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# IS-OXYAN-100(P)/200(P)

## OEM Oxygen Analyser

### User Guide



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Web: [www.intelec-systems.com](http://www.intelec-systems.com)

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# 1. Features and Specifications

- Range from 0.1% to 100%
- Super long-life sensor due to non-consumptive technology (5 to 10 years)
- High accuracy of 1%
- Active pressure compensation (version with **P** postfix) from 0.5 bar to 1.2 bar ambient atmospheric pressure
- Operates off 24V DC supply
- Low power consumption of 12W (except auto-calibration version)
- 4-20mA output; optional 0-5V/10V
- Single and 2-point calibration
- Linearity of better than 0.3% from 0.1% to 100% oxygen
- 1 bar input pressure
- Consumption of 300ml / min
- Built-in internal restriction
- Max ambient temperature of 60°C (convection cooled)
- Internal resettable fuse (automatic)
- Cold start-up time of 5 minutes
- Heartbeat / Ready LED and Power LED
- Two open collector alarm outputs
- Calibration and setup from RS232 on hyperterminal **OR** manual pushbutton calibration (no PC required)
- Block manufactured from anodised aluminium
- Open stainless steel chassis of size: 168 X 130 X 68mm
- 4mm push pipe gas inlet, outlet and reference gas (**OXYAN-200**)
- Remote auto-calibration model (**OXYAN-200**) has built-in solenoid valves to automatically switch to reference.
- Calibration reference gas may be dry air @ 20.95% which allows accurate low-cost calibration (**OXYAN-200**)

## 2. Introduction

The **IS-OXYAN** series are microprocessor-controlled OEM oxygen analysers with zirconium-dioxide sensors. They are designed to continuously measure oxygen content of pure, dry gases and gas mixtures that demand high measuring-accuracy, reliability and long-term stability. They can measure over the range from 0.1% to 100%. They provide a 4-20mA output or a 0-5V / 10V output. The **IS-OXYAN** series has been developed specifically for integration into oxygen generators and other oxygen applications. They feature extremely long life due to non-consumptive sensor design – in excess of 5 years under ideal conditions.

The **IS-OXYAN-200 (P)** auto-calibration version allows remote auto-calibration. This can save many hours in travelling time and costs. It has built-in solenoid valves for switching between the reference gas and the calibration gas. The auto-calibration gas should be dry air, thus allowing very low maintenance costs.

The **IS-OXYAN-100 (P)** version does not have built-in solenoid valves for auto-calibration.

The version with P postfix has active pressure compensation from 0.5 bar to 1.2 bar.

### 3. Installation and Usage Precautions

- 1) **The IS-OXYAN series requires an initial 200 hour burn-in time for the sensor to stabilize. After this period, the units should be re-calibrated.**
- 2) The stainless steel block gets very hot (about 75°C), so touching it may cause burns.
- 3) The sensor can be damaged by mechanical impact.
- 4) The sensor can be damaged due to thermal shock eg if the input gas is very cold.
- 5) The measured gas should be pure and dry. Dust or moisture in the gas may lead to incorrect measuring results. If required, use a filter on the input gas.
- 6) For processes where grease / oil from solenoid valves can be released into the oxygen, **a filter MUST be used** in order to realise a long sensor lifetime.
- 7) **Blocking or restricting of the exhaust outlet can lead to incorrect measurements.**
- 8) The module **MUST be installed upright**, else the sensor may be damaged over time by moisture collecting on it.
- 9) The **IS-OXYAN** series module does not need ventilation as long as the ambient temperature is kept below 60°C.
- 10) The **IS-OXYAN** series module is designed to fit into systems where the measuring gas is available in the form of an overpressure. The module has an integrated restriction, which gives the correct flow rate at the specified pressure of 1bar. If the correct pressure is not available or if it is not stable, a pressure regulator must be installed between the gas input supply and the **IS-OXYAN** series modules.

**Warning1:** Substances such as fluorine, chlorine, bromine, iodine, sulphur compounds and vapours of organic silicone compounds may reduce the service life of the sensor and at worst, destroy it.

**Warning2:** In the case of the **OXYAN-200**, the auto-calibration solenoid valves **MUST** be cleaned for oxygen use.

**Warning3:** The PC / laptop **MUST** be **disconnected** from the mains before the RS232 serial cable is plugged in to J5.

**Warning4:** A USB / RS232 galvanic isolator **MUST** be used when connecting the PC / laptop communications cables in the event that both the OXYAN and the PC / laptop are switched on. Failure to adhere to this rule may result in damaged hardware.

## 4. Wiring Instructions

### Wiring

Apart from the four M3 mounting screws, the OXYAN-100 (P)/200(P) oxygen analyser units have the following wires and pipes to connect:

- a) 4-20mA output (2 wires) to J9.
- b) 24V power (2 wires) to J4.
- c) Auto-calibration start connections (2 wires from OxyPro relays) to J10 \*<sup>2</sup>
- d) Oxygen inlet 4mm push-pipe from concentrator \*<sup>1</sup>
- e) Auto-calibration gas inlet 4mm push-pipe (from air tank or reference gas tank) \*<sup>1</sup> \*<sup>2</sup>
- f) Outlet 4mm push-pipe to external environment.
- g) For connection to a PC, plug the PC RS232 port with the supplied connector to J5 \*<sup>3</sup>
- h) Do a calibration cycle after waiting for 1 hour for sensor to heat up properly.

- \* **NOTES:**
- 1) Must be regulated to 1 bar.
  - 2) OXYAN-200 (P) only
  - 3) The PC / laptop **MUST** be **disconnected** from the mains before the RS232 serial cable is plugged in to J5.
  - 4) A USB / RS232 galvanic isolator **MUST** be used when connecting the PC / laptop communications cables in the event that both the OXYAN and the PC / laptop are switched on. Failure to adhere to this rule may result in damaged hardware.

\* **WARNING:** In the case of the auto-calibration version (OXYAN-200(P)), the solenoid valve **MUST** be cleaned for oxygen use.

The unit is now ready for operation.



## Indicators

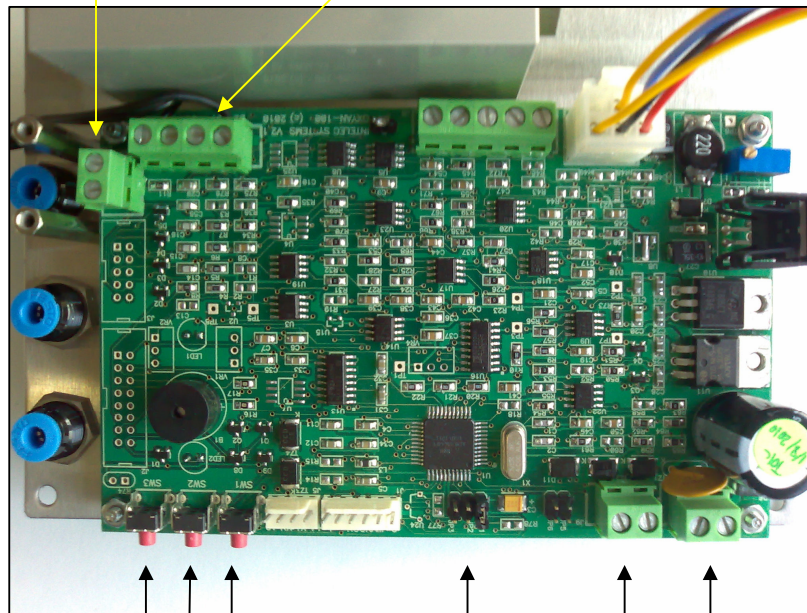
Note that on power-up, the red power LED will light up.

When the sensor has heated up adequately (about 2minutes), the yellow status LED will begin to flash. This is the heartbeat signal which indicates that the OXYAN series module is operating correctly. As the oxygen purity increases, the LED will flash slower (about 5secs at 95% and about 1sec at 21%.)



J10 - AUTO-CALIBRATE TRIGGER

J6 : Relay Drivers



SW3 SW2 SW1

Jumpers 1..3

J9 : 4-20mA

J4 : +24V

**OxyAn Pin Connections:**

| <b>Connector</b> | <b>Function</b>        | <b>Return Signal</b> |
|------------------|------------------------|----------------------|
| J4               | Power (+24V)           |                      |
| J9               | 4-20mA                 |                      |
| J10              | Auto-calibrate Trigger | 0V                   |
| J6               | Relay drivers          | +24V                 |

**Note 1:** For Auto-calibrate connector, the pins should be connected to a **dry contact**.

## 5. Setup and Calibration

### Setup

The initial setup and maintenance of your **OXYAN-100(P)/200(P) oxygen analyser** is managed via an RS232 serial port with Windows Hyperterminal or some such terminal emulator. Please read the user guide in full before attempting to configure your **OXYAN-100(P)/200(P)**.

On power-up of the **OXYAN-100(P)/200(P)** oxygen analyser, the unit will beep 3 times. After an initial warm-up period of 5mins, the unit will begin to output the oxygen purity on the 4-20mA connector. If a computer with a serial port running a terminal emulator is connected, the values may be viewed on the screen.

The calibration / setup menu has 3 options:

- 1) Single-point calibration
- 2) Two-point calibration, and
- 3) MA filter point number.

To enter the calibration menu, “Control” and “S” keys must be pressed simultaneously.

**Note that only jumper 1 (JMP1), jumper 2 (JMP2) or jumper 3(JMP3) MUST be on for the calibration / setup menu to be activated.**

a) Thereafter, you will be prompted for the password.

Enter: 888888

b) You will now be prompted with:

Set Single Point (S) or Two-Point (2) Calibration Purities or MA points (M):

Type “S”, “2” or “M” to select single-point calibration, two-point calibration or the filter point number respectively.

As the names denote, single-point calibration allows for calibration on the slope of the sensor output only. The sensor is very linear, so usually single-point calibration is adequate.

Two-point calibration allows for the calibration of the slope and the offset. This allows one to eliminate any non-linearities in the sensor output.

The MA (moving average) filter value allows one to filter out noise at the expense of response time. The values vary from 1 to 100. The output response time with 100 is 100 times slower. The default is 10.

c) If single-point calibration is selected, you will then be prompted as follows:

Enter single point CAL gas %:

Enter the % eg 90.00% and press the <Enter> key.

If 2-point calibration is selected, you will then be prompted as follows:

Enter 1st CAL gas %:

Enter the % eg 0.30% and press the <Enter> key.

Enter 2<sup>nd</sup> CAL gas %:

Enter the % eg 90.00% and press the <Enter> key.

If MA value is selected, you will then be prompted as follows:

Enter MA filter number:

Enter the value eg 10 and press the <Enter> key.

The range is 1..100. Default is 10.

## Measurement Calibration

### (I) Single point calibration cycle (OXYAN-100(P))

- 1) Ensure only jumper 1 (JMP1) is on.
- 2) Connect the input reference gas
- 3) Set the single-point calibration to the reference gas purity value as above

- 4) Allow 30min settling time and then press SW3 (pushbutton 3.) Note that if SW1 (pushbutton 1) is pressed, the unit will be calibrated to 20.95% irrespective of the single-point calibration parameter setting.
- 5) The unit will beep twice. The calibration is now complete.

**(II) Two-point calibration cycle (OXYAN-100(P))**

- 1) Ensure only jumper 2 (JMP2) is on.
- 2) Connect the first input reference gas to the oxygen gas input.
- 3) Set the 2-point calibration values to the reference gas purity value as above
- 4) Allow 30min settling time and then press SW1 (pushbutton 1.)
- 5) The unit will beep once.
- 6) Connect the second input reference gas to the oxygen gas input.
- 7) Allow 30min settling time and then press SW3 (pushbutton 3.)
- 8) The unit will beep twice.
- 9) The calibration is now complete.

**(III) Single point and Two-point offset calibration cycle using solenoid valve (OXYAN-200(P)) [\* See Appendix B]**

- 1) Single-point or 2-point offset solenoid auto-calibration may be set up from the jumpers. Note that for 2-point offset calibration, an offset calibration only is performed, thus first requiring a full 2-point auto-calibration cycle as seen in the following paragraph (iv) below.
- 2) To set up single point (default) calibration, jumper 3 (JMP3) should be inserted. Press SW1 (pushbutton 1) for 1-point auto-calibration mode. The unit will emit one long beep and one short beep for 1-point auto-calibration mode.
- 3) To set up 2-point auto-calibration, jumper 3 (JMP3) should be inserted. Press SW2 (pushbutton 2) for 2-point auto-calibration mode. The unit will emit one long beep and two short beeps for 2-point auto-calibration mode.
- 4) Remove jumper 3 (JMP3.)
- 5) If 2-point offset auto-calibration mode is set up, then the unit first needs to be calibrated as seen in the following paragraph (iv) below.
- 6) Connect the input reference gas to the reference gas input
- 7) Set the single-point calibration to the reference gas purity value as above

- 8) Allow 30min settling time and then bridge the ACAL (**auto-calibrate**) trigger input connector (J10) with a wire for 10secs.
- 9) The unit will beep once.
- 10) After the full cycle is complete (20mins), the unit will beep twice
- 11) The calibration is now complete.

**Note 1:** that the same procedure as for the OXYAN-100 single-point calibration (above) may be used.

**Note 2:** the 4-20mA output will show 95.0% for the duration of the ACAL (auto-calibrate) cycle.

**Note 3:** if the ACAL connector (J10) is held closed indefinitely, the 4-20mA output will show 95.0% until the ACAL connector bridge is released. Also, if the ACAL input is held closed for more than an hour, the auto-calibration cycle will be aborted after the ACAL input is released.

#### **(IV) Two-point calibration cycle (OXYAN-200(P))**

- 1) Ensure only jumper 2 (JMP2) is on.
- 2) Connect the first input reference gas to the oxygen gas input.
- 3) Set the 2-point calibration values to the reference gas purity value as above
- 4) Allow 30min settling time and then press SW1 (pushbutton 1.)
- 5) The unit will beep once.
- 6) Connect the second input reference gas to the oxygen gas input.
- 7) Allow 30min settling time and then press SW3 (pushbutton 3.)
- 8) The unit will beep twice.
- 9) The calibration is now complete.

**\*NOTE 1: Allow OXYAN-100(P)/200(P) one hour warm-up time before calibrating.**

**\*NOTE 2: Do not under any circumstances restrict the outlet in any way during normal operation or calibration, since this will affect the output result.**

## Pressure compensation

For OXYAN100P / OXYAM200P (versions with pressure compensation sensors), the pressure compensation may be switched on or off by the following actions:

- 1) Insert jumper 2 and jumper 3 (JMP2 and JMP3.)
- 2) Press SW1 (pushbutton 1) for pressure compensation OFF. The unit will emit one long beep and one short beep.
- 3) Press SW2 (pushbutton 2) for pressure compensation ON. The unit will emit one long beep and two short beeps.
- 4) Remove jumper 2 and jumper 3 (JMP2 and JMP3.)

## 4-20mA Output Calibration

To calibrate the 4-20mA output, you will need an accurate DMM (digital multimeter) accurate to 0.1% or better. The following procedure is required:

- 1) Insert all jumpers (JMP1, JMP2 and JMP3.)
- 2) Connect the DMM to the 4-20mA output and set the DMM to current mode.
- 3) Press all pushbuttons (SW1, SW2 and SW3) simultaneously.
- 4) You will hear 2 beeps.
- 5) The output will show around 4mA.
- 6) Press pushbutton 1 (SW1) to decrease the value or pushbutton 2 (SW2) to increase the value.
- 7) Press pushbutton 3 (SW3) to toggle between 4mA and 20mA output.
- 8) Repeat steps 6 and 7 until the correct 4.00mA and 20.00mA outputs are seen when toggling between the modes (pushbutton 3.)
- 9) Remove the jumpers to exit the 4-20mA calibration mode.
- 10) You will hear 3 beeps.
- 11) The 4-20mA output is now calibrated.

## 6. Contact Details

### South Africa:

Intelec Systems cc

Cape Town, South Africa

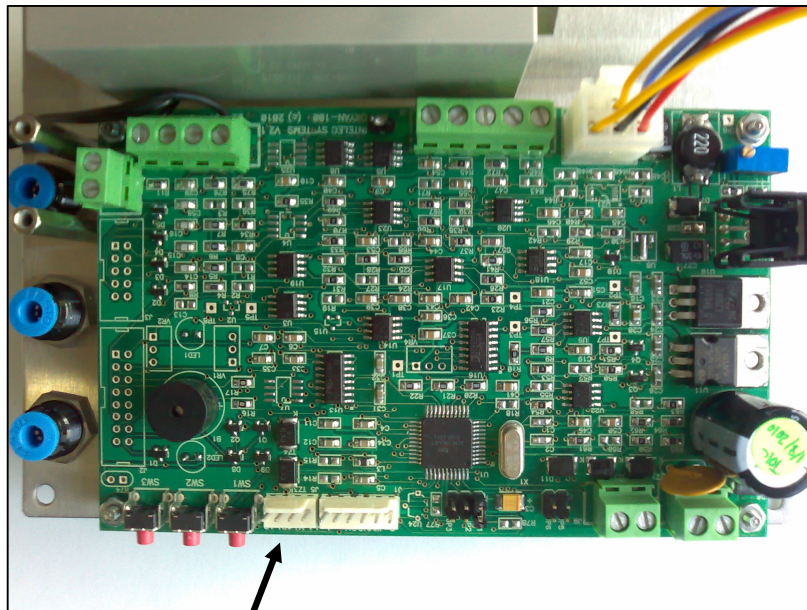
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## Appendix A Firmware Upgrading

### Procedure

- a) Make sure laptop mains cable is **unplugged** or a USB / RS232 **isolator** is used.
- b) Plug cable into J5.  
**[Note: make sure of correct orientation]**
- c) Plug DB9 end of cable into laptop.  
**[\* Note: make sure laptop mains cable unplugged]**
- d) With the OxyAn power off, run the supplied batch file eg UpdateOxyAn10.  
**[Note: you may have to edit the batch file (eg update\_oxyan10.bat) parameter COM2 to have the correct serial port number – eg. change COM2 to COM1]**
- e) Power up OxyAn. A fast beeping will be heard. If it is followed by a constant long beep and the percentage counter on the program counts up to 100% with a “Target updated successfully!” message, then the upgrade was successful.
- f) If the “Target updated successfully!” message was not received then disconnect the OxyAn’s power and repeat the process.



Firmware upgrade connector J5 on the OxyAn PCB.

## Appendix B            Using Air for Auto-calibrating

OxyAn200 has built-in auto-calibrating valves. The connector J10 is used for signaling an auto-calibration cycle by connecting J10 pin 1 and 2 together. This can be done remotely via an OXYPRO TC1000 GPRS / GSM controller.

In this mode, high purity oxygen is very expensive for unlimited on-demand calibration, so it is advantageous to use dry air from the receiver of the PSA system as a reference gas.

When using dry air (20.9% O<sub>2</sub>) for single-point auto-calibration, **[for the very first time]**: first supply a high-purity eg 96% reference gas and calibrate manually (single-point calibration) as described above. Then apply the dry air and after the requisite settling time, note the purity reading. This value is then entered as the air single-point auto-calibration value.

This effectively removes the scale-up error of low-purity oxygen to high-purity oxygen in the system.