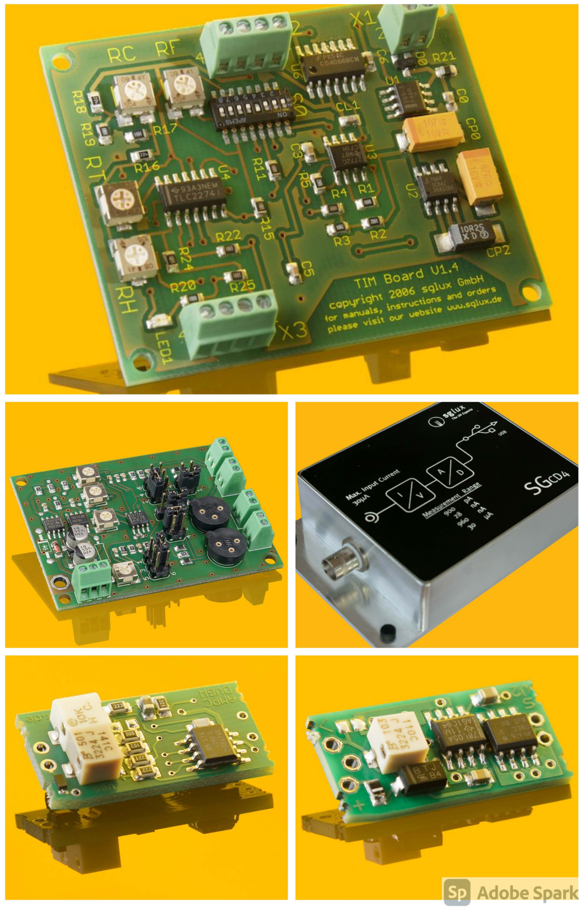
Transducers



- sglux transducers transform low photocurrents from photodiodes to robust standard signals for reliable data transmission and simple data acquisition.
- Different models output current, voltage or digital signals

sglux
The UV Experts

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UV Solutions from Boston Electronics and sglux

Thank you for your interest in our **UV detection solutions**. In this catalog, you will find dedicated sections describing the full breadth of **sglux'** product offerings. In this catalog you will find discussions on the applications, tutorials on the technology and UV measurements, and information on sensor selection. The enclosed information should allow you to appropriately select the sensor you need for your specific application.

Sections:

- SiC UV Photodiodes
- UV TOCONS
- UV Probes
- Displays
- UV Calibration
- UV Spectrometer
- UV-Index Measurement

If you wish to look at a specific data sheet, please go to our website or web store. Also, do not hesitate to contact our applications staff so that they can answer any questions you have, and provide a quotation.

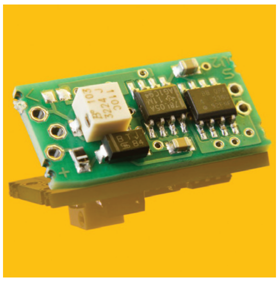
If you also have a need for **UV Light Emitting Diodes (UV LEDs)** please see our web site. We carry high performance, affordable solutions from **Nikkiso**.




VOLTCON series

Transmitter of photocurrent to 0 - 5 V signal

GENERAL FEATURES



Properties of the VOLTCON

The VOLTCON converts a photocurrent into an output voltage between 0 and 5 V and can be connected to any PLC system.

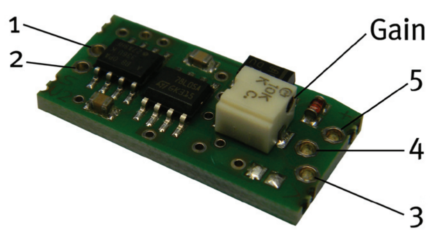
Three models with different measurement ranges are available. The amplification factor (gain) can be adjusted by a potentiometer. The measurement range can also be customized by replacing passive components (see description on page 2).

SPECIFICATIONS

Parameter	Value	
Photocurrent measurement range	VOLTCON_low	500 µA
	VOLTCON_med	5 µA
	VOLTCON_high	50 nA
Supply voltage	7* … 24 V (*usable down to 5V, but this is not recommended)	
Gain adjustment range	± 35%	
Dark output voltage	< 1 mV	
Dimensions	13 x 26 x 8 mm (WxLxH)	
Operating temperature	-20 … +80 °C	
Storage temperature	-40 … +80 °C	
Standards	RoHS 2 2011/65/EU, DIN IEC 60381-2	

We strongly recommend to process this product on ESD protected workplaces.

CONNECTION



1 - Photodiode anode

2 - Photodiode cathode

3 - Signal output (connect to current input)

4 - GND power supply

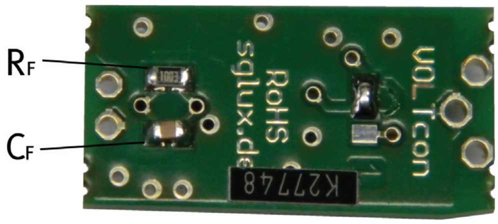
5 - V+ power supply

Gain - turn left to increase the gain

VOLTCON series

Transmitter of photocurrent to 0 - 5 V signal

CUSTOMIZATION OF MEASUREMENT RANGE



To modify the measurement range beyond the available adjustment range the feedback resistor R_f must be replaced. The adjustment range remains unaffected by this change. I_{max} is the designated maximum photocurrent to be measured.

$R_{f,new}$ (in MΩ) = 5 / I_{max} (in µA)

The capacitor C_f defines the time constant τ of the measurement and may need modification too. By default τ is 10 ms for all models. The required value of C_f can be calculated from $R_{f,new}$ and the intended time constant:

C_f (in nF) = τ_{new} (in ms) / $R_{f,new}$ (in MΩ)

Recommended values:

10 kΩ <= $R_{f,new}$ <= 3 GΩ and 1 ms <= τ <= 200 ms, $C_{f,new}$ >= 33 pF,

components package size 0805 (2.0 x 1.25 mm)

Default component values:

Model	**R_f**	**C_f**
VOLTCON_low	10 kΩ	1 µF
VOLTCON_med	1 MΩ	10 nF
VOLTCON_high	100 MΩ	100 pF

AMPCON series

Transmitter of photocurrent to 4 - 20 mA current loop

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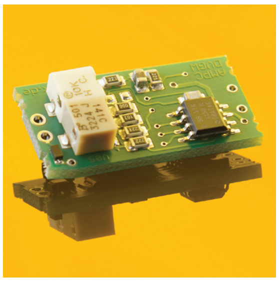
GENERAL FEATURES



Properties of the AMPCON

The AMPCON converts a photocurrent to an industry standard current loop signal. It exhibits a loop-powered (passive) 4 to 20 mA sensor to any PLC system.

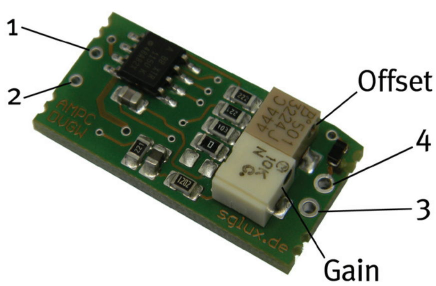
Three models with different measurement ranges are available. Gain and offset can be adjusted by potentiometers. The measurement range can also be customized by replacing passive components (see description on page 2).

SPECIFICATIONS

Parameter	Value	
Photocurrent measurement range	AMPCON_low	250 µA
	AMPCON_med	2.5 µA
	AMPCON_high	25 nA
Loop supply voltage	(10 to 24) V ± 10 % depending on loop resistance	
Total loop resistance	<= 700 Ω@ 24V, <= 100 Ω at 10V	
Gain adjustment range	± 35%	
Offset adjustment range	4 mA (±12.5%)	
Dimensions	13 x 26 x 8 mm (WxLxH)	
Operating temperature	-20 to +80 °C	
Storage temperature	-40 to +80 °C	
Standards	RoHS 2 2011/65/EU, DIN IEC 60381-1	

We strongly recommend to process this product on ESD protected workplaces.

CONNECTION



1 - Photodiode anode

2 - Photodiode cathode

3 - Signal output (connect to current input)

4 - V+ power supply

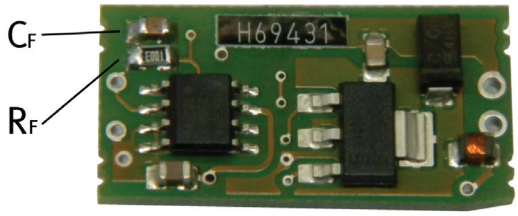
Gain - turn left to increase the gain

Offset - turn left to decrease the offset

AMPCON series

Transmitter of photocurrent to 4 - 20 mA current loop

CUSTOMIZATION OF MEASUREMENT RANGE



To modify the measurement range beyond the available adjustment range the feedback resistor R_f must be replaced. The adjustment range remains unaffected by this change. I_{max} is the designated maximum photocurrent to be measured.

$R_{f,new}$ (in MΩ) = 2160 / I_{max} (in nA)

The capacitor C_f defines the time constant τ of the measurement and may need modification too. By default τ is 10 ms for all models. The required value of C_f can be calculated from $R_{f,new}$ and the intended time constant:

C_f (in nF) = τ_{new} (in ms) / $R_{f,new}$ (in MΩ)

Recommended values:

10 kΩ <= $R_{f,new}$ <= 3 GΩ and 1 ms <= τ <= 200 ms, $C_{f,new}$ >= 33 pF,

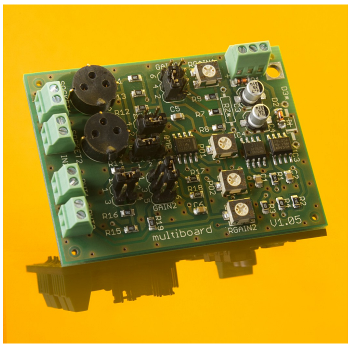
components package 0805 (2.0 x 1.25 mm)

Default component values:

Model	**R_f**	**C_f**
AMPCON_low	10 kΩ	1 µF
AMPCON_med	1 MΩ	10 nF
AMPCON_high	100 MΩ	100 pF

MULTIBOARD (TW-MF2CAB)
Multifunctional 2-Channel Photodiode Amplifier

Introduction



Photodiodes generate small photo-currents ranging from microamperes down to picoamperes, which cannot be measured with commonly available multimeters – amplifiers are required. Amplifiers such as the sglux dual channel MULTIBOARD converts very small currents into a voltage of 0…4V. Thus such amplifiers convert the small current signal of photovoltaic elements (photodiodes) to signal voltages suitable for typical voltmeters, microcontrollers and PLC systems.

Basics

Photo-currents can be converted to voltages by transimpedance amplifiers (TIA). The MULTIBOARD utilizes this approach. The schematic is shown in Appendix C. For basic knowledge about this device please refer to application note (SBOA061) for device OPA128 from texas instruments. Other approaches employ current-to-frequency converters and integrators, such as the sglux “DIGIBOARD”.

Specifications

The MULTIBOARD contains two independent amplifier channels with adjustable gain. By using jumpers one can select the amplifier type (voltage or transimpedance amplifier) and configuration (two independent amplifiers or single two-stage amplifier) as well as the gain.

The board provides current gain in the range 10^5 V/A…10^7 V/A and voltage gain from 2…1000 V/V in single-stage configuration. Additionally to the fixed gain factors are potentiometers for custom gain factors in the range 10^4 V/A…10^6 V/A. By two stages one may reach gains of 10^{10} V/A respectively 10^5 V/V if offsets are carefully adjusted. The maximum usable output voltage range is ±4 V and must be considered while calculating gain factors.

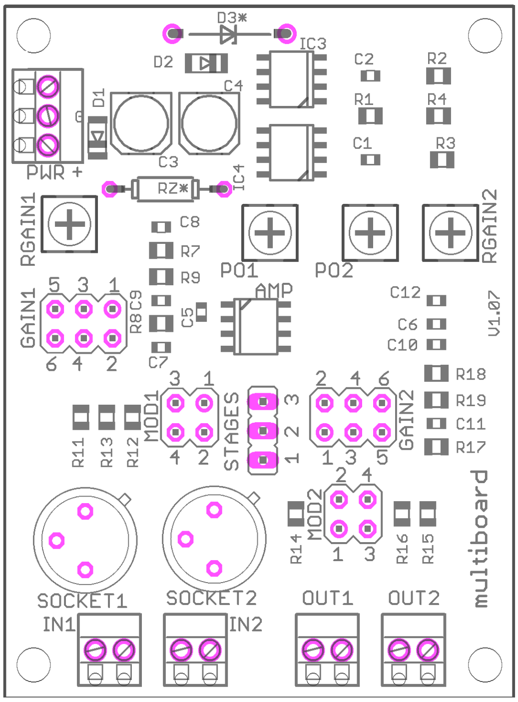
The circuit is ideally operated with a split power supply of ±7 V…±26 V. For lower performance measurements a single supply of 15 V…36 V may be used. **Note**: For using single supply mode see Appendix B. **Note**: Applying operating voltage with a wrong polarity can destroy the board. The photodiodes plug directly into sockets or are externally connected via screw terminals. The output voltages are available on screw terminals.

Specifications overview

Signal out	Ranges	Setting facilities	U_{supply}
0…4V	...400nA ...4µA ...40µA 40nA...4µA	• 3 ranges configurable with jumpers • continuously adjustable amplification with potentiometer • offset control with potentiometer	15…36V single supply or 2 x 7…26V dual supply

Starting

The index “x” in names relates to the channel number (“1” or “2”), for positions and pin numbers please refer to the picture on the right.



- Choose operation modes and configuration by setting jumpers MODx and STAGES; refer to Appendix A, tables 2 and 3.
- Set required gains with jumpers GAINx and/or potentiometers RGAINx; again refer to Appendix A, table 4.
- Connect voltmeter(s) to screw terminals OUTx. Right pin (#1) is the output, left pin (#2) equals to GND.
- Connect the power supply to screw terminal PWR. For dual power supply use top terminal (#3) for negative, middle (#2) for GND and bottom terminal (#1) for positive voltage. A single supply must be connected with positive pole to bottom pin (#1) and supply GND to top pin (#3), middle pin is left open.
  Note: In case of single supply there is a floating virtual ground on the middle terminal to which the inputs and outputs relate and which must not be connected to power supply GND.
- Adjust offsets for all channels. To do this shorten inputs for voltage amplifiers and leave inputs open for transimpedance stages (or insert photodiodes and darken them to compensate dark currents as well). Now adjust the output voltages to 1mV or less by potentiometers POx.
- Connect photodiode(s) to either terminal INx or SOCKETx. The right pins (#1) of screw terminals INx are the inputs, the left pins (#2) equal to GND (cathode). If using the sockets the upper pinhole is the input and must be plugged with one photodiode pin in any case. Other pinholes are grounded and may be used as required. Polarity of the photodiodes within sockets depends only on desired output voltage polarity.

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Examples

Problem 1:

Compare photocurrents of two different photodiodes. This task at first requires two identical channels and an estimation of the photocurrent generated with this experiment. This current can be calculated by the formula:

$$I = A_{chip} \cdot S_{chip} \cdot E_{\lambda} \cdot 10.000$$

where I is the photocurrent in nA, A_{chip} is the chip active area of the photodiode you plan to use in mm^2. S_{chip} is the chip's spectral sensitivity in $AW^{-1}nm^{-1}$ and E_{λ} is the spectral irradiance of the UV light source in $mWcm^{-2}nm^{-1}$. Please get A_{chip} and S_{chip} from the photodiode's datasheet. E_{λ} needs some knowledge of the UV source you plan to use. Sun and purification lamps generate approx. 1…..10 $mWcm^{-2}nm^{-1}$. For a very detailed tutorial have an internet search for: "SiC UV Photodiode Selection Guide". Further to the example experiment, the estimated photocurrent may be approx. 1…2µA. As the output of the MULTIBOARD is 0…4V, you may expect to get 1…2V output voltage by defining the gain as 1V/µA = 10^6 V/A.

Solution:

- ✓ set jumper STAGES to position 1-2 (two channel mode), set MOD1 and MOD2 to position 1-2 (transimpedance amplifier)
- ✓ set GAIN1 and GAIN2 to position 2-4 (transimpedance gain 10^6 V/A)
- ✓ connect and turn on power supply
- ✓ insert photodiodes, darken them, compensate offsets (and dark currents) by adjusting PO1 and PO2
- ✓ illuminate photodiodes with visible and ultraviolet light, compare voltages on terminals OUT1 and OUT2

Problem 2:

Convert a photocurrent of 1nA to a voltage of 2.0 Volts. This requires a total gain of 2V/nA = $2 \cdot 10^9$ V/A, which can be provided by two amplifier stages. The first stage converts the current to a voltage of 10mV with a gain 10^7 V/A, which is then boosted to 2.0 V by the second voltage amplifier stage with a gain of 200 V/V. This voltage can be displayed easily by a standard digital panel voltmeter.

Solution:

- ✓ set jumper STAGES to position 2-3 (two channel mode)
- ✓ set MOD1 to position 1-2 (transimpedance amplifier) and GAIN1 to position 1-3 giving 10^7 V/A in the first stage
- ✓ open MOD2 (voltage amplifier, pre-gain 2) and set GAIN2 to position 1-3 (giving overall voltage amplification of 200 in stage two)
- ✓ connect and turn on power supply

- ✓ insert photodiode into SOCKET1 and darken it; first compensate offset of first stage by adjusting PO1 until voltage on OUT1 is below 1 mV; then compensate offset of second stage by adjusting PO2 until voltage on OUT2 is below 1 mV
- ✓ illuminate photodiode and measure voltage on terminal OUT1

Appendix A

Table 1: pin, terminal and other assignments for split supply

	Pin 1	Pin 2	Pin 3	If a single supply is applied see Appendix B.
PWR	+7 V … +26 V	GND	-7 V … -26 V	
IN1	input terminal channel 1	GND		
SOCKET1	input socket channel 1	GND	GND	
OUT1	output terminal channel 1	GND		
PO1	offset compensation channel 1			
IN2	input terminal channel 2	GND		
SOCKET2	input socket channel 2	GND	GND	
OUT2	output terminal channel 2	GND		
PO2	offset compensation channel 2			

Table 2: channel configuration

STAGES	Function
1-2	two independent amplifier channels
2-3	single two-stage amplifier; note: channel two must be configured as voltage amplifier by setting MOD2 in any position but 1-2 and offsets must be carefully adjusted

Table 3: amplifier mode

MODx	Function
1-2	transimpedance amplifier
1-3	voltage amplifier pre-gain -10
3-4	voltage amplifier pre-gain -5
Open	voltage amplifier pre-gain -2

Table 4: gain factor setting

GAINx	transimpedance gain [V/A]	voltage gain (multiply by voltage pre-gain to get total voltage gain) [V/V]
1-3	10^7	100
2-4	10^6	10
3-5	10^5	1
4-6	adjustable by potentiometer RGAINx in range 10^4 … 10^6	0.1…10

Appendix B

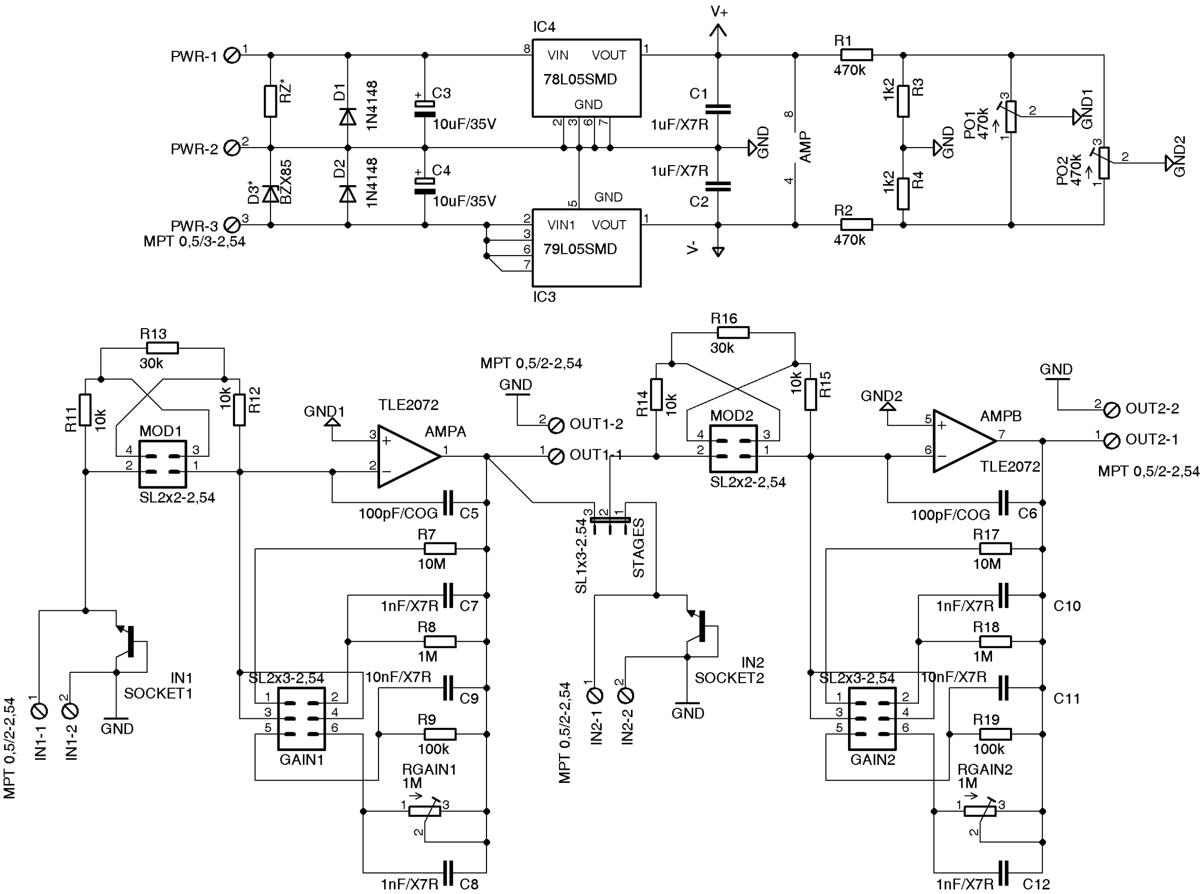
Table 1: pin, terminal and other assignments for single supply

	Pin 1	Pin 2	Pin 3	
PWR	+15 V … +36 V	open	Supply GND	The board GND is not referenced to the power supply GND
IN1	input terminal channel 1	GND		
SOCKET1	input socket channel 1	GND	GND	
OUT1	output terminal channel 1	GND		
PO1	offset compensation channel 1			
IN2	input terminal channel 2	GND		
SOCKET2	input socket channel 2	GND	GND	
OUT2	output terminal channel 2	GND		
PO2	offset compensation channel 2			

If a single supply is used add a zener diode (D3) with at least 7,5V zener voltage. The recommended zener voltage is half the single supply input voltage.

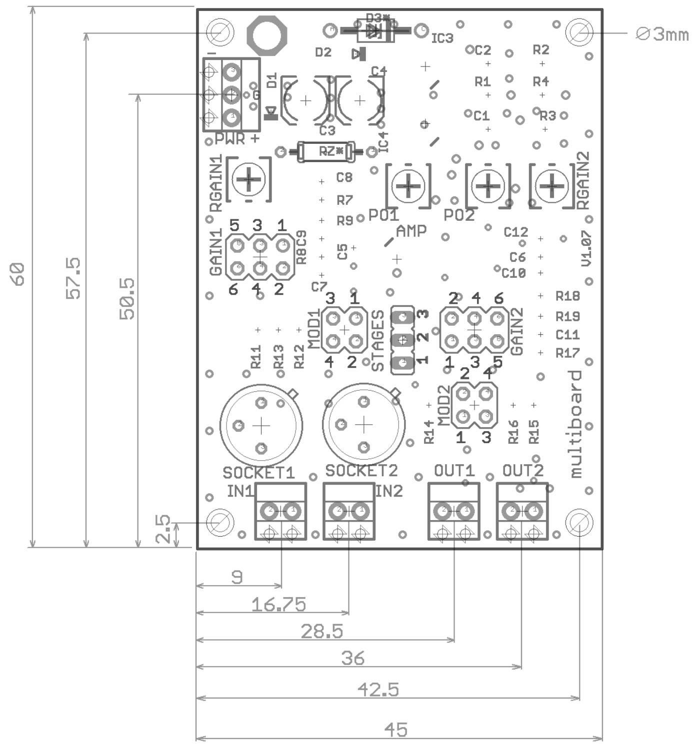
Appendix C

Schematic:



Appendix D

Dimensions:



Description

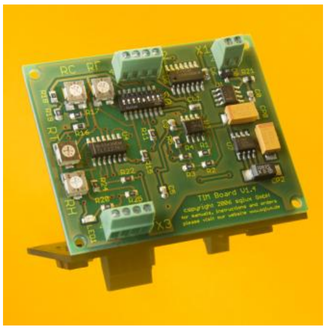


Fig. 1: Board overview

Most applications of photodiodes and especially those in the ultraviolet wavelength range require special amplifiers because of the small photocurrents. Although the uv-sensors of **sg***lux* provide large active areas you mostly may consider using an amplifier.

To support your application development we provide you this completely new photodiode amplifier board. Based on our successful **Multifunctional 2-Channel Amplifier Board** we included additional features: one analog channel with adjustable Schmitt-Trigger (ST) and a Current-to-Frequency converter (CFC) channel.

The CFC clearly simplifies the integration of our photodiodes into digital- and microprocessor based designs.

Features

- wide single supply voltage range 5.0 V … 18.0 V with surge and polarity protection
- low power consumption (< 50 mW @ 5 V)
- analog transimpedance amplifier channel with:
  - adjustable gain in the range 10^5 … 10^7 V/A with fine tuning option
  - Schmitt-Trigger stage with adjustable switching point and adjustable Hysteresis
  - LED for easy adjustment of the Schmitt-Trigger
- Current-to-Frequency converter with:
  - 2 measurement ranges giving high dynamic range
  - standard CMOS compatible digital output

Important Notice

Please consider any possible action to protect the sensitive devices on the board against electrostatic discharge (ESD). Not to do so voids warranty.

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Getting Started

Power Supply

This board requires a single DC voltage supply from 5 V … 18 V to be connected as shown in figure 2. In general a simple filtered DC source is sufficient.
But for ultra low noise and high gain measurements we recommend using batteries or carefully selected power supply units.
The Board is protected against wrong polarity of the power supply. The surge protection device (AVX TransGuard VC080518) has a breakdown voltage of about 23 V and is capable of handling Pulses with 0.1 J / 10 µs.

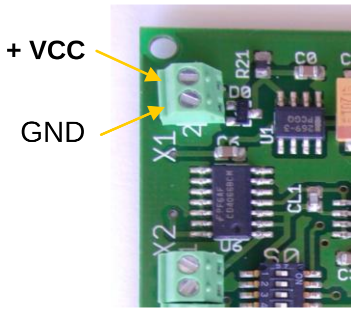


Fig. 2: Power supply connection

Current-to-Frequency Converter

The input and output connections for this Channel are shown in figure 3. The anode of the photodiode must be connected to the input terminal and the cathode to GND.

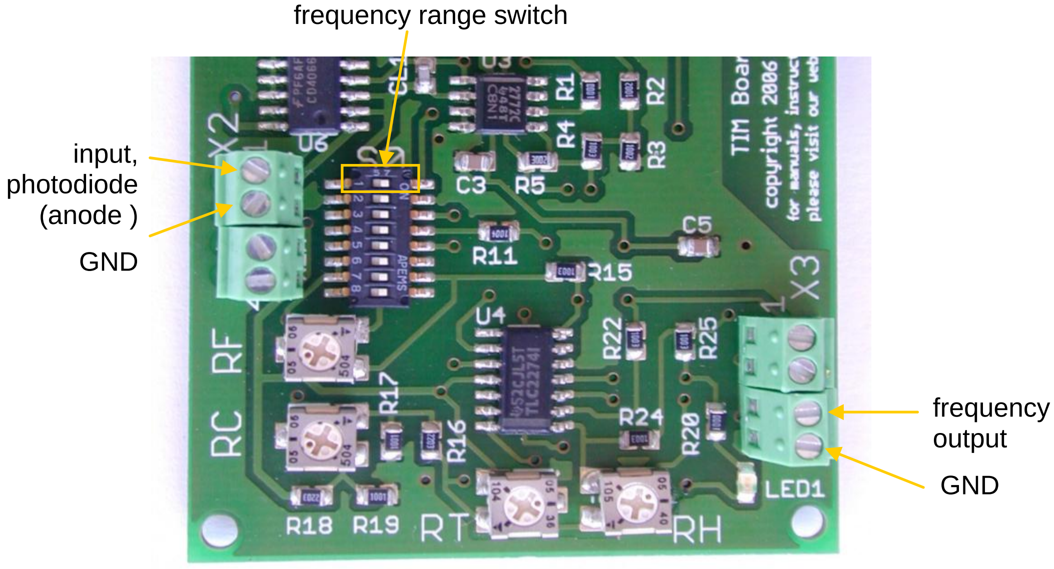


Fig. 3: Current-to-Frequency Converter input, output and switches

If there appears no pulse signal on the output the polarity of the photodiode may be wrong. Also check that your equipment is able of recognising pulses as short as 1 µs. Especially with older analog oscilloscopes and under artificial illumination it can be tricky to trigger these pulses because the output frequency may vary with the double of the mains frequency.

The measurement range can be selected by switch 1 as shown in the following table. One can calculate the output frequency by multiplying the photocurrent with the given conversion factor.

Switch 1	***Mode***	***Conversion factor***
1 = OFF	high frequency / low current	~ 3.3 □ 10^9 Hz / A
1 = ON	low frequency / high current	~ 3.0 □ 10^8 Hz / A

In both ranges the useful frequencies range from 0.1 Hz up to about 40 kHz giving a dynamic range of 112 dB. Above 40 kHz the linearity error increases steeply as shown in figure 4 due to the influence of the fixed output pulse duration on the total integration cycle lenght.

In programmable systems the linearity error can be corrected by using a matched lookup table. In this case frequencies up to 500 kHz can be used and thus the total dynamic range increases by two orders of magnitude.

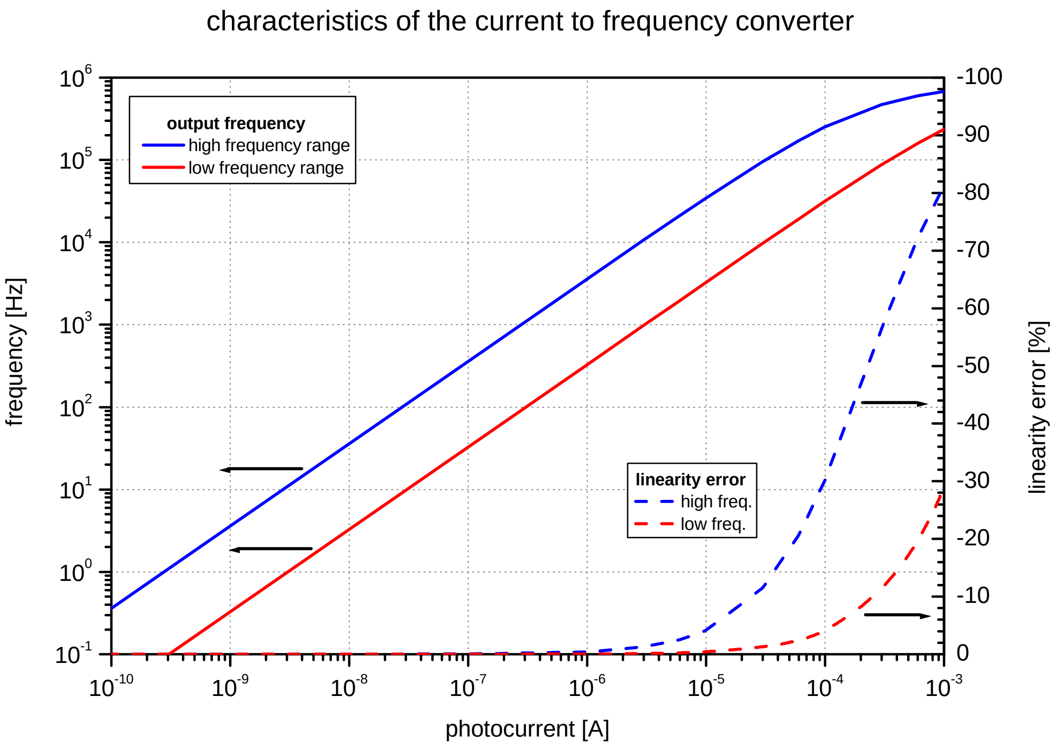


Fig. 4: CFC performance

Hint: If you require different conversion factors the load capacitors CL1 and CL2 have to be changed. CL1 is solely active with switch 1 opened. Closing switch 1 puts both capacitors in parallel and the active load capacitance equals their sum. We are happy to assist you with that or to deliver boards adapted to your application.

Analog Amplifier Channel

Amplifier stage

This channel is completely independent of the CFC and works fully bipolar. Please refer to figure 5 for the appropriate connections and controls.
If you connect the anode of the photodiode to the input pin the output voltage is negative and vice versa.

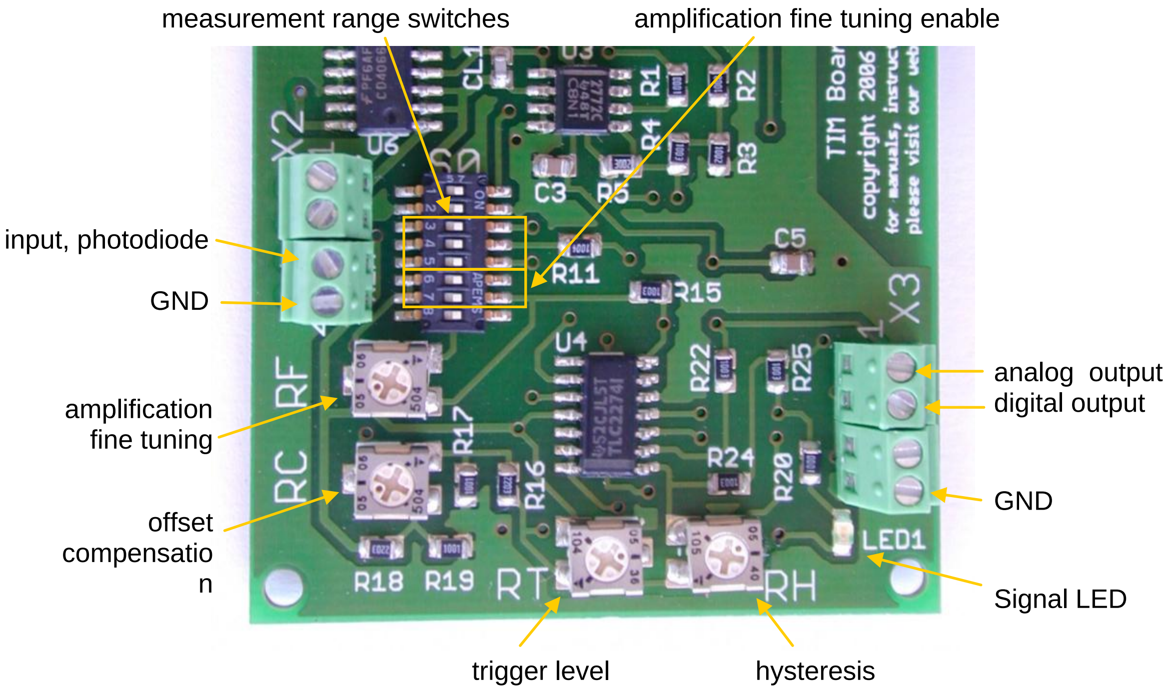


Fig. 5: Analog amplifier channel: input, output, potentiometers and switches

For basic operation close (ON) one of the switches 3, 4, 5 and both switches 6 and 7. The amplification can be selected as follows:

Switches 3,4,5			***Amplification***
3 = ON	4 = OFF	5 = OFF	10^7 V/A
3 = OFF	4 = ON	5 = OFF	10^6 V/A
3 = OFF	4 = OFF	5 = ON	10^5 V/A

To activate amplification fine tuning you must open both switches 6 and 7 (OFF). Now you can adjust the total amplification with potentiometer "RF" by a factor in the range 0.5 … 1.5.

Switches 6,7	***Amplification fine tunig***
6 = OFF 7 = OFF	enabled
6 = ON 7 = ON	disabled

Example: You choose 10^6 V/A and fine tuning. Now with "RF" you can trim the amplification in the range $5 \cdot 10^5$ V/A to $1.5 \cdot 10^6$ V/A.

The maximum analog output voltage is approx. ± 3.0 V and the output current must not exceed 1 mA. Please note that the amplifier is fast enough to resolve intensity modulation of the doubled mains frequency as normally found when using fluorescent lamps.

The input offset can be compensated by this procedure:

1. select amplification
2. connect the (darkened) photodiode
3. switch power on
4. adjust 'RC' potentiometer until the analog output voltage is as small as possible (typically below 10 mV)

Schmitt-Trigger

The analog output voltage is internally connected to the Schmitt-Trigger. The switching point can be adjusted by potentiometer "RT" within the range +3 V (left stop) … -3 V (right stop).

The Hysteresis is adjustable by potentiometer "RH" from 0.05 V (left stop) to approx. 1.5 V (center position). It doesn't make sense to use the range from beyond the middle to the right stop because with such large hysteresis the function is unstable.

The logical state of the Schmitt-trigger output is displayed by the red LED. The LED is on if the output is logically HIGH (~ 3 V).

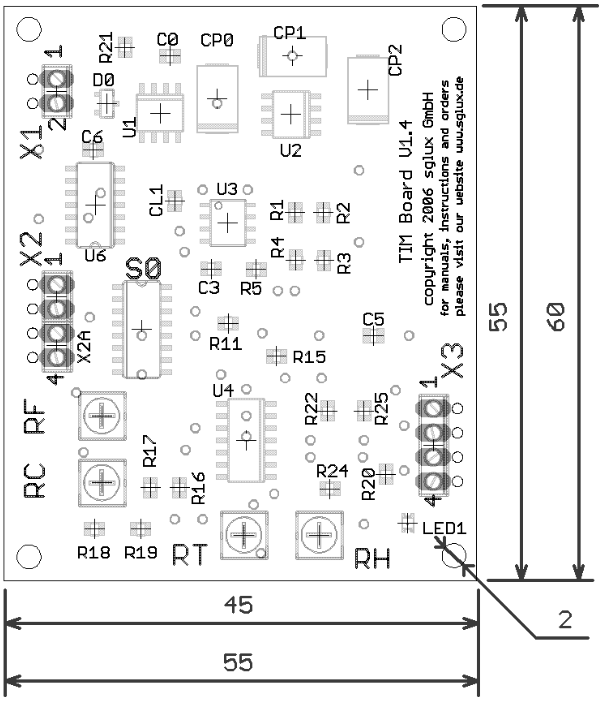
Special feature:

- if the analog output voltage is positive: the Schmitt-Trigger output goes HIGH if the analog output voltage exceeds the switching point.
- if the analog output voltage is negative: the Schmitt-Trigger output goes LOW if the analog output voltage exceeds the switching point.

Thus it is possible to realise either overshoot or undershoot detection with the same device by changing the polarity of the photodiode!

Physical Dimensions

All dimensions are shown in millimeters.



Absolute Maximum Ratings

Exceeding these limits may decrease lifetime or destroy the board or parts of it immediately.

Parameter	***Unit***	***Value***
Operation Temperature range *	°C	0 … +70
Storage Temperature range *	°C	-25 … +85
Supply voltage	V	+18.5
Output current (digital output)	mA	0.5
Output current (analog output)	mA	10

**in non condensing environment only*

Electrical Characteristics **(at 25°C unless otherwise noted, default jumper settings)**

General

Parameter	***Unit***	***Value*** ***min***	***typ***	***max***
Supply voltage	V	5	12	18
Power dissipation *(at 5 V supply voltage, depends on load and switching frequency)*	mW		50	

Analog channel

Parameter	***Unit***	***Value*** ***min***	***typ***	***max***
Fixed transimpedance gain *(gain setting by switches 3,4,5)* low medium high	V/A	0.98 □ 10^5 0.98 □ 10^6 0.90 □ 10^7	10^5 10^6 10^7	1.02 □ 10^5 1.02 □ 10^6 1.10 □ 10^7
Variable transimpedance gain factor range*		0.7 – 1.3	0.5 – 1.5	0.3 – 1.7
Input current	A			□ 30 □ 10^{-6}
Maximum output voltage *(in both polarities)*	V	□ 2.6	□ 2.9	□ 3.3
Output offset voltage *(with optimal compensation)*	mV		< □ 5	□ 10

** if fine tuning selected by closing switches 6 and 7 total gain derived by multiplying fixed gain with variable gain factor*

Digital channel

Parameter	***Unit***	***Value*** ***min***	***typ***	***max***
Output voltage LOW*	V	0	0.05	0.1
Output voltage HIGH*	V	2.8	3.1	3.3
Frequency output pulse length FWHM *(levels above)*	µs	1	1.2	2
Input current	A	~ 10^{-10}		~ 10^{-4}
Conversion rate low frequency mode high frequency mode	Hz / A	2.8 □ 10^8 3.1 □ 10^9	3.0 □ 10^8 3.3 □ 10^9	3.2 □ 10^8 3.5 □ 10^9
Conversion rate temperature dependance	1 / K		□ 3 □ 10^{-5}	

Linearity error, high frequency mode @ 10 kHz @ 40 kHz @ 100 kHz	%		1 5.2 12	
Linearity error, low frequency mode @ 10 kHz @ 40 kHz @ 100 kHz	%		1 5.5 13	

** for the frequency output as well as for the Schmitt-Trigger output*

BostonElectronics

Switchable Gain Photocurrent Digitizer (Photodiode Preamplifier with A/D)

- switchable gain photocurrent digitizer, converting small DC currents (e.g. generated by photodiodes) into digital values transmitted via USB to a computer for displaying and recording
- four switchable gain levels
- no specific previous metrological knowledge needed
- delivered with a PTB traceable current calibration
- low noise cable available on request

www.boselec.com | boselec@boselec.com | shop.boselec.com | 617.566.3821

SGCD4

Switchable Gain Photocurrent Digitizer

sglux
The UV Experts

Boston Electronics

GENERAL FEATURES

Properties of the SGCD4

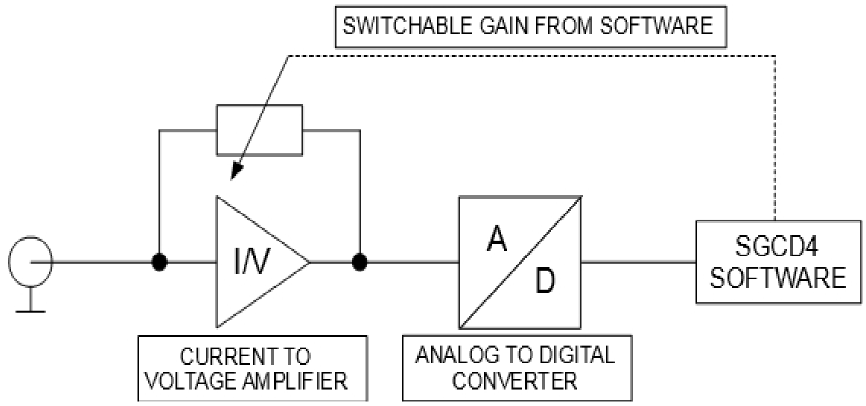
The SGCD4 is a switchable gain photocurrent digitizer that converts small DC currents (e.g. generated by photodiodes) into digital values transmitted via USB to a computer for displaying and recording. Four different current measurement ranges are user selectable by software. The device is delivered with a PTB traceable current calibration.

SPECIFICATIONS

Parameter	Value
Current measurement range 1 (end of range)	1 nA
Current measurement range 2 (end of range)	30 nA
Current measurement range 3 (end of range)	900 nA
Current measurement range 4 (end of range)	30 µA
Maximum input current	30 µA
Measurement range control	by software
Operating temperature range (non condensing)	-20 to +80 °C
Storage temperature range (non condensing)	-20 to +80 °C
Dimensions (width x length x height)	80 x 130 x 28 mm

We strongly recommend to process this product on ESD protected workplaces.

BLOCK DIAGRAM



SOFTWARE - INSTRUCTIONS

Installation instructions

Navigate to https://download.sglux.de/amplifiers/sgcd4 and download “sglux-sgcd4-*-setup.exe”, start it and follow the instructions. We recommend to keep all settings to default and to just press next/next/.../finish.

Information about the software being installed on your computer

The install wizard will install three software modules:

1. USB serial port driver (2 MB, manufacturer FTDI)
2. Labview runtime engine (280 MB, manufacturer National Instruments)
3. SGCD4 Software (10 MB, manufacturer sglux)

To install updates please download sglux-sgcd4-*-update.exe.

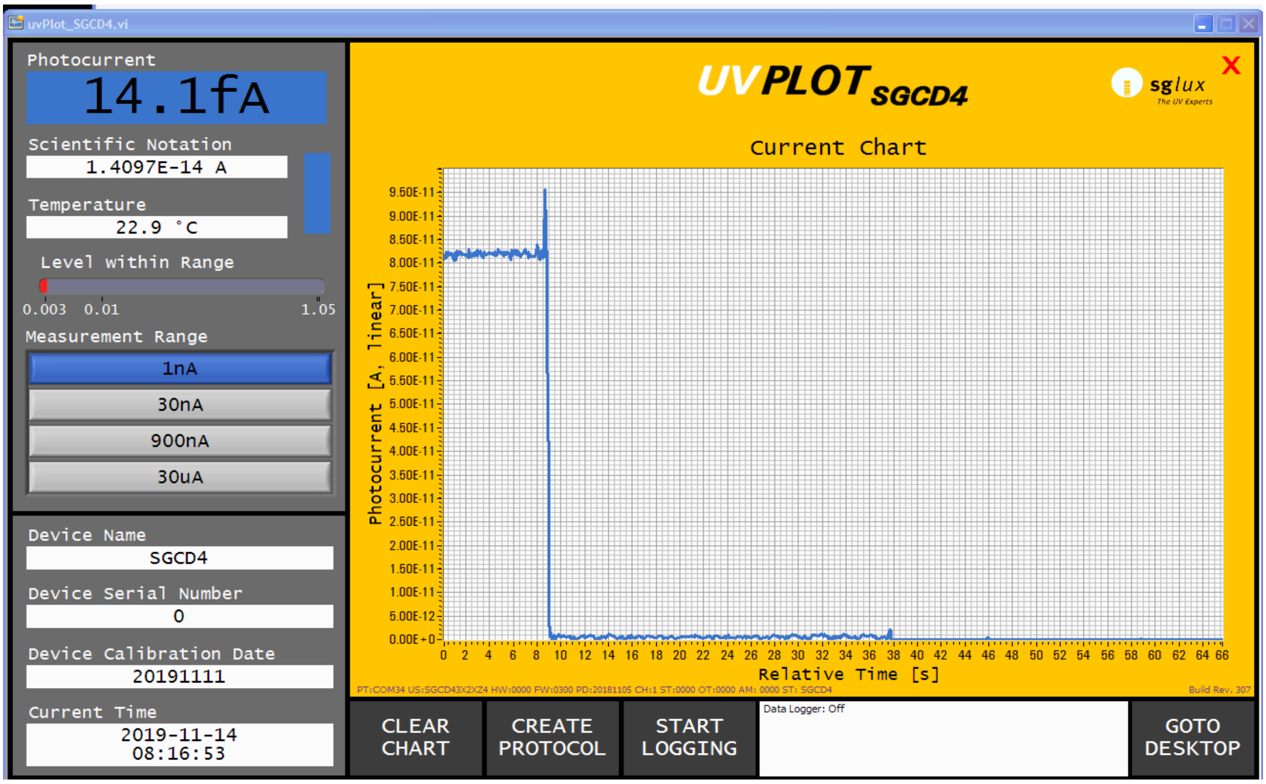
SGCD4

Switchable Gain Photocurrent Digitizer

SOFTWARE - INSTRUCTIONS

Usage instructions for uvPLOT SGCD4

After installing the prerequisites and the program connect the SGCD4 unit to the computer and open the program uvPLOT SGCD4.

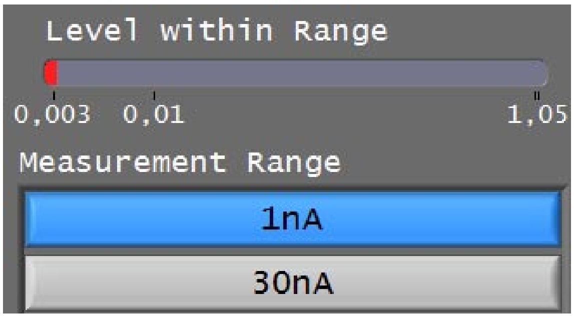


By default, the smallest measurement range is selected.

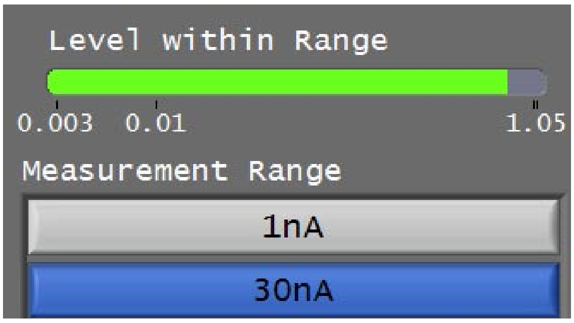
The “Level within range” indicator shows the signal level within the currently selected measurement range. It is green if the measurement range is appropriate for the given current.

SOFTWARE - INSTRUCTIONS

If it is red the signal current is either too small or too large for the selected measurement range. If possible change the range accordingly.



The measurement range can be changed by clicking one of the 4 buttons. Your selection will be marked blue and is immeadiately effective.



CREATE PROTOCOL - Button

Clicking this button creates a HTML file with an overview of all sensor data and a chart of the current measurement. This file is saved in the installation folder and can be opened with any web-browser.

START / STOP LOGGING - Buttons

Activation this button creates a CSV file and all subsequent sensor readings are recorded. The file can be found in the installation folder. During data logging, it is not possible to change the measurement range. For this the logging must be interrupted.

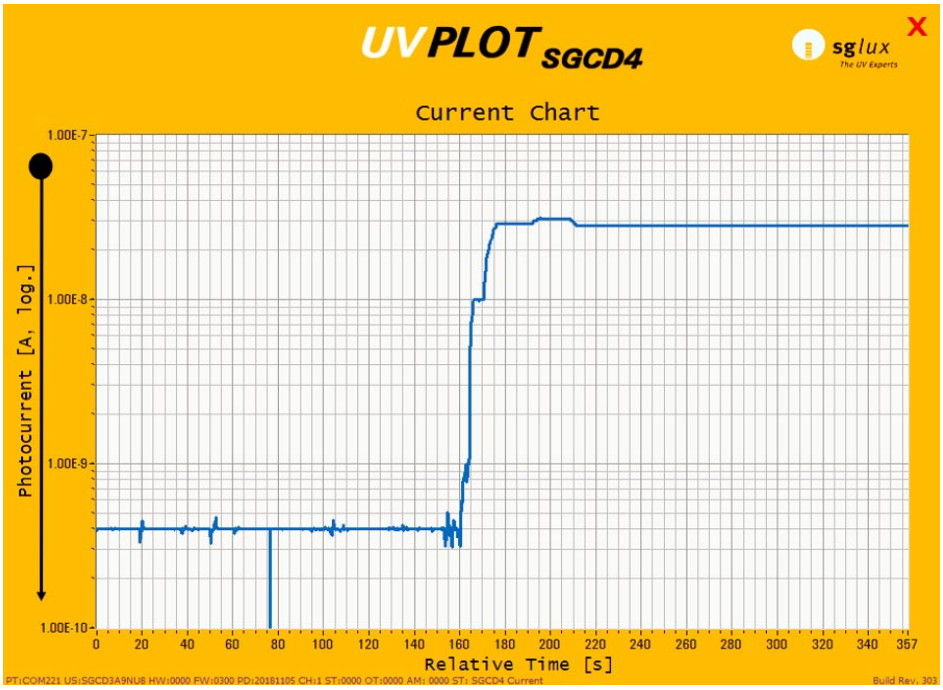
SGCD4

Switchable Gain Photocurrent Digitizer

SOFTWARE - INSTRUCTIONS

CHANGING THE CHART SCALE

To change the chart scale from linear to logarithmic or from logarithmic to linear click and hold on the axis title and swipe down or up.



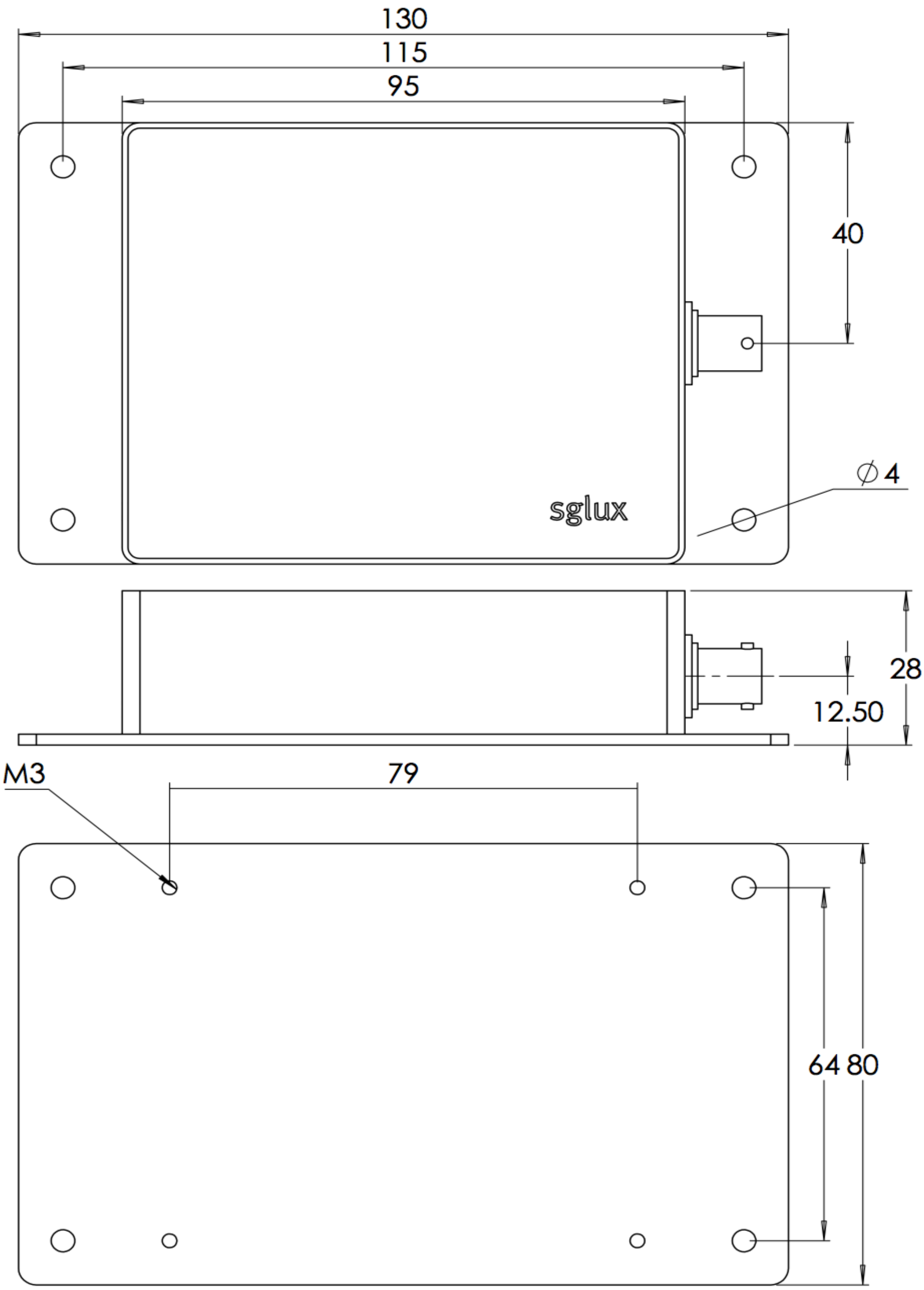
PERFORMANCE DEPENDING ON GAIN SETTING

	Range 1	Range 2	Range 3	Range 4
End of range current	1 nA	30 nA	900 nA	30 µA
Input noise current (peak to peak)	120 fA	400 fA	8 pA	200 pA
Time constant (T)	102 ms	103 ms	102 ms	100 ms
Settling time (5*T)	510 ms	515 ms	510 ms	500 ms
Cutoff frequency (-3dB)	1.6 Hz			
Temperature coefficient (ppm/K)	-300	-280	360	50

SGCD4

Switchable Gain Photocurrent Digitizer

DRAWING



RADIKON_simple

external amplifier for the UV-Cure-HT sensor

GENERAL FEATURES

Properties of the RADIKON_simple

The RADIKON_simple is used for the sglux UV-Cure-HT sensor. The photocurrent of the sensor will be converted into a 4 - 20 mA current signal output or into a 0 - 5 V voltage signal output.

SPECIFICATIONS

Fixed Specifications **Parameter**	**Value**
Dimensions	48 x 44 x 33 mm
Operation temperature	-20 to 80°C
Storage temperature	-20 to 80°C
Temperature response	<0.03 %/K
Weight	220 g

Configurable Specifications **Parameter**	**Value**
Signal output	0 - 5V voltage output or 4 - 20 mA current output

COMPONENTS

LIYCY 3x0.34 mm cable - length 2 m with tinned leads on free end

Ampcon PCB or Voltcon PCB (by sglux)

Male coaxial connector

Aluminium housing

RADIKON

Versatile radiation controller for industry and science

GENERAL FEATURES

Properties of the RADIKON

The RADIKON is used to control the value generated by a detector (e.g. radiation sensor or a pressure sensor). If the detector value falls below a certain setpoint value a relay is activated where a valve, an alarm buzzer or other modules can be connected.

The highlight of the RADIKON is its high versatility making the module very interesting to industrial developers who need to match the controller with different imput signals.

The RADIKON can read the generic current of a photodiode (5nA < ISensor < 5µA) as well as 0...x Volt and 0(4)...20mA probe signals. The value x is user definable. The RADIKON outputs a voltage of 0...10V which can be used to attach a separate display or to connect the RADIKON with a PID controller. A multi-colour LED changes its colour with the radiation intensity level. All these features as well as easy set up and configuration make the RADIKON a perfect tool for developers or manufacturers of small series. For medium series controller modules with customized properties are offered.

SPECIFICATIONS

Input Values **Parameter**	**Value**
Generic sensor signal, e.g. photodiode current	0 to x nA x can be configured (with jumpers) to 50 nA, 150 nA, 500 nA, 1.5 µA and 5 µA, other values are possible by soldering an own feedback resistor
Voltage input	0 to x Volt x can be configured (with jumpers) to 50 mV, 142 mV, 450 mV, 1160 mV, 2500 mV and 10 V, other values are possible by soldering an own feedback resistor
Current input (current loop)	y to 20 mA y can be configured (with jumpers) to 0 mA or 4 mA
Adjustable setpoints	relay setpoint, multi colour LED
Other Properties	
Inputs	DC-isolated, EMC and EDS conform
Power supply	12 to 24 VDC

RADIKON

Versatile radiation controller for industry and science

HOW TO SET UP

Using the potentiometers „SET POINT HIGH“ and „SET POINT LOW“ the setpoints for the value “good” = LED is green to value “critical” = LED is blue (SET POINT HIGH) and for the value “critical” to “too low” = LED is red (SET POINT LOW) can be adjusted. Please start with adjusting SET POINT LOW by creating an input value which equals to a signal which is quite between “critical” and “too low”. Turning right of the potentiometer shifts the setpoint towards lower signal level and turning left shifts it towards higher signal level. After turning the potentiometer the module needs 5 seconds to store the value. Now your RADIKON is ready to use. Additionally you may also adjust a setpoint for the value “good” to “critical”. This feature is particularily interesting if the decline of the signal intensity (e.g. the aging of a lamp) needs be be monitored before the signal is too low. To set the value the source, e.g. the lamp, needs to be adjusted at that point. Now, analogue to the above procedure the setpoint can be configured while turning the SET POINT HIGH potentiometer. The colour of the LED changes from green=good to blue=critical.

HOW TO USE

After powering on the RADIKON a 100ms selftest starts. Then the LED “POWER” is on and a 180 s warm up delay starts. During the warm up delay the LED “STATE” is on and the LED “RADIATION” is green. That means that during the first 180s each imput value is interpreted as “good”. This feature is important to avoid false alarms during warm up of the lamps to measure. If you need another warm up delay please inform is with your order. After the warm up delay the RADIKON is ready. If the imput value is OK the LED is green, is it critical the LED is blue and is it too low the LED is red and the relay changes its position. If zero imput is present (e.g. sensor failure) the LED blinks red. In case of overrange the LED blinks green.

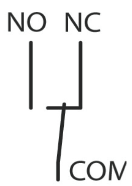
POWER SUPPLY

A power supply of 12-24VDC is required. Positive pole goes to terminal + and supply ground to terminal -.

OUTPUT CONNECTIONS

The response the RADIKON calculates based on the input value can be read using two different methods.

Relay Output
The free floating relay output is connected with the terminals "NO" and "COM" if the relay should be "normally open". If "normally closed" is needed please connect with "NC" and "COM".



0 - 10 V - output
This output is to be connected with the terminals "AO"and "-". You can use this output to connect a display or to use the 0-10V output as actual value input of a PID regulator.

RADIKON

Versatile radiation controller for industry and science

sglux The UV Experts

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INPUT CONNECTIONS

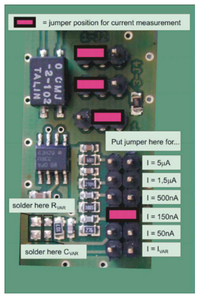
The RADIKON is able to read all common sensor outputs. Below the wiring for the different sensor outputs is explained:

Wiring of a Photodiode or another small current source

- Anode (+) to terminal PD+
- Cathode (-) to terminal PD-
- Shielding to terminal –
- please consider that cable length must be as short as possible

Configuration of the photodiode input

If you like to use the generic photodiode input at first you need to know about the typical current coming from your photodiode. The RADIKON works with currents from 50nA and 5µA. By default the unit is set to a typical current of 150nA. If your sensor gives another current please open the RADIKON's housing and remove the PCB. The picture at the right side shows the different jumper positions. If your current is below 50nA or above 5µA please set the jumper to „VAR" and solder a special 0804 SMD resistor calculated by the formula R_{VAR} = 5000/I, where R_{VAR} is given in MOhm, and I, the input current you need is given in nA. The value C_{VAR} calculates by C_{VAR}=0.1s/ R_{VAR}



Jumper positions for photodiode input

Wiring sensor voltage 0-10V:

- Anode (+) to terminal AI
- Cathode (-) to terminal –
- Bridge from + to F2

Configuration of the voltage input 0-10V:

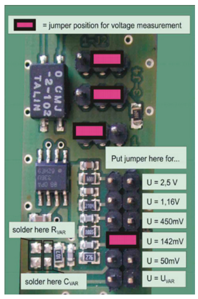
No configuration is needed. No jumpers must be moved.

Wiring sensor voltage 0-x V

- Anode (+) to terminal PD+
- Cathode (-) to terminal PD-

Configuration of the voltage input 0-xV:

The maximum value x ist the maximum voltage your sensor outputs. If this max. voltage is not 10V you need to configure another max. voltage with the jumpers as shown at the right side picture. You can select max. values x = 50mV, 142mV, 450mV, 1160mV or 2500mV. If your max. voltage is below 50mV or above 2.5V please set the jumper to „VAR" and solder a special 0804 SMD resistor calculated by the formula R_{VAR}= 5000/U, where R_{VAR} is given in MOhm, and U, the input voltage you need is given in mV. The value C_{VAR} calculates by C_{VAR}=0.1s/ R_{VAR}



Jumper positions for sensor voltage 0-x V input

Wiring sensor current 0-20mA:

- Anode (+) to terminal +
- Cathode (-) to terminal AI
- 500Ohm- Resistor from AI to – (included in the delivery)
- Bridge from + to F2

Configuration of the sensor current input 0-20mA:

No configuration is needed. No jumpers must be moved.

Wiring sensor current 4-20mA:

- Anode (+) to terminal +
- Cathode (-) to terminal AI
- 500 Ohm- Resistor from AI to –
- Bridge from + to F1

Configuration of the sensor current input 4-20mA:

No configuration is needed. No jumpers must be moved.

SENSOR MONITOR 5.0

Radiation monitor and controller

sglux
The UV Experts
Boston Electronics

GENERAL FEATURES

Properties of the Sensor Monitor 5.0 series

The Sensor Monitor 5.0 series are measurement and control modules for monitoring and automation of irradiation processes. They display radiation, dose and status information which is simultaneously provided via USB / RS232.

Three programmable relays allow an automated control of single- and multi-level irradiation processes.

The Sensor Monitor 5.0 is used as a radiation monitor or control module in disinfection, drying, hardening, biotechnology and in scientific research.

It is available with a NIST or PTB traceable calibration.

SPECIFICATIONS

Fixed Specifications **Parameter**	**Value**
Panel dimensions (L x W x H) (DIN 43700 - Uninorm)	144 mm x 86 mm x 72 mm
Weight	140 g
Cut-out at control cabinet (L x W)	137 mm x 67 mm
Degree of protection	IP40
Operating temperature	0 ... +70°C
Storage temperature	-25 ... +85°C
Power supply	12 ... 24 V_{DC}
Power consumption at 24 V_{DC}	0.4 W

Configurable Specifications **Parameter**	**Value**
Number of probe inputs	1 or 2
Data output	none or USB / RS232
Number of relay outputs	3

MODEL OVERVIEW

Sensor Monitor 5.0 Classic	One channel, no data output
Sensor Monitor 5.0 Connect	One channel, USB / RS232 data output
Sensor Monitor 5.0 Double	Two channels, no data output
Sensor Monitor 5.0 Double Connect	Two channels, USB / RS232 data output

SENSOR MONITOR 5.0

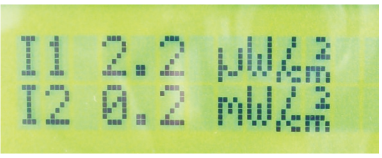
Radiation monitor and controller

CONNECTIONS AND OUTPUTS

Sensor input

The input terminal can be connected to amplified probes with voltage output or photodiodes.

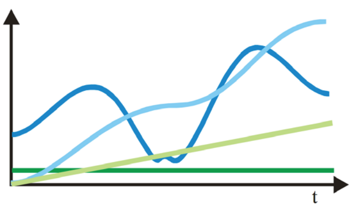
Visualization of values and state



Each row of the user configurable illuminated display shows the following information:

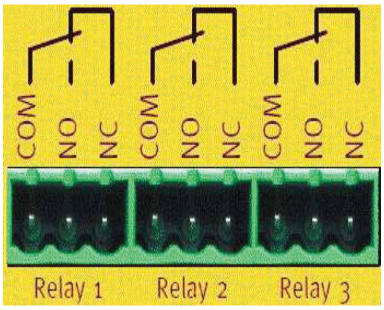
- Radiation or dose (in selectable units) and relay state
- Error messages like overrange

Data output



If the option *Connect* is selected the measurement data can be read out via USB or RS232 to a PC or PLC. The transfer is done with a CSV file which can be analyzed with a typical software like Origin or Excel.

Relay functions



Three potential-free relays can be used for process control.

- Activation when excessing or failing below a threshold intensity or reaching an irradiation dose (lamp switch and/or alarm).
- Logic combination, control of transport processes, switch conditions depending on dose, intensity and relative lamp output.

SENSOR MONITOR 5.0

Radiation monitor and controller

sglux
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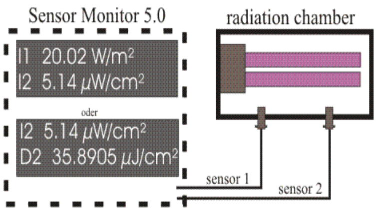
Boston Electronics

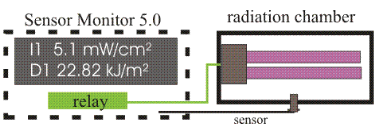
BASIC FUNCTIONS

Radiation measurement



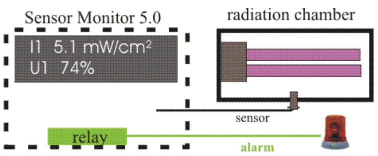
Parallel measurements of two lamp outputs or radiation parts of one lamp can be realized (e.g. UVA and UVB). In the first display example the intensity I1 at sensor 1 and the intensity I2 at sensor 2 is displayed. The second picture shows intensity and dose (time integration of the intensity). If the data port is activated the complete relevant information (intensities, doses, error messages and state of relays and dose measurements) is transferred to a PC.

Measurement and lamp control



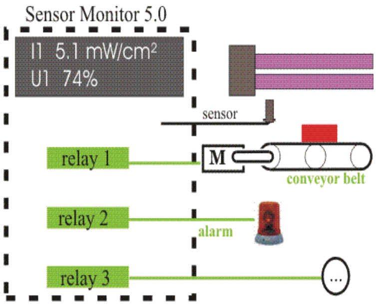
At excessing or failing below a configurable intensity threshold or reaching an irradiation dose the lamp can be switched off or changed over to another lamp.

Measurement and alarm



In the example an alarm is given if the percentaged lamp power falls below a configurable threshold. Further two relays can be used for other functions (switching of pumps, shutters, etc.).

Transport control of irradiated goods



Measurement of the dose at irradiated goods and activation of the belt transport. The hold times of the relays are variable therefore the transport distance can be adjusted with the hold time. In the example a second relay is giving an alarm if the intensity falls below the threshold. The third relay can be used for information from a second sensor or for a logic combination with one of the other relays (e.g. transport if dose threshold is exceeded and intensity is higher than a minimum value at the same time).

SENSOR MONITOR 5.0

Radiation monitor and controller

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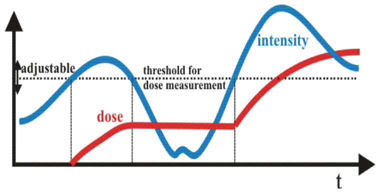
ADVANCED USE IN PROCESS AUTOMATION

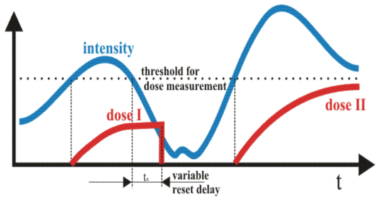
Automated dose measurement

The measurement of irradiation doses can be done manually or subjected to automation conditions.

In the first example the dose measurement is started at exceeding a critical intensity. If the intensity falls below the threshold the integration is interrupted and the dose stays constant. While exceeding the threshold again, the integration is continued.



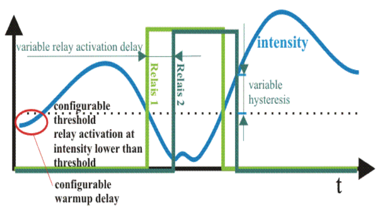
In the second example the dose measurement is finish with falling under the intensity threshold. The reset delay keeps the value on the display. At exceeding of the threshold a new dose is generated. The generation of single doses is used if the dose stop condition is activating a pump or a transport of a good (see below). For each irradiated good or segment a dose is calculated.



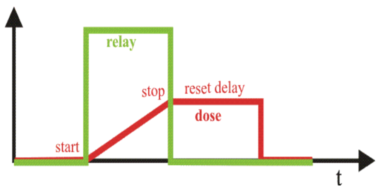
Relay configuration

Three relays can be configured for controlling different functions activated by various configurable process conditions. In the simplest use the relays activate at falling under or exceeding a critical threshold of a selectable measure.

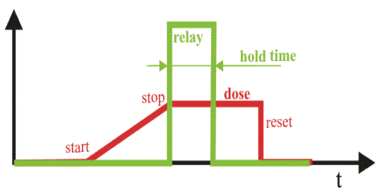
A warmup delay can be implemented to avoid false reports at the start-up process. Additionally it may be reasonable to ignore a short malfunction and only to consider a longer malfunction by using a relay activation delay. Hysteresis parameters can be set for values that are alternating around the threshold.



Dose measurement indication
Each relay can be associated with dose functions. Running dose measurements can be indicated by an activated relay. There is no difference if the dose measurement is operated manually or under automated conditions.



Dose limit indication
At the dose limit indication the relay is activated if the dose measurement is finished. With the hold time the time of the relay activation is set.



Photodiode Amplifier Dual

Two channel photocurrent amplifier

sglux *The UV Experts*

Boston Electronics

GENERAL FEATURES

Properties of the Photodiode Amplifier Dual

The Photodiode Amplifier Dual is a two channel photocurrent amplifier. The instrument is used for amplification of low currents like they are generated by a photodiode. The output signal is a voltage between -5 V and 5 V. Both channels have 5 gain settings for amplification and measurement of photocurrents between 10 pA and 400 microA.

The amplifier combines approved metrology with a simple and comfortable manageability and robustness. The input signal is integrated via a BNC plug, the output voltage and the relay signal is read out via banana plugs.
The amplifier is primarily used in measurement laboratories and in experimental setups. All sglux photodiodes are available with BNC output and can be used with the amplifier. The devices comes with an 18 VDC external power supply.

FEATURE OVERVIEW

Measurement properties	Two measurement channels, gain factors 10^4, 10^5, 10^6, 10^7 and 10^8 V/A (other gain values on request); photocurrent input via BNC plugs
Output	Output signal -5 V ... 5 V via banana plugs
Housing	Powder-coated aluminium housing with good EMC conditions, rubber feet
Accessories	Power supply
Optional accessories	Photodiodes from the sglux offer, integrated into a housing with BNC output

SPECIFICATIONS

Parameter	Value
Degree of protection	IP54
Operating temperature	-40 ... +80 °C
Storage temperature	-40 ... +85 °C
Power supply	18 ... 24 VDC
Power consumption (24V)	10 mA
Weight	0.54 kg

Photodiode Amplifier Connect

Photocurrent amplifier with relay output

sglux The UV Experts

Boston Electronics

GENERAL FEATURES

Properties of the Photodiode Amplifier Connect

The Photodiode Amplifier Connect is a photocurrent amplifier with integrated relay output. The instrument is used for amplification of very low currents like they are generated by a photodiode. These currents are converted into a voltage between -5 V and 5 V. The amplifier has a potential free relay output with configurable threshold for switching of alarms, lamps or shutters. Three gains are chosable for conversion and measurement of photocurrents between 100 pA and 40 micro A.

The threshold and hysteresis settings can be done stepless via two control dials. The relay activation is additionally shown by a LED on the panel. The input signal is integrated via a BNC plug, the output voltage and the relay signal is read out via banana plugs.

The amplifier is primarily used in measurement laboratories and in experimental setups. All sglux photodiodes are available with BNC output and can be used with the amplifier. The devices comes with an 18 VDC external power supply.

FEATURE OVERVIEW

Measurement properties	One measurement signal, gain factors 10^5, 10^6 and 10^7 V/A; photocurrent input via BNC plugs
Output	Voltage -5 V ... 5 V and potential free relay output, both via banana plugs
Housing	Powder-coated aluminium housing with good EMC conditions, rubber feet
Accessories	Power supply
Optional accessories	Photodiodes from the sglux offer, integrated into a housing with BNC output

SPECIFICATIONS

Parameter	**Value**
Degree of protection	IP54
Operating temperature	-40 ... +80 °C
Storage temperature	-40 ... +85 °C
Power supply	5 ... 18 VDC
Power consumption (24V)	10 mA
Weight	0.54 kg

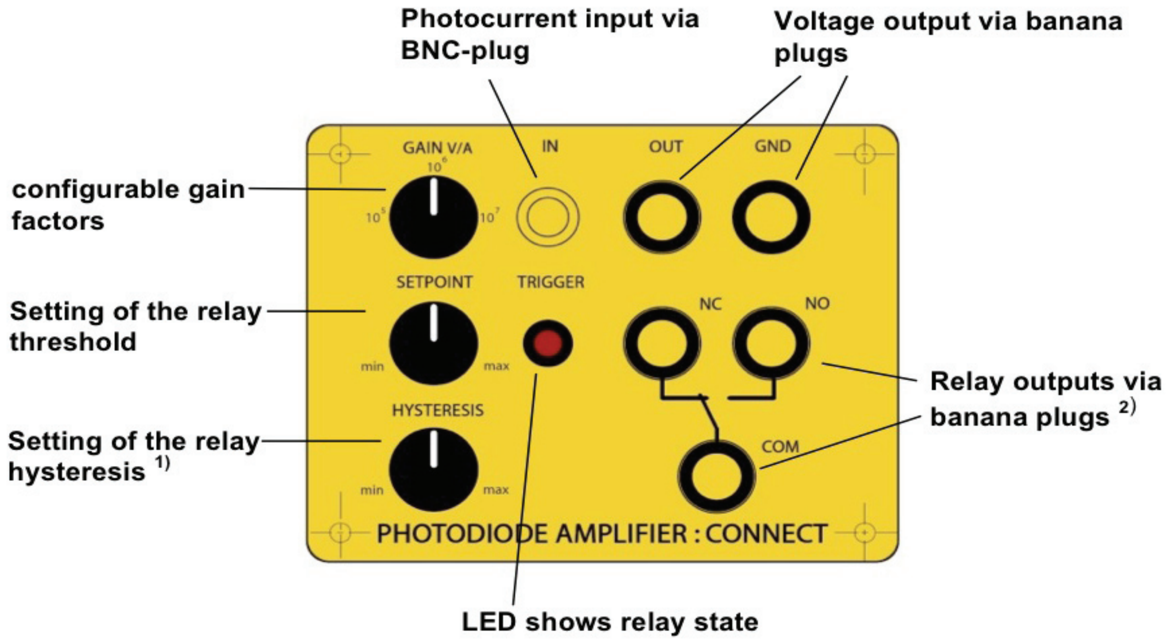
Photodiode Amplifier Connect

Photocurrent amplifier with relay output

sglux The UV Experts

Boston Electronics

OPERATION



[1] The activation of the threshold hysteresis is necessary, if the measurement value is fluctuating around the threshold value and small variations should not activate the relay.

[2] This is a potential free relay output. If connections NC (normally closed) and COM are used, the switching circuit is closed and will be opened by the relay activation. If connections NO (normally open) and COM are used, the switching circuit is open and will be closed by the relay activation.