



## CO2-EVAL-SL

- Evaluation System for Carbon Dioxide (CO<sub>2</sub>) detection
- Based on Mid-IR LED and PD, with glass covering
- Compact optical Cell
- Contains preamplifier, driver and synchronous detector
- Ready for a quick and easy start



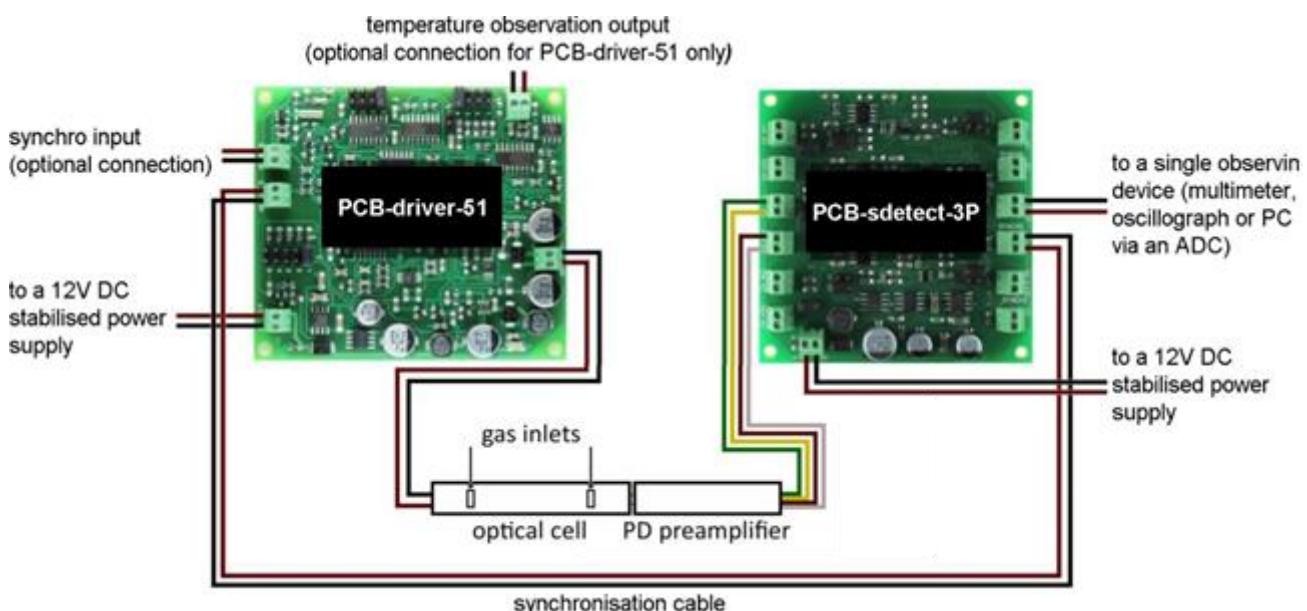
### Description

**CO2-EVAL-SL** is an evaluation system for Carbon Dioxide (CO<sub>2</sub>) detection, based on Mid-IR LED and PD with glass covering. It is an out-of-the-box solution that can be launched with minimal effort and can provide fast results. All necessary components are included for a quick and simple start.

### Packing Arrangement

CO2-EVAL-SL contains:

- Optical Cell containing
  - Light-emitting diode LED43-LR
  - Photodiode PD43-03LR
- PD preamplifier in an aluminum tube
- LED driver PCB-driver-41 / PCB-driver-51 / PCB-mdriver-P (depends on customer request)
- synchronous detector PCB-sdetect-3P





## Overview Of Containing Components

### Optical Cell

The optical cell includes light-emitting diode LED43-LR and photodiode PD43-03LR mounted inside the metal chamber.

Tube-type chamber is made of steel and is polished inside to assure minimal LED radiation loss through an optical path. There are two holes in the chamber for gas diffusion. The length of the chamber is about 50 mm, its diameter is 9 mm, and the length of the optical path is 30 mm.

LED43-LR emitting diode with a peak wavelength at 4.3  $\mu\text{m}$ , covered with a special glass for increased optical output power, in TO-18 package with a conic reflector.

For detailed information and set of characteristics, please refer to the appropriate technical passport.

PD43-03LR with a cut-off wavelength at 4.6  $\mu\text{m}$ , with a special glass covering for increased responsivity and mounted in TO-18 package with a conic reflector.

For detailed information and set of characteristics, please refer to the appropriate technical passport.

### Driver Unit

LED driver PCB-driver-41, PCB-driver-51, or PCB-mdriver-P (depends on customer request).

A LED driver is a power supply for an LED. PCB-driver-41 and PCB-driver-51 have a set of adjustable parameters to customize the desired operation mode of an LED. PCB-mdriver-P provides operation at one fixed pulse mode.

For brief information about drivers, please refer to Appendix 1. For comprehensive information about the driver, please refer to the driver's instruction manual.

### PD Preamplifier in an aluminum tube

PD preamplifier, amplifies the current, generated by photodiode, and converts it into voltage signal. There is straight correspondence between PD current and resulting output voltage, i.e. if the photocurrent from photodiode is a meander, the converted signal will be a meander too with the same frequency and pulse duration. The preamplifier is placed in aluminum tubing for noise reduction.

### Synchronous Detector

PCB-sdetect-3P synchronous detector measures the voltage signal from the output of photodiode preamplifier and converts it to the DC voltage signal proportional to amplitude of voltage from input.

For comprehensive information about the synchronous detector, please refer to the appropriate instruction manual.

## Recommended Operation Mode For The Kit

### Driver settings (PCB-driver-41 and PCB-driver-51)

Parameter	Symbol	Value	Unit
LED Current	I	0.2 – 1.0	A
Pulse Duration	T	150	$\mu\text{s}$
Frequency	f	0.5	kHz

### Synchronous detector settings (PCB-sdetect-3P)

Parameter	Value	Unit
Signal Gain	x5	Times
Averaging Time	300	ms

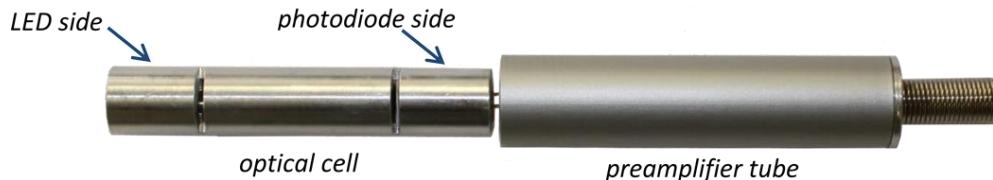
### Note!

Do not use 1 kHz (with 1 A current), 2 kHz (with 1 and 0.6 A current) and 4 kHz driver frequency settings, since they are incompatible with 150  $\mu\text{s}$  pulse duration setting.



## Operating Instructions

1. Connect the optical cell's photodiode contacts with the preamplifier tube socket.

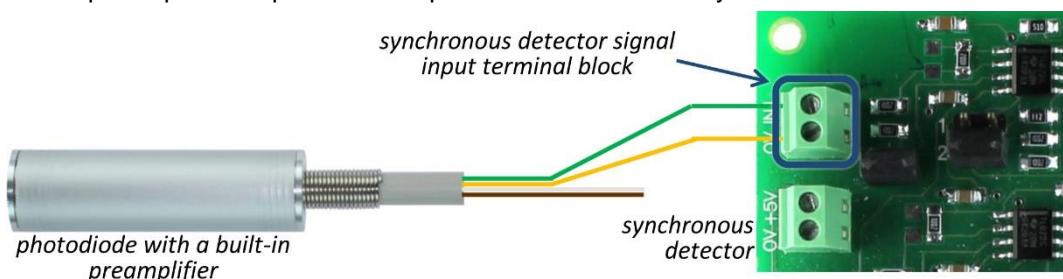


### Note!

Please observe the polarity of the connection. Photodiode anode (marked with red) must be connected to the "+" sign of the preamplifier socket.

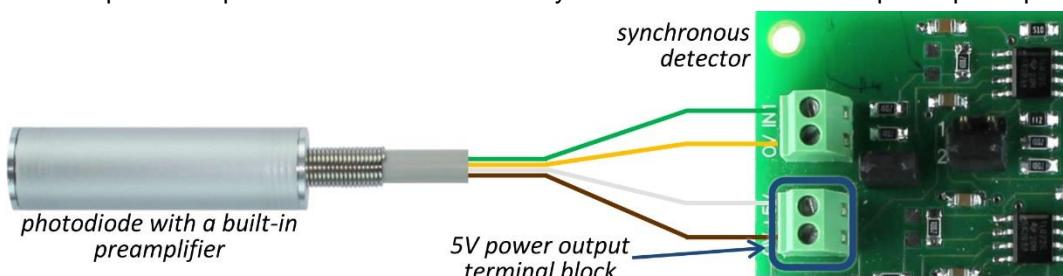
We strongly recommend establishing electrical connection between optical cell and "0" of any terminal block of PCB-sdetect-3P synchronous detector.

2. Connect the preamplifier output with an input of PCB-sdetect-3P synchronous detector.



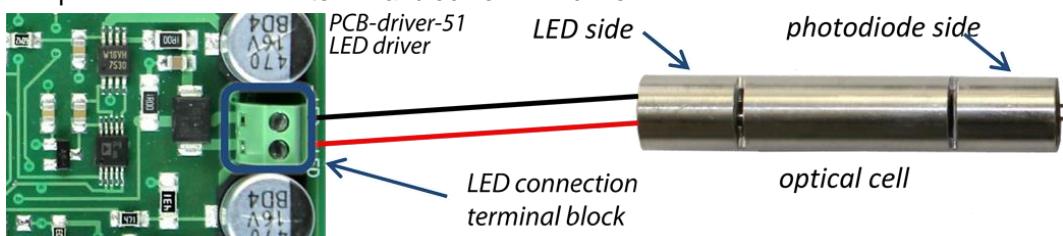
Green cord – to the signal input "+"; Yellow cord – to the signal input "0"

3. Connect a 5V power output of the PCB-sdetect-3P synchronous detector to the preamplifier power input.



White cord – to the power output "+"; Brown cord – to the power output "0"

4. Connect optical cell's LED with terminal block of LED driver.

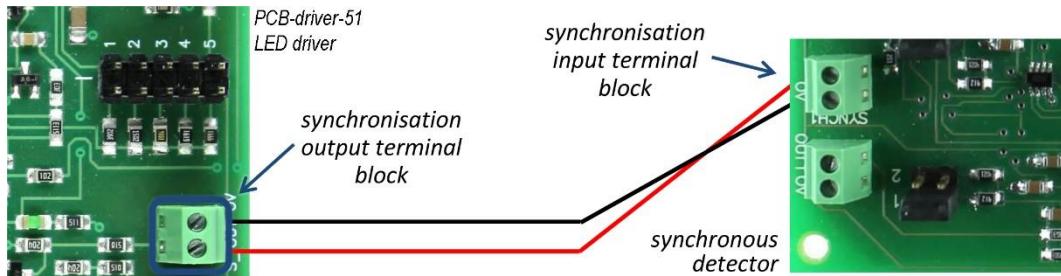


### Note!

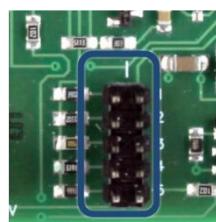
Please observe the polarity of the connection. LED anode (marked with red) must be connected to the "+" sign of the driver socket.



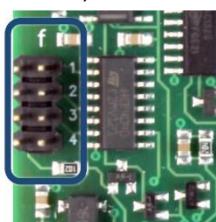
5. Connect the synchronisation output of the LED driver with the synchronisation input of the synchronous detector via synchronisation cable.



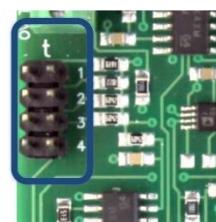
6. Select the needed mode of the LED driver, using pulse duration, frequency and current adjustment jumpers (available for PCB-driver-41 and PCB-driver-51).



current adjustment jumper



frequency adjustment jumper



pulse duration adjustment jumper

**Note!**

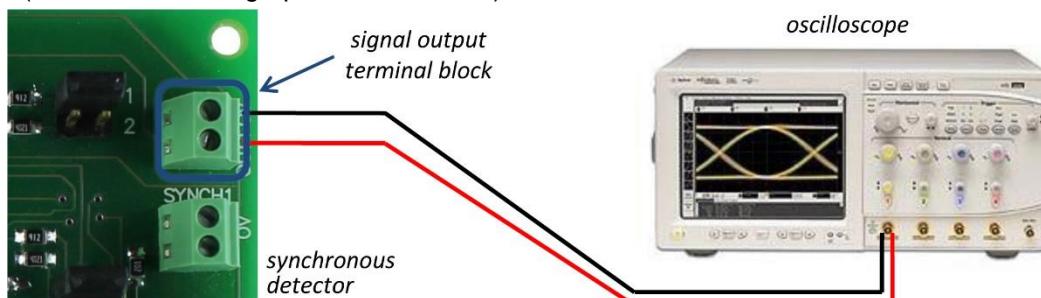
You can find out more about driver modes and their adjustment in the appropriate driver instruction manual.

7. Select the needed mode of the PCB-sdetect-3P synchronous detector using signal gain and averaging time adjustment jumpers.

**Note!**

You can find out more about synchronous detector modes and their adjustment in the appropriate synchronous detector instruction manual

8. Connect signal output terminal block of the PCB-sdetect-3P synchronous detector with signal observing device (multimeter, oscilloscope or PC via ADC).



9. Connect a 12V DC stabilized power supply to the LED driver and PCB-sdetect-3P synchronous detector (red wire to the "+"; black wire to the "-").



## Precautions & Notes

- Turn on the power supply of the LED Driver and PCB-sdetect-3P synchronous detector only after all connections are made and tested
- Do not switch driver regimes during operation.
- Do not use multimeter to control and adjust current of the LED.
- Do not bend and/or twist LED and photodiode pins; otherwise the optical system will get damaged.

## Appendix 1

### PCB-driver-41



provides pulse mode operation. Using this mode it is possible to

- choose one of five current values (0.2/0.6/1/1.5/1.9 A) and
- select one of four frequencies (0.5/1/2/4 kHz) and
- choose pulse duration within five values (5/10/20/50/150 µs).

### PCB-driver-51



has the same characteristics as PCB-driver-41, but additional features temperature control:

The possibility to define LED p-n junction temperature using current-voltage dependence. Driver generates the low current signal for plugged LED, measures and outputs the voltage. Using the obtained voltage value it is possible to calculate the intrinsic LED temperature.

### PCB-mdriver-P



is a cost-effective driver that enables LED operation at fixed pulsed driving mode: 2 A current, 2 kHz frequency and 5 µs pulse duration.