

Operations Manual for PRO₂ *mobile* Oxygen Indicator



Oxygen indicator for measuring rest oxygen levels in inert gases and forming gases for the welding industry.

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1. Preface

This operating manual describes the components, functionality, operations and safety precautions when using the PRO₂ *mobile* Oxygen Indicator.

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2. Safety Precautions

Individuals need to read and understand this manual before using the oxygen indicator. There is no need to open the housing of this unit. Only authorized personnel should open for service concerns and to not void the warranty.

If authorized to open the unit, please ensure that all power sources are turned off. Unplug from power supply and press the On/Off button on the front of the unit, to eliminate battery power.

WARNING! The use of this measuring device in potentially explosive environments is forbidden. For example, when reading forming gases the hydrogen content must be below 10% concentration.

Any used rechargeable batteries (NiMH) should be disposed of according to local regulations.

3. Delivery Scope

Included with the unit are the following:

- Unit with attached special measuring hose and probe
- Case
- Calibration certificate
- Universal plug 100 V - 240 V AC / 12 V DC 1.2 Ah
- Manual

4. Applications

This rest oxygen indicator is designed to constantly measure rest oxygen levels in inert gases as well as in special forming gases, specifically hydrogen (H₂) mixtures with a maximum concentration of 10% H₂.

This unit is especially suited to the welding industry and corresponding applications. The very high quality pipe welds that were required for the semiconductor industry of the past are now common for the aerospace, pharmaceutical, dairy, brewery and other industries. This oxygen indicator enables welders to accurately recognize when extremely low rest oxygen atmospheres are in the weld environment. This environment permits the welder to potentially reach a high quality weld today that was difficult to reach in the past.

A few of the features of the PRO₂ *mobile*

- a. Internal power source recognition for 100 V - 240 V AC
- b. Programmable audio alert
- c. Analog data interface 0 - 5 V DC (0 ppm - 1000 ppm)
- d. Integrated NiMH rechargeable battery (5x 3200 mAh)
- e. Color coded display
- f. Graphic display
- g. Multi language, English, French, German (June 2009)
- h. Documentation (optional or upgradeable)
- i. RS 232 interface and Bluetooth
- j. Can-Bus interface for data logging via PC

5. Design

Amperometric oxygen sensors incorporate an electro-chemical oxygen sensor made from zirconium oxide. If a current is applied to the cell, oxygen ions are pumped from the cathode to the anode. This reaction occurs in a closed and insulated sensor at a temperature of 580°C. A particulate filter that is also insulated against heat loss protects the sensor.

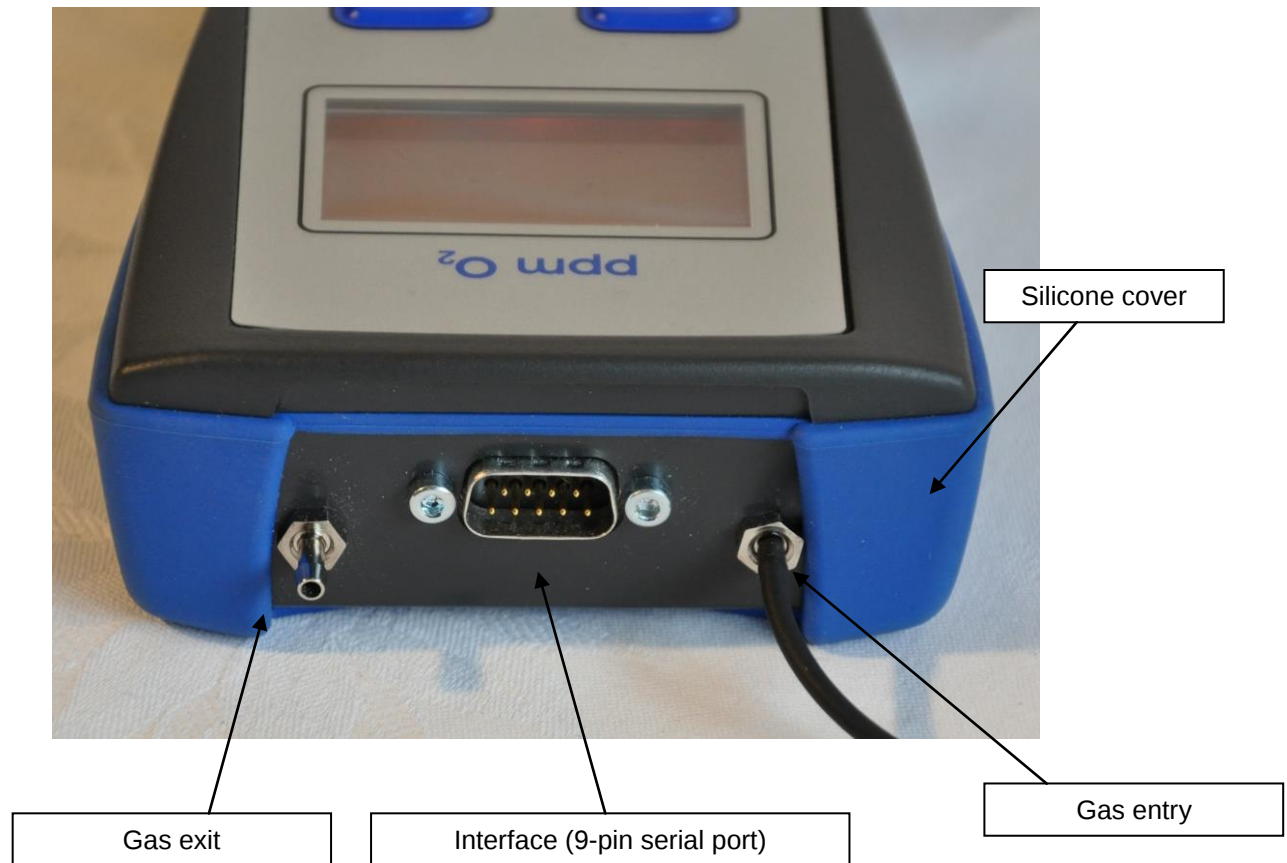
Behind the sensor a pump is positioned that pulls the sample medium through the sensor. Using low permeability hoses that are temperature resistant, the resulting resistance is processed by the electronics and is displayed on the colored LCD screen. With the integrated and easy to use software, the operator has the opportunity to set a variety of parameters with acoustic and visual signals.

6. Description and Operation

6. 1. Front View



6. 2. Top View



6. 3. Rear View



4. Bottom View



7. Different Colored Display Screens

The multi colored display allows a variety of colors to be used. This innovative feature allows the operator a quick visual glance to see the current situation.

The unit uses the following colors to indicate:

Blue Display: Sensor warming up

Turquoise: Standby mode

Red Display: Sensor ready (approx. 580°C)

Green Display: Upper limit O₂ crossed

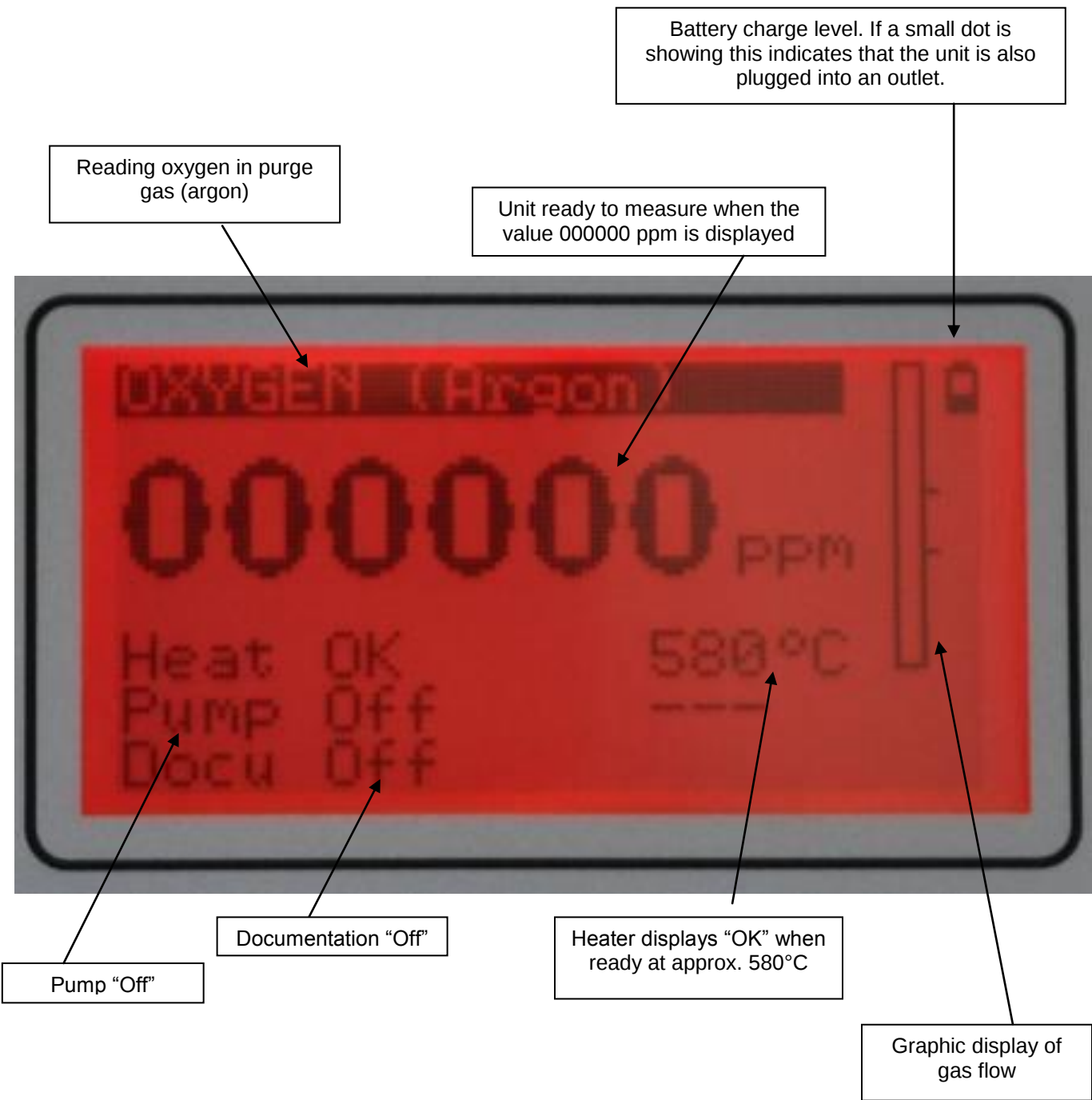
Yellow Display: Programming mode



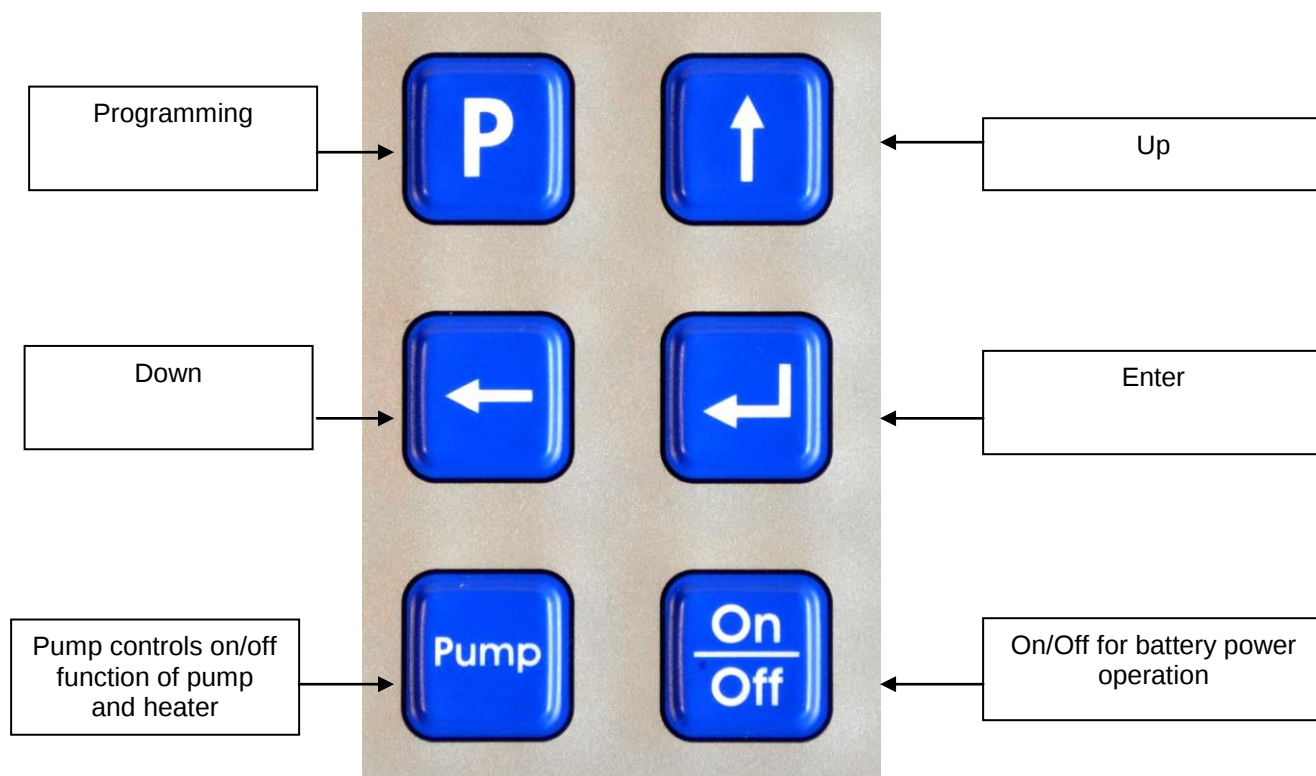
8. Operation

Zirconium cells need a high temperature to function, a heater is used and after approx. 3 minutes the sensor has reached its operating temperature of approx. 480°C. The color in the display will be turquoise (Standby). When the Pump button is pressed, the temperature will raise to its true operating temperature of 580°. During this phase the display will be blue. If the “**Signal Sound**” is set to “**On**”, the unit after reaching 550°C will beep 5 X in order to alert the operator that the unit will be ready shortly. After the sensor has reached its operating temperature, the display will switch to red and “**000000**” will flash. When the “**Pump**” is activated, the display switches to “**1000**” ppm, which is the highest value this unit will indicate.

Main Menu



9. Operating Buttons



The keyboard is user-friendly and allows for function display changes even with work gloves or welding gloves. Through the audible “click” of the operation keys, choices are confirmed. The PRO₂ *mobile* can be programmed for a variety of functions, including audible and visual settings.



9. 1. On/Off Button

Holding down this button for approx. 2 seconds will turn the unit on. To turn the unit off, hold down the button for approx. 3 seconds.



9.2. Pump Button

Holding down this button will turn on/off the pump.



9.3. Enter Button

Pressing this button engages the selected line item on the screen.



9.4. Down Button

This button is used to move back through the menu as well as to reduce a programmable value.



9.5. Up Button

This button is used to move forward through the menu as well as to increase a programmable value.



9.6. Programming Functions

This button allows for movement through a multitude of menus. It enables the unit to be programmed and can document the results, as well. Default parameters can be changed so that the unit can visually and acoustically alert information and much more.

10. Menu

10.1. Basic Settings (Yellow Display)



In the menu “**Basic Settings**” the values for the “**Signal Sound**” and “**Signal ppm**”, which are visual and acoustic alerts, can be changed. “**Documentation**” can also be turned on or off.

Navigation through the Menus:

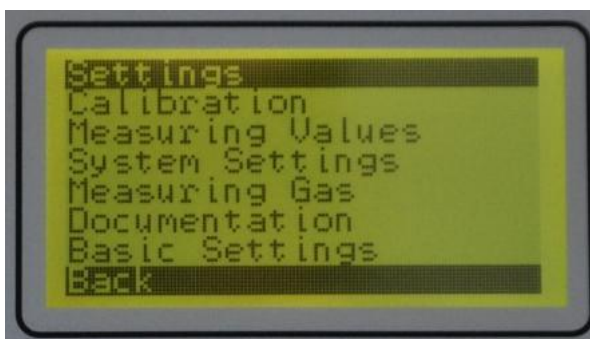
Description of Terminology in “Basic Settings”.

“Signal ppm” If the set value has not been reached, the display will flash red. When the readout drops below the set value in ppm, the display will flash green.

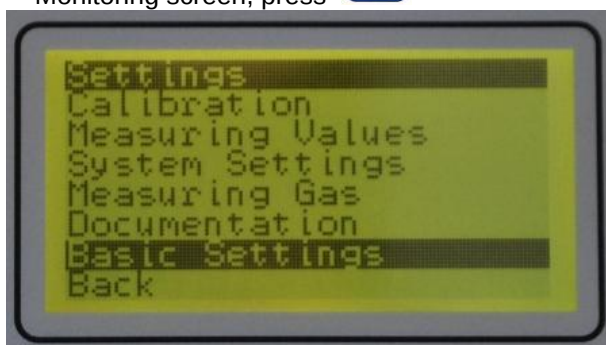
“Signal Sound” An acoustic “beeping” alert can be programmed, for example within the 30 ppm – 100 ppm range, see last three pictures that show an “audible” signal setting of 30 ppm.



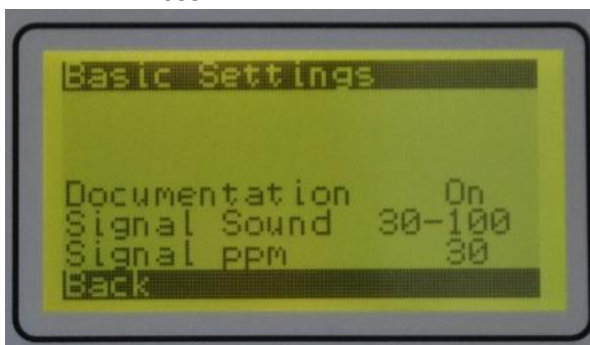
Monitoring screen, press



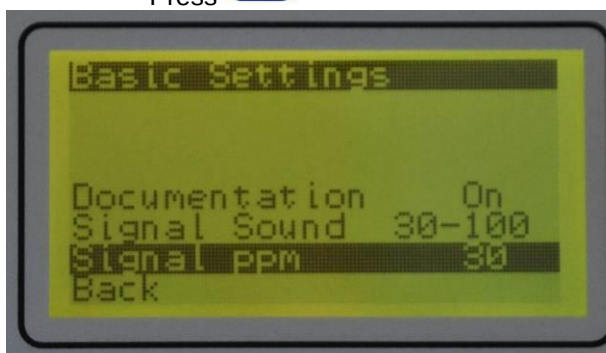
Press



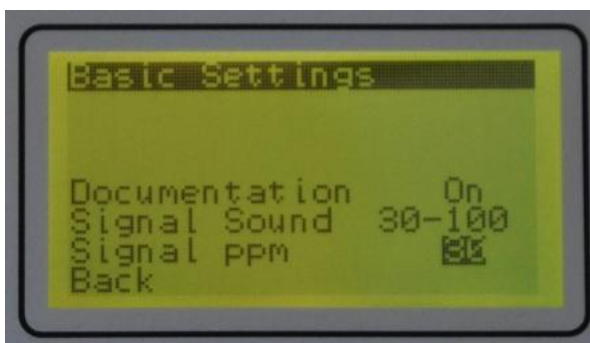
Press



Press



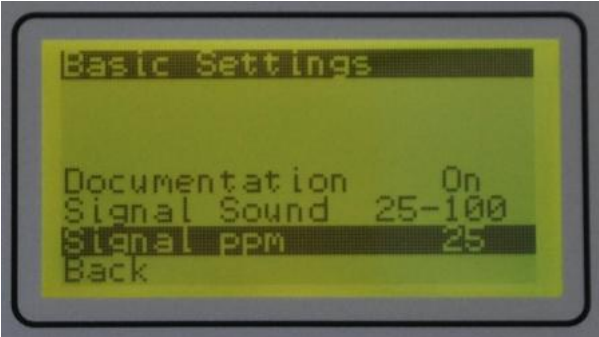
Press



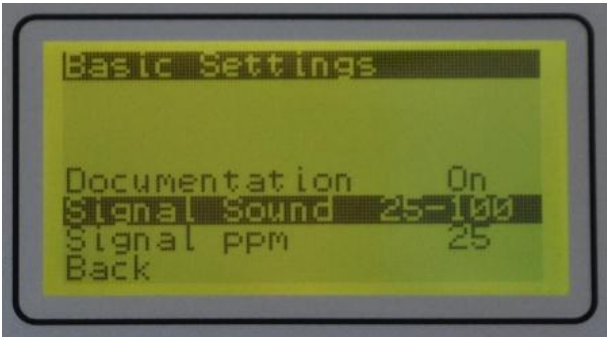
Press



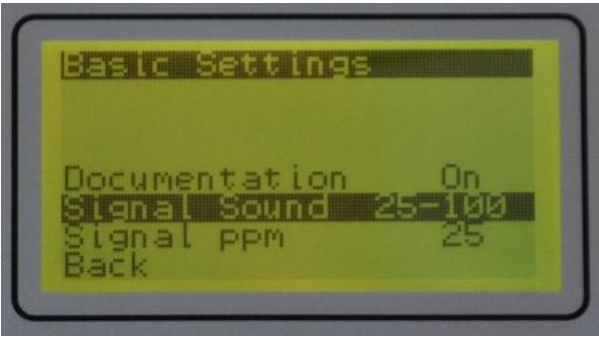
Press 



Press 



Press 



Press 



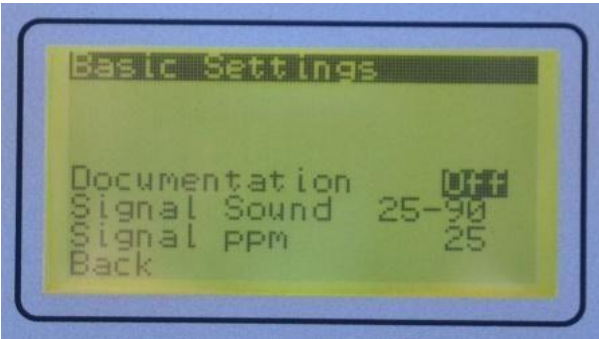
Press 



Press 



Press 



Press 



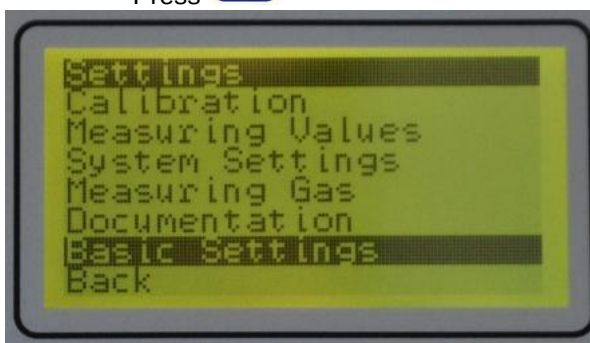
Press 



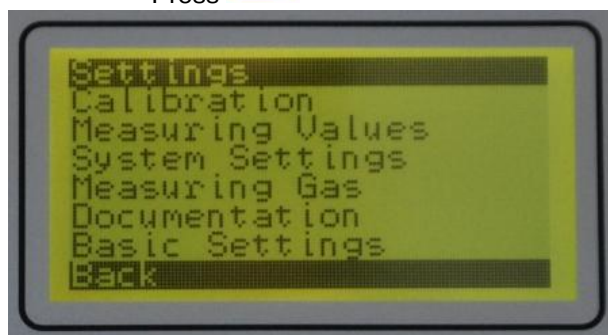
Press 



Press 



Press 



Press 



The instructions under “**Basic Settings**” in this manual, show in great detail that the changing of individual line items, values and menu points can be done instantly. Other menu options in this manual are navigated and changed as easily too, though shown only in point form.

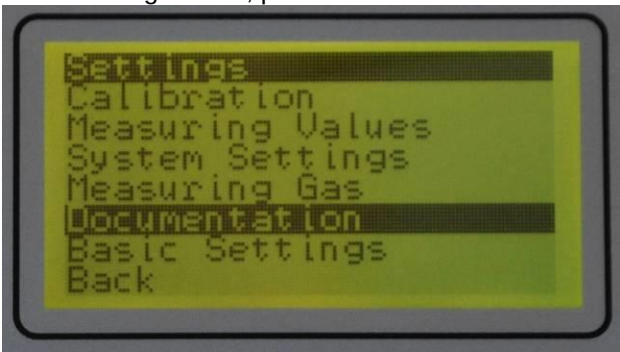
10.2. Documentation (Yellow Display)



Monitoring screen, press



Press



Press



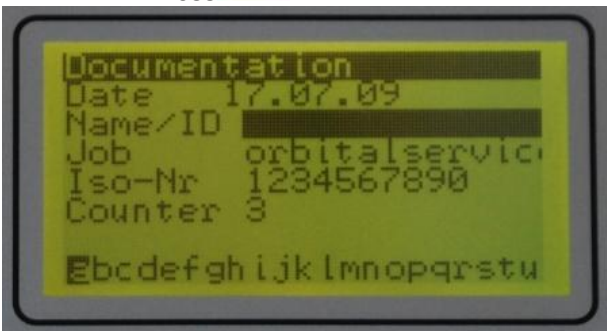
Changing the name, press



Press



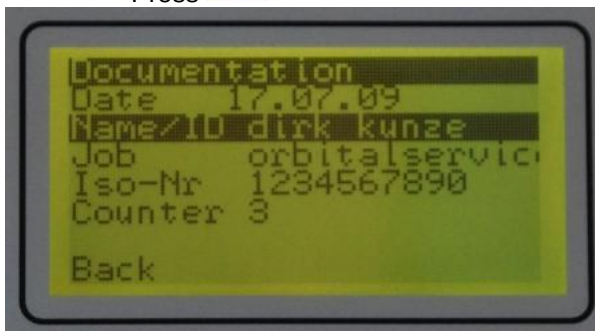
Press



Press 



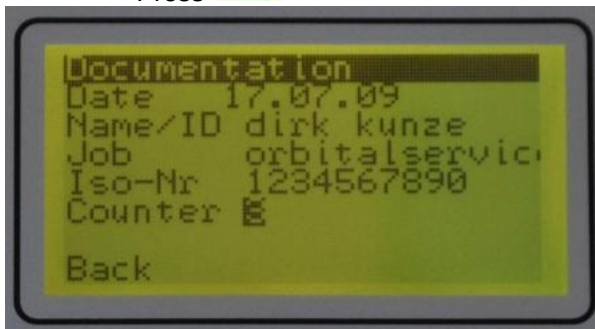
Press 



Press 



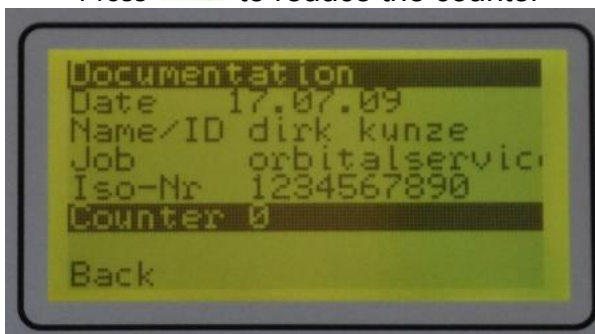
Press 



Press 



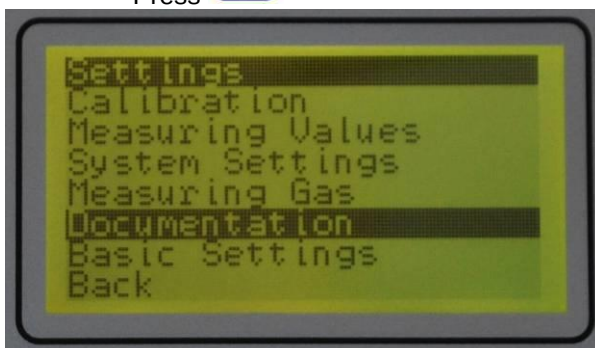
Press  to reduce the counter



Press 



Press 



Press 



Press 



Press 

10.3. Measuring Gas

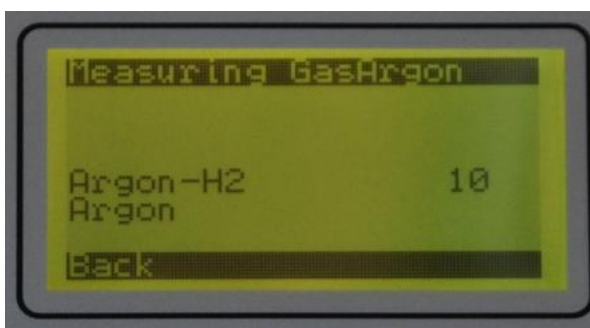
The default setting is “**Argon**” but the unit can be programmed to measure inert gases such as Argon or Forming Gases with hydrogen (H₂) components.

The percentage of hydrogen components CANNOT EXCEED 10%, as there is a danger of explosion!

To change from default, select “**Argon - H2**” (Forming Gas with 10% or less hydrogen content)



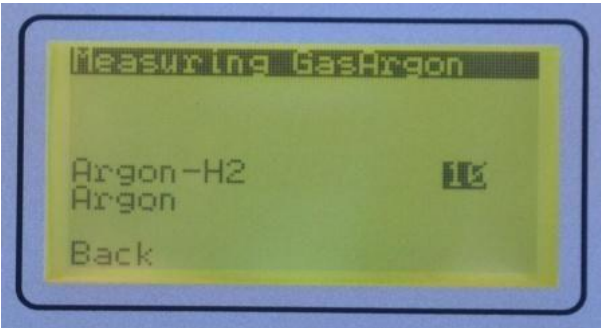
Press 



Press 



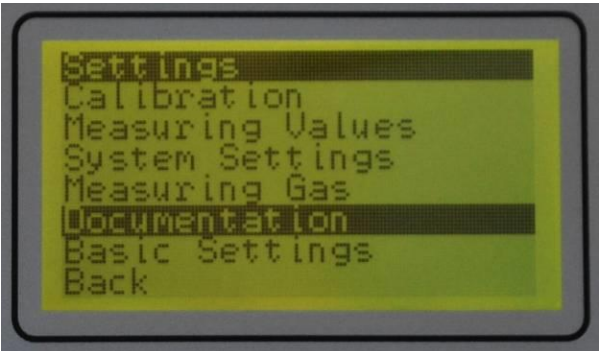
Press 



Press 



Press 

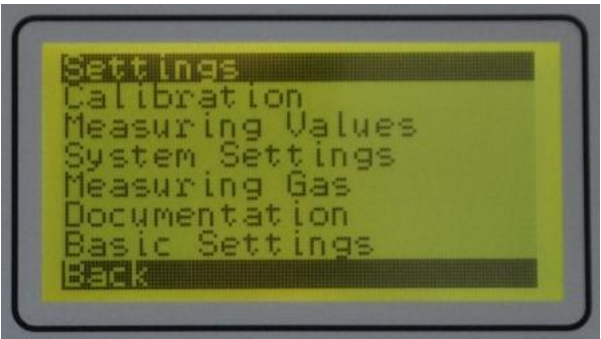


Press 

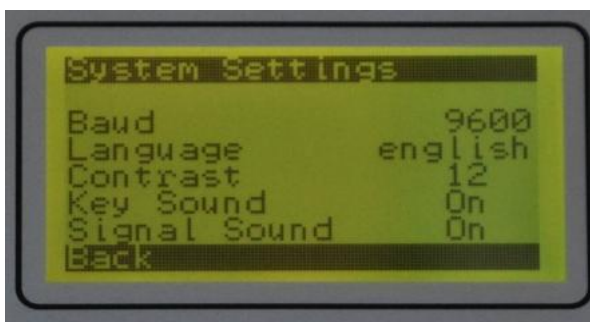
10.4. System Settings



Monitoring screen, press 



Press 



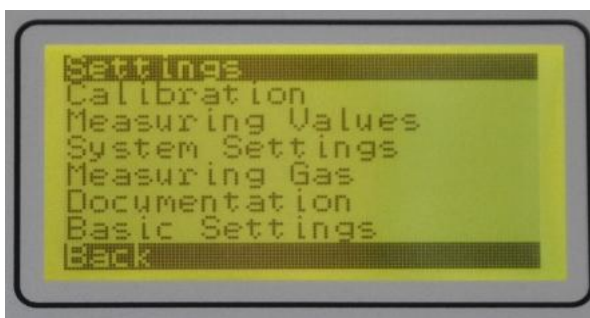
Changes in the menu function are the same as in the previous menus. Standard language settings at this time are English and German.

Baud rate: 9600 (printer, PC connection, Bluetooth Dongle)
19200 exclusively for administration and software updates

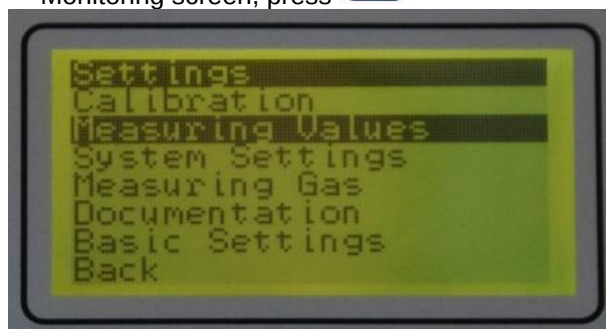
10.5. Measuring Values



Monitoring screen, press



Press



Press



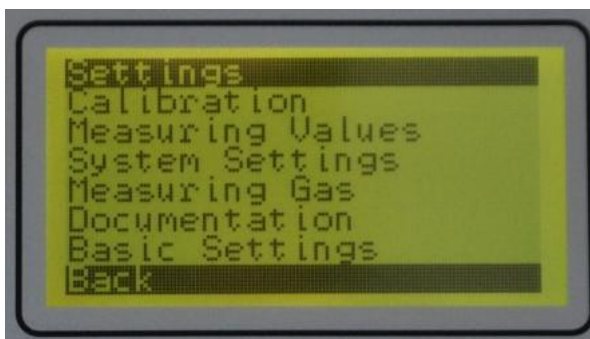
The “Measuring Values” screen is diagnostic and cannot be manipulated.

10.6. Calibration!

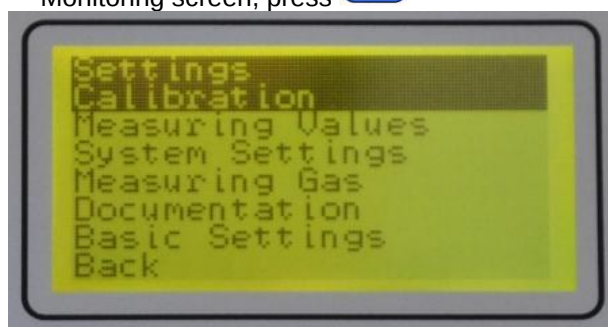
Only the manufacturer or an authorized calibration facility can do the calibration and not void the warranty. During this process the unit is calibrated against two reference gases to insure a linear and accurate calibration.



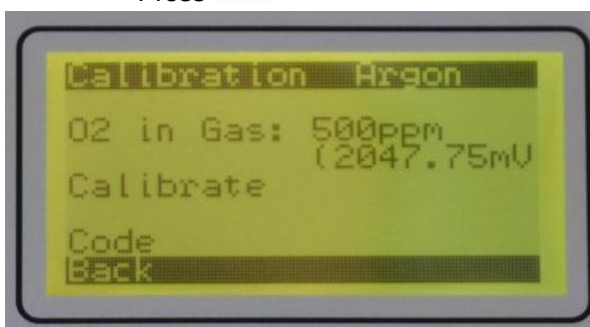
Monitoring screen, press



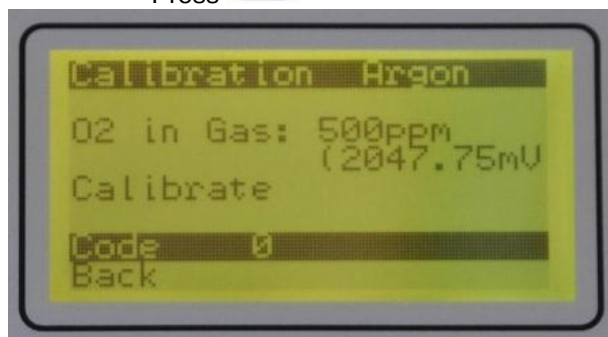
Press



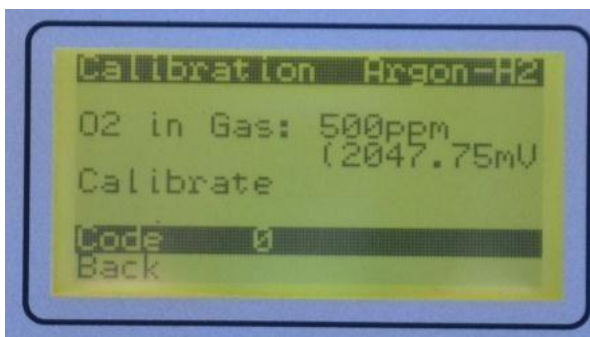
Press



Press



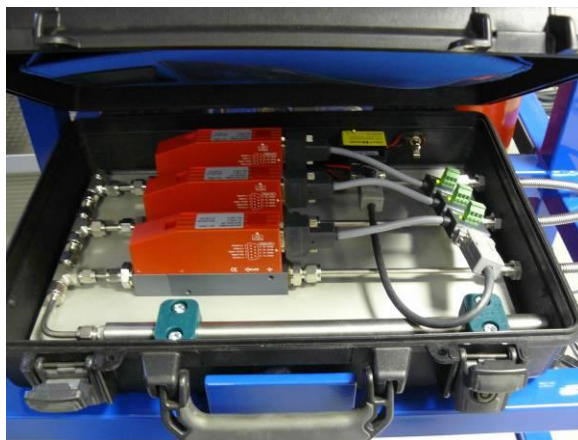
Press



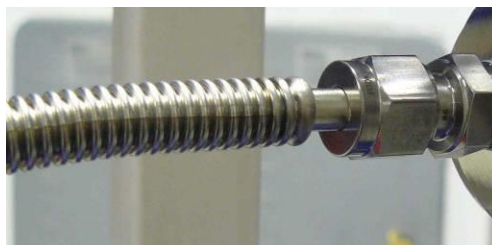
Press

After entering the factory authorization code, the “Calibration Argon-H2” screen will then allow access to the calibration procedure.

The PRO₂ *mobile* is calibrated on a state of the art calibration station. With certified reference gases the unit is calibrated to give a linear readout throughout the whole measuring range of 10 – 1000 ppm. After calibration is completed, the unit is delivered with a calibration certificate for quality control purposes.



In the calibration station, all connections for the high purity gases (rated quality 5.0) are manufactured from stainless steel to avoid any leaks and potential permeability. The flow meters used in this operation are also designed for high purity applications.



11. Precautions Regarding Sensor

Operating with Hydrogen Forming Gases

WARNING!

The temperature of the sensors is heated to approx. 580°C and for this reason the unit cannot be exposed to gas mixtures such as hydrogen gases greater than 10% that explode under these conditions.

Exposure to Water

If water is introduced to the sensor element, the sudden temperature shock can lead to sensor cracking and failure.

Exposure to Gases

Gases, which contain halogens such as fluorine (F), chlorine (Cl), bromine (Br), iodine (I) and astatine (At), as well as halogen mixtures, for example CFCs, will damage the sensor even in small quantities.

Gases such SO₂, SO₃, and H₂S in concentrations higher than 50 ppm will cause a reduction in the electrode activity and will dramatically shorten the life span.

Other organic gases from silicone compositions and adhesives can affect the life expectancy of the sensor.

Moisture

As the sensor has an operating temperature higher than 100°C, moisture present in the measuring gas will not condense inside the unit. Ambient moisture in the measuring gas does not affect the sensor.

12. Technical Data

Measuring Data:

Measuring Range	1000 ppm - 10 ppm
Accuracy	< 10 ppm
Measuring gas flow	approx. 2 l/h
Max. Temperature of the measuring gas	80° C at gas entry

Specifications:

Dimensions (LxWXH)	220 mm x 100 mm x 40 mm
Weight	1 kg
Gas entry and exit ports	3 mm hose barb
Operating conditions	10 - 45°C, relative humidity <80% at 20 °C
Storage conditions	-20 - 60°C, relative humidity <95% at 20 °C

Specifications (Electronics)

Voltage	100-240 VAC, 47- 63 Hz, 1.2 Ah
Internal battery	7 VDC, 3200 mAh
Keyboard	Graphic display (128 x 64 pixel) with 4 different colors