

# **CO<sub>2</sub> Sensor Evaluation Kit User Guide**

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## INTRODUCTION

The GSS CO<sub>2</sub> sensor evaluation kit contains the following items.

- CO<sub>2</sub> sensor
- USB cable with sensor connector

## SOFTWARE INSTALLATION

The GSS evaluation board software is available direct from the GSS web site. Download the .zip file to your computer. Unzip and click on **Setup.exe** and follow the instructions on the screen. A short video showing how to get started with your evaluation kit and start taking readings in less than 2 minutes is available here: <https://www.gassensing.co.uk/videos/>

For more technical information on the sensor, download the appropriate data sheet from here: <https://www.gassensing.co.uk/products/>

## CONNECTOR PIN-OUT DESCRIPTION

The cable has a USB-A connector at one end and a 4-way connector at the other end. The 4-way connector must be connected to the sensor UART pins.

PIN	NAME	TYPE	DESCRIPTION	COLOUR
1	GND	Supply	Sensor ground	Black
2	VDD	Supply	Sensor supply voltage	Red
3	Rx_In	Digital Input	UART Receive Input	Orange
4	Tx_Out	Digital Output	UART Transmit Output	Yellow

Ensure the connector is in the correct position before plugging the USB connector into a USB port. Full sensor pin-out details are provided in the appropriate product datasheets.

## USB DRIVER

The USB cable contains an integrated circuit that converts from the sensor UART output to the PC USB input. Recent versions of Windows will automatically identify and install the USB driver when you plug in the lead.

If you are prompted to locate a driver, download from the FTDI website:

<https://www.ftdichip.com/Drivers/VCP.htm>

Choose “VCP Drivers” and select the correct driver for your operating system.

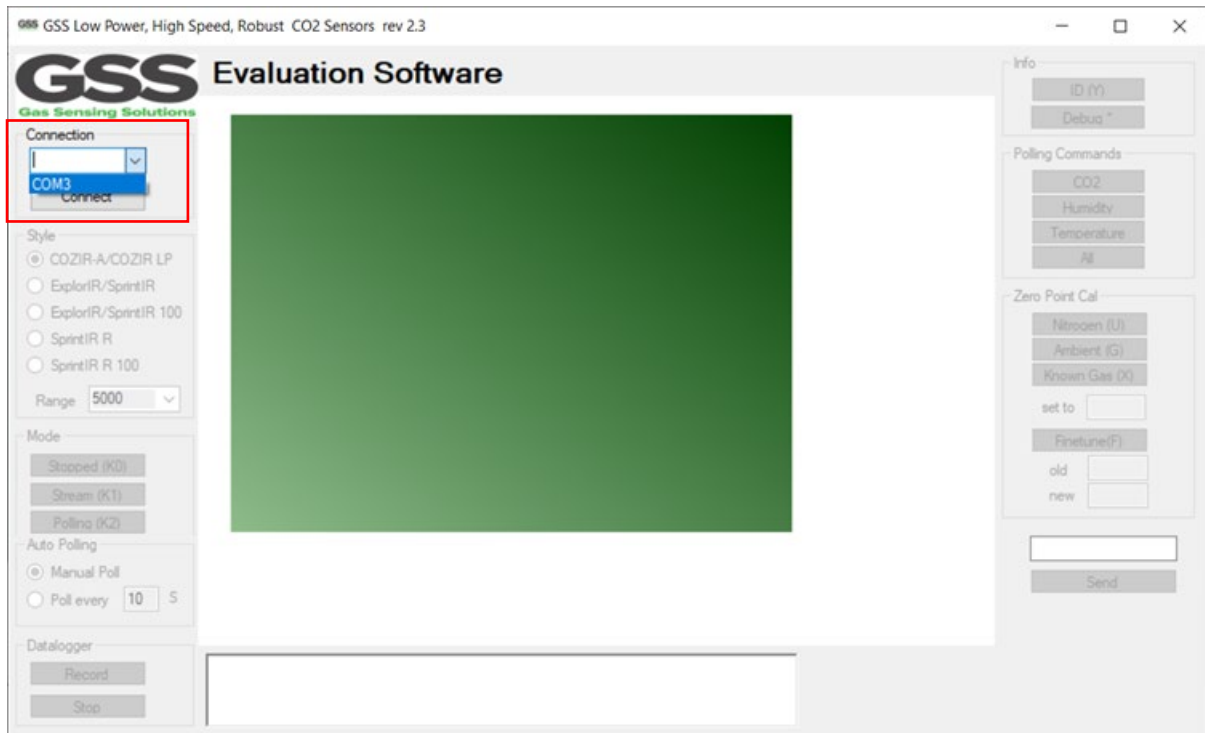
## SOFTWARE INSTALLATION

The GSS sensor software can be found on the GSS website in the resources section. Click on **Setup.exe** and follow the instructions on the screen.

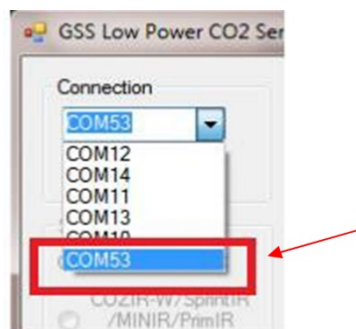
## RUNNING THE SOFTWARE

The software may start automatically after installation. If it does not, you can start it from the “Program” Menu in the Start Menu.

The opening screen is below.



To connect to the sensor, select the correct COM port from the drop-down Connection list, then click the **CONNECT** button. The drop-down list will only show ports with active devices attached.



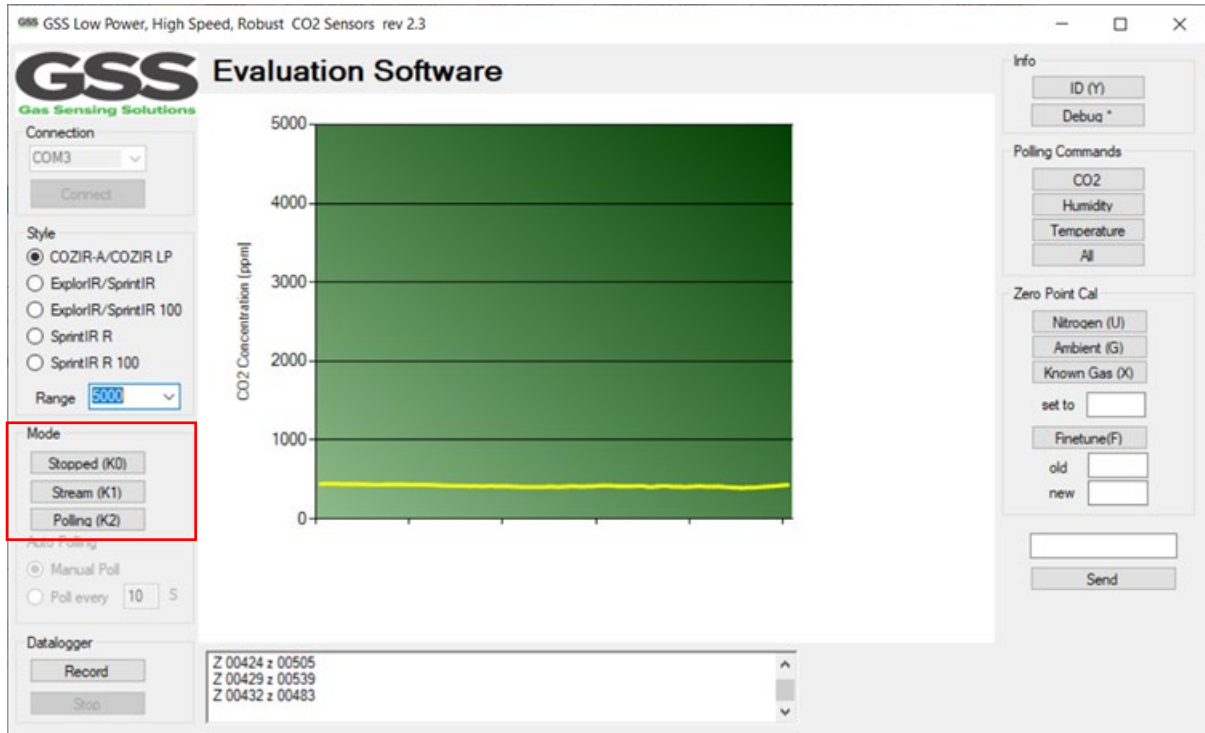
## SENSOR SELECTION

The screenshot shows the GSS Evaluation Software interface. On the left, the 'Style' section is highlighted with a red box, containing radio buttons for 'COZIR-A/COZIR LP' (selected), 'ExplorIR/SprintIR', 'ExplorIR/SprintIR 100', 'SprintIR R', and 'SprintIR R 100'. Below it, the 'Range' dropdown is set to '5000'. The 'Mode' section has 'Stopped (K0)', 'Stream (K1)', and 'Polling (K2)' buttons. The 'Auto Polling' section has 'Manual Poll' selected and 'Poll every' set to '10' seconds. The 'Datalogger' section has 'Record' and 'Stop' buttons. The central graph shows 'CO2 Concentration (ppm)' on the y-axis (0 to 5000) and a fluctuating yellow line around 500 ppm. The data log at the bottom, also highlighted with a red box, shows three entries: 'Z 00424 z 00505', 'Z 00429 z 00539', and 'Z 00432 z 00483'. On the right, there are sections for 'Info' (ID (Y), Debug \*), 'Polling Commands' (CO2, Humidity, Temperature, All), and 'Zero Point Cal' (Nitrogen (U), Ambient (G), Known Gas (X), set to, Finetune(F), old, new, Send).

Select the correct sensor type and the full-scale range (CO<sub>2</sub> ppm) of the sensor. The sensor should automatically start to take CO<sub>2</sub> measurements after 1-2 seconds. These measurements are shown graphically in the middle of the screen, and in the dialogue box (red) at the bottom. The dialogue box contains sensor serial data output ('Z' data). The CO<sub>2</sub> 'Z' value needs to be scaled to calculate the ppm value.

Ambient sensors measuring up to 1% (10000ppm) do not need a scaling factor, for sensors capable of measuring 0-60%, the scaling factor is 10. For sensors capable of measuring 0-100%, the scaling factor is 100.

## CONTROLLING THE SENSOR



The software interface replicates the UART controls of the sensor. For full details of the functions, refer to the product data sheet. After power is applied, the sensor will automatically start to take CO<sub>2</sub> measurements using the Mode 1 default settings, where the sensor is pre-programmed to send CO<sub>2</sub> measurement data. This mode is labelled as 'Stream (K1)' mode.

### MODE K1 STREAMING MODE

Click on the **STREAM** button. This is the factory default setting, where the sensor is constantly taking measurements at a pre-programmed rate, defined by the sensor type.

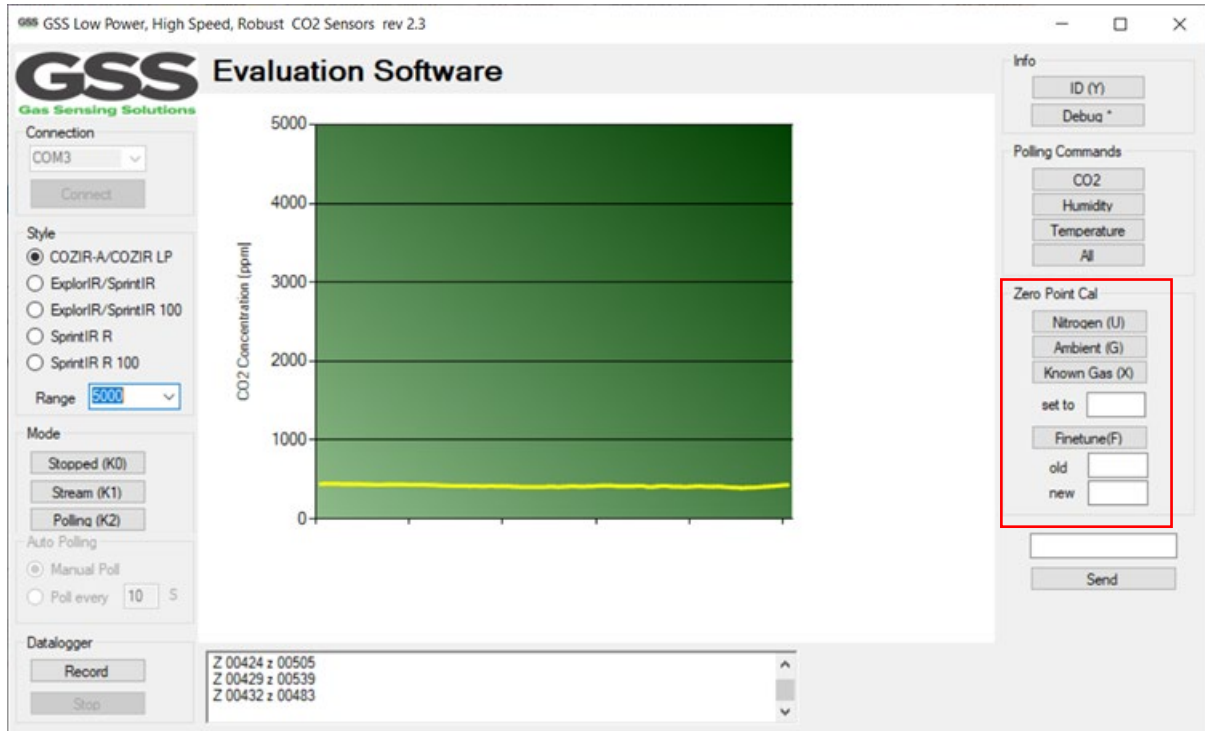
### MODE K0 COMMAND MODE

Click on the **STOPPED** button. In this mode, the sensor is in a SLEEP mode, waiting for commands. No measurements are made. There is no latency in command responses. All commands that report measurements or alter the zero-point settings are disabled in Mode 0. Mode 0 is NOT retained after power cycling.

### MODE K2 POLLING MODE

Click on the **POLLING** button. In polling mode, the sensor only reports readings when requested. The sensor will continue to take measurements in the background, but the output stream is suppressed until data is requested. In this mode, the user can programme the sensor to take a reading on request, or at a pre-defined period.

## ZERO-POINT SETTING COMMANDS



There are several methods available to the user to set the zero point of the sensor. In all cases, the best zero is obtained when the gas concentration is stable, and the sensor is at a stabilised temperature. Note the zero-point settings are not cumulative and only the latest zero-point setting is effective. For example, there is no benefit in zeroing in nitrogen, and then zeroing in a calibration gas. The sensor will store only the latest zero point.

### ZERO IN NITROGEN

Place the sensor in nitrogen gas and allow time for the sensor temperature to stabilise and the gas to be fully diffused into the sensor. Click on the **NITROGEN (U)** button. The sensor is zeroed assuming a 0ppm CO<sub>2</sub> environment.

### ZERO IN FRESH AIR

If there is no calibration gas or nitrogen available, the sensor zero-point can be set in fresh air. Ambient CO<sub>2</sub> concentrations in fresh air are typically 400ppm. The CO<sub>2</sub> concentration fresh air zero level is programmable over a range from 0ppm to the full scale of the sensor.

Place the sensor in a fresh air environment and allow time for the sensor temperature to stabilise, and for the fresh air to be fully diffused into the sensor. Click on the **AMBIENT (G)** button.

The sensor can use the default fresh air CO<sub>2</sub> concentration value (400ppm), or the user can write a different fresh air value to the sensor if desired. To write a different fresh air CO<sub>2</sub> concentration value to the sensor, write the new value in the 'set to' box.

## ZERO IN A KNOWN GAS CONCENTRATION

Place the sensor in a known gas concentration, and allow time for the sensor temperature to stabilise, and for the gas to be fully diffused into the sensor. Set the CO<sub>2</sub> concentration value to the appropriate value by writing the value in the 'set to' box. Click on the **KNOWN GAS (X)** button.

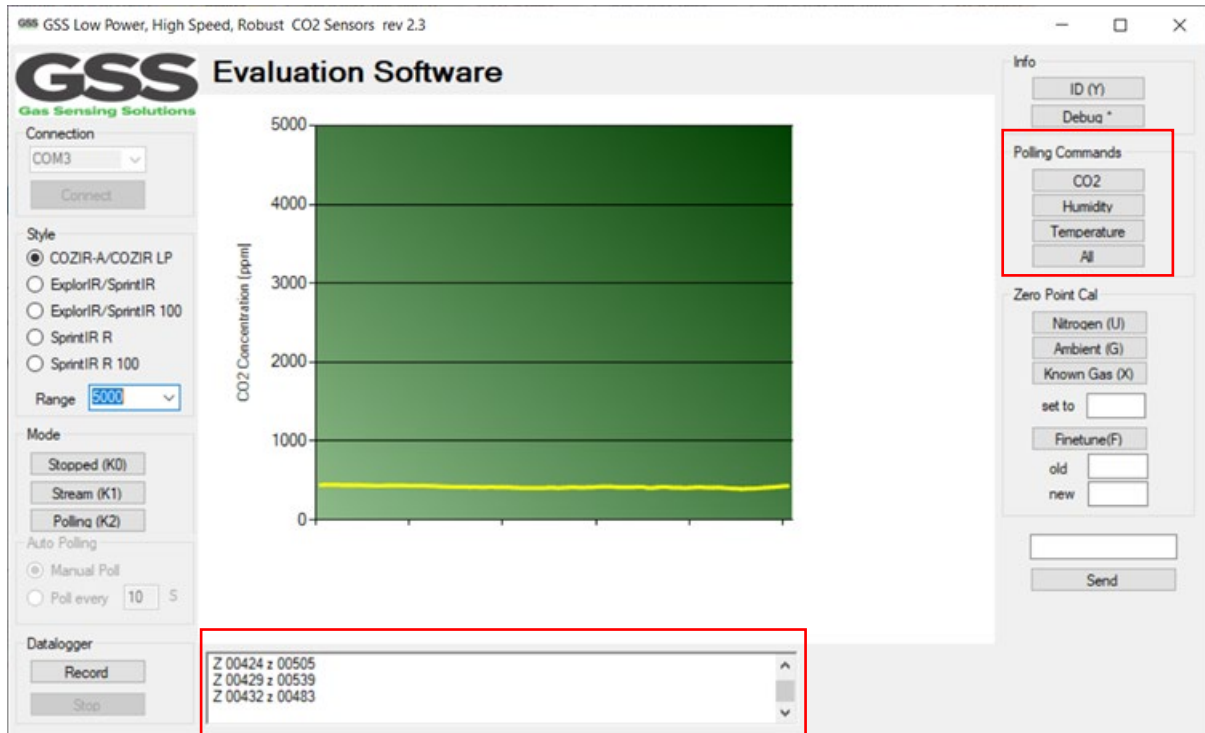
## ZERO-POINT ADJUSTMENT

If the CO<sub>2</sub> concentration and the sensor reported concentration are known (both in **ppm**), the zero point can be adjusted using the known concentration to fine tune the zero point. For example, if the sensor has been in an environment that has been exposed to outside air, and the sensor reading is known at that time, the zero point can be fine-tuned to correct the reading. This is typically used to implement automated zeroing routines.

The known CO<sub>2</sub> concentration value should be entered into the 'new' box, the reported CO<sub>2</sub> value from the sensor into the 'old' box and click **Finetune(F)**.



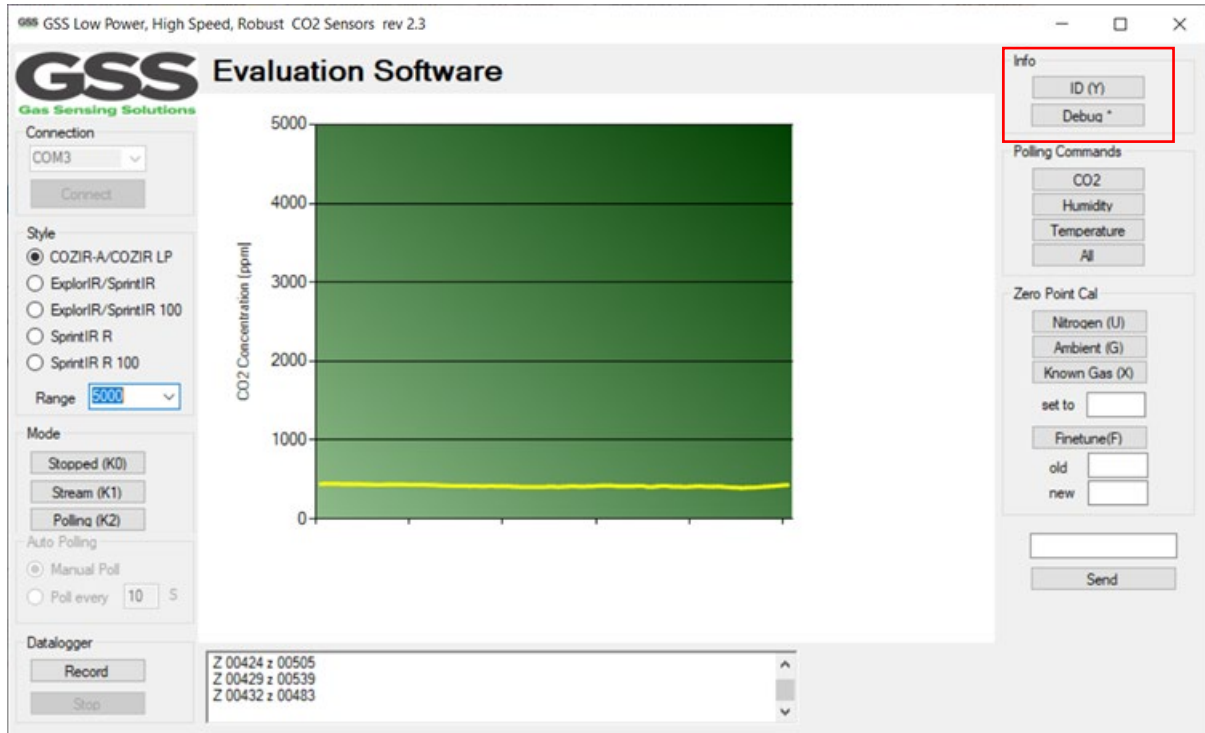
## POLLING COMMANDS



Depending on the sensor type, various parameters can be output as a single string of data in the dialogue box. If a temperature or humidity sensor is fitted, the dialogue box will show the relevant data fields depending on user requirements.

If running in polling mode, a single line of data is output each time the '**POLLING (K2)**' button is clicked, or automatically within a set interval if preferred by selecting the '**Poll every seconds**' option.

## INFO COMMANDS



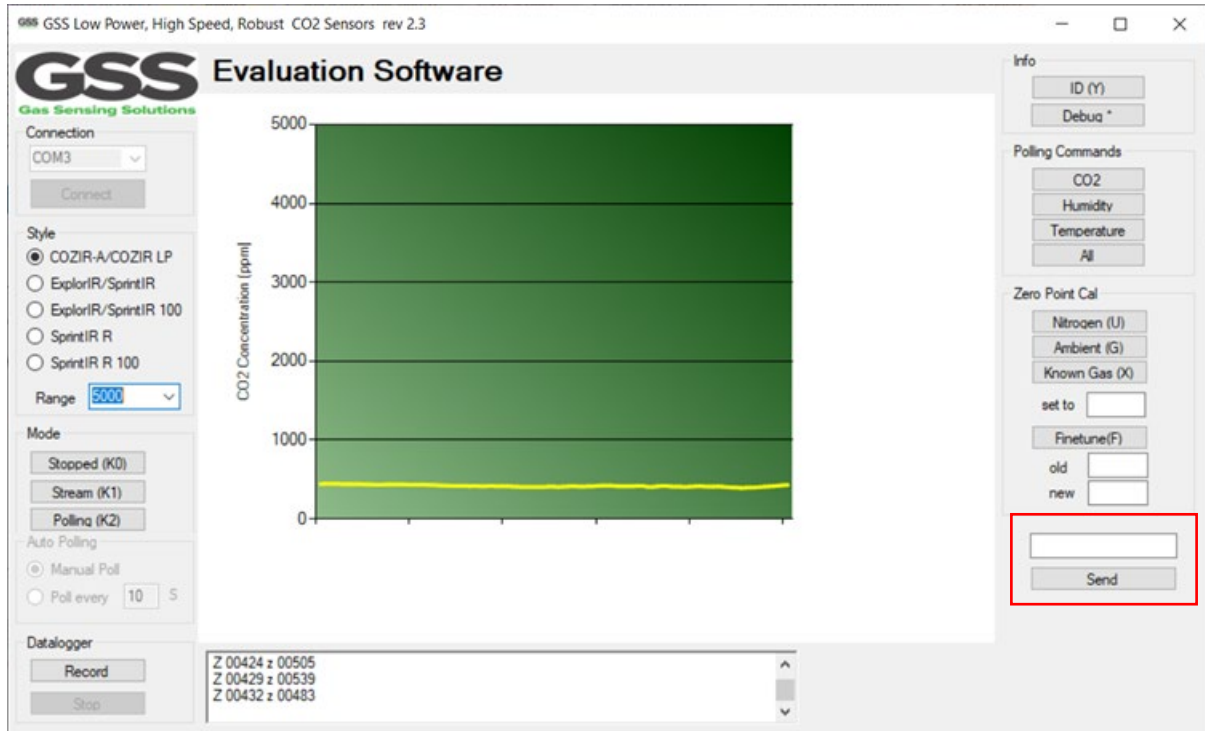
### ID

Clicking the 'ID' button will return the sensor serial number and firmware version.

### DEBUG

Clicking the 'Debug' button will return additional information about the settings of the sensor. It is primarily intended to assist in remote debugging by GSS Ltd.

## CUSTOMISING SENSOR SETTINGS



The evaluation kit software allows the user to fully customise the settings of the sensor. Refer to the sensor data sheet for a full command and control description. All UART commands and functions of the sensor can be manually set by writing in the blank box with the correct syntax. To send an UART command or data to the sensor, write in the blank box and click the '**SEND**' button.

## DATALOGGER

You can record the sensor output to a text file. To start recording, click '**Record**' button and follow the instructions. Click '**Stop**' button to stop recording.

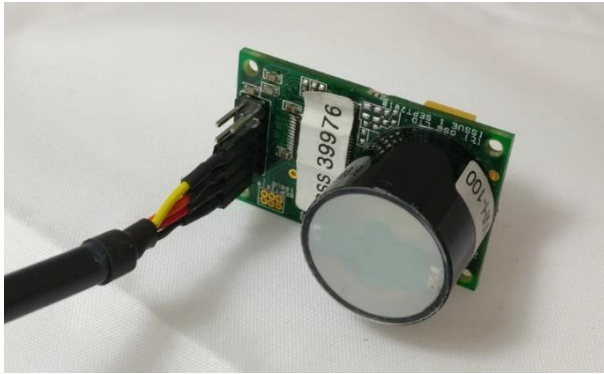
The datalogger will record the same information as is displayed in the dialogue box and will precede each line with a timestamp.

```
25/03/2016 14:07:51 Z 00426 z 00434
25/03/2016 14:07:51 Z 00426 z 00450
25/03/2016 14:07:52 Z 00428 z 00448
25/03/2016 14:07:52 Z 00428 z 00436
25/03/2016 14:07:53 Z 00428 z 00417
25/03/2016 14:07:53 Z 00428 z 00440
25/03/2016 14:07:54 Z 00428 z 00417
```

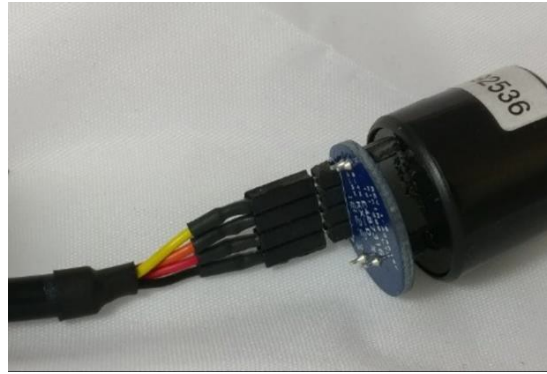
## FAULT FINDING

Fault	Resolution
No output from sensor	<p>If you do not see readings from the sensor after a few seconds, or if you get an error message indicating a problem, then follow these steps in order:</p> <ul style="list-style-type: none"> <li>• Check cable is connected correctly to the UART pins on the sensor (refer to data sheet for pin-out)</li> <li>• Check that you are clicking on the correct com port. If you cannot see the USB lead in the comport list, there has been a problem installing the USB driver. Check that you have downloaded the correct driver and follow the instructions on the FTDI website.</li> <li>• Select the COM Port corresponding to the USB Lead. Check the available ports with the USB lead unplugged. Then plug in the USB lead and note the new comport.</li> <li>• Check the sensor is in 'streaming' mode by clicking the button marked 'Stream (K1)'</li> </ul>
Sensor reading is high/low	Press Zero-point setting – Ambient (air). Sensor should output a reading of approximately 400ppm.

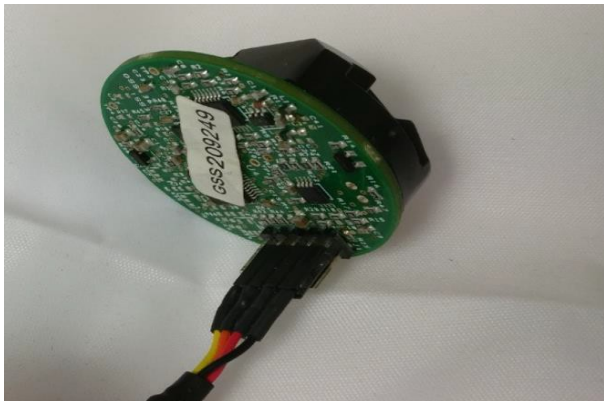
## EVK EXAMPLES



**ExplorIR<sup>®</sup> -W**



**ExplorIR<sup>®</sup> -M**



**CozIR<sup>®</sup> -A**



**CozIR<sup>®</sup> -LP**

## IMPORTANT NOTICE

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## REVISION HISTORY

DATE	RELEASE	DESCRIPTION OF CHANGES	PAGES
13/05/2020	1.0	First revision	All
27/05/2020	1.1	Re-write	All
29/05/2020	1.2	Added revision 2.1 of evaluation kit software	All
28/01/2021	1.3	Minor update to contents of kit	P.3
09/06/2021	1.4	Software Installation	P.4,