SKP215
Quantum Sensor

User Guide

Issued 26.2.96

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This equipment is guaranteed against defects in materials and workmanship. This guarantee applies for twelve months from date of delivery. We will repair or replace products which prove to be defective during the guarantee period provided they are returned to us prepaid. The guarantee will not apply to:

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- Batteries
- Any product which has been subjected to misuse, neglect, acts of God or damage in transit.

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Campbell Scientific Ltd,
Campbell Park, 80 Hathern Road,
Shepshed, Loughborough, LE12 9GX, UK
Tel: +44 (0) 1509 601141
Fax: +44 (0) 1509 601091
Email: support@campbellsci.co.uk
www.campbellsci.co.uk

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SKP215 Quantum Sensor

The SKP215 measures incident quanta between 400 and 700nm. Light in this waveband is used for photosynthesis and is often referred to as 'PAR' (Photosynthetically Active Radiation).

Quanta below 400nm are not generally used in photosynthesis and those above 700nm have insufficient energy for the process. The number of quanta is related to sugar production and this measurement is now a standard referred to in scientific papers world-wide. Filtering in the sensor means that the measurement may be made accurately under any light source (sun, tungsten, fluorescent, xenon, etc.). The head is completely sealed and can be left indefinitely in exposed conditions.

The sensor is calibrated against standard quartz halogen lamps traceable to NPL reference lamps. Absolute errors are always within 5%, and typically much better than 3%.

The calibration is given in units of μmolm^{-2}s^{-1}. A μmol is the new name for the unit μEinstein, which is one millionth of Avagadro's number of quanta or photons.

1. Specifications

- Sensitive to light between 400nm and 700nm wavelength (see Figure 1)
- Output 1mV per 100μmolm^{-2}s^{-1}
- Absolute accuracy ±5% (typically <±3%)
- Cosine corrected head (typical errors zero 0-70°, <10% 85-90°; see Figure 2)
- Blue-enhanced silicon photocell detector with low fatigue characteristics
- Constructed from Dupont 'Delrin', sensor head fully sealed to IP68
- Operating temperature -35°C to +75°C

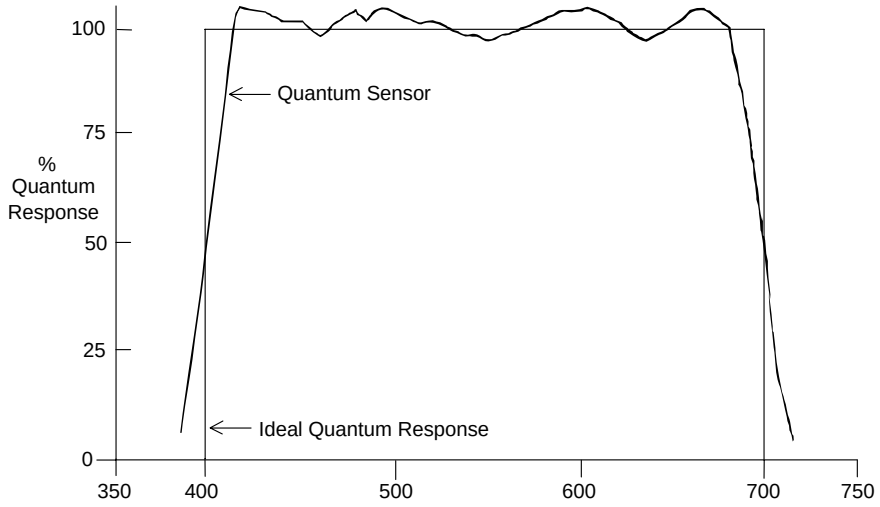


Figure 1 Typical Spectral Response of SKP215

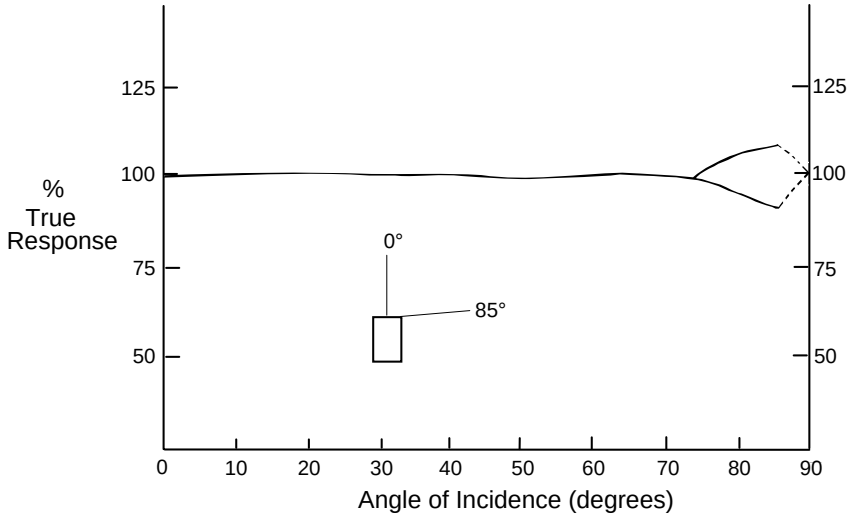


Figure 2 Typical Cosine Response Error for SKP215

2. Installation

For accurate positioning of the sensor we recommend the use of a levelling fixture (SKE211). To achieve accurate and repeatable results great care should be taken in siting the sensor. Avoid objects such as trees that may shade the sensor selectively compared with the areas under study.

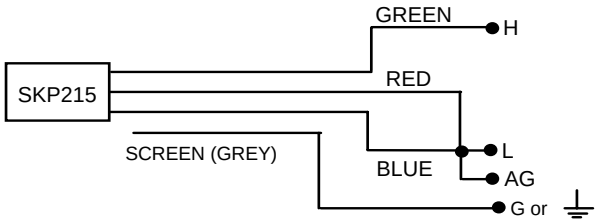
The SKP215 can give a voltage output or a current output (see Figure 3). Voltage output is normally used with Campbell Scientific dataloggers. To obtain voltage output, the red and blue wires must be connected to the same point; differential and single-ended connections to the datalogger are shown in Figure 3.

NOTE If the SKP215 is supplied with a connector the red and blue wires are joined inside the connector.

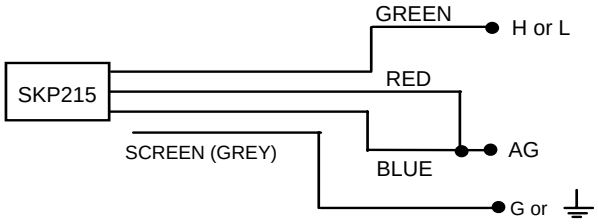
CAUTION External voltages must not be applied to the sensor, as the silicon photocell and precision resistive elements may be damaged by reverse voltage or excess current.

3. Programming

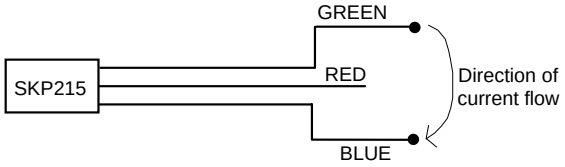
The SKP215 outputs a low level voltage ranging from 0 to a maximum of about 20mV depending on the radiation level. A differential voltage measurement (Instruction 2) is recommended because it has better noise rejection than a single-ended measurement. If a differential channel is not available, a single-ended measurement (Instruction 1) can be used. The acceptability of a single-ended measurement can be determined by simply comparing the results of single-ended and differential measurements made under the same conditions.



(a) Differential Measurement



(b) Single-Ended Measurement



(c) Current Output

Figure 3 SKP215 Wiring

NOTE

1. AG refers to Analogue Ground and G refers to Power Ground on the CR10/CR10X, which are the same as ground (⏚) for the 21X and CR7.
2. For the differential measurement, the low side of the differential channel is connected to analogue ground in order to keep the output signal inside the common mode range of the datalogger.
3. Current output is not normally used with Campbell Scientific dataloggers.

3.1 Input Range

The output voltage of the SKP215 is 1mV per 100μmolm^{-2}s^{-1}.

Select the input range as follows:

1. Estimate the maximum expected input voltage by dividing the maximum expected irradiance in μmolm^{-2}s^{-1} by 100.
2. Select the smallest input range which is greater than the maximum expected input voltage. Normally the 50mV range (21X and CR7) or the 25mV range (CR10/10X) are suitable.

The measurement integration time is also specified by the input range parameter code. A more noise-free reading is obtained with the slow or 50Hz rejection integration. A fast integration takes less power and allows for faster throughput.

NOTE If the sensor is being used under AC-powered artificial lighting, it is necessary to use 50Hz rejection as the photodiode has a fast enough response time to measure the variations in light level caused by the alternating current.

For the CR10/10X datalogger the 50Hz rejection option will not remove the noise. An alternative technique of oversampling and storing an average will give an accurate result. Please contact Campbell Scientific for further details.

3.2 Multiplier

The multiplier converts the millivolt reading to engineering units. Use a multiplier of 100 to obtain output in $\mu molm^{-2}s^{-1}$.

3.3 Output Format Considerations

The largest number the datalogger can store in Final Storage is 6999 in low resolution and 99999 in high resolution. If the measurement value is totalized, there is some danger of overranging the output limits. The simplest solution to this problem is to change the output units by reducing the multiplier in the measurement instruction by a factor of, for example, 1000.

NOTE At night, imperfections in the sensor can cause apparently negative radiation values. Since these values have no meaning, they can be detected and set to zero, if required, by adding the appropriate instructions to the datalogger program.

4. Maintenance

The only regular maintenance required is to clean the sensor surface with a blast of clean, dry air or a soft brush every 1-3 months depending on the environment.

Recalibration is recommended every two years, and the sensor should be returned to Campbell Scientific for this.

CAMPBELL SCIENTIFIC COMPANIES

Campbell Scientific, Inc. (CSI)
815 West 1800 North
Logan, Utah 84321
UNITED STATES
www.campbellsci.com • info@campbellsci.com

Campbell Scientific Africa Pty. Ltd. (CSAf)
PO Box 2450
Somerset West 7129
SOUTH AFRICA
www.csafrica.co.za • sales@csafrica.co.za

Campbell Scientific Australia Pty. Ltd. (CSA)
PO Box 8108
Garbutt Post Shop
QLD 4814 AUSTRALIA
www.campbellsci.com.au • info@campbellsci.com.au

Campbell Scientific do Brazil Ltda. (CSB)
Rua Luisa Crapsi Orsi, 15 Butantã
CEP: 005543-000 São Paulo SP BRAZIL
www.campbellsci.com.br • suporte@campbellsci.com.br

Campbell Scientific Canada Corp. (CSC)
11564 - 149th Street NW
Edmonton, Alberta T5M 1W7
CANADA
www.campbellsci.ca • dataloggers@campbellsci.ca

Campbell Scientific Centro Caribe S.A. (CSCC)
300N Cementerio, Edificio Breller
Santo Domingo, Heredia 40305
COSTA RICA
www.campbellsci.cc • info@campbellsci.cc

Campbell Scientific Ltd. (CSL)
Campbell Park
80 Hathern Road
Shepshed, Loughborough LE12 9GX
UNITED KINGDOM
www.campbellsci.co.uk • sales@campbellsci.co.uk

Campbell Scientific Ltd. (France)
3 Avenue de la Division Leclerc
92160 ANTONY
FRANCE
www.campbellsci.fr • info@campbellsci.fr

Campbell Scientific Spain, S. L.
Avda. Pompeu Fabra 7-9
Local 1 - 08024 BARCELONA
SPAIN
www.campbellsci.es • info@campbellsci.es

Campbell Scientific Ltd. (Germany)
Fahrenheitstrasse13, D-28359 Bremen
GERMANY
www.campbellsci.de • info@campbellsci.de

Please visit www.campbellsci.com to obtain contact information for your local US or International representative.