k min impedance for 1% accuracy
	Digital Outputs	2 x 24Vac 2A Triac; requires 24Vac Power Supply (DO1 & DO2)
	Option -PB (Push Button)	DO1 or DO2 configurable as 24Vac Triac; requires 24Vac Power Supply
	Option -LL (Occupancy)	DO1 or DO2 configurable as 24Vac Triac; requires 24Vac Power Supply
Signal Inputs	Resistive Input	1 x NTC10/Resistive Input, 0..50kOhms (network value)
	Digital Input	1 x Digital Input, Volt-Free Contact, Impedance <1KOhm Pulse Counting: Max 25Hz, Min Pulse Length 20mA (Volatile)
	Option -RI2	Additional NTC10/Resistive Input, in total 2 x NTC10/Resistive Inputs, 0..50kOhms (network values; NTC10 default)
	Option -DI2	Additional Digital Input, in total 2 x Digital Inputs, Volt-Free Contacts (network values), Impedance <1KOhm Pulse Counting: Max 25Hz, Min Pulse Length 20mA (Volatile)
Sensing Characteristics	Humidity	
	Range	0..100%rH
	Accuracy	±2% rH (within 0..90% rh)
	Temperature	
	Range	0..50°C (32..122°F)
	Accuracy	±0.3°C
Light Level and Occupancy; Option -LL	<i>Note: If this option is selected RI1 (resistive input) is no longer available and need to be left disconnected.</i>	
Range	0..3,000 Lux	
Occupancy	Infrared Detection (Adjustable Delay)	
Communication	Modbus Communications	
	Protocol	Modbus RTU
	Interface	RS485; maximum 63 devices
	Addressing	1..63 via a bit switch; 1..247 via tool / network
Communication	9k6/19k2/38k4/57k6 Baud; Parity None/Even/Odd, 1 or 2 Stop Bits (baud rate adjustable through bit switch or network)	
Connections	Terminal Connections	Solid and Stranded Cable; 55° Angle for Wiring Maximum Size: 0.05 to 1.5mm ² (EN ISO) / 14 to 30 AWG (UL) Rising Clamp: Size 2.5 x 1.9mm

Environmental Conditions	Operating	
	Temperature	0°C...+50°C (32..122°F)
	Humidity	0...95%rh (non-cond.)
	Storage	
	Temperature	-30°C...+70°C (-22..158°F)
	Humidity	0...95%rh (non-cond.)
Standards	CE Conformity	CE Directive 2004/108/EY EN61000-6-3: 2001 (Generic Emission) EN61000-6-1: 2001 (Generic Immunity).
	Degree of Protection	IP20
Housing	Housing Material	ABS Plastics, Self Extinguishing
	Mounting	Wall or Junction Box Mounting, RAL9010 Pure White
	Dimensions	W86 x H120 x D29mm
	Weight	180g

Wiring Terminals



* Each of the outputs can be configured individually as for temperature, humidity, light level, control or as a network value.

DO1	Digital Output; 24Vac Triac Switching to 0V; max. 2A
DO2	Digital Output; 24Vac Triac Switching to 0V; max. 2A
G	24Vac/dc Power Supply
G0	0V Common
Y1	0..10Vdc Analogue Output (Function Selectable)
Y2	0..10Vdc Analogue Output (Function Selectable)
Y3	0..10Vdc Analogue Output (Function Selectable)
G0	0V Common
A+	RS485 A+ Connection (Modbus)
B-	RS485 B- Connection (Modbus)
G0	0V Common
RI1	NTC10/Resistive Input 0..50kOhms
DI1	Digital Input; Volt-Free, Max 25Hz, Min Pulse Length 20ms
RI2	NTC10/Resistive Input 0..50kOhms
DI2	Digital Input; Volt-Free, Max 25Hz, Min Pulse Length 20ms

Wiring Precautions

Switch off the power before any wiring is carried out. If the sensor has the LCD display fitted, unplug the LCD display and then wire the power supply and analogue outputs, if relevant.

After the wiring has been completed; plug-in the display and power up the sensor.

Digital Input Pulse Counting Digital Inputs can be used for pulse counting up to 25Hz, minimum pulse length 20mS. The pulse count is stored in a dedicated register and can be read over the network. It is possible to write to this register to reset the value.

NOTE: The pulse count value is not battery backed, and therefore the network master is required to manage the data synchronisation in case of power failure.

NTC10/ Resistive Inputs The resistive inputs can be configured to operate as NCT10 inputs or Resistive Inputs. As default the inputs are configured as NTC10. The maximum measurement range is -10°C to 100°C (-40°F to 212°F). The configuration is changed via the Configuration Software.

Y1/Y2/Y3 Analogue Output Operation (Modes) The analogue outputs Y1/Y2/Y3 can be configured for the following options.

Output Modes	Description
Network	The output is set by the Modbus network. On the Modbus network the actual value is configured through "Y1, Y2, Y3 Override Values" parameters, respectively.
Temperature Measurement (Default for Y2)	The output represents the temperature measurement. This is scaled over 0..10V.
Humidity Measurement (Default for Y1)	The output represents the humidity measurement. This is scaled over 0..10V.
Light Measurement	The output represents the light level measurement. This is scaled over 0..10V.
Temperature Control	The output represents the temperature control signal.
Humidity Control	The output represents the humidity control signal.
Light Control (requires -LL option)	The output represents the light level (LUX) control signal.
Potentiometer	Allows the setpoint potentiometer position to be fed to the analogue output as 0..10V signal.

DO1/DO2 Digital Output Modes

The DO1/DO2 digital outputs can be used to switch plants on/off based on a configured measurement and setpoint (thermostatic operation). If OC (Occupancy Sensor) option is fitted and then selected, the DO1/DO2 can be used to switch output on when occupancy is detected. If the push button option (-PB) is fitted then DO1/DO2 can be set to switch ON when push button is pressed (delayed switch off).

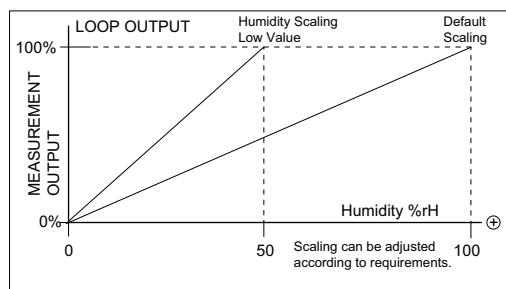
Digital Output Mode Options	Description (Typical Operation)
Network	The DO1/DO2 is switched on over the communication network
Temperature Control Mode (e.g. Low Temperature Limit)	Reverse Mode: The DO1/DO2 is switched ON when the temperature drops below the Temperature Setpoint - Temperature Mode Hysteresis. The output is switched OFF when the temperature exceeds the Setpoint. The control direction is adjustable; reverse (heating) / direct (cooling).
Humidity Control Mode (e.g. Humidity High Limit)	Direct Mode: The DO1/DO2 is switched ON when the humidity reading exceeds the Humidity Setpoint (60% default) + Humidity Digital Output Mode Hysteresis, and switches OFF when the humidity drops below the Setpoint. The control direction is adjustable; reverse (humidification) / direct (de-humidification).
Light Level Control (LUX) Mode (e.g. Low Light Level) (requires -LL option)	Reverse Mode: The DO1/DO2 is switched ON when the light level drops below the Light Level Setpoint - Light Level Digital Output Mode Hysteresis, and switches OFF when the level increases above Setpoint. The control direction is adjustable.
Occupancy (requires -LL option)	The DO1/DO2 is switched ON when the occupancy sensor detects occupancy; the output remains on adjustable time "Occupancy Delay Time Setting" plus approx 10 seconds after occupancy has been detected.
Push Button (requires -PB option)	If -PB option is fitted, it is possible to have the DO1 (or DO2) on for the "Push Button Delay Time" specified in the settings after the pressing of button is detected.

Humidity Measurement Output Scaling and Single Point Calibration

The RHR measures the room space humidity. The humidity reading is available over the Modbus network, and the measurement can be sent to any of the analogue outputs (Y1/Y2/Y3).

This output is scaled as default 0% = 0°C and 100% = 100%rH. The scaling can be modified through Maximum Humidity Scaling parameter.

Furthermore the humidity measurement reading can be adjusted on site using the Single Point Calibration field.

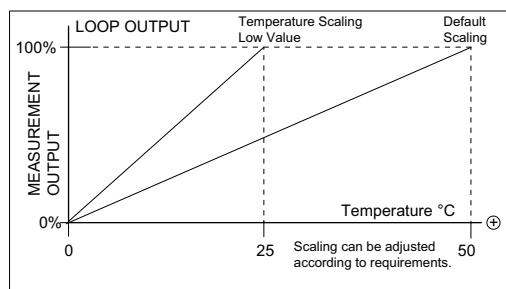


Temperature Measurement Output Scaling and Single Point Calibration

The RHR measures the room space temperature, and the measurement can be sent to any of the analogue outputs (Y1/Y2/Y3). It is also available over Modbus.

This output is scaled as default 0% = 0°C and 100% = 50°C. The scaling can be modified through Maximum Temperature Scaling parameter. The output can also be scaled in Fahrenheit units.

Furthermore the temperature measurement reading can be adjusted on site using the Single Point Calibration field.

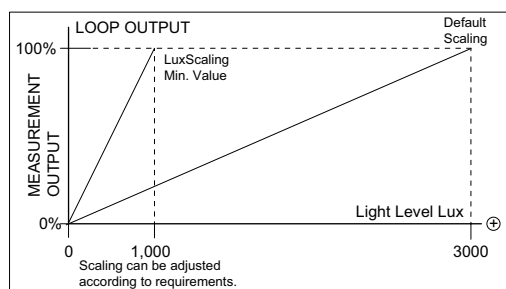


Light Level Measurement Output Scaling; Only when -LL Option Fitted

The RHR sensors fitted with -LL option measure the light level. The light level (LUX) reading is available over the Modbus network, and the measurement can be sent to any of the analogue outputs (Y1/Y2/Y3).

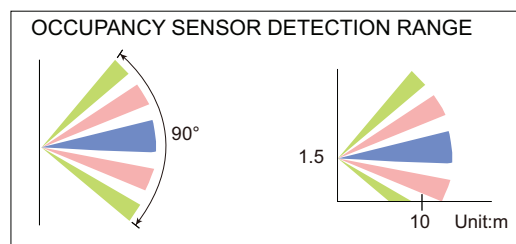
This output is scaled as default 0% = 0 LUX and 100% = 3,000 LUX). The scaling can be modified through Maximum LUX Scaling parameter.

ENERGY SAVING FEATURE: When the LL option is combined with the SPB (Setpoint by buttons) option, it is possible to configure the control setpoint to automatically switch to setback/boost value when the room space is not occupied.



Occupancy Sensor (-LL Option)

The LL option offers a low power Passive Infrared Motion sensor with 21mm Fresnel lens designed for HVAC ventilation and lighting control applications. The sensor detects human body within its detection range. The LL sensor employs a dual element pyroelectric infrared sensor with advanced electronics circuitry.

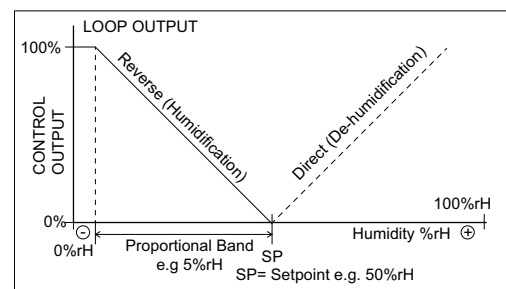


Humidity Control Loop Operation Mode Selection

Proportional or Proportional + Integral Control (Reverse/ Direct)

The humidity measurement can also be used for the humidity control. The calculated control demand is then sent to the output Y1, Y2 or Y3 (depending on the corresponding analogue output mode selection).

The humidity control loop output corresponds to the humidity setpoint and the humidity proportional band. If configured as Reverse Control (humidification), then if the humidity level drops below the setpoint the loop output starts to modulate to 100%. When the humidity is the amount of the Proportional Band below the setpoint the loop output is 100%. In the Direct Control mode the output modulates in reverse. The configuration is done via the configuration parameters (or over Modbus).



The humidity control loop can also be configured to operate as Proportional + Integral control by changing the Integral Action Time from 0 to a required value.

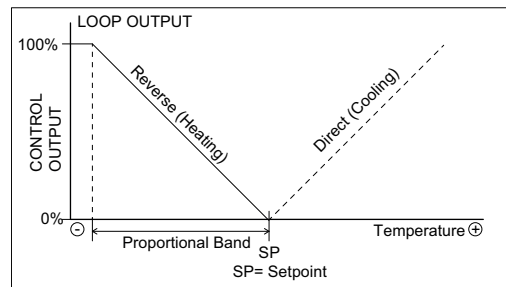
It is possible apply the Boost function to the control loop to override the output to 100% (see Boost Function for more details).

Temperature Control Loop Operation

Proportional or PI Control (Reverse/ Direct)

The temperature measurement can also be used for the temperature control. The calculated control demand is then send to the output Y1, Y2 or Y3 (depending on the corresponding analogue output mode selection).

The temperature control loop output corresponds to the temperature setpoint and the temperature proportional band. If configured as Reverse Control (heating), then if the temperature level drops below the setpoint the loop output starts to modulate to 100%. When the temperature is the amount of the Proportional Band below the setpoint the loop output is 100%. In the Direct Control mode the output modulates in reverse. The configuration is done via the configuration parameters (or over Modbus).



The temperature control loop can also be configured to operate as Proportional + Integral control by changing the Integral Action Time from 0 to a required value.

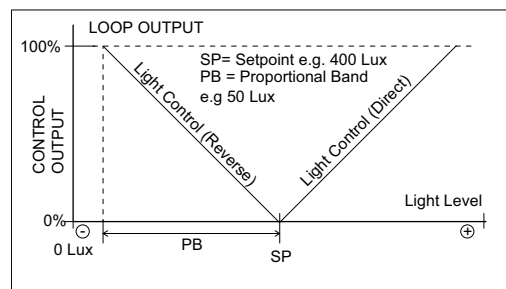
It is possible apply the Boost function to the control loop to override the output to 100% (see Boost Function for more details).

Light Level (LUX) Control Loop Operation; Only when -LL Option Fitted

Proportional Control (Reverse/ Direct)

The LUX measurement can also be used for the light control. The calculated control demand is sent to the output Y1, Y2 or Y3 (depending on the corresponding analogue output mode selection).

The light control loop output corresponds to the light level setpoint and the light control proportional band. If configured as Reverse Control, then if the light level drops below the setpoint the loop output starts to modulate to 100%. When the light level is the amount of Proportional Band below the setpoint the loop output is 100%. In the Direct Control mode the output modulates in reverse. The configuration is done via the configuration parameters (or over Modbus).



The LUX control loop can also be configured to operate as Proportional + Integral control by changing the Integral Action Time from 0 to a required value.

It is possible apply the Boost function to the control loop to override the output to 100% (see Boost Function for more details).

Unoccupied Setpoint

If the sensor has been configured for control, then it is possible to set the control setpoint to a different setting during the unoccupied periods (controlled by the occupancy sensor). Great feature for energy savings.

Boost Function

It is possible to boost/override any of the control outputs to 100%. This can be achieved via a push button on the device (PB-option) or via a digital input. If the Push Button is used then the control output is boosted to 100% for the amount of Push Button Delay Time. When the boost is active the Blue Push Button backlight is lit. When the digital input the output is boosted to 100% when the input is closed. When the digital input is opened the output remains 100% for the time set in the parameter Digital Input Off Delay.

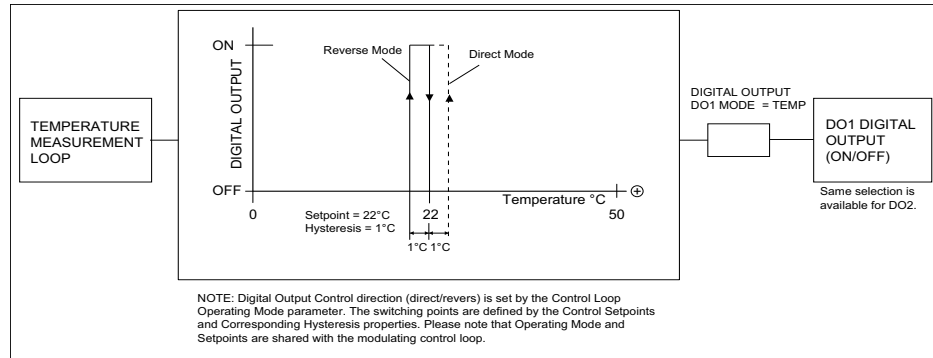
Maximum Control

Each of the analogue output can be configured as "Max Hum/Temp" in which case the maximum of humidity and temperature control loops is taken and sent to the analogue output.

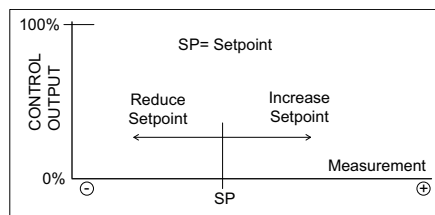
Digital Output DO1/DO2 Control Modes

When the digital output DO1 or DO2 is configured to work in any of the control modes; Temperature Control; Humidity Control or LUX control; the corresponding digital output is switched ON/OFF based on the corresponding Setpoint property and the corresponding hysteresis. The direction of the operation is also adjustable through Control Loop Operating Mode Parameter.

The diagram below illustrates the operation for Temperature Control Mode. The same concept is applicable for any of the DO1/DO2 control modes (Temperature, Humidity, LUX).



Active Setpoint Potentiometer (-SP option) or Setpoint with Push Buttons (-SPB option)



With setpoint options it is possible to adjust the current control setpoint. The setpoint potentiometer (knob) option provides rotary knob for the setpoint whereas the SPB option provides two push buttons for setpoint. The adjustment shifts the CO2, temperature, humidity or LUX setpoint up or down depending on the configuration parameter settings. The setpoint can also

be made only to be available as a network parameter (no influence to control). In this case the value displayed is between the minimum and the maximum settings (e.g -5.0 to +5.0).

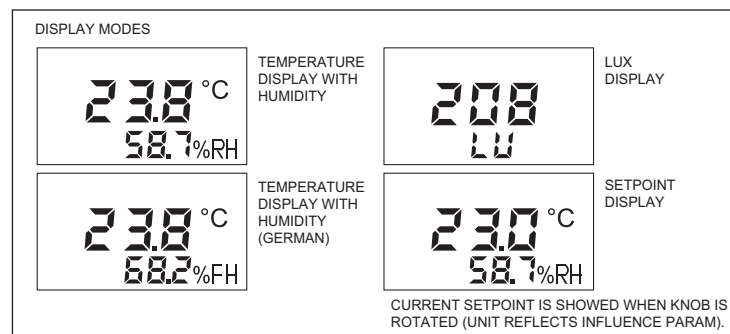
It is also possible to send the setpoint potentiometer position (-SP option) to an analogue output as 0..10V signal.

When SPB option is used, by writing the setpoint over the network resets the user adjustments to 0 if the "Reset SPA on SP Change" property is enabled (default). If "Reset SPA on SP Change" is disabled, then writing the setpoint over the network will not reset the user adjustment. In this case "Reset SPA" network variable can be used to reset the user adjustment to zero. Enabling "Save SPA" option will store the user adjustment to the non-volatile memory.

Note: SPB option requires also -LCD option to be selected/fitted.

Display (Requires Option -LCD)

The LCD display shows the temperature, humidity, and LUX readings. Temperature and LUX readings are displayed on the "top line". These readings can be rotated. The humidity reading is shown on the "bottom line". The display has white backlight which is as default switched off. The backlight can be switched on and its intensity can be adjusted via the configuration tool.



Note: The backlight is permanently on if activated. At 50% intensity the backlight lifetime is approx 10,000 hours. After this time the LCD module needs replacing if the backlight is required. The display continues to operate without the backlight.

Alarm Indication with -LCD Option

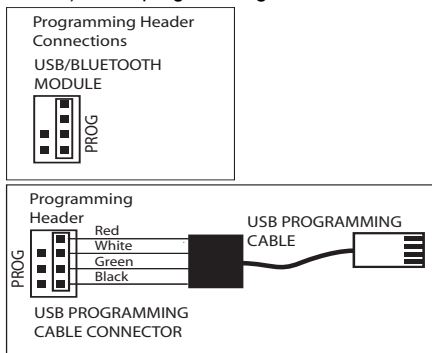
The sensor can configured to monitor the humidity, temperature or light levels for alarms. The alarm condition is displayed using the backlight colours of the LCD. If the measurement exceeds the amber alarm limit then the amber backlight is switched ON. If the measurement exceeds the red alarm limit, the red backlight is switched ON. At normal condition no backlight is ON (can be configured to be white backlight in normal mode - note the maximum life of 10,000 hours of the backlight). The alarm mode has an adjustable hysteresis to prevent the backlight flickering and all alarm limits are adjustable.

The alarm condition is also available over the Modbus. The configuration is done via the configuration parameters (or over the Modbus).

Configuration Parameters and Programming

The parameter options can be configured using the SCT Sensor Configuration Tool software; or via the Modbus network).

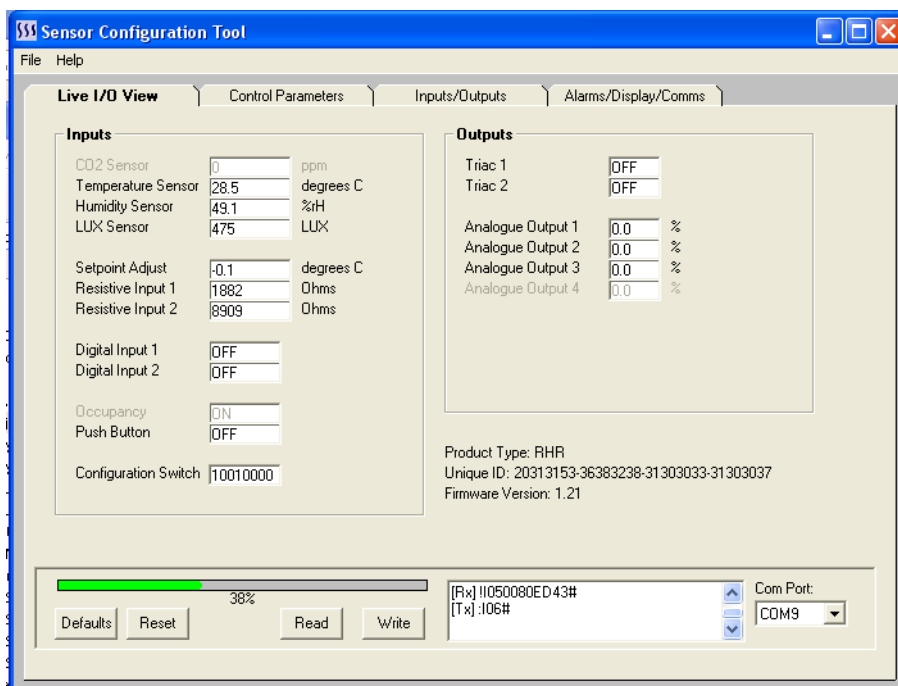
If the SCT Configuration software is used, this is connected via the PC USB cable (or via Bluetooth module) to the programming header of the transmitter as shown on the image below.



The correct process for connecting the sensor via the USB is as follows:-

- Disconnect USB Connector from PC
- Disconnect the Sensor from Power
- Plug-In the 4-Way Connector to the Sensor
- Connect the USB to the PC
- Power Up the Sensor

NOTE: Always disconnect USB from PC before plugging the cable into the sensor.



Common Parameters	
Parameter Name	Description
Defaults	Reloads the default configuration from the sensor non-volatile memory. Note: All modified settings are lost.
Reset	Performs soft reset of the sensor. Apply after major changes.
Read	Reads the sensor data.
Write	Writes the new settings to the sensor (automatically stored in the non-volatile memory)

Common Parameters	
Parameter Name	Description
COM Port	Select the COM port for the USB Cable or Bluetooth. USB cable driver must be installed in order the Serial to TTL connection to operate.

Live IO-View		
Parameter Name	Description	Range
INPUTS		
Temperature Sensor	Temperature Sensor Reading	0..50°C (32..122°F)
Humidity Sensor	Humidity Sensor Reading	0..100% rH
LUX Sensor	LUX Sensor Reading	0..3,000 LUX
Setpoint Adjust	Setpoint Adjuster Reading	-500..+500
Resistive Input 1	Resistive Input 1 Reading	0..50kOhms
Resistive Input 2	Resistive Input 2 Reading	0..50kOhms
Digital Input 1	Digital Input 1 Status	Off - On
Digital Input 2	Digital Input 2 Status	Off - On
Occupancy	Occupancy Status	Off - On
Push Button	Push Button Status	Off - On
Configuration Switch	Bit Switch Status for Each Switch	00000000 - 11111111
OUTPUTS		
Triac 1	Digital Output 1	Off - On
Triac 2	Digital Output 2	Off - On
Analogue Output 1	Analogue Output 1	0..100%
Analogue Output 2	Analogue Output 2	0..100%
Analogue Output 3	Analogue Output 3	0..100%

Control Parameters		
Parameter Name	Description	Range
TEMPERATURE		
Temperature Loop Operating Mode	Direction of the temperature control loop.	0 = Reverse Control (Heating) 1 = Direct Control (Cooling)
Temperature Control Setpoint	Temperature Setpoint	0.0...150.0°C/°F (Default 20°C)
Temperature Proportional Band	Temperature Proportional Band	1.0...150.0°C/°F (Default 50°C)
Temperature Control Integral Action	Integral Action time of the temperature control loop. Set to 0 to disable.	0..10,000 seconds (Default 0s)
Temperature Digital Output Mode Hysteresis	Hysteresis for the digital output temperature control function.	0.1...150.0°C/°F (Default 2°C)
Temperature Loop Boost Input	Boosts the Control Output to 100%	Select Push Button 1/2 or Digital Input 1/2.
HUMIDITY		
Humidity Loop Operating Mode	Direction of the humidity control loop.	0 = Reverse Control (Humidification) 1 = Direct Control (De-humidification)
Humidity Control Setpoint	Humidity Setpoint	0.0...100.0 %rH (Default 50%)
Humidity Proportional Band	Humidity Proportional Band	0.1...100.0 %rH (Default 20.0%)
Humidity Control Integral Action	Integral Action time of the humidity control loop. Set to 0 to disable.	0..10,000 seconds (Default 0s)
Humidity Digital Output Mode Hysteresis	Hysteresis for the digital output humidity control function.	0.1...100.0 %rH (Default 5.0%)
Humidity Loop Boost Input	Boosts the Control Output to 100%	Select Push Button 1/2 or Digital Input 1/2.
CO2 (Not Applicable)		
LUX		
Lux Loop Operating Mode	Direction of the LUX control loop.	0 = Reverse Control 1 = Direct Control
Lux Control Setpoint	LUX Setpoint	0..3,000 Lux (Default 400 Lux)
LUX Proportional Band	LUX Proportional Band	1..3,000 Lux (Default 400 Lux)

Control Parameters		
Parameter Name	Description	Range
LUX Control Integral Action	Integral Action time of the LUX control loop. Set to 0 to disable.	0..10,000 seconds
LUX Digital Output Mode Hysteresis	Hysteresis for the digital output LUX control function.	1..3,000 Lux (Default 100 Lux)
LUX Loop Boost Input	Boosts the Control Output to 100%	Select Push Button 1/2 or Digital Input 1/2.
SETPOINT ADJUST		
Setpoint Adjuster Minimum Value	Sets the minimum value for the setpoint (setpoint turned fully anti clockwise)	-500..0 (Default -3.0)
Setpoint Adjuster Maximum Value	Sets the maximum value for the setpoint (setpoint turned fully clockwise)	0..500 (Default 3.0)
Setpoint Value Influence to Control Setpoint	Setpoint Value Influence to Control Setpoint	0 = No Influence 1 = CO2 Control (not applicable) 2 = Temperature 3 = Humidity 4 = Lux
Unoccupied SPA	Changes the control setpoint to the set value when the space is unoccupied (requires -LL option)	0..500 (Default 0.0)
Save SPA	Saves User Setpoint (Setpoint Adjustment) changes to non-volatile after changes have been completed.	0 = Disabled (Default) 1 = Enabled
Reset SPA on SP Change	Resets the User Setpoint Adjustment (SPA), when the setpoint is written over the network.	0 = Disabled 1 = Enabled (Default)

Inputs / Outputs		
Parameter Name	Description	Range
SENSOR INPUTS		
Temperature Offset	One Point Temperature Calibration Field	-3.0..+3.0°C/°K (Default 0°C)
Temperature AO Scale	Analogue Output Maximum Temperature Scaling	0.1...150.0°C/°F (Default 50°C)
Humidity Offset	One Point Humidity Calibration Field	-5.0..+5.0 %rH (Default 0 %rH)
Humidity AO Scale	Analogue Output Humidity Maximum Scaling	1...100.0 %rH (Default 100.0%)
LUX AO Scale	Analogue Output Maximum Lux Scaling	1000..3,000 Lux (Default 3,000 Lux)
Occupancy Off Delay	Delay Time Setting for Occupancy	1..7200 Seconds (Default 600s)
Push Button Off Delay	Delay Time Setting for Push Button	1..7200 Seconds (Default 600s)
DI1 Off Delay	Delay Time Setting for Digital Input 1	0..7200 Seconds (Default 0s)
DI2 Off Delay	Delay Time Setting for Digital Input 2	0..7200 Seconds (Default 0s)
OUTPUTS		
AO1 (Y1)	Analogue Output Y1 Mode	0 = Network Value 1 = CO2 (not applicable) 2 = Temperature Measurement 3 = Humidity Measurement (Default) 4 = Light Measurement (LUX) 5 = CO2 Control (not applicable) 6 = Temperature Control 7 = Humidity Control 8 = Light Control (LUX) 9 = Maximum (not applicable) 10 = Potentiometer 11 = Max Hum/Temp Control 12 = Max Hum/Temp/CO2 (N/A)

Inputs / Outputs		
Parameter Name	Description	Range
AO2 (Y2)	Analogue Output Y2 Mode	0 = Network Value 1 = CO2 (not applicable) 2 = Temperature Measurement 3 = Humidity Measurement (Default) 4 = Light Measurement (LUX) 5 = CO2 Control (not applicable) 6 = Temperature Control 7 = Humidity Control 8 = Light Control (LUX) 9 = Maximum (not applicable) 10 = Potentiometer 11 = Max Hum/Temp Control 12 = Max Hum/Temp/CO2 (N/A)
AO3 (Y3)	Analogue Output Y3 Mode	0 = Network Value 1 = CO2 (not applicable) 2 = Temperature Measurement 3 = Humidity Measurement (Default) 4 = Light Measurement (LUX) 5 = CO2 Control (not applicable) 6 = Temperature Control 7 = Humidity Control 8 = Light Control (LUX) 9 = Maximum (not applicable) 10 = Potentiometer 11 = Max Hum/Temp Control 12 = Max Hum/Temp/CO2 (N/A)

Alarm/Display/Comms		
Parameter Name	Description	Range
ALARMS		
Alarm Source	Alarm LED Mode	0 = Not Applicable (CO2) 1 = Temperature 2 = Humidity 3 = LUX 4 = None
Alarm Amber Threshold	Amber Alarm LED Switching Point	0..5000 (Default 750)
Alarm Red Threshold	Red Alarm LED Switching Point	0..5000 (Default 1250)
Alarm Hysteresis	Alarm LED Hysteresis	0..5000 (Default 50)
DISPLAY		
Temperature Units	Temperature Unit Selection	0 = Celsius 1 = Fahrenheit
Language	Language Selection (for display rH vs FH)	0 = English (default) 1 = German
Display Mode	Display Mode	0 = Rotate Installed 1 = CO2 Only (not applicable) 2 = Temperature Only 3 = LUX Only 4 = Setpoint Only
LCD brightness	Brightness of the LCD	Off - 10% to 100%
COMMS		
Modbus Baud Rate NOTE: Does not show Modbus Baud Rate set via bit switches.	Modbus Baud Rate (can only be set if BR1 and BR2 are in OFF position)	0 = 9600 (Default) 1 = 19200 2 = 38400 3 = 57600
Modbus Parity	Modbus Parity	0 = None (Default) 1 = Odd 2 = Even
Stop Bits	Stop Bits	0 = 1 Stop Bit (Default) 1 = 2 Stop Bits
Address NOTE: Does not show Modbus address set via bit switches.	Modbus Address (can only be set if all address bit switches are in OFF position)	0..247 (Default 1)

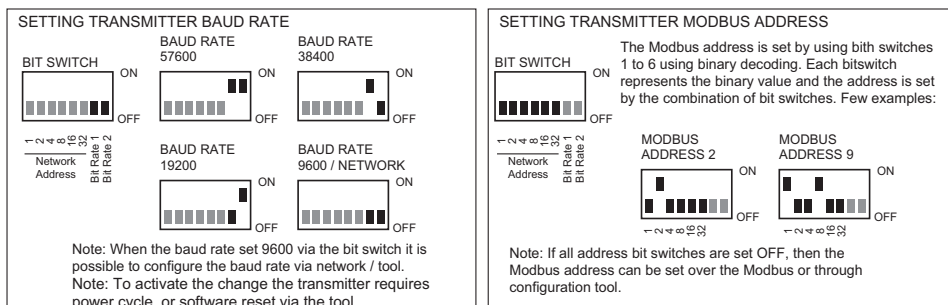
Parameter Storage

The configuration parameters are stored in the non-volatile memory. The SCT (Sensor Configuration Tool) software will automatically store the register values on the non-volatile permanent memory after the changes are carried out. If the changes are carried out over the Modbus network, then "NonVol Update" flag is required to be forced on to save the changes. The parameter returns automatically to the off state once the values have been stored.

Setting Up Modbus Address and Baud Rate

The RHR-MOD Modbus address and the baud rate is normally set through the bit switch. It is also possible to set the address and baud rate over the configuration tool or over the Modbus communication network.

NOTE: The new settings are activated automatically after approx 5 seconds if the bit switch positions have not been moved. In this case the controller reset is applied to activate the new settings.



Modbus Registers - RHR-MOD

The RHR-MOD transmitter supports the following Modbus registers and function codes. The default communication speed is 9600 bps, 8 data bits, Parity None and 1 Stop Bit. The default Modbus Slave address is 0. The device Parity can be changed between Odd, None and Even. The baud rate is selectable between 9600, 19200, 38400 and 57600 bps. The baud rate speeds can be selected using the built-in bit switch, or over the network if BR1 and BR2 are set to OFF. The sensor addresses 1 to 63 can be set using the local bit switch, and over the Modbus the adjustable address range is 1 to 247.

Please note that Modbus register space is specified from the Modbus master perspective as in the Modbus Application Protocol specification. The Modbus registers for Function Codes 02, 03, 06 and 16 have presentation for both Modbus "address blocks" and for actual Modbus register offsets. For example, the Temperature is read from Modbus register 1 using Function Code 04. Some Modbus masters will require Function Code 04, register 1 to be entered, whereas the others will require register 30001 and Function Code 04. The Modbus addressing starts from the zero Base address. (Some Modbus masters start addressing from 1, in this case add one to the listed register values).

Register	Parameter Description	Data Type	Raw Data	Range
	FUNCTION CODE 01 - READ COILS FUNCTION CODE 05 - WRITE SINGLE COIL FUNCTION CODE 15 - WRITE MULTIPLE COILS			
0	Digital Output 1 Override (Network Write)		0..1	Off - On
1	Digital Output 2 Override (Network Write)		0..1	Off - On
7	Reset SPA - Setpoint Adjustment (Network Write)		0..1	Off - On
	FUNCTION CODE 02 - READ DISCRETE INPUTS			
10000	Digital Input 1 Status		0..1	Off - On
10001	Digital Input 2 Status		0..1	Off - On
10002	Digital Output 1 Status		0..1	Off - On
10003	Digital Output 2 Status		0..1	Off - On
10004	Occupancy Status (Switch Off Delayed "Delay Time Setting" amount in seconds)		0..1	Off - On
10005	Push Button 1 Status (Switch Off Delayed "Delay Time Setting" amount in seconds)		0..1	Off - On
10006	Push Button 2 Status (Switch Off Delayed "Delay Time Setting" amount in seconds)		0..1	Off - On
	FUNCTION CODE 04 - READ INPUT REGISTERS			
30001	Temperature Measurement	Signed 16	0..500 320..1220	0.0...50.0°C (32.0..122.0°F)
30002	Relative Humidity Measurement	Unsigned 16	0..1000	0..100.0 %rH
30003	Light Level Measurement	Unsigned 16	0..10000	0..3000 Lux

Register	Parameter Description	Data Type	Raw Data	Range
30004	Resistive Input 1 (NTC10 default)	Unsigned 16	0...50000	0..50000 Ohms
30005	Resistive Input 2 (NTC10 default)	Unsigned 16	0...50000	0..50000 Ohms
30006	Current Calculated Setpoint (°C / %rH / LUX) or Current Setpoint Adjustment (none option)	Signed 16	-32,767..+32,767	-3,276..+3,276.. Act Setpoint or Low..High Value
30007	Analogue Output Y1	Unsigned 16	0..1000	0..100.0 %
30008	Analogue Output Y2	Unsigned 16	0..1000	0..100.0 %
30009	Analogue Output Y3	Unsigned 16	0..1000	0..100.0 %
30010	Analogue Output Y4	Unsigned 16	0..1000	0..100.0 %
30011	Alarm Status	Unsigned 16	1..3	1 = Normal State 2 = Amber Alarm State 3 = Red Alarm State
30012	NTC10 Input 1 (RI1 in NTC mode; default)	Signed 16	-400...3020	-40.0..302.0 °F -40.0..150.0 °C
30013	NTC10 Input 2 (RI2 in NTC mode; default)	Signed 16	-400...3020	-40.0..302.0 °F -40.0..150.0 °C
30100	Firmware Version	Unsigned 16	n/a	n/a
FUNCTION CODE 03 - READ HOLDING REGISTERS FUNCTION CODE 06 - WRITE SINGLE HOLDING REGISTER FUNCTION CODE 16 - WRITE MULTIPLE HOLDING REGISTERS				
40000	Analogue Output Y1 Override Value	Unsigned 16	0..1000	0..10.0 V Default 0
40001	Analogue Output Y2 Override Value	Unsigned 16	0..1000	0..10.0 V Default 0
40002	Analogue Output Y3 Override Value	Unsigned 16	0..1000	0..10.0 V Default 0
40003	Analogue Output Y4 Override Value (Reserved for future use)	Unsigned 16	0..1000	0..10.0 V Default 0
40004	Analogue Output Y1 Mode	Unsigned 16	0..5	0 = Network Value 1 = CO2 (not applicable) 2 = Temperature Measurement 3 = Humidity Measurement (Default) 4 = Light Measurement 5 = CO2 Control (not applicable) 6 = Temperature Control 7 = Humidity Control 8 = Light Control 9 = Maximum (not applicable) 10 = Potentiometer
40005	Analogue Output Y2 Mode	Unsigned 16	0..5	0 = Network Value 1 = CO2 (not applicable) 2 = Temperature Measurement (Default) 3 = Humidity Measurement 4 = Light Measurement 5 = CO2 Control (not applicable) 6 = Temperature Control 7 = Humidity Control 8 = Light Control 9 = Maximum (not applicable) 10 = Potentiometer
40006	Analogue Output Y3 Mode	Unsigned 16	0..5	0 = Network Value 1 = CO2 (not applicable) 2 = Temperature Measurement 3 = Humidity Measurement 4 = Light Measurement 5 = CO2 Control (not applicable) 6 = Temperature Control 7 = Humidity Control 8 = Light Control 9 = Maximum (not applicable) 10 = Potentiometer

Register	Parameter Description	Data Type	Raw Data	Range
40008	Digital Output 1 Mode	Unsigned 16	0..6	0 = Network Value (Default) 1 = CO2 Relay (not applicable) 2 = Temperature Relay 3 = Humidity Relay 4 = Light Relay 5 = Occupancy Relay 6 = Push Button
40009	Digital Output 2 Mode	Unsigned 16	0..6	0 = Network Value (Default) 1 = CO2 Relay (not applicable) 2 = Temperature Relay 3 = Humidity Relay 4 = Light Relay 5 = Occupancy Relay 6 = Push Button
40015	Temperature Control Setpoint	Unsigned 16	0..1500	0.0..150.0°C/°F (Default 20°C)
40016	Temperature Proportional Band	Unsigned 16	1..1500	0.1..150.0°C/°F (Default 50°C)
40017	Temperature Control Integral Action	Unsigned 16	0..10,000	0..10,000 seconds
40018	Temperature Loop Operating Mode	Unsigned 16	0..1	0 = Reverse Control (Heating) 1 = Direct Control (Cooling)
40019	Temperature Digital Output Mode Hysteresis	Unsigned 16	1..1500	0.1..150.0°C/°F (Default 2°C)
40020	Humidity Control Setpoint	Unsigned 16	0..1000	0.0..100.0 %rH (Default 50%)
40021	Humidity Proportional Band	Unsigned 16	1..1000	0.1..100.0 %rH (Default 20.0%)
40022	Humidity Control Integral Action	Unsigned 16	0..10,000	0..10,000 seconds
40023	Humidity Loop Operating Mode	Unsigned 16	0..1	0 = Reverse Control (Humidification) 1 = Direct Control (De-humidification)
40024	Humidity Digital Output Mode Hysteresis	Unsigned 16	10..1000	1.0..100.0 %rH (Default 5.0%)
40025	Lux Control Setpoint	Unsigned 16	0..3000	0..3,000 Lux (Default 400 Lux)
40026	LUX Proportional Band	Unsigned 16	1..3000	1..3,000 Lux (Default 400 Lux)
40027	LUX Control Integral Action	Unsigned 16	0..10,000	0..10,000 seconds
40028	Lux Loop Operating Mode	Unsigned 16	0..1	0 = Reverse Control 1 = Direct Control
40029	LUX Digital Output Mode Hysteresis	Unsigned 16	1..3000	1..3,000 Lux (Default 100 Lux)
40030	Amber Alarm LED Switching Point	Unsigned 16	0..5000	0..5000 (Default 750)
40031	Red Alarm LED Switching Point	Unsigned 16	0..5000	0..5000 (Default 1250)
40032	Alarm LED Hysteresis	Unsigned 16	0..5000	0..5000 (Default 50)
40033	Alarm LED Mode	Unsigned 16	0..3	0 = Not Applicable 1 = Temperature 2 = Humidity 3 = LUX 4 = None
40034	Delay Time Setting for Occupancy	Unsigned 16	1..7200	1..7200 Seconds
40035	Delay Time Setting for Push Button	Unsigned 16	1..7200	1..7200 Seconds
40036	Setpoint Adjuster / Potentiometer Low Position	Signed 16	-5000..0	-500..0.0 (-3.0) Default
40037	Setpoint Adjuster / Potentiometer High Position	Unsigned 16	0..5000	0..+500.0 (3.0) Default

Register	Parameter Description	Data Type	Raw Data	Range
40038	Setpoint Value Influence to Control Setpoint	Unsigned 16	0..4	0 = No Influence 1 = CO2 Control (not applicable) 2 = Temperature 3 = Humidity 4 = Lux
40039	Temperature Unit Selection	Unsigned 16	0..1	0 = Celsius 1 = Fahrenheit
40040	Language Selection (for display rH vs FH)	Unsigned 16	0..1	0 = English (default) 1 = German
40041	Display Mode	Unsigned 16	0..3	0 = Rotate Installed 1 = CO2 Only (not applicable) 2 = Temperature Only 3 = LUX Only
40043	Analogue Output Maximum Temperature Scaling	Unsigned 16	1..1500	0.1...150.0°C/°F (Default 50°C)
40044	Analogue Output Humidity Maximum Scaling	Unsigned 16	1..1000	0.1...100.0 %rH (Default 100.0%)
40045	Analogue Output Maximum Lux Scaling	Unsigned 16	1000..3000	1000..3,000 Lux (Default 3,000 Lux)
40047	One Point Temperature Calibration Field	Signed 16	-30..+30	-3.0..+3.0°C/°K (Default 0°C)
40048	One Point Humidity Calibration Field	Signed 16	-50..+50	-5.0..+5.0 %rH (Default 0 %rH)
40050	Modbus Address	Unsigned 16	0..247 See Note 1	0..247 (Default 1)
40051	Modbus Baud Rate	Unsigned 16	0..3 See Note 2	0 = 9600 (Default) 1 = 19200 2 = 38400 3 = 57600
40052	Modbus Parity	Unsigned 16	0..2	0 = None (Default) 1 = Odd 2 = Even
40053	Stop Bits	Unsigned 16	0..1	0 = 1 Stop Bit (Default) 1 = 2 Stop Bits
40067	Hold On Delay Setting for Digital Input 1	Unsigned 16	1..7200	1..7200 Seconds
40068	Hold On Delay Setting for Digital Input 2	Unsigned 16	1..7200	1..7200 Seconds
40070	RI1 Single Point Calibration	Signed 16	-10,000..10,000	-1,000..1,000 °C, °F or Ohms
40071	RI2 Single Point Calibration	Signed 16	-10,000..10,000	-1,000..1,000 °C, °F or Ohms
40072	DI1 Pulse Count Most Significant 16 Bits	Unsigned 16	0..65280	0..65280
40073	DI1 Pulse Count Least Significant 16 Bits	Unsigned 16	0..65535	0..655350
40074	DI2 Pulse Count Most Significant 16 Bits	Unsigned 16	0..65280	0..65280
40075	DI2 Pulse Count Least Significant 16 Bits	Unsigned 16	0..65535	0..655350
40080	LCD Backlight Level	Unsigned 16	0..10	0..10
40081	Reset SPA on Setpoint Change	Unsigned 16	0..1	0 = Disabled, 1 = Enabled (Default)
40082	Save SPA (user adjustment on exit)	Unsigned 16	0..1	0 = Disabled (Default), 1 = Enabled
40100	Force Reset	Unsigned 16	0..1	0 = Normal 1 = Force Reset
40101	Non Volatile Memory Update	Unsigned 16	0..1 Note 3	0 = Normal 1 = Update
40103	Force Factory Defaults	Unsigned 16	0..1	0 = Normal 1 = Force Defaults
40104	Force 0..10V Output Calibration Routine	Unsigned 16	0..1	0 = Normal 1 = Force Calibration

Note 1. Modbus address can be configured via network/tool only if the bit switches 1-6 are switched off. Please note if changed over the Modbus, the Non Volatile Memory Updated parameter MUST BE exercised before power cycle or reset.

Note 2. Modbus Baud Rate can be configured over the Modbus if bit switches 7 & 8 are in off state (9600). Please note if changed over the Modbus, the Non Volatile Memory Updated parameter MUST BE exercised before power cycle or reset.

Note 3. When the settings are changed over the communication bus, the changes for the configuration parameters are not stored in the non-volatile memory automatically. In order to store the changes "Non Volatile Memory Update" is required to be set true. If Sensor Configuration Tool is used, the tool will automatically force non-volatile data update.

Dimensions

