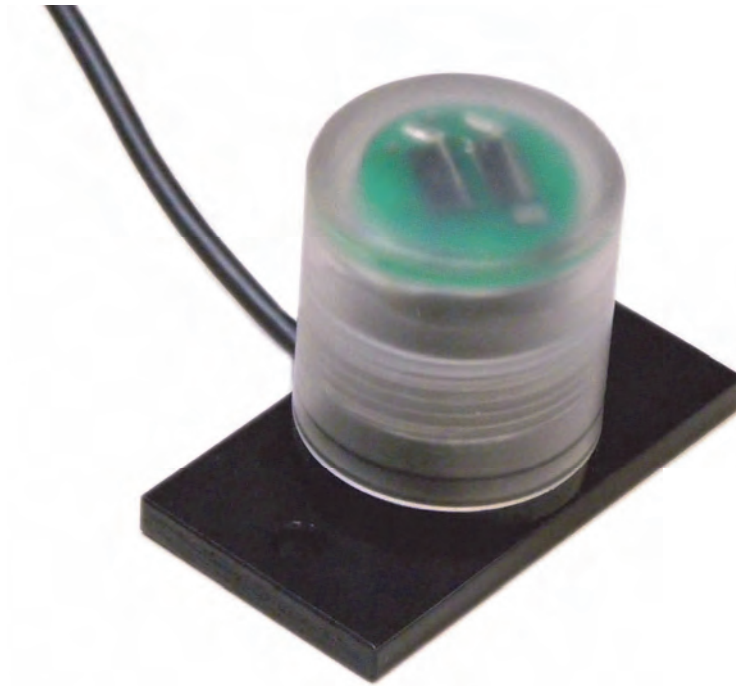


Pyranometer - Light Sensor.



Installation Guide.

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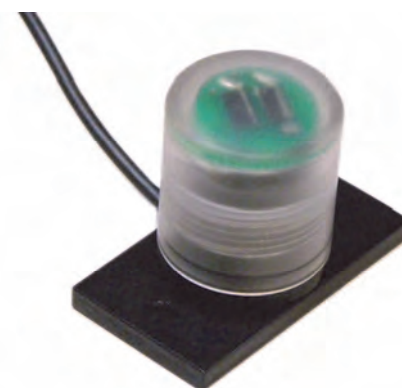
LE Light Sensor

Pyranometer.
Light / Solar Radiation Sensor.

Description.

The pyranometer uses a polycrystalline silicon solar cell to measure the incoming global solar radiation. This gives good accuracy without the expense and maintenance required by a thermopile pyranometer. It also provides a flatter spectral response than the photodiodes that are frequently used for this type of sensor.

The pyranometer has been designed to provide a wide spectral response, a good cosine response and low susceptibility to inaccuracies caused by rain drop and dirt effects. The pyranometer has a relatively large surface compared to many photo diode sensors. This minimizes inaccuracies caused by the effect of rain drops and dirt on the surface. The sensor has a slightly domed top to facilitate rain drainage. Dirt sitting on the surface of the sensor is dispersed by rain flowing off the dome.



Ordering Information.

Standard output models.

LE-CL Light sensor with 4~20mA output and 5m cable.

Special output models. Note: Minimum Order Quantity applies.

LE-V Light sensor with 0~5Vdc output and 5m cable.

LE-USB Light sensor with USB output and 5m cable.

LE-RS485 Light sensor with RS485 output and 5m cable.

Specifications.

Common Specifications:

Accuracy	±5%.
Range	0~1500 w/m ² .
Cosine error	Typically less than 3% from vertical to 85° in all directions.
Temperature Coefficient	0.15% per 1°C.
EMC Compliances	Emissions EN 55022-A. Immunity EN 50082-1.
Safety Compliances	EN 60950.
Dimensions -Sensor	Ø=38mm, H=45mm.
-Mounting Plate	L=70mm, W=38mm, H=7mm, PCD=5.5mm.

Current Output Specifications:

Output	4~20mA, 2 wire (Loop Powered).
Load Resistance	600Ω @ 24Vdc.

Voltage Output Specifications:

Output	0~5Vdc, 3 Wire (common ground).
Power Supply Required	12Vdc.

USB Output Specifications:

Output	USB (Std Male Type A, 5Vdc Powered).
Baud Rate	9600.
Format	8 Bit, No Parity, 1 Stop Bit (<i>non selectable</i>).
Protocol	MODBUS RTU.

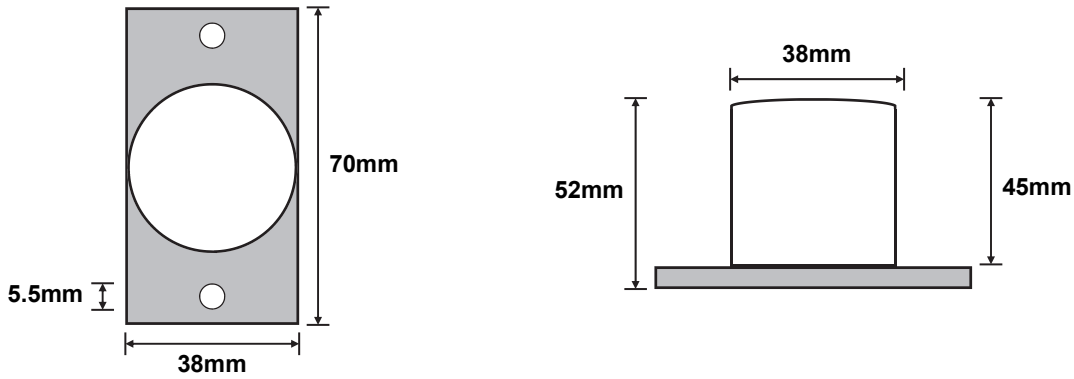
RS485 Output Specifications:

Output	RS485.
Baud Rate	9600.
Format	8 Bit, No Parity, 1 Stop Bit (<i>non selectable</i>).
Protocol	MODBUS RTU.

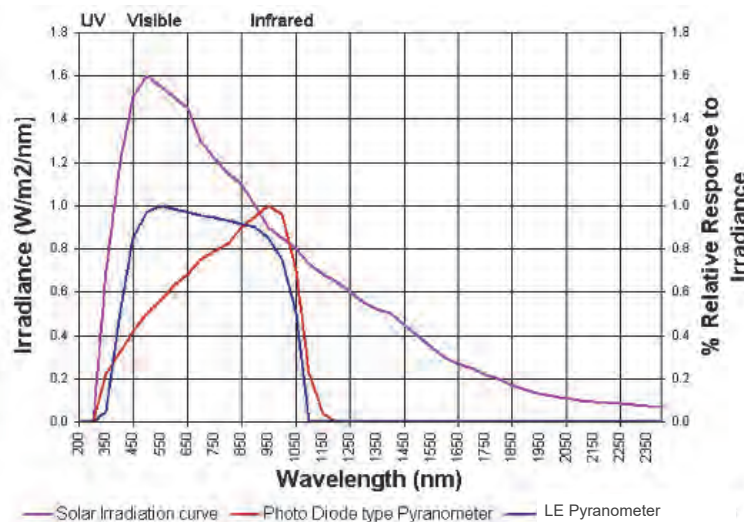
Product Liability. This information describes our products. It does not constitute guaranteed properties and is not intended to affirm the suitability of a product for a particular application. Due to ongoing research and development, designs, specifications, and documentation are subject to change without notification. Regrettably, omissions and exceptions cannot be completely ruled out. No liability will be accepted for errors, omissions or amendments to this specification. Technical data are always specified by their average values and are based on Standard Calibration Units at 25C, unless otherwise specified. Each product is subject to the 'Conditions of Sale'.

Warning: These products are not designed for use in, and should not be used for patient connected applications. In any critical installation an independent fail-safe back-up system must always be implemented.

LE Layout & Dimensions.

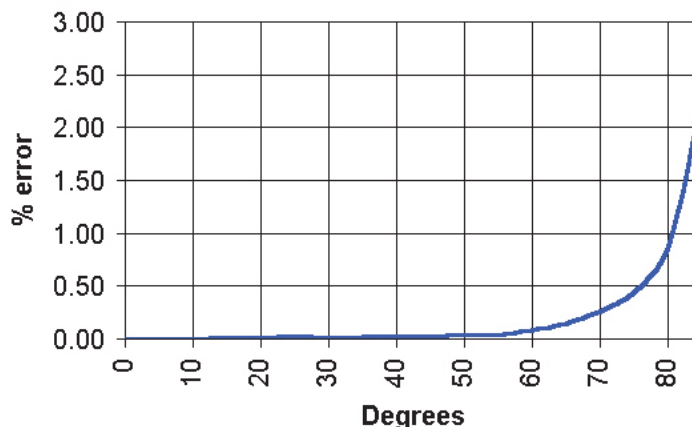


Spectral Response.



The full terrestrial solar spectrum deposits measurable energy at the earth's surface in the range from 287 nanometers (nm) to beyond 4000 nm. However, as can be seen from the spectral response graph, the pyranometer measures the radiation between 300 and 1100 nanometers. As over 90% of the solar energy is between 300~1100nm, the pyranometer is calibrated so as to estimate the short-wave component of the solar radiation.

Cosine Response.



An ideal pyranometer collects radiation from horizon to horizon and should therefore have a reception angle of 180° in all directions. In reality, some low angle radiation will not be detected because of the geometry of the sensor but this has been minimized by the sensor head design. As can be seen from the cosine response graph, the cosine error for this pyranometer is typically less than 3% from vertical to 85° in all directions.

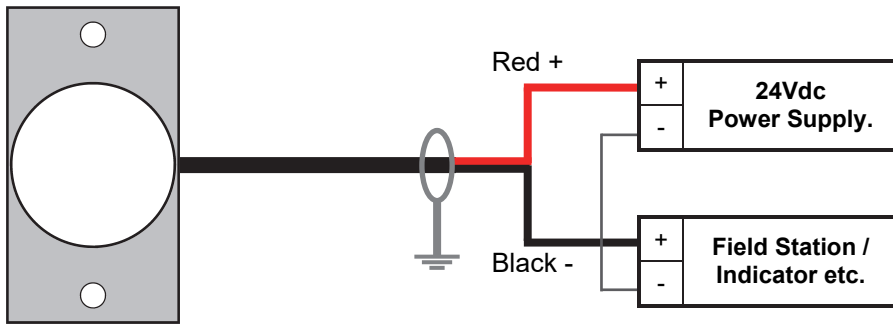
Other Sources of Errors.

The polycrystalline silicon solar cells have a temperature coefficient of 0.15% per 1°C. The pyranometer is calibrated at 20°C giving a possible 3% error from 0°C to 40°C.

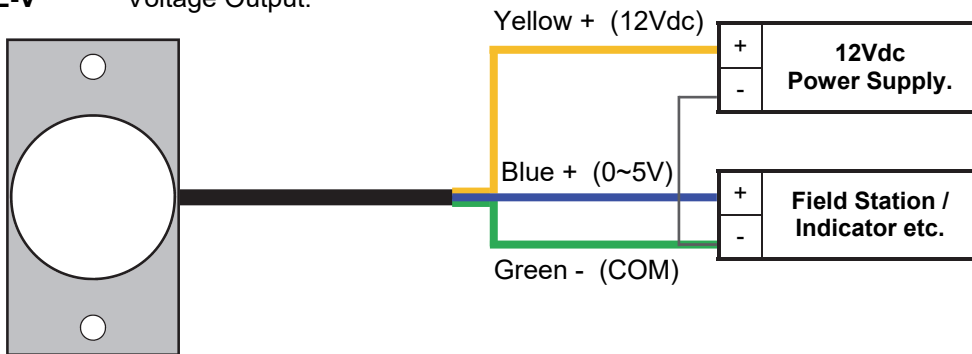
The output of all radiation sensors tends to decrease over time as the detector ages. Our calculations estimate that the average decrease of the sensor is between 1% and 2% per year.

Connection Diagrams.

LE-CL Loop Powered Output.

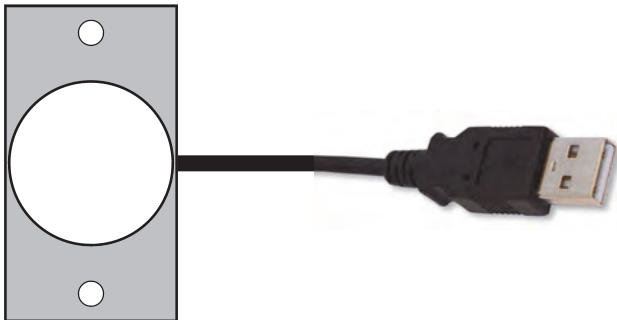


LE-V Voltage Output.



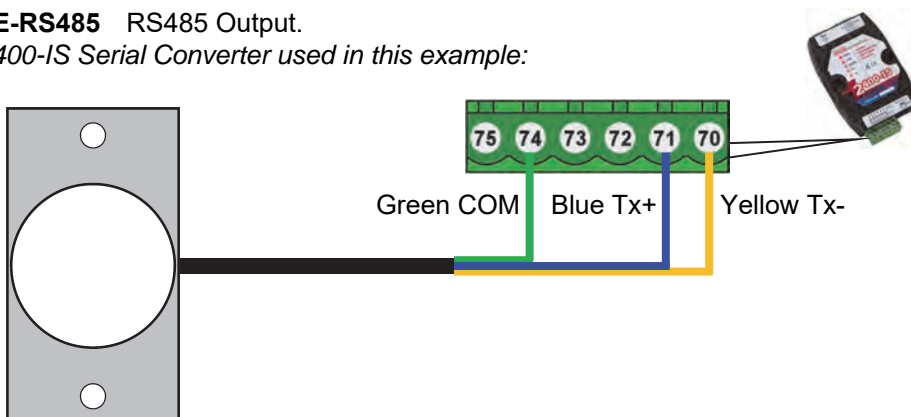
LE-USB USB Output.

USB Connector = standard male type A.



LE-RS485 RS485 Output.

2400-IS Serial Converter used in this example:



USB and RS485 Protocol.

MODBUS RTU slave.

Light Sensor Modbus Registers and Commands. (LE-USB / LE-RS485).

The following registers are used:

Holding Register 1 (Address 0000) for light energy in Watts per square metre.

Holding Register 2 (Address 0001) for Gain.

Input Register 1 (Address 0000) for raw Analogue to Digital Converter counts

In the following sentences the CRC is assumed.

To read light energy in Watts per square metre:

Address - Function Code - Start Address - Quantity of Registers.

Address will always be 01 (one byte) for USB models.

Function Code will always be 03 (1 byte).

Start address will always be 0000 (2 bytes).

Quantity of Registers will always be 0001 (2 bytes).

Reply will be:

Address - Function Code - Number of Bytes - Value.

Address will always be 01 (one byte) for USB models.

Function Code will always be 03 (1 byte).

Number of Bytes will always be 02 (1 byte).

Light Energy Value (2 bytes MSB First).

To read Gain:

Address - Function Code - Start Address - Quantity of Registers.

Address will always be 01 (one byte) for USB models.

Function Code will always be 03 (1 byte).

Start address will always be 0001 (2 bytes).

Quantity of Registers will always be 0001 (2 bytes).

Reply will be:

Address - Function Code - Number of Bytes - Value.

Address will always be 01 (one byte) for USB models.

Function Code will always be 03 (1 byte).

Number of Bytes will always be 02 (1 byte).

Gain Value (2 bytes MSB First) / 10,000.

The Gain value read from the register is divided by 10,000 to give the true gain value.

To read Raw Analogue to Digital Converter counts:

Address - Function Code - Start Address - Quantity of Registers.

Address will always be 01 (one byte) for USB models.

Function Code will always be 04 (1 byte).

Start address will always be 0000 (2 bytes).

Quantity of Registers will always be 0001 (2 bytes).

Reply will be:

Address - Function Code - Number of Bytes - Value.

Address will always be 01 (one byte) for USB models.

Function Code will always be 04 (1 byte).

Number of Bytes will always be 02 (1 byte).

A2D converter Value (2 bytes MSB First).

To write Gain:

Address - Function Code - Register Address - Value.

Address will always be 01 (one byte) for USB models.

Function Code will always be 06 (1 byte).

Register Address will always be 0001 (2 bytes).

Value will be Gain X 10,000 (2 Bytes).

Reply will be:

Address - Function Code - Register Address - Value.

Address will always be 01 (one byte) for USB models.

Function Code will always be 06 (1 byte).

Register Address will always be 0001 (2 byte).

Gain Value (2 bytes MSB First) (NB: / 10,000 for actual Gain).

To Calibrate:

Read the Raw A2D converter value.

Divide the Actual Solar Energy Value in Watts per Sq Metre by the A2D converter reading.

This gives the Actual Gain.

Multiply the Actual Gain by 10,000.

Write this value to the gain register (Holding Register 2 Address 0001).

Installation.

All power and signals must be de-energised before connecting any wiring.

Mounting:

- Mount in a clean environment.
- Do not subject to vibrations.
- Avoid mounting near power control equipment.
- Mount onto a solid panel or bar.

Wiring:

- All cable should be good quality overall screened instrumentation cable with the screen earthed at one end only.
- Signal cables should be laid a minimum distance of 300mm from any power cables.
- It is recommended that you do not ground current loops and use power supplies with ungrounded outputs.
- Lightning arrestors should be used when there is a danger from this source.
- Cables are available ready made; Standard cable size is 5 metres.

Maintenance:

- The LE light sensor is designed for outside mounting in a location that does not have any obstructions to the sun light.
- All cable terminations and connections must be in a dry location.
- The LE light sensor is by design, self cleaning with natural rain fall. However, regular inspection for dirt settling on the sensor should be made to determine the required maintenance cleaning period.
- For cleaning the LE light sensor, use a clean wet cloth and ensure all traces of dirt are removed. Do not use any cleaning agents.
- Recommended annual calibration checks. Calibration checks are available by returning the LE light sensor to Intech Instruments Ltd.
- Calibration Procedure: Short wave calibration carried out at normal incidence using a reference Pyrometer with the sun as a source (ISO 9847, type 1c). Recommend the reference Pyrometer to be traceable to the World Radiometric Reference.
- If the LE light sensor requires adjustment, please return the unit to Intech Instruments Ltd.

Intech Weather Station.



WS3-WD-THP-TB-CL

Wind Speed (3 cup), Wind Direction, Temperature,
Humidity and Barometric Pressure mounted on T-Bar.
Standard: 4~20mA Output.
Option: MODBUS RTU.

Intech INSTRUMENTS LTD

www.intech.co.nz

Christchurch Ph: +64 3 343 0646

Auckland Ph: 09 827 1930

Email: sales@intech.co.nz