PST-UM-2010-EN-02 Minox i Oxygen Transmitter User Manual

Contents

PST-UM-2010-EN-02 Minox i Oxygen Transmitter

Issue No.	Description	Date	Author Initials
01	Original document issued	03/2022	CdF
02	Re-brand template applied	08/2022	IMcC

Minox i Oxygen Transmitter For PST contact information, visit ProcessSensing.com This document is the property of Process Sensing Technologies and may not be copied or otherwise reproduced, communicated to third parties, nor stored in any Data Processing System without the express written authorization of Process Sensing Technologies.

Before using your Minox i

Safety information

Please read this manual, ensuring that you fully understand the content before attempting to install, maintain or use the Minox i. Important safety information is highlighted throughout this document as follows

The caution symbol indicates instructions that must be followed to avoid damage to equipment (hardware and/or software) or the occurrence of a system failure.
NOTE highlights an essential operating procedure, condition, or statement.

Abbreviations

- AC Alternating current
- DC Direct current

- oC Degrees celcius
- oF Degrees fahrenheit
- EC Electrochemical
- g Grams
- GND Ground
- kg Kilogram
- LED Light emitting diode
- LPM Liters per minute
- mA Milliampere
- oz Ounces
- PC Personal computer
- PCB Printed circuit board
- PLC Programmable logic controller
- PPM Parts per million
- SCFH Standard cubic feet per hour
- S-S Solid-state
- SS Stainless steel

Introduction to Minox i

This manual is applicable to Minox i oxygen transmitter with electrochemical (EC) or solid-state (S-S) sensors; and KF-40 flange, flow-through or tri-clamp connections.

Overview

ATEX, IECEx and UKCA certified, the Minox i is an intrinsically safe, 2-wire, loop-powered transmitter, with a 4… 20mA output. It is designed with proven sensor technology to accurately measure O_2 in a variety of gases, in the most demanding applications and hazardous environments. Minox i is available with the three process connections shown below.

NOTE: You must provide suitable mating flange and clamp for KF-40 and tri-clamp connections.

Figure 1. Three process connections for Minox i

Minox i can be used with a Programmable Logic Controller (PLC) or suitable equipment capable of providing a 4…20 mA loop-power interface. For operation in hazardous Ex-rated areas, the interface must be provided via a suitable isolation barrier device. The Minox i oxygen transmitter must only be operated in the way set out in this user manual. Always verify electrical interface circuit compatibility before connection.

Structure

The Minox i oxygen transmitter consists of an oxygen sensor and inbuilt microprocessor. They are encased in stainless steel, with a process connection on the removable housing and an electrical signal connector on the main housing. The sensor is replaceable and can be accessed via the removable housing, as shown in Figure 2:

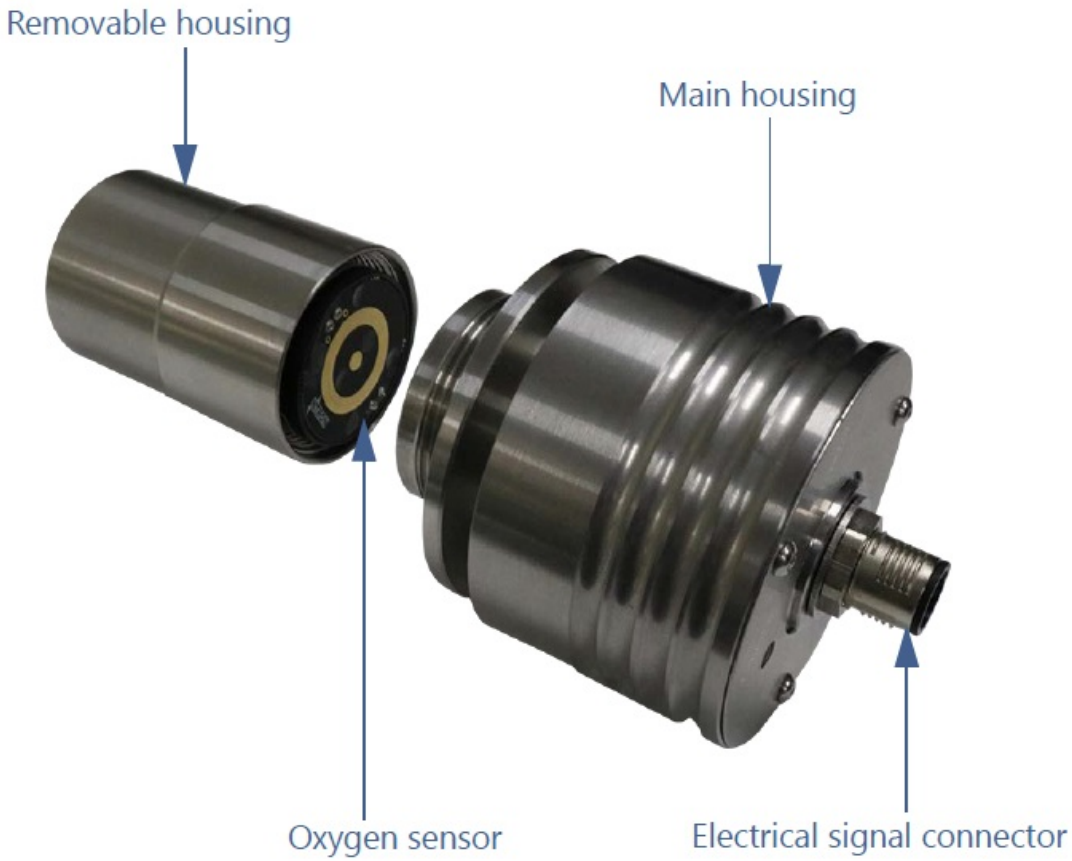


Figure 2. Structure of Minox i with EC sensor (KF-40 flange pictured)

Sensors

Electrochemical (EC)

The Minox i EC oxygen sensor is a galvanic fuel cell capable of superior performance, accuracy, and stability. Its operational life is typically up to 24 months in ambient air. The sensor is designed to be unaffected by the presence of other background gases or hydrocarbons, and the XLT variant is compatible with acid gases including pure carbon dioxide.

Solid-state (S-S)

The Minox i S-S sensor can operate with or without sample flow, making it ideal for in-situ monitoring. The result is a linear output transmitter with a sensitivity that is constant throughout its operating range. It responds to the presence of electrons in its circuit by converting them to data, and converting them in an electrochemical reaction. This sensor has a life expectancy of up to three years with normal operation.

Applications

Typically, the intrinsically safe Minox i oxygen transmitter can be used in the following applications

- Inerting
- Glove box purge and containment solutions
- Sieving and powder transfer systems (PTS)

- Additive manufacturing
- Hydrogen generation
- Nitrogen generation
- Biogas and biomethane
- Pharmaceutical.

Installation

Before installing your Minox i oxygen transmitter, ensure that its specifications are suitable for the process or pipeline where it will be installed. See “2.2.1 KF-40 flange and tri-clamp process connections with dimensions” on page 5 or “2.2.2 Flow-through process connection with dimensions” on page 6 for more guidance. This product is not approved for use in applications where the sample gas is greater than 21 % volume O2.

Unpack the Minox i

NOTE: The sensor is packed in a low O2 environment to preserve shelf life. It should not be removed from its bag until you are ready to use it. Your Minox i oxygen transmitter pack is comprised of the following equipment:

1. Minox i oxygen transmitter
2. Electrochemical or solid-state oxygen sensor
3. A MagTip calibration tool
4. Certificate of calibration
5. Cable fitted with M12 connector.

Figure 3. Contents of Minox i package

Connect Minox i

The Minox i oxygen transmitter is factory calibrated and will be ready to use when you unpack it. The oxygen transmitter operates from a two-wire industry-standard 4…20 mA loop-powered supply, which you must be provide. For flow-through connection, continue to “2.2.2 Flow-through process connection with dimensions” on page 6.

KF-40 flange and tri-clamp process connections with dimensions

A suitable mating flange and seal/centering ringwill be required to install the KF-40 flange or triclamp Minox i. These are not included in the pack.

Dimensions are in mm unless otherwise stated.

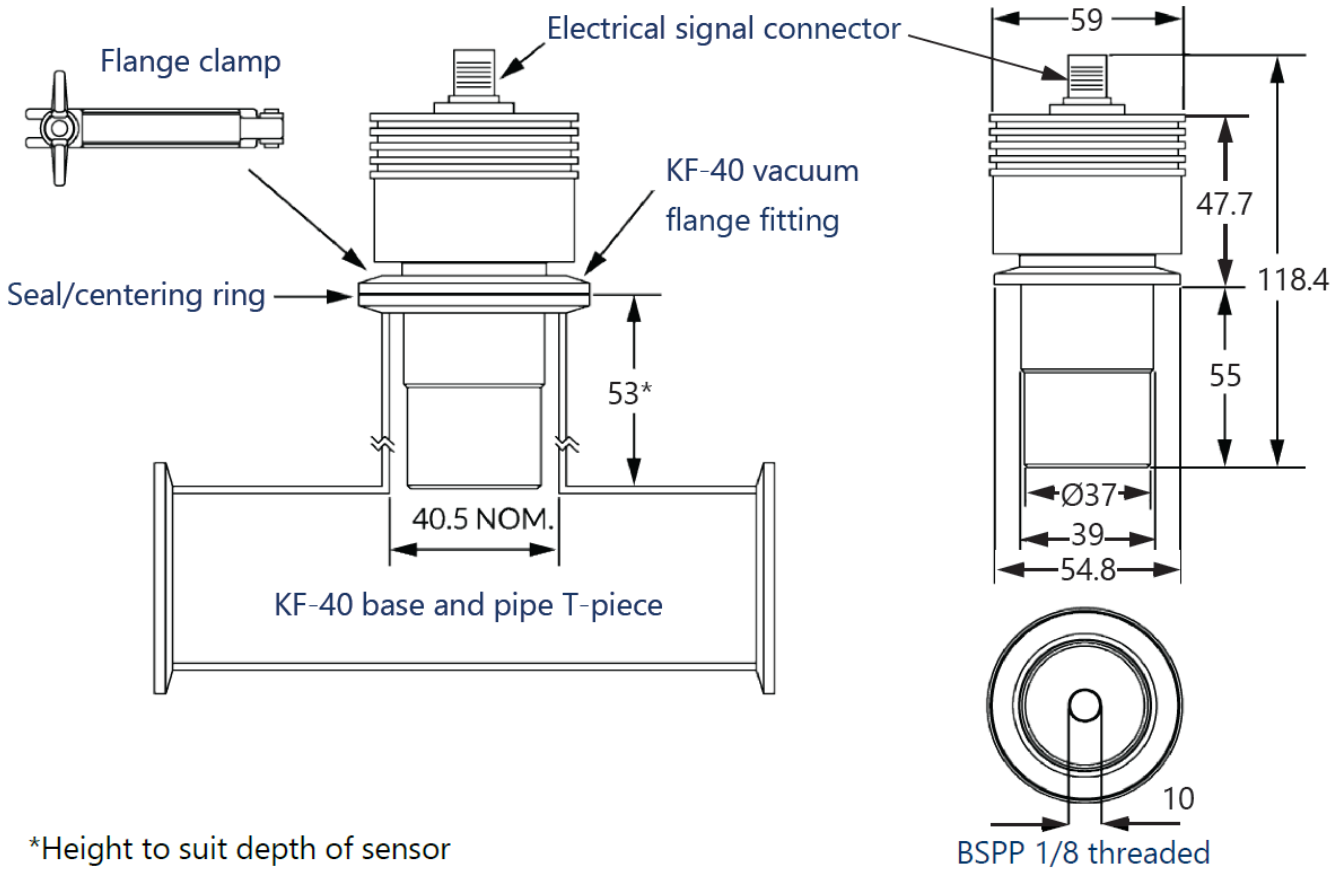


Figure 4. Technical drawing of KF-40 flange and tri-clamp process connections

1. Place the seal/centering ring on the pipe where the Minox i will be installed.
2. Put the process connection end of the Minox i into the pipe.
3. Place your flange clamp or tri-clamp over the seal/centering ring and the Minox i where they meet the pipe.
4. Fasten the flange or tri-clamp until finger-tight.
5. Continue to “2.2.3 Electrical connection” on page 7.

Flow-through process connection with dimensions

The flow-through Minox i can handle a fixed pressure of up to 2 barg, maintaining the correct gas flow to the

sensor. This eliminates the need for pumps or extractive sample systems.

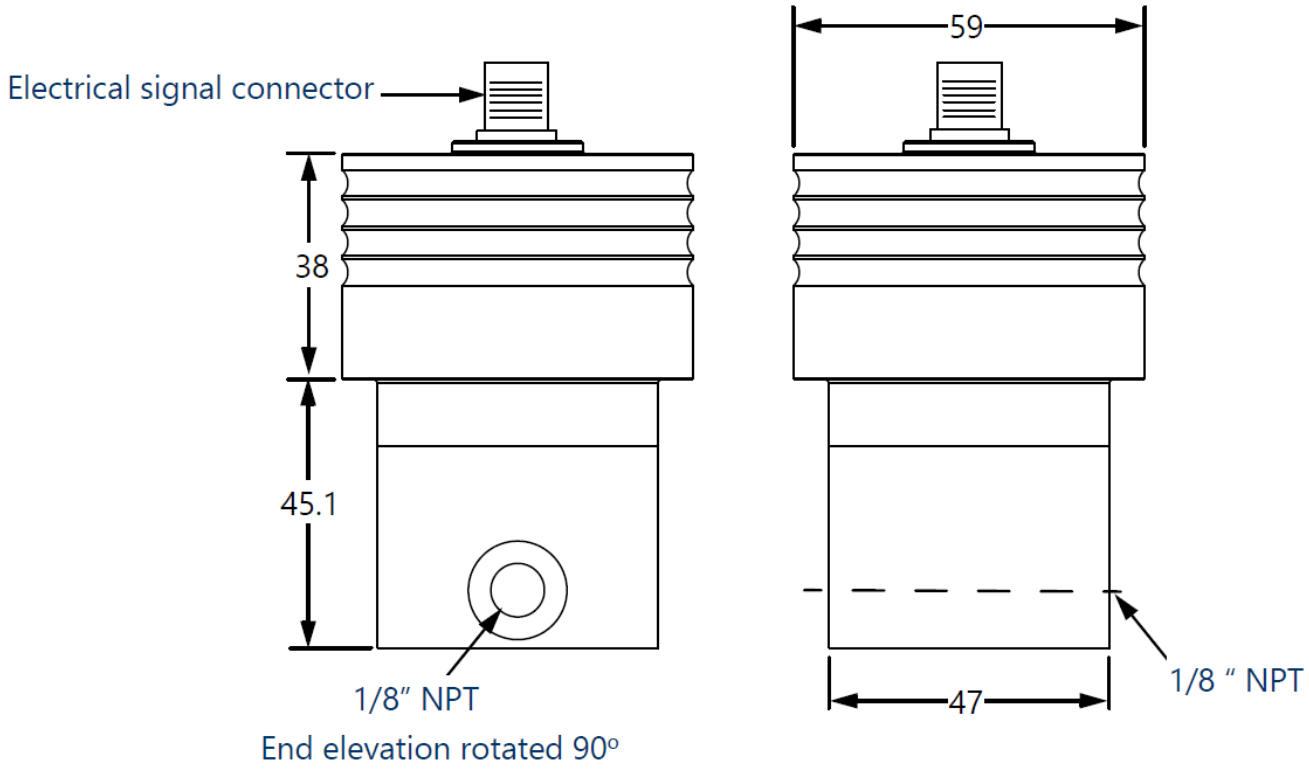
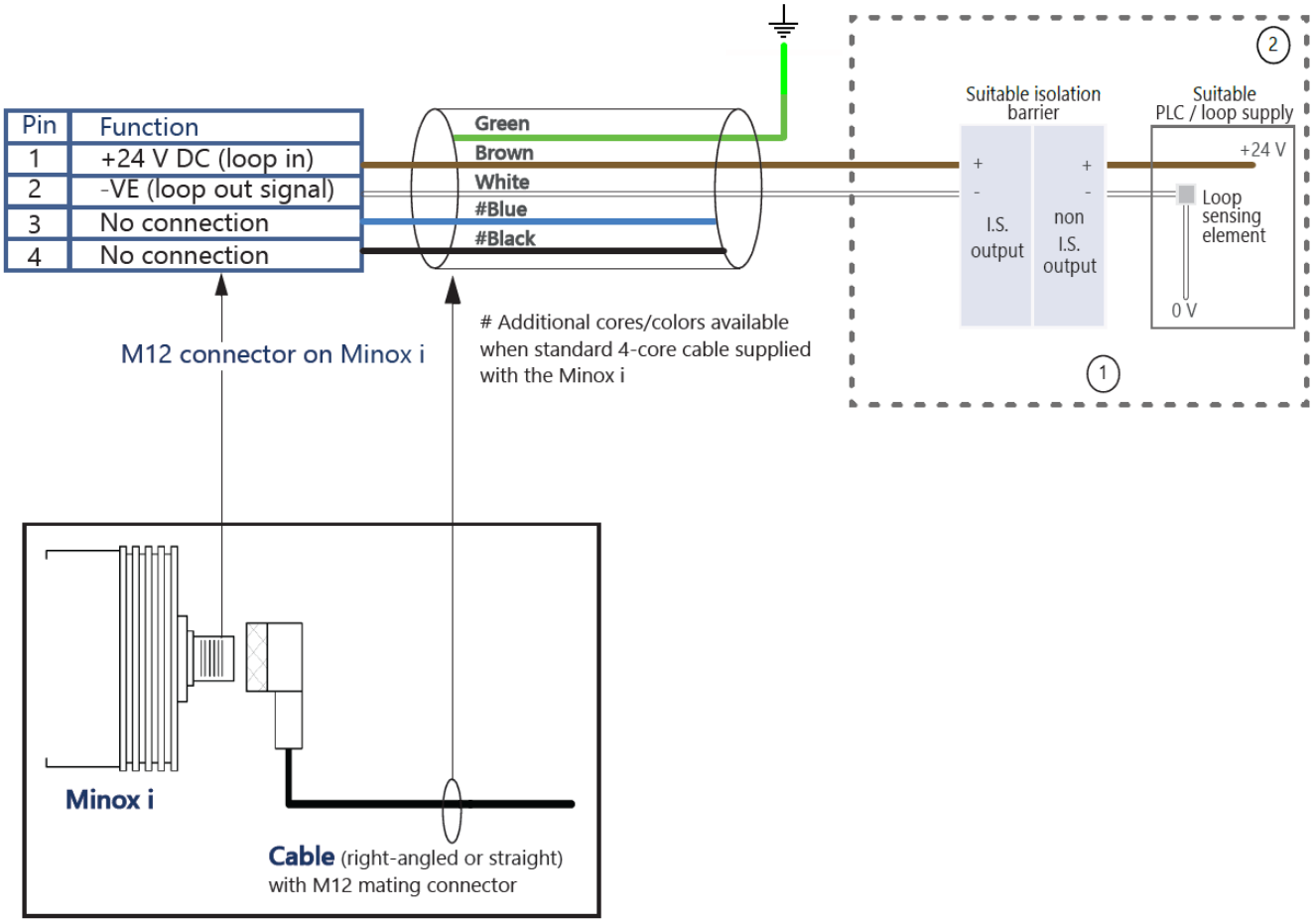


Figure 5. Technical drawing of flow-through process connection

1. Align the flow-through Minox i 1/8" NPT with your pipe fitting.
2. Fasten screws to adapt to pipe fitting.

Electrical connection



NOTE:

1. The above equipment to be supplied by customer.
2. A suitable 4…20 mA loop-power source/ measurement circuit is required. A typical representation is shown above.

Figure 6. Typical connection cable wiring

The Minox i oxygen transmitter operates using a 2-wire industry-standard 4…20 mA loop-powered supply which you must provide. Once the Minox i is connected to your process, it is ready to be connected to your power supply. To do this:

1. Align the pins in the Minox i electrical signal connector with the M12 mating connector on the cable. The cable connector can then be gently pushed into place.
2. Rotate the fastener clockwise until finger tight. Your Minox i oxygen transmitter is now connected. A pulsing red LED will indicate it is operating correctly.

Calibration

NOTE: Calibration should be carried out by an appropriately trained or suitably qualified person. The oxygen sensor output will decrease over time, and periodic calibration will be required. This is a non-intrusive procedure, achieved by using the MagTip one-touch calibration tool included with your Minox I. Calibration cycles for the Minox i depend on the application, the applied gases, and the sensor type. They can be carried out in-situ or after safely removing the oxygen transmitter from your process in a bench test.

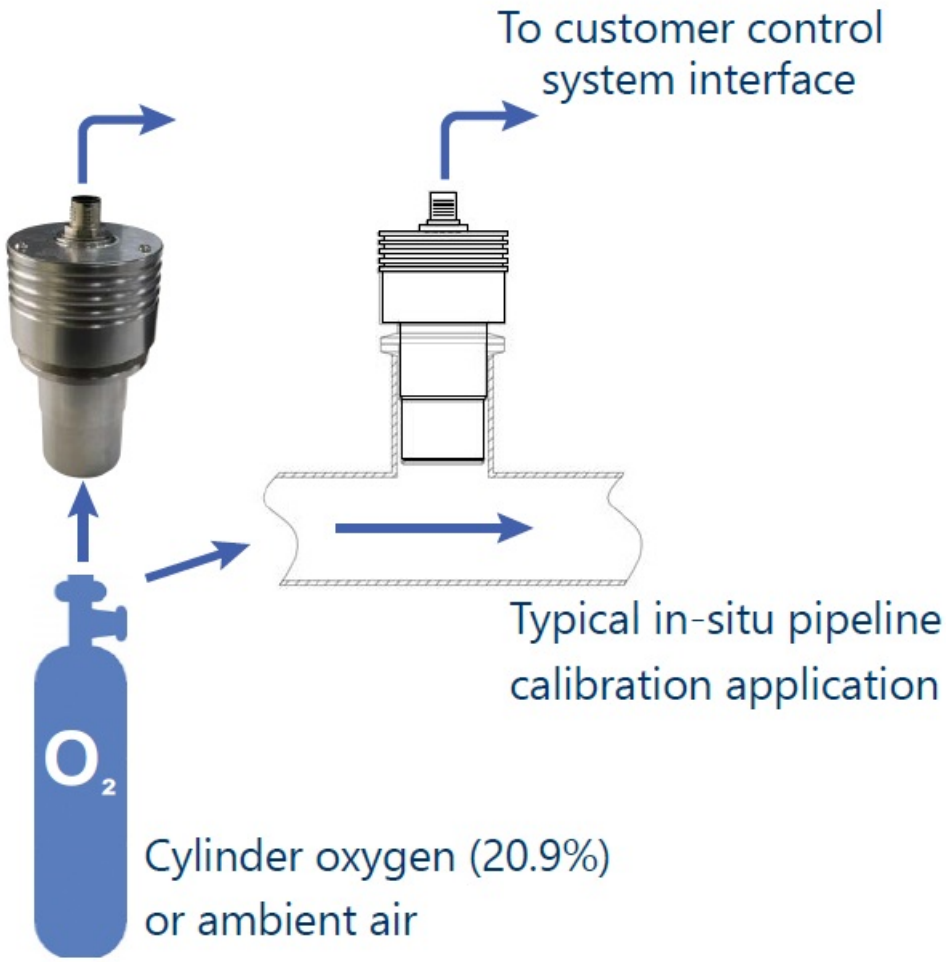
NOTE: For optimal calibration, the atmosphere surrounding the sensor must be ambient air (20.9 % volume O2) with no contaminants present. This can be achieved using an oxygen analyzer or by flushing the system with clean, oil-free compressed air. The Minox i 100 (ppm) must be calibrated in a controlled environment. Calibrating the Minox i 100 in ambient air will significantly reduce sensor life. When the MagTip tool is applied, the indicator LED will flash six times in rapid succession. This confirms calibration is in progress. During normal operation, the indicator LED will flash once every two seconds. This slower flash confirms Minox i is powered up and operational.

In-situ

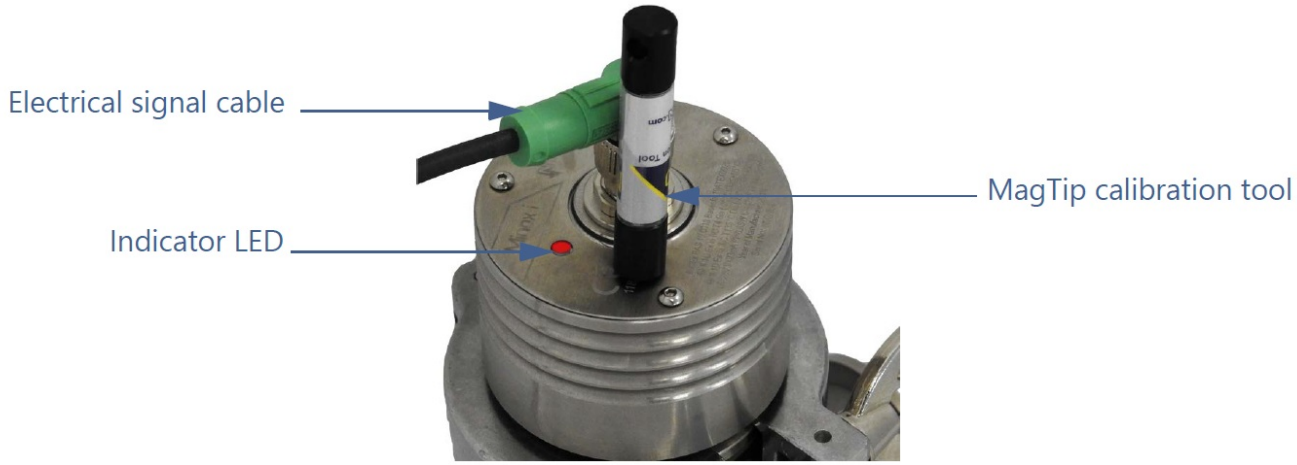
Minox i 100 (ppm) / 200 (%)

Please see above before proceeding

1. Apply the calibration gas (20.9 % volume O2) for a minimum of 15 minutes. The pressure flow should replicate that applied to the Minox i during normal operation. This will ensure calibration is accurate, and avoid over-pressurizing the oxygen sensor.



2. Allow one to two minutes for the output to stabilize (i.e reach its ambient air concentration value and remain at the value). An independent portable oxygen analyzer can be used to check this.
3. Observe the O2 concentration on your oxygen analyzer display. It should read 20.9 % volume O2.
4. Place the MagTip on the Minox i main housing, adjacent to the red indicator LED, as shown in Figure 8 below. The indicator LED will begin to flash rapidly.



5. When calibration is complete, the indicator LED will resume flashing at a steady pulse. For the standard 0…25 % O2 range, the 4…20 mA output will be automatically adjusted to 17.376 mA.

Air calibration

The following method of air calibration should only be performed on a Minox i 200 (containing a % sensor).

Figure 9. Minox i indicator LED

1. Unfasten and remove the Minox i from your process, and leave it in an ambient air environment. Ensure the environment has normal oxygen concentration, an independent portable oxygen analyzer can be used to check this.

2. Observe the O2 concentration on your oxygen analyzer display. When the concentration has stabilized it should read 20.9 % volume O2. This usually takes between five and ten minutes.
3. Place the MagTip on the Minox i main housing, adjacent to the indicator LED, as shown in Figure 8. The red indicator LED will begin to flash rapidly.
4. When calibration is complete, the indicator LED will resume flashing at a steady pulse.
5. Re-install your Minox i following the instructions “2.2.1 KF-40 flange and tri-clamp process connections with dimensions” on page 5 or “2.2.2 Flow-through process connection with dimensions” on page 6, depending on your process connection.

Maintenance

General

To maintain performance, the sensor in Minox i will require replacement. Please check the Technical Specifications for frequency. During sensor replacement, it is recommended that light cleaning of the external housing is carried out, as well as the checks outlined in this section. Never use chemical cleaning agents or high pressure water or steam to clean the equipment. Do not submerge in water.

Replace the sensor

The Minox i oxygen sensor is replaceable. When it reaches the end of serviceable life, calibration can no longer be performed and the sensor must be replaced. A regular program of calibration will mitigate against sudden sensor failure. It is advisable to establish a program of preventative maintenance to ensure process downtime is kept to a minimum or avoided. To replace your sensor

1. Unscrew the removable housing from the main housing of Minox i by turning it clockwise. The sensor will be located in the removable housing, as shown.
2. Gently tip the sensor out of the removable housing into your hand or onto a soft surface.

3. Place your new EC or S-S oxygen sensor into the removable housing, ensuring the sensor’s brass rings are facing out of the removable housing as shown in Figure 10.

4. Screw the removable housing back onto the main housing, by turning it counter-clockwise.

NOTE: The brass slip rings on the sensor must face into the main housing and out of the removable housing as shown above.

Check your Minox i

The following checks will ensure your Minox i oxygen transmitter is operating as its optimum.

- Check for any damage to the connecting cable
- Depending on process conditions and location, check the gas entry orifice at the face-end of the Minox I. This is to ensure there is no build-up of particulate matter, and that moisture is not being retained at the orifice.

Typically, the Minox i will require removal from the process to carry out checks, cleaning and sensor replacement.

Appendices

Appendix A – Technical Specifications

Sensor				
	Solid-state	**Electrochemical (%)**	**Electrochemical (PSR)**	**Electrochemical (XLT)**
Model	OC-92	OC-90	PSR-12-233-H	XLT-12-123
Operating temperature	-20 °C…+50 °C (-4 °F…+122 °F)	-20 °C…+45 °C (-4 °F…+113 °F)	+5 °C…+45 °C (+31 °F…+113 °F)	-10 °C…+45 °C (+14 °F…+113 °F)
Sensor life (in original packaging)	Up to 3 years	2 years < 1,000 ppm O_2 @ 25 °C (77 °F) and atmospheric pressure		
Calibration interval	Up to 1 year	Up to 6 months	Up to 3 months	
Gas-wetted materials	Acetal, Stycast 2651 mm, stainless steel, PTFE, FR4 and gold	HDPVDF, ABS, Teflon, FR4 and gold	HDPVDF, stainless steel, Teflon, FR4 and gold	
Performance				
Measuring range	0…1, 0…5, 0…25 % O_2	0…25% O_2	0…10, 0…1000 ppm_V O_2	
Output resolution	0.01 % O_2		1 ppm_V O_2	
LDL (sensitivity)	0.05 % O_2 (500 ppm)		1 ppm_V O_2	

Accuracy (intrinsic error)	+/-2 % of reading @ calibrated temperature and pressure
Linearity	+/- 2 % of reading
Response time (T90)	< 15 seconds @ 25 °C (77 °F) within selected range
Flow rate	250…500 ml/min (0.5…1.0 SCFH)
Humidity	0…98 %rh non-condensing
Operating pressure	Nominally atmospheric (+/-100 mBar)
Electrical input/output	
Output signal	4…20 mA
Power supply	24 V DC +/- 10 %
Maximum power consumption	50 mA @ 24 V DC
Electrical interface	M12 connector (1.5 metre cable supplied)
Mechanical	
Housing material	303 and 316 stainless steel
Gas-wetted materials excluding sensor	316 stainless steel
O-ring material	Nitrile
Ingress protection	IP66 (NEMA4)
Weight	800 g (28 oz)

Appendix B – Hazardous area certification

Area	Certification details	Standards
	IECEx / ATEX / UKCA	EN IEC 60079-0:2018
Europe	IECEx BAS 19.0013 / Baseefa 19ATEX0020 / BAS22UKEX0052	EN 60079-11:2012
& **Japan** *(Pending)*	II 1 GD Ex ia IIC T4 Ga (-20 °C≤Ta≤+55 °C) Ex ia IIC T200 135°C Da (-20 °C≤Ta≤+55 °C)	IEC 60079-0 Ed. 7 2017 IEC 60079-11 Ed. 6 2011
	Ui=28 V Ii=93 mA Pi=0.65 W Ci=12nF Li=705uH	
North America/Canada *(Pending)*	Class I Division 1 Group A-D T4	CSA C22.2 No. 60079-0:19 CSA C22.2 No. 60079-11:14 UL 60079-0:2019 UL 60079-11:2014
	Class II Division 1 Groups E-G T135°C Class I Zone 0 AEx ia IIC T4 Ga / Ex ia IIC T4 Ga	CSA C22.2 No. 61010-1-12 (Reference only)
	Class 1 Zone 20 AEx ia IIC T135°C Da / Ex ia IIC T135°C Da	
	Ta = -20°C≤Ta≤+55°C	
	UI/Vmax=28 V II/Imax=93 mA Pi=0.65 W Ci=12nF Li=705uH	

Appendix C- Quality, recycling and warranty information

The PST Oxygen group of companies – AII, Ntron and SST – comply with applicable national and international standards and directives. Full information can be found on our website at **https://www.processsensing.com/en-us/** compliance The compliance site contains information on the following directives:

- ATEX (equipment for explosive atmosphere)
- REACH (Registration, Evaluation, Authorization, and Restriction of Chemicals)
- RoHS (Restriction of Hazardous Substances in electrical and electronic equipment
- ETL (The ETL mark is proof of product compliance to North American safety standards
- WEEE (Waste Electrical and Electronic Equipment recycling
- Recycling policy
- Warranty and returns.

www.ProcessSensing.com

Documents / Resources

	**PST PST-UM-2010-EN-02 Minox i Oxygen Transmitter** [pdf] User Manual PST-UM-2010-EN-02, Minox i Oxygen Transmitter, PST-UM-2010-EN-02 Minox i Oxygen Transmitter, Oxygen Transmitter, Transmitter

References

- Process Sensing Technologies | Monitoring Instruments
- Process Sensing Technologies | Monitoring Instruments
- Process Sensing Technologies | Monitoring Instruments