

LLR-MOD Modbus Light Level and Occupancy Sensor

The LLR-MOD sensors are designed to measure Light Level (LUX) in the room spaces and have built-in RS485 Modbus communication interface. The sensors can be also used for occupancy detection.

The LLR-MOD sensors have linear 0..10V signals outputs relating to light level and optional temperature. The LLR-MOD sensors have two 24Vac triacs (digital outputs) that can be used for the occupancy detection, or the detection is carried out through the communication network. The LLR-MOD include a built-in resistive and two digital inputs for integrating local measurements such as window contacts or external temperature sensors.

The LLR -MOD sensors can be installed on a wall surface or on a wall mounting box in dry indoor environment. The LLR-MOD sensors come with a number of additional options such as display, and one or two push buttons. Furthermore passive sensor element options are available.

The LLR-MOD sensors can also operate as temperature and light level controllers.



Model Type	Model	Description
	LLR-MOD	LLR Modbus Room Light Level and Occupancy Sensors, 2 DI, 1RI, 3AO (0..10Vdc), 2DO
	-LCD	Display and Alarm Indication Option
	-PB	Push Button Interface Option with Timer
	-PB2	2 Momentary Push Buttons with Timer
	-TE	Active Temperature Sensor Option
	-TE-NTC10K3	Passive Temperature Sensor Option <small>See Note 1</small>

Accessories	Model	Description
	SW-DCT-USB	Windows Device Configuration Tool Software with Serial USB Interface, 1.8m USB Lead

Note 1: Replaces digital input 2.

Order Codes

L L R - M O D - L C D - P B



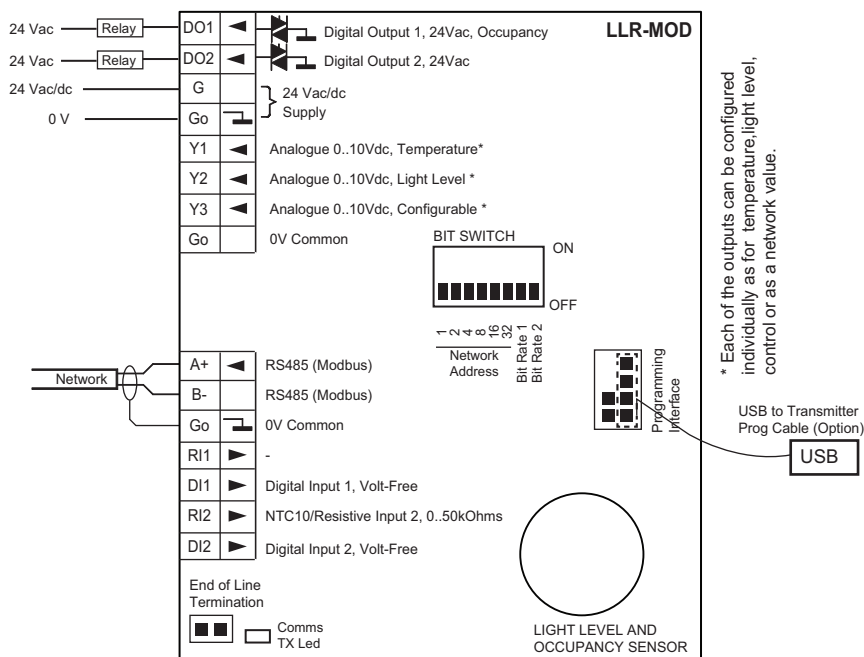
e.g. LLT-MOD-LCD-PB
 Room Light Level Sensor with Modbus,
 Display, Push Button
 Optional Add On
 Optional Add On
 Optional Add On
 Modbus Output
 Room Space Installation
 Light Level and Occupancy (Primary Measurement)

Technical Data

Power Supply	Power supply	24Vac/dc -10%/+15%, max 1VA
Displays and Interfaces	Option -LCD	LCD Display for Showing Light Level, Temperature and Alarm Condition using Backlight (configurable through the tool or via Network)

	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 Triacs; 2A maximum; requires 24Vac Power Supply (DO1 & DO2)
	Option -PB (Push Button)	Uses DO1 or DO2; 24Vac Triac
Signal Inputs	Resistive Input	1 x NTC10/Resistive Input, 0..50kOhms (network value)
	Digital Inputs	2 x Digital Input, Volt-Free Contact, Impedance <1KOhm Pulse Counting: Max 25Hz, Min Pulse Length 20mA (Volatile)
Sensing Characteristics	Light Level and Occupancy	
	Range	0..3,000 Lux
	Occupancy	Infrared Detection (Adjustable Delay)
	Temperature (TE-option)	
	Range	0..50°C (32..122°F)
	Accuracy	±0.3°C
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 Ceiling Mounting
	Dimensions	W86 x H120 x D29mm
	Weight	180g

Wiring Terminals



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

DO1	Digital Output; 24Vac Triac Switching to 0V; max. 2A (default Push Button Status)
DO2	Digital Output; 24Vac Triac Switching to 0V; max. 2A (default Occupancy status)
G	24Vac/dc Power Supply
Go	0V Common
Y1	0..10Vdc Analogue Output (Temperature)
Y2	0..10Vdc Analogue Output (LUX)
Y3	0..10Vdc Analogue Output (Function Selectable)
Go	0V Common
A+	RS485 A+ Connection (Modbus)
B-	RS485 B- Connection (Modbus)
Go	0V Common
RI1	- (Not Applicable)
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 Input

The resistive input can be configured to operate as a NCT10 input or a Resistive Input. 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 Y1)	The output represents the temperature measurement. This is scaled over 0..10V.
Light Measurement (default for Y2)	The output represents the light level measurement. This is scaled over 0..10V.
Temperature Control	The output represents the temperature control signal.
Light Control (requires -LL option)	The output represents the light level (LUX) control signal.

DO1/DO2 Digital Output Operation

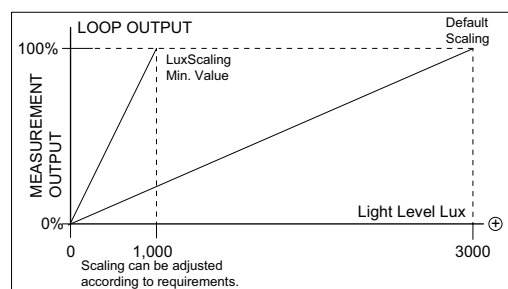
The DO2 is used to switch output on when occupancy is detected. If the push button option (-PB) is fitted then DO1 is set to switch ON when push button is pressed (delayed switch off) The outputs are also configurable to other functions as listed below.

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).
Light Level Control (LUX) Mode (e.g. Low Light Level)	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)	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	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.

Light Level Measurement Output Scaling

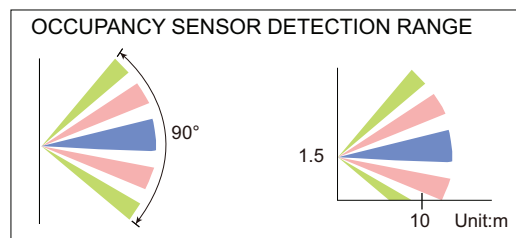
The LLR sensors measure the light level. The light level (LUX) reading is available over the Modbus network, and the measurement can be sent to any of the analogue outputs (Y1/Y2/Y3).

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

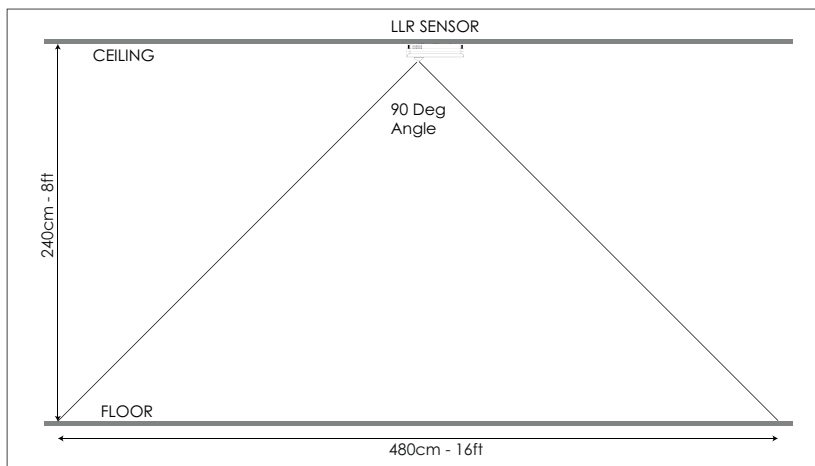


Occupancy Sensor

The LLR 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 LLR sensor employs a dual element pyroelectric infrared sensor with advanced electronics circuitry. The occupancy status is available over the network or via the digital output.



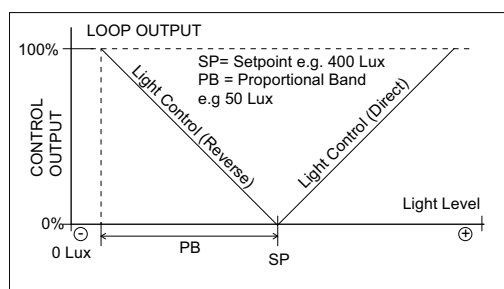
Occupancy Sensor in Ceiling Mounting



Light Level (LUX) Control Loop Operation

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).



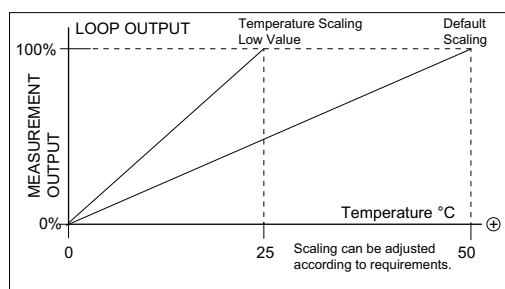
The light control loop output corresponds to the light level setpoint and the light control proportional band. If configured as Reverse Control, then if the light level drops below the setpoint the loop output starts to modulate to 100%. When the light level is the amount of the Proportional Band below 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 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).

Temperature Measurement Output Scaling and Single Point Calibration (TE-Option)

If TE-option is fitted the LLR can also measure 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.



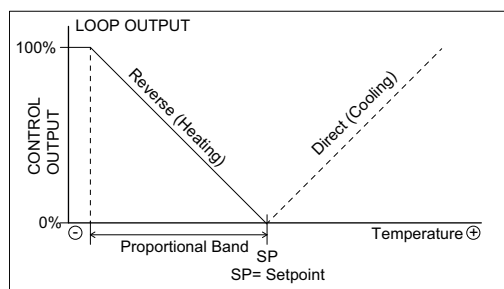
This output is scaled as default 0% = 0°C and 100% = 50°C). The scaling can be modified through Maximum Temperature Scaling parameter. The output can also be scaled in Fahrenheit units.

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

Temperature Control Loop Operation (TE-Option)

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).

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. The boost can be cancelled by pressing the push button again.

When the digital input option is selected, 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. If PB2 option is fitted then it is possible to select either Button 1 or Button 2 to boost the output.

Push Buttons

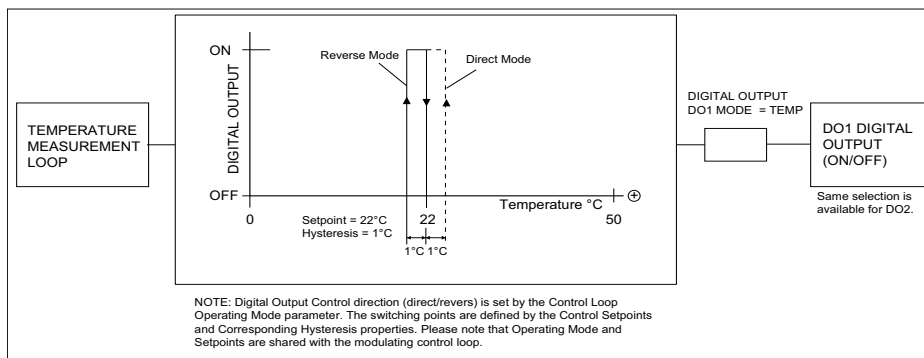
It is possible to fit up to four push buttons (or up to two if -SPB push button setpoint option is fitted). The push buttons can be used to activate the boost as described in Boost Function section, or used as a network user interface. The push button LED is as default controlled by the internal application i.e. the LED is ON when the push button timer is active.

If the Push Button LED Mode is set to BMS, then the LED can be controlled by the BMS. In typical application, when the user presses the push button, the internal timer starts, and the BMS reads the push button status. When the push button status has been confirmed by the BMS, the BMS switches the corresponding PB LED ON and therefore sending acknowledgement to the user.

Note: It is possible to print the push button caps with custom legends. Please contact SyxtSense Sales for further details.

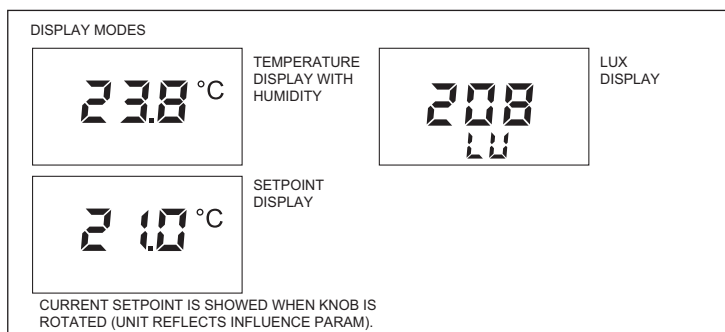
Digital Output DO1/DO2 Control Modes

The digital outputs DO1/DO2 can also be configured to work in LUX or temperature control modes (instead of as an occupancy measurement). In these modes 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 the LUX control mode.



Display (Requires Option -LCD)

The LCD display shows the temperature and LUX readings. These readings can be rotated. 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.

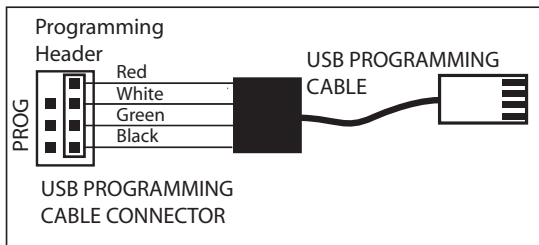
Alarm Indication with -LCD Option

The sensor can configured to monitor the 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.

Configuration Parameters and Programming

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

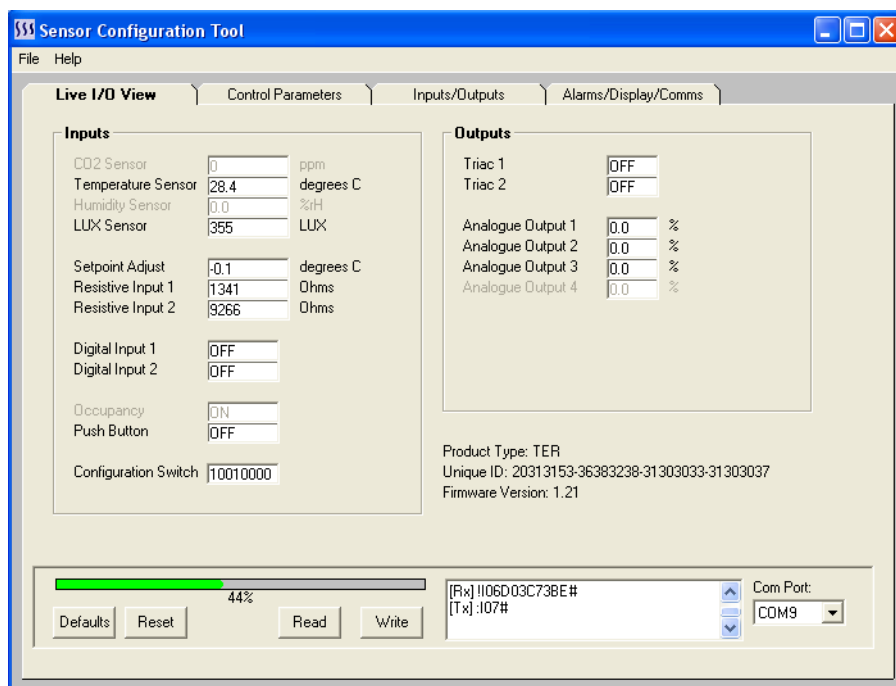
If the DCT Configuration software is used, this is connected via the PC USB cable to the programming header of the transmitter as shown on the image below.



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)
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)
LUX Sensor	LUX Sensor Reading	0..3,000 LUX
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 (Not Applicable)		
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)
LUX Control Integral Action	Integral Action time of the LUX control loop. Set to 0 to disable.	0..10,000 seconds (Default 0s)
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 (not applicable) 4 = Lux

Control Parameters		
Parameter Name	Description	Range
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)
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..28800 Seconds (Default 600s)
DI1 Off Delay	Delay Time Setting for Digital Input 1	0..28800 Seconds (Default 0s)
DI2 Off Delay	Delay Time Setting for Digital Input 2	0..28800 Seconds (Default 0s)

OUTPUTS

AO1 (Y1)	Analogue Output Y1 Mode	0 = Network Value 1 = CO2 (not applicable) 2 = Temperature Measurement 3 = Humidity (not applicable) 4 = Light Measurement (LUX) 5 = CO2 Control (not applicable) 6 = Temperature Control 7 = Humidity Cont (not applicable) 8 = Light Control (LUX) 9 = Maximum (not applicable) 10 = Potentiometer
AO2 (Y2)	Analogue Output Y2 Mode	0 = Network Value 1 = CO2 (not applicable) 2 = Temperature Measurement 3 = Humidity (not applicable) 4 = Light Measurement (LUX) 5 = CO2 Control (not applicable) 6 = Temperature Control 7 = Humidity Cont (not applicable) 8 = Light Control (LUX) 9 = Maximum (not applicable) 10 = Potentiometer
AO3 (Y3)	Analogue Output Y3 Mode	0 = Network Value 1 = CO2 (not applicable) 2 = Temperature Measurement 3 = Humidity (not applicable) 4 = Light Measurement (LUX) 5 = CO2 Control (not applicable) 6 = Temperature Control 7 = Humidity Cont (not applicable) 8 = Light Control (LUX) 9 = Maximum (not applicable) 10 = Potentiometer
DO1	Digital Output 1 Mode	0 = Network Value (Default) 1 = CO2 Relay (not applicable) 2 = Temperature Relay 3 = Humidity Relay (not applicable) 4 = Light Relay (LUX) 5 = Occupancy Relay 6 = Push Button
DO2	Digital Output 2 Mode	0 = Network Value (Default) 1 = CO2 Relay (not applicable) 2 = Temperature Relay 3 = Humidity Relay (not applicable) 4 = Light Relay (LUX) 5 = Occupancy Relay 6 = Push Button

Alarm/Display/Comms		
Parameter Name	Description	Range
ALARMS		
Alarm Source	Alarm LED Mode	0 = Not Applicable (CO2) 1 = Temperature 2 = Not Applicable (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
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)

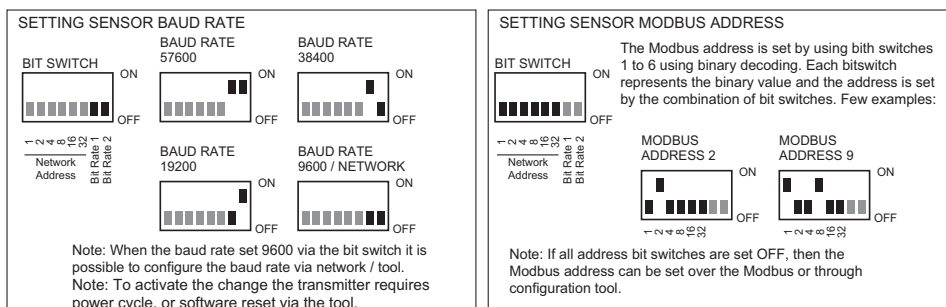
Parameter Storage

The configuration parameters are stored in the non-volatile memory. The DCT (Device 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 LLR-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 - LLR-MOD

The LLR-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
8	PB1 LED Override		0..1	Off - On
9	PB2 LED Override		0..1	Off - On
10	PB3 LED Override		0..1	Off - On
11	PB4 LED Override		0..1	Off - On
FUNCTION CODE 02 - READ DISCRETE INPUTS (Add 10,000 for Modicon Addressing)				
0	Digital Input 1 Status		0..1	Off - On
1	Digital Input 2 Status		0..1	Off - On
2	Digital Output 1 Status		0..1	Off - On
3	Digital Output 2 Status		0..1	Off - On
4	Occupancy Status (Switch Off Delayed "Delay Time Setting" amount in seconds)		0..1	Off - On
5	Push Button 1 Status (Switch Off Delayed "Delay Time Setting" amount in seconds)		0..1	Off - On
6	Push Button 2 Status (Switch Off Delayed "Delay Time Setting" amount in seconds)		0..1	Off - On
FUNCTION CODE 04 - READ INPUT REGISTERS (Add 30,000 for Modicon Addressing)				
1	Temperature Measurement	Signed 16	0..500 320..1220	0.0...50.0°C (32.0..122.0°F)
3	Light Level Measurement	Unsigned 16	0..10000	0..3000 Lux
4	Resistive Input 1 (NTC10 default)	Unsigned 16	0..50000	0..50000 Ohms
5	Resistive Input 2 (NTC10 default)	Unsigned 16	0..50000	0..50000 Ohms
6	Current Calculated Setpoint (°C / LUX) or Current Setpoint Adjustment (none option)	Signed 16	-32,767..+32,767	-3,276..+3,276.. Act Setpoint or Low..High Value
7	Analogue Output Y1	Unsigned 16	0..1000	0..100.0 %
8	Analogue Output Y2	Unsigned 16	0..1000	0..100.0 %
9	Analogue Output Y3	Unsigned 16	0..1000	0..100.0 %
10	Analogue Output Y4	Unsigned 16	0..1000	0..100.0 %
11	Alarm Status	Unsigned 16	1..3	1 = Normal State 2 = Amber Alarm State 3 = Red Alarm State
13	NTC10 Input 2 (RI2 in NTC mode; default)	Signed 16	-400...3020	-40.0...302.0 °F -40.0...150.0 °C
100	Firmware Version	Unsigned 16	n/a	n/a
FUNCTION CODE 03 - READ HOLDING REGISTERS (For Modicon Addressing Add 40,000)				
FUNCTION CODE 06 - WRITE SINGLE HOLDING REGISTER				
FUNCTION CODE 16 - WRITE MULTIPLE HOLDING REGISTERS				
0	Analogue Output Y1 Override Value	Unsigned 16	0..1000	0..10.0 V Default 0
1	Analogue Output Y2 Override Value	Unsigned 16	0..1000	0..10.0 V Default 0

Register	Parameter Description	Data Type	Raw Data	Range
2	Analogue Output Y3 Override Value	Unsigned 16	0..1000	0..10.0 V Default 0
4	Analogue Output Y1 Mode	Unsigned 16	0..5	0 = Network Value 1 = Not Applicable 2 = Temperature Measurement 3 = Not Applicable 4 = Light Measurement 5 = Not Applicable 6 = Temperature Control 7 = Not Applicable 8 = Light Control 9 = Not Applicable 10 = Potentiometer
5	Analogue Output Y2 Mode	Unsigned 16	0..5	0 = Network Value 1 = Not Applicable 2 = Temperature Measurement 3 = Not Applicable 4 = Light Measurement 5 = Not Applicable 6 = Temperature Control 7 = Not Applicable 8 = Light Control 9 = Not Applicable 10 = Potentiometer
6	Analogue Output Y3 Mode	Unsigned 16	0..5	0 = Network Value 1 = Not Applicable 2 = Temperature Measurement 3 = Not Applicable 4 = Light Measurement 5 = Not Applicable 6 = Temperature Control 7 = Not Applicable 8 = Light Control 9 = Not Applicable 10 = Potentiometer
8	Digital Output 1 Mode	Unsigned 16	0..6	0 = Network Value (Default) 1 = Not Applicable 2 = Temperature Relay 3 = Not Applicable 4 = Light Relay 5 = Occupancy Relay 6 = Push Button 1
9	Digital Output 2 Mode	Unsigned 16	0..6	0 = Network Value (Default) 1 = Not Applicable 2 = Temperature Relay 3 = Not Applicable 4 = Light Relay 5 = Occupancy Relay 6 = Push Button1 7 = Push Button 2
15	Temperature Control Setpoint	Unsigned 16	0...1500	0.0...150.0°C/°F (Default 20°C)
16	Temperature Proportional Band	Unsigned 16	1...1500	0.1...150.0°C/°F (Default 50°C)
17	Temperature Control Integral Action	Unsigned 16	0..10,000	0..10,000 seconds
18	Temperature Loop Operating Mode	Unsigned 16	0..1	0 = Reverse Control (Heating) 1 = Direct Control (Cooling)
19	Temperature Digital Output Mode Hysteresis	Unsigned 16	1...1500	0.1...150.0°C/°F (Default 2°C)
25	Lux Control Setpoint	Unsigned 16	0..3000	0..3,000 Lux (Default 400 Lux)
26	LUX Proportional Band	Unsigned 16	1..3000	1..3,000 Lux (Default 400 Lux)
27	LUX Control Integral Action	Unsigned 16	0..10,000	0..10,000 seconds
28	Lux Loop Operating Mode	Unsigned 16	0..1	0 = Reverse Control 1 = Direct Control

Register	Parameter Description	Data Type	Raw Data	Range
29	LUX Digital Output Mode Hysteresis	Unsigned 16	1..3000	1..3,000 Lux (Default 100 Lux)
30	Amber Alarm LED Switching Point	Unsigned 16	0..5000	0..5000 (Default 750)
31	Red Alarm LED Switching Point	Unsigned 16	0..5000	0..5000 (Default 1250)
32	Alarm LED Hysteresis	Unsigned 16	0..5000	0..5000 (Default 50)
33	Alarm LED Mode	Unsigned 16	0..3	0 = Not Applicable 1 = Temperature 2 = Not Applicable 3 = LUX 4 = None
34	Delay Time Setting for Occupancy	Unsigned 16	1..7200	1..7200 Seconds
35	Delay Time Setting for Push Button	Unsigned 16	1..7200	1..28800 Seconds
36	Setpoint Adjuster / Potentiometer Low Position	Signed 16	-5000..0	-500..0.0 (-3.0) Default
37	Setpoint Adjuster / Potentiometer High Position	Unsigned 16	0..5000	0..+500.0 (3.0) Default
38	Setpoint Value Influence to Control Setpoint	Unsigned 16	0..4	0 = No Influence 1 = Not Applicable 2 = Temperature 3 = Not Applicable 4 = Lux
39	Temperature Unit Selection	Unsigned 16	0..1	0 = Celsius 1 = Fahrenheit
41	Display Mode	Unsigned 16	0..3	0 = Rotate Installed 1 = CO2 Only (not applicable) 2 = Temperature Only 3 = LUX Only
43	Analogue Output Maximum Temperature Scaling	Unsigned 16	1..1500	0.1...150.0°C/°F (Default 50°C)
45	Analogue Output Maximum Lux Scaling	Unsigned 16	1000..3000	1000..3,000 Lux (Default 3,000 Lux)
47	One Point Temperature Calibration Field	Signed 16	-30..+30	-3.0..+3.0°C/°K (Default 0°C)
50	Modbus Address	Unsigned 16	0..247 See Note 1	0..247 (Default 1)
51	Modbus Baud Rate	Unsigned 16	0...3 See Note 2	0 = 9600 (Default) 1 = 19200 2 = 38400 3 = 57600
52	Modbus Parity	Unsigned 16	0...2	0 = None (Default) 1 = Odd 2 = Even
53	Stop Bits	Unsigned 16	0...1	0 = 1 Stop Bit (Default) 1 = 2 Stop Bits
67	Hold On Delay Setting for Digital Input 1	Unsigned 16	1..28800	1..28800 Seconds
68	Hold On Delay Setting for Digital Input 2	Unsigned 16	1..28800	1..28800 Seconds
69	Push Button LED Mode	Unsigned 16	0...1	0 = Local (Default) 1 = BMS
70	RI1 Single Point Calibration	Signed 16	-10,000..10,000	-1,000..1,000 °C, °F or Ohms
71	RI2 Single Point Calibration	Signed 16	-10,000..10,000	-1,000..1,000 °C, °F or Ohms
72	DI1 Pulse Count Most Significant 16 Bits	Unsigned 16	0..65280	0..65280
73	DI1 Pulse Count Least Significant 16 Bits	Unsigned 16	0..65535	0..655350
74	DI2 Pulse Count Most Significant 16 Bits	Unsigned 16	0..65280	0..65280
75	DI2 Pulse Count Least Significant 16 Bits	Unsigned 16	0..65535	0..655350
80	LCD Backlight Level	Unsigned 16	0..10	0..10
81	Reset SPA on Setpoint Change	Unsigned 16	0..1	0 = Disabled, 1 = Enabled (Default)

Register	Parameter Description	Data Type	Raw Data	Range
82	Save SPA (user adjustment on exit)	Unsigned 16	0..1	0 = Disabled (Default), 1 = Enabled
100	Force Reset	Unsigned 16	0..1	0 = Normal 1 = Force Reset
101	Non Volatile Memory Update	Unsigned 16	0..1 Note 3	0 = Normal 1 = Update
103	Force Factory Defaults	Unsigned 16	0..1	0 = Normal 1 = Force Defaults
104	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

