

GP-02

Calibration Manual



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PENDING

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1 Introduction

The purpose of this document is to describe the calibration process of the GP-O2 detector.

To perform a calibration of the detector, two test gases must be used.

The zero calibration is conducted using an oxygen poor gas, in this case nitrogen (N₂), which is fed to the detector via suitable piece of soft plastic hose.

Span calibration is conducted using atmospheric air containing approximately 20.9 Vol.-% O₂.

The detector is manufactured with a threaded hole in the bottom of the sensor section (M16 thread). The test gas, N₂, is supplied to the threaded hole in the bottom through an adaptor, product number MON-1430, where the N₂ is forced through the center nozzle and out through the side holes of the adaptor.

The table below lists main necessary calibration equipment.

Table 1 Main tools for the calibration process of the GP-O2.

Name	Adaptor	Pure Nitrogen	Digital Multimeter (DMM)	Potentiometer Adjustment Tool
Picture				
Product number	MON-1430	-	-	-
Purpose	Adaptor to feed the detector with test gas	Calibrating 0 Vol.-%	Measuring output voltage via X1	Adjusting RA1 and RA2 potentiometers

2 Calibration Procedure

2.1 Preparation

1. Remove all four screws holding the front cover.
See Figure 1.



Figure 1: Front cover with the four screws indicated by the yellow arrows.

2. Pull the front cover aside, so potentiometers RA1, RA2 and connector X1 are accessible.

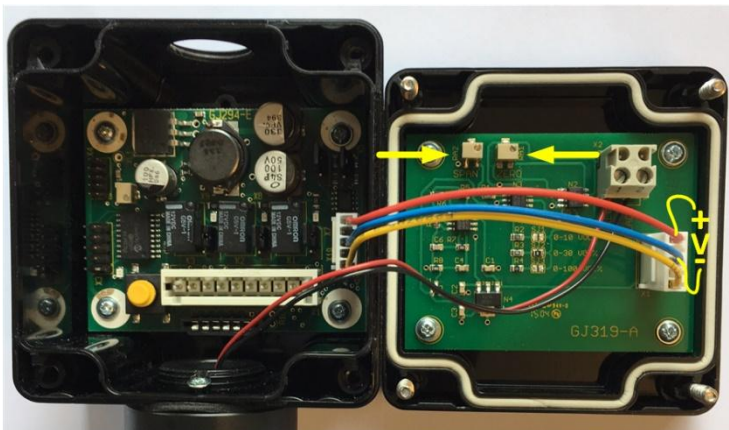


Figure 2: RA1 top right for Zero calibration and RA2 top left for Span calibration. Both are indicated with yellow arrows. The output of the detector is measured via X1. (Blue wire is negative and Red wire is positive)

3. Attach the adaptor to the bottom of the detector and connect the test gas hose.
See Figure 3.

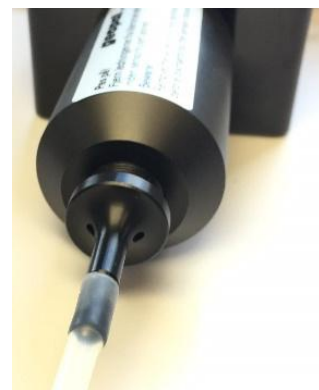


Figure 3: The adaptor attached to the bottom of the detector.

2.2 Zero Calibration

1. Connect the DMM to X1 (Blue is negative and Red is positive) and read the voltage – typically around 2.7 V in atmospheric air, see Figure 4.

Feed the detector with pure Nitrogen (N_2) and wait until the voltage stops decreasing.



Figure 4: Typical output voltage value of 2.7 V when the detector is exposed to atmospheric air.

2. When the output voltage has stopped decreasing, adjust it to 0.1 V, via RA1, marked with the text ZERO, indicated with a yellow circle in Figure 5.

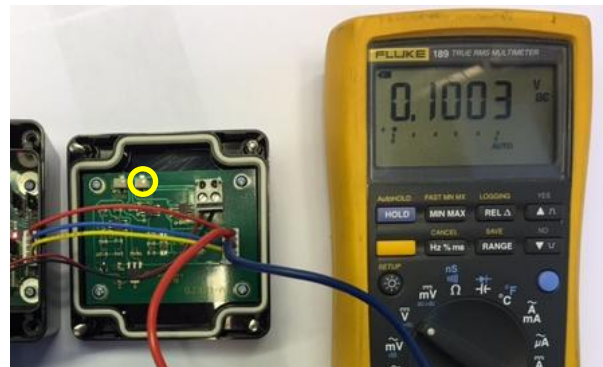


Figure 5: The output voltage, measured on X1, is adjusted to 0.1 V via RA1, while the detector is exposed to N_2 .

2.3 Span Calibration – with test gas

Depending on the measurement range, atmospheric air containing around 20.9 Vol.-% O₂ is used to span calibrate the detector. See when to use atmospheric air as test gas in the table below:

Table 2 Measurement range and corresponding test gas.

Measurement range	Calibration gas
0 – 10 Vol.-%	5 Vol.-% O ₂
0 – 30 Vol.-%	20.9 Vol.-% atmospheric air ¹
0 – 100 Vol.-%	20.9 Vol.-% atmospheric air ¹

In this section, the output voltage is adjusted based on a measurement range of 30 Vol.-%.

First, the local atmospheric pressure is found, this can be done by a weather app. See Figure 6.

Once the local atmospheric pressure is known, the value of the output voltage can be calculated using the equation below:

$$\text{Output Voltage [V]} = \frac{\text{Calibration gas [Vol.-%]} \cdot 3.9 \text{ V}}{\text{Measurement range [Vol.-%]}} + 0.1 \text{ V}$$

Example:

Atmospheric pressure = 1009 hPa

Using Table 3 to extract the amount of Oxygen $\cong$ 20.8 Vol.-%

Measurement range = 30 Vol.-%

Hence

$$\text{Output Voltage [V]} = \frac{20.8 \text{ Vol.-%} \cdot 3.9 \text{ V}}{30 \text{ Vol.-%}} + 0.1 \text{ V} \cong 2.8 \text{ V}$$

In the example above, RA2 should be trimmed until the output voltage, measured via X1, is 2.8 V. See Figure 7.

The GP-O2 is now calibrated according to Geopal System guidelines.



Figure 6: Atmospheric pressure extracted from a weather app, marked with yellow.

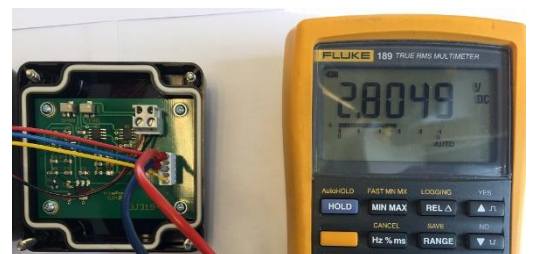


Figure 7: The output voltage is adjusted to 2.8 V.

¹ The local Vol.-% of O₂ is extracted based on the local atmospheric pressure, see Table 3 in Appendix 1.

3 Appendix

3.1 Appendix 1: Oxygen concentration at different atmospheric pressure

Table 3: Oxygen at different atmospheric pressure.

Pressure [hPa]	Oxygen [Vol.-%]	Pressure [hPa]	Oxygen [Vol.-%]
1050	21,66	1000	20,63
1048	21,62	998	20,59
1046	21,58	996	20,55
1044	21,54	994	20,51
1042	21,50	992	20,47
1040	21,46	990	20,43
1038	21,42	988	20,38
1036	21,37	986	20,34
1034	21,33	984	20,30
1032	21,29	982	20,26
1030	21,25	980	20,22
1028	21,21	978	20,18
1026	21,17	976	20,14
1024	21,13	974	20,10
1022	21,09	972	20,05
1020	21,04	970	20,01
1018	21,00	968	19,97
1016	20,96	966	19,93
1014	20,92	964	19,89
1013	20,90	962	19,85
1012	20,88	960	19,81
1010	20,84	958	19,77
1008	20,80	956	19,72
1006	20,76	954	19,68
1004	20,71	952	19,64
1002	20,67	950	19,60