Operating Manual

OXY *Integral*

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Preface

This instrument determines the partial pressure of oxygen in gas atmospheres by using an oxygen sensor. Such sensors operate at very high temperatures. Precautions must be taken to ensure that no flammable gas mixtures reach either the sensor or the instrument. Should the ceramic portion of the sensor be damaged, the gas measured may escape or may be diluted by air. Precautions must be taken to avoid damaging either components or the environment.

Damage to the equipment and false readings can arise due to incorrect operation, leaks, corrosion, condensation, etc. Regular servicing of all components is essential.

The oxygen measuring instruments and their accessories are built and tested under quality control standards in accordance with DIN EN-ISO 9001. The instruments must be installed and used in compliance with all applicable local and specific regulations. The equipment must be periodically checked for accuracy and function depending on its degree of use, and should be checked in accordance with the calibration and test instructions with which it was supplied.

This measuring instrument is not suitable for use with explosive gas mixtures, especially with pure hydrogen. There is a risk of explosion.

Introduction

Principle of measurement

Oxygen measuring instruments are designed to process the output from an oxygen sensor made of stabilised zirconium oxide. This material is a ceramic, also known as a solid electrolyte, and is ideally suited at high temperatures as an oxygen ion conductor.

Such ion conductors within a temperature range, depending on the composition of the material, possess the capability to fill empty spaces in their crystal structure with oxygen ions. The oxygen ions attach themselves to a conductive contact surface most commonly platinum. The degree of oxygen concentration in a gas when measuring determines the degree of oxygen activity and thus the quantity of oxygen ions.

A sensor consists in principle of a solid electrolyte, which is exposed to gas on both sides. One side is in contact with a reference gas, air for example, the other with the gas to be measured. The physical construction of the sensor keeps the two gases apart, so that any mixing is prevented.

In applications as described above both heated and unheated sensors are used. Unheated sensors are normally used with ovens. Where gases are under 600°C, a heated sensor is used. Heated sensors require a minimum temperature of between 500°C- 650°C as required by the measurement principle.

Heated sensors are held at a set temperature by a controller built into the electronic processor. The temperature of both heated and unheated sensors is measured by the processor and is an essential component in the calculation of the oxygen content (oxygen partial pressure).

Electronics

The electronics of the "Oxy - ***Integral*** " are capable of the following functions:

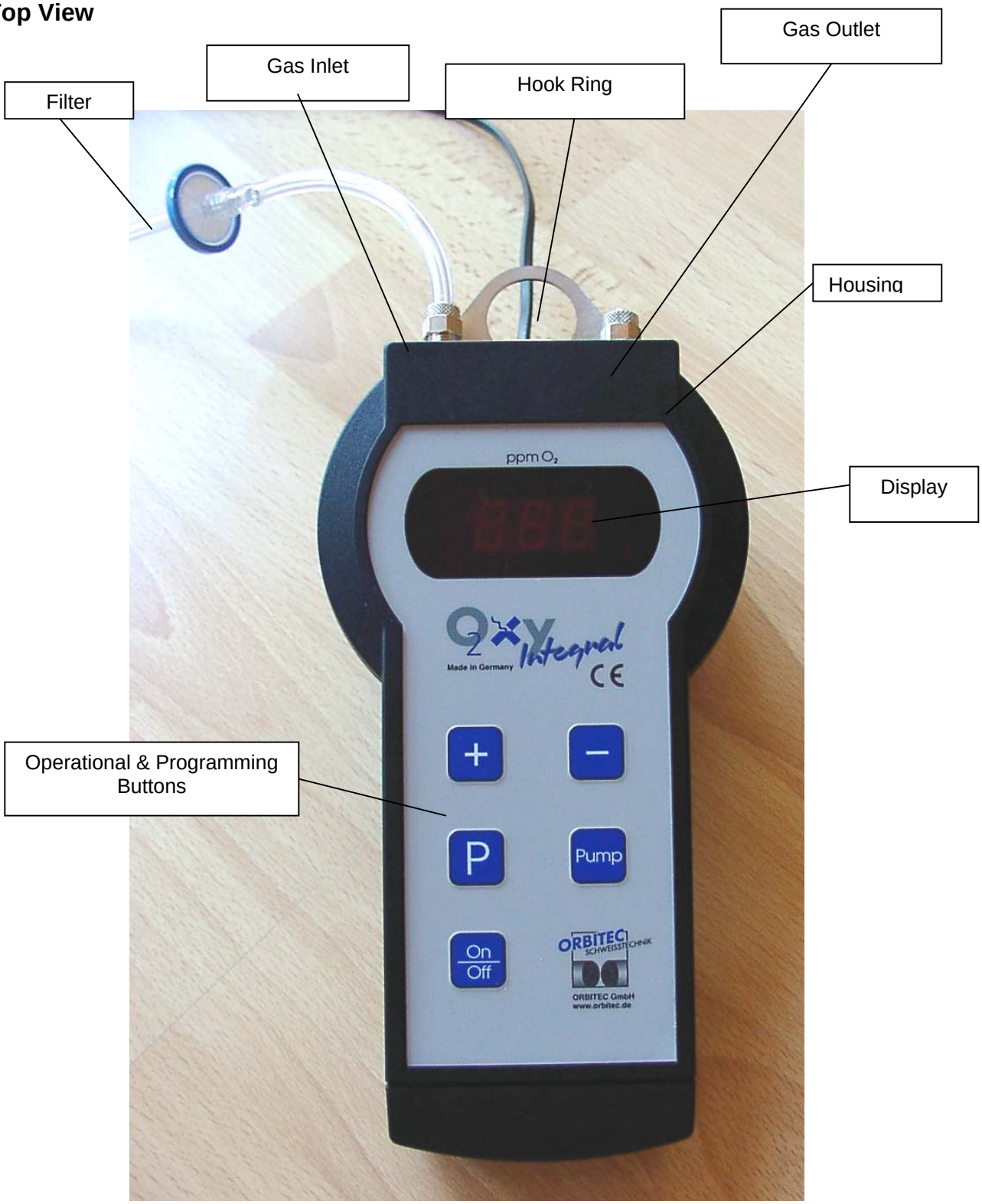
- Measuring accurately the rest oxygen component in inert gases such as argon and helium as well as nitrogen.
- The setting for the type of gas used is chosen using the **P** button in combination with the **Plus+** button or the **Minus–** button (see page 17)
- The maximum hydrogen content in the purge gas cannot exceed 10%.
- Forming gases are gas mixtures of nitrogen and hydrogen. This type of sensor cannot accurately measure rest oxygen levels in these types of gases. What can be shown is a tendency and an accurate value.

Sensor

The built in sensor includes the measuring element of platinized zirconium oxide, the heating element and the heating controller. The heating element is required to keep the sensor at approximately 550°C.

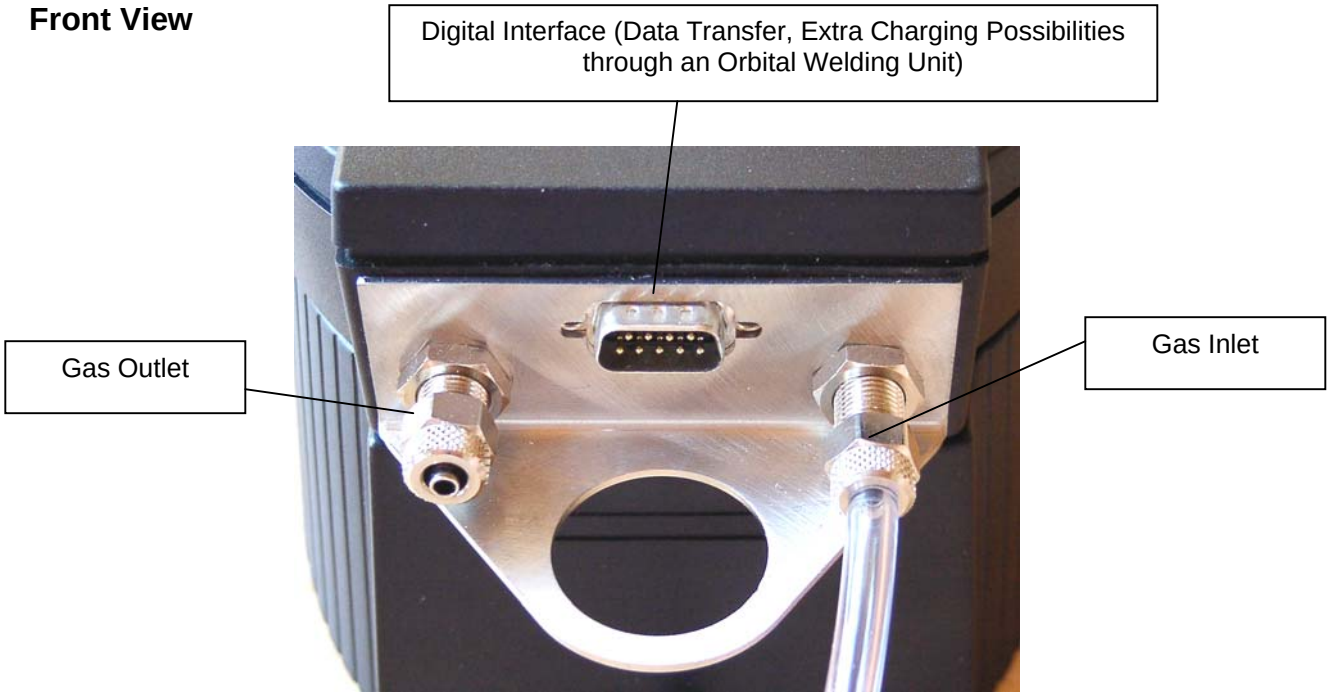
General Design

Top View



Side View

Front View



Display

3 Digit Display
(Max. Measuring Range: 999 PPM)

Plus+
(Increases Upper Limit Value after Pressing the P Button)

Minus-
(Decreases Upper Limit Value after pressing the P Button)

P
(Button to Program Upper Limit Value or Select Gas Types)

Pump
(On and Off Button for the Integrated Pump)

ON/OFF

Operation

Turning on the Unit

Pressing and holding down the **ON/OFF** button for approx. 1 second will turn on the instrument. The element heats up the sensor, which needs to be brought up to a specific temperature for accurate operation. During this warm-up phase no measurement is possible. The digital display will rise slowly until it reaches **999**. If the **Pump** button is pressed during the warm up phase, the display will show 3 small letters **ccc**, indicating the sensor is not ready to use.

After the warm up phase the display will indicate the maximum value **999**. This will take between 45 seconds to 1 minute.

The unit is now fully operational.

Program Functions

When using the OXY ***Integral*** it is possible to set a desired upper limit within the entire measuring range, which is 0 – 999 PPM. The operator will be alerted through the flashing of the display if the value displayed is higher than the upper limit. When the setting has been reached the display will no longer flash and welding can proceed.

Important: During the welding procedure the probe must be removed!
The sensor will not function during the welding procedure and the displayed value shown during that period does not correspond to the actual oxygen content.

Programming

1. Press the **P** button (3 dots will flash and after that an upper limit setting, for example 20 PPM will be displayed). While in the programming function there will be 3 dots behind the numbers as in picture 1.

Picture 1

Picture 2

2. To change the upper limit, press the **Plus+** or the **Minus-** buttons until the desired limit is selected, for example push the **Plus+** once and the value goes to 21 PPM as in picture 2.
3. Press the **P** button to confirm programmed upper limit setting.

This setting is now retained in the unit's processor. This upper limit remains even if the unit is switched off or if the battery is replaced.

Measuring

After the zirconium oxide sensor has reached operating temperature the unit is fully functional. An upper limit setting for QC purposes can be programmed through the **P** button, which is recommended but not necessary for measuring purposes.

The probe at the end of the sensor's hose can be inserted into the purge chamber or root gap and the **Pump** button is pressed. Now the sample gas is drawn through the oxygen sensor hose (approx. 50l/h) into the unit for analysis.

Important: During the welding procedure the probe must be removed!
The sensor will not function during the welding procedure and the displayed value shown during that period does not correspond to the actual oxygen content.

Recharging of the Battery Pack

Recharging

This oxygen analyser is powered by internal battery pack (2300 mA) with a life between charges of approx. 3 – 4 hours. When replacing a complete battery pack, use batteries from the same manufacturer with the same charge capacity. All five batteries must be replaced at the same time.
Important: Only use rechargeable batteries!

When the battery pack is low and recharging is necessary, three dots in a row flash from right to left. This feature displays when the battery depletion is approaching 45% of capacity. This suggests that the operator return the unit to the supplied docking station for recharging. The unit is fully functional even while in the docking station.

Important: The sensor must be turned on during the charging phase!
If the sensor is not turned on, the charging station only provides a small maintenance charge of approx. 50 mA in order to prevent further battery depletion. The sensor also has an energy saving feature to extend battery life and internal components. After 10 minutes of inactivity the unit will shut itself down unless the unit is charging or the pump is on.

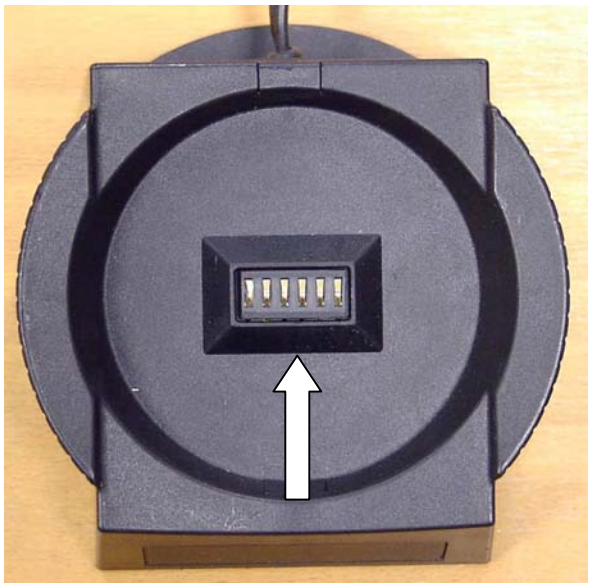
Recharging Necessary
(Flashing three dots from right to left)

Charging on the Docking Station
(Flashing three dots from left to right)

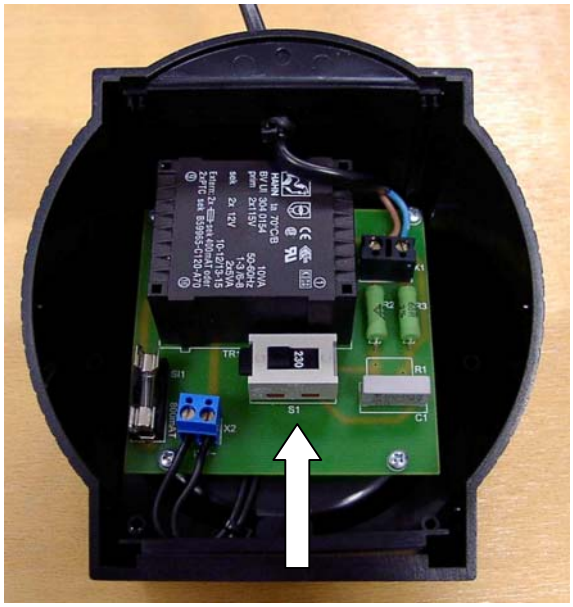
Docking Station for Recharging

This oxygen analyser is a portable handheld battery operated unit, which makes it excellent for job site work. After use the unit is placed back in the docking station so that the battery pack can be recharged. The unit is placed into the middle of the docking station where a receptacle with spring loaded clamps attaches itself to the metallic contacts on the back of the sensor.

Important: Ensure that the sensor is seated correctly into the docking station; a misaligned sensor will not charge!



Spring loaded clamps in the middle of the docking station.



Switching to the local power requirements either 230 V / 115 V

Important: Before opening docking station, disconnect power supply!

Unit in picture is using 230 V Power; This is visible by the number on the switch (see arrow).

Status of Battery Pack

By pressing the **Plus+** and the **Minus–** button at the same time the status of the battery pack can be viewed. At approx. 45% capacity the unit will indicate that it needs recharging by flashing three dots in a row from right to left.

Energy Saving

In order to extend battery life, especially if the unit is accidentally left on, the unit is programmed with an energy saving function. If within 10 minutes of non-use or not being placed back in the docking station, the unit will shut itself down. The sensor is fully functional again after it has been turned on for approx. 1 minute. This feature extends battery life and internal components.

Changing Battery Pack

Remove the black end cap by pressing the side tabs and pulling. Then by pressing up on the grey tab on the battery pack and pulling, the battery housing is removed and batteries can be inserted.

Important: When replacing battery pack please note polarity!

Turning Unit OFF

By pressing and holding down the **ON/OFF** button continuously for 3 seconds the unit shuts off. This delay prevents turning the unit off accidentally.

When pressing the **ON/OFF** button continuously for the 3 seconds the display indicates **8.8.8.** and turns off.

Measuring Different Gases

Press and hold down the **P** button and the **Minus-** button at the same time to program for the measurement of rest oxygen in **Argon**. Display will read **0** as shown above.

Press and hold down the **P** button and the **Plus+** button at the same time to program for the measurement of rest oxygen in **Forming Gases**. Display will read **1** as shown above.

Note: Factory default for this unit is always argon!

In most cases the unit is exposed to situations where argon is used. To prevent errors the unit always resets to the default, which is argon, when the unit is shut off. If hydrogen based forming gases are used the selection must be made **again** (see above). In principle the sensor is **not suited** to measure oxygen content in forming gases such as hydrogen mixtures and atmosphere.

When using the oxygen analyser to measure rest oxygen in forming gases the following is to be noted and followed:

- Maximum concentration of H2 is 10 %.
- The reaction time of the sensor on the H2 elements is much longer than with inert gas such as argon, nitrogen and helium.
- When switching from H2 mixtures back to inert gases, the sensor is contaminated for a while. To purge the unit, turn pump on and let regular air be sucked through the unit.

Unlike inert gases, which can be measured accurately, rest oxygen cannot be accurately measured with forming gases. This is why a small test weld to visually compare rest oxygen exposure enables what the indicator displays to be used as a reference point.

Important: The value displayed when measuring forming gases indicates a tendency and not a fixed value.

Important: During the welding procedure the probe must be removed!
The sensor will not function properly during the welding procedure and the value shown during that period does not correspond to the actual accurate oxygen content.

Filter Life

To measure rest oxygen in the sample gas the unit requires a minimum flow of approx. 50 l/h. If this amount is not delivered to the sensor the unit is not able to measure accurately. The most common cause for this is if the filter is plugged. A flashing **ccc** indicates the sensor is measuring below the minimum flow required. The value of the sampling measurement as well as the flashing of the **ccc** will alternate approx. every 100 ms.

This situation will not stop the measurement from taking place but make the operator aware that the filter needs changing. The value displayed may not be accurate and could possibly be higher than indicated.

Important: Check hose and connections for leaks when changing filter.

Technical Data

Measurement Instrument (Dimensions and Weight)

Length	290 mm	11 3/8“
Width	130 mm	5 1/8“
Height	60 mm	2 3/8“
Weight	0, 8 kg	1.8 lbs.

Power Supply: 6 V
Digital Interface for documentation

Interface is compatible with Orbital Welding System TIGTRONIC Compact

Docking Station (Dimensions and Weight)

Length	140 mm	5 ½“
Width	125 mm	5“
Height	80 mm	3 3/16“
Weight	0, 5 kg	1.1 lbs.

Power Supply: 115 V / 230 V

Important Information

- **Do not insert probe into high-pressure lines or attempt to use in strong vacuum environments.**
- **Do not open docking station when power cord is still connected to power supply.**
- **Battery packs should be replaced as a component (battery packs can be ordered from INTERCON).**
- **Do not measure without the filter (no warranty). Use only original filter from INTERCON.**
- **Avoid exposure to organic gases such as melting plastic. These gases can destroy the sensor.**
- **Do not measure gases with hydrogen content higher than 10%. RISK OF EXPLOSION!**

Notes: