



- Light sensor
- PCB/enclosure temperature sensor
- Interface to PLCs using the MODBUS protocol
- Communicate via 2-wire RS-485
- Interface to instrumentation using 0 to 20 mA, 4 to 20 mA, or 0 to 10 V signals
- Generate alarms based on values of light or temperature
- Monitor alarms using MODBUS protocol or on-board open collector outputs

Introduction:

The KTA-275 is a light and PCB temperature sensor. Values of light and/or temperature can be monitored via the analogue retransmission channels in 0 to 20mA, 4 to 20mA, or 0 to 10 V formats. Additional control is provided by two on-board open collector outputs, which can be configured to trigger at pre-defined values of light or temperature. In addition, all readings and configurations can be monitored and changed via the MODBUS protocol over two-wire RS-485.

Connections:

Connection	Description
Vs	24V DC Power Input
GND	Common Ground Connection
D-	RS485 Data -
D+	RS485 Data +
OC1	Open Collector Output 1
OC2	Open Collector Output 2
Iout	Analogue Current Output
Vout	Analogue Voltage Output

Modbus:

Modbus is a Master-Slave protocol. The PLC or PC is usually the master with a number of slaves (in this case KTA-275 cards). Each slave is given a unique address from 1 to 243. The master outputs a command to the slave and the slave processes the command and transmits a response back to the master.

In the KTA-275 all data is stored in 16 bit *holding registers*. All configuration registers are backed by EEPROM, conserving their values between power downs.

Reg #	Read/W rite	EEPROM Backed?	Description
1	R	No	Light Value (Lux) ¹ (max: 16384) ⁴
2	R	No	PCB Temperature Value (Degrees Celsius x 10) ² (max: 2555) ⁴⁵
3	R	No	Open Collector 1 Status (1 = On, 0 = Off)
4	R	No	Open Collector 2 Status (1 = On, 0 = Off)
10	R/W	Yes	OC1 Sensor (0 = light, 1 = temperature)
11	R/W	Yes	OC1 Configure: Bit 0: Enable OC1 lower threshold (0 = off, 1 = On) Bit 1: Enable OC1 upper threshold (0 = off, 1 = On) Bit 2: OC1 Trigger Mode (0 = within thresholds; 1 = outside thresholds)
12	R/W	Yes	OC1 Lower Threshold ⁶
13	R/W	Yes	OC1 Upper Threshold ⁶
14	R/W	Yes	OC1 Hysteresis Band
15	R/W	Yes	OC2 Sensor (0 = light, 1 = temperature)
16	R/W	Yes	OC2 Configure: Bit 0: Enable OC2 lower threshold (0 = off, 1 = On) Bit 1: Enable OC2 upper threshold (0 = off, 1 = On) Bit 2: OC2 Trigger Mode (0 = within thresholds ; 1 = outside thresholds)
17	R/W	Yes	OC2 Lower Threshold ⁶
18	R/W	Yes	OC2 Upper Threshold ⁶
19	R/W	Yes	OC2 Hysteresis Band
20	R/W	Yes	Iout Sensor (0 = light, 1 = temperature)
21	R/W	Yes	Iout Configure (0 = 4-20 mA, 1 = 0-20 mA)
22	R/W	Yes	Iout Lower Bound
23	R/W	Yes	Iout Upper Bound
24	R/W	Yes	Vout Sensor (0 = light, 1 = temperature)
25	R/W	Yes	Vout Lower Bound
26	R/W	Yes	Vout Upper Bound
		Yes	
30	R/W	Yes	Modbus Address (1 to 243; default: 1)
31	R/W	Yes	Baud Rate: 1: 2400 baud 2: 4800 baud 3: 9600 baud 4: 19200 baud 5: 38400 baud 6: 57600 baud 7: 115200 baud Default ³ : 9600 baud
32	R/W	Yes	Parity:

			1: Odd 2: Even 3: None Default ³ : None
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IMPORTANT NOTES:

1: Lux is the SI unit of illuminance; defined as 1 lumen per square meter. The lumen is a (human eye weighted) measure of light power.

Several Australian Standards dictate minimum levels of light. Some main ones are summarised here:

Location/Activity	Minimum Illuminance (Lux)
Office	320
Factory (Large Scale Assembly)	160
Factory (Fine Work – electronics assembly, etc)	600
Factory (Precision assembly/machining)	1200

2: The PCB temperature value is scaled by a factor of 10 to provide increased resolution. Take care when reading the temperature value or setting configurations.

3: All values not specified will automatically use the default value.

4: The sensor value ranges must be considered when setting user definable registers. Do not exceed these limits.

5: The temperature sensor is that of the PCB. Due to heat generated by the internal electronics, this value will typically be higher than ambient. **This value can differ from ambient by as much as 10°C; depending on the power supply voltage.**

6: Only **one threshold** should be enabled at any one moment.

Communications:

The KTA-275 is equipped with a RS-485 transceiver. Communications settings of the unit are configured using the on-board 8-way DIP switch, or by manipulating the relevant Modbus holding registers. SW1-2 control the Modbus address, SW3-5 control the baud rate, SW6-7 control the parity, and SW8 resets all comms settings to default.

After changing any communications configuration settings (either by writing to the holding registers or changing the switches) the power must be cycled to adopt the new values.

SW1	SW2	Address
OFF	OFF	Set using Modbus (holding register 30)
ON	OFF	1
OFF	ON	2
ON	ON	3

SW3	SW4	SW5	Baud
OFF	OFF	OFF	Set using Modbus (holding register 31)
ON	OFF	OFF	2400
OFF	ON	OFF	4800
ON	ON	OFF	9600
OFF	OFF	ON	19200
ON	OFF	ON	38400
OFF	ON	ON	57600
ON	ON	ON	115200

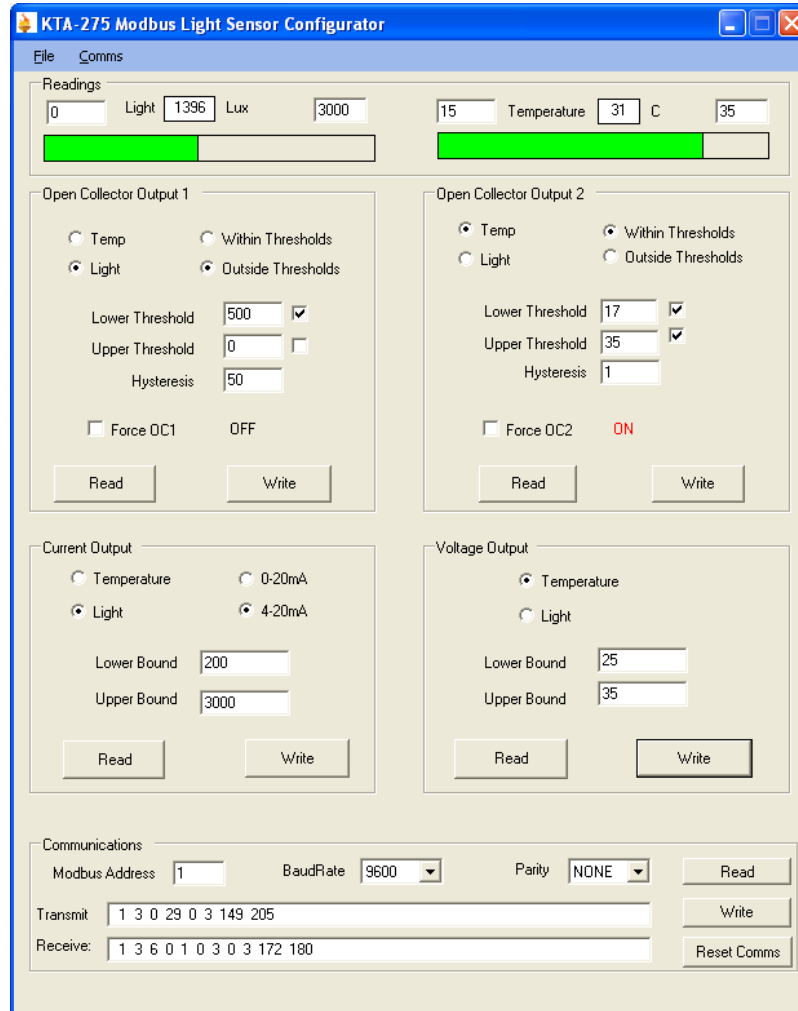
SW6	SW7	Parity
OFF	OFF	Set using Modbus (holding register 32)
OFF	ON	Odd
ON	OFF	Even
ON	ON	None

SW8	Reset
OFF	No action
ON	Reset all settings to default (address = 1, baud = 9600, parity = none)

If the switches are set to OFF, the communications settings are set via the Modbus holding registers; these default to Address = 1, Baud Rate = 9600 and Parity = None. The reset switch overwrites all other settings.

Configuration Software:

Ocean Controls supply a software configuration package called “KTA-275 Configurator” which is a simple to use program. The configuration software allows the user to monitor the light and temperature values, and the statuses of the open collector outputs, as well as setting all user configurable values.



Communications

Communication settings can be set by pressing the *Comms* menu item. The following values are required:

- Com port (The PC com port connected to the KTA-275)
- Modbus address
- Baud rate
- Parity

If these settings are correct, the unit and PC will start communicating. Sent and received data can be observed in the *transmit* and *receive* text boxes at the bottom of the screen.

The area marked *communications* allows the comms settings of the **KTA-275** to be manipulated (this is not to be confused with the comms settings of the Configuration Software previously described). These values read and write the relevant Modbus registers.

Readings

The top of the screen displays the instantaneous values of light and temperature numerically and

graphically - in units of Lux and degrees Celsius respectively. Text boxes on either side of the graphic control the resolution of the bar. Set each value# to provide a suitable range for displaying the light and temperature.

The minimum and maximum values of these sensors is given in the specifications at the end of this document. Take heed of these values when setting any user configurable parameters.

Open Collector Outputs

The open collector outputs can be configured in a multitude of ways to suit your particular application.

Begin by choosing the sensor; each output can be triggered by either light or temperature. A second control allows the user to choose the behaviour of the output; *inside thresholds* will turn on the output if the reading (light or temperature) falls **below** the upper threshold **OR above** the lower threshold. Conversely, *outside thresholds* will turn on the output if the reading is **below** the lower threshold **OR above** the upper threshold – see note 6 above.

The thresholds themselves can be defined using the text boxes marked *upper threshold* and *lower threshold*. The accompanying tick box will enable each of these controls. A third text box – marked *hysteresis* – allows the user to define a guard band to prevent multiple triggering of the output when the reading is varying close to the threshold(s).

The tick boxes marked *Force OC1* and *Force OC2* can be used to override these settings and set the output manually. Ensure that no thresholds are enabled when using this functionality.

All settings must be written to the RTU before they become functional. Configurations can also be read using the corresponding button.

The state of the output is indicated by dynamic text below the mode selector controls (OFF in black or ON in red).

Example

The user requires notification when the light level in their factory falls below 500 lux, and if the PCB/enclosure temperature is above 27 C. The KTA-275 would be configured as follows:

Open Collector 1

Mode: Light

Trigger: Outside thresholds

Lower Threshold: 500 lux + enabled

Upper threshold: disabled

Hysteresis: ~50

Open Collector 2

Mode: Temperature

Trigger: Within Thresholds

Lower threshold: 27+ enabled

Hysteresis: ~1

Analogue Re-Transmission

The KTA-275 can also output the value of light or PCB temperature as voltage or current signal. The lower and upper bound for transmission can be set using the corresponding text box. The output will scale linearly between these two values.

The current output has an option of 0 to 20mA or 4 to 20mA range. The voltage will vary between 0 to 10 V. Each selection must be written to the RTU before it becomes functional.

#: These thresholds do not affect the KTA-275 in any way; they are only used to manipulate the graphic.

Specifications

Power Supply	Min	Typ	Max	Unit
Supply Voltage	12	24	40	V
Current Draw			100	mA
Operating Temperature	-20		80	C

RS-485 Transceiver	Min	Typ	Max	Unit
Driver Current			28	mA
Symbol Rate	2400	9600	115200	Baud
Data Bits		8		
Parity		None	Odd, Even	
Stop bit		1		

Open Collector Outputs	Parameter	Unit
Max Current Sink	300	mA
Max Voltage	50	V

Voltage Output	Min	Max	Unit
Voltage	0	10	V
Current Draw		18	mA

Current Output	Parameter	Unit
Max Current	20	mA
Max Loop Resistance	$(V_{\text{supply}} \times 49) - 360$	Ohm

Sensors	Min	Max	Unit
Light Reading	0	16384	Lux
Temperature Reading	-20 ⁰	125 ⁰	Celsius