SERVOMEX
Gas Detection

SERVOMEX OxyDetect
Oxygen Deficiency Fixed Gas Detector

Operator Manual

Part Number: 05311001A
Revision: 1
Language: UK English

CONTENTS

1 DESCRIPTION AND DEFINITIONS

1.1 Scope of this manual

This manual provides installation, operation and routine maintenance instructions for the SERVOTOUGH OxyDetect - Oxygen Deficiency Fixed Gas Detector, abbreviated to "instrument" in the remainder of this manual.

1.2 Safety information

Read this manual and ensure that you fully understand its content before you attempt to install, use or maintain the instrument. Important safety information is highlighted in this manual as WARNINGs and CAUTIONs, which are used as follows:

WARNING

Warnings highlight specific hazards which, if not taken into account, may result in personal injury or death.

CAUTION

Cautions highlight hazards which, if not taken into account, can result in damage to the instrument or to other equipment or property.

This manual also incorporates 'Be aware of' information, which is used as follows:

☞ This highlights information which it is useful for you to be aware of (for example, specific operating conditions, and so on).

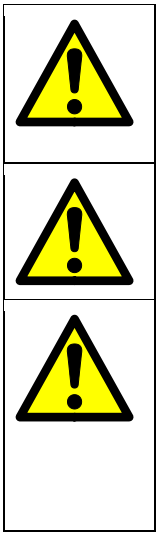
1.3 Description

The Instrument is a fixed wall mounted gas detector with an integral oxygen sensor that outputs a linear 4-20mA signal that represents an ambient oxygen concentration. This output must be integrated into a gas detection system as the instrument gives no warning or alarm of an oxygen-deficient environment, its function being solely to measure the ambient level of oxygen. It offers a measurement of ambient oxygen based on the principles of paramagnetism, a non-depleting and inherently linear measurement technique.

The instrument is designed to be installed within indoor working environments such as laboratories, workshops or analyser shelters.

Gas sample measurements are shown on the instrument display, and can be output as a milliAmp (mA) signal to a gas detection system.

The instrument requires little routine maintenance, other than calibration which is essential for the accuracy of the gas measurements.



WARNING

The instrument is not to be used for process control or process monitoring

WARNING

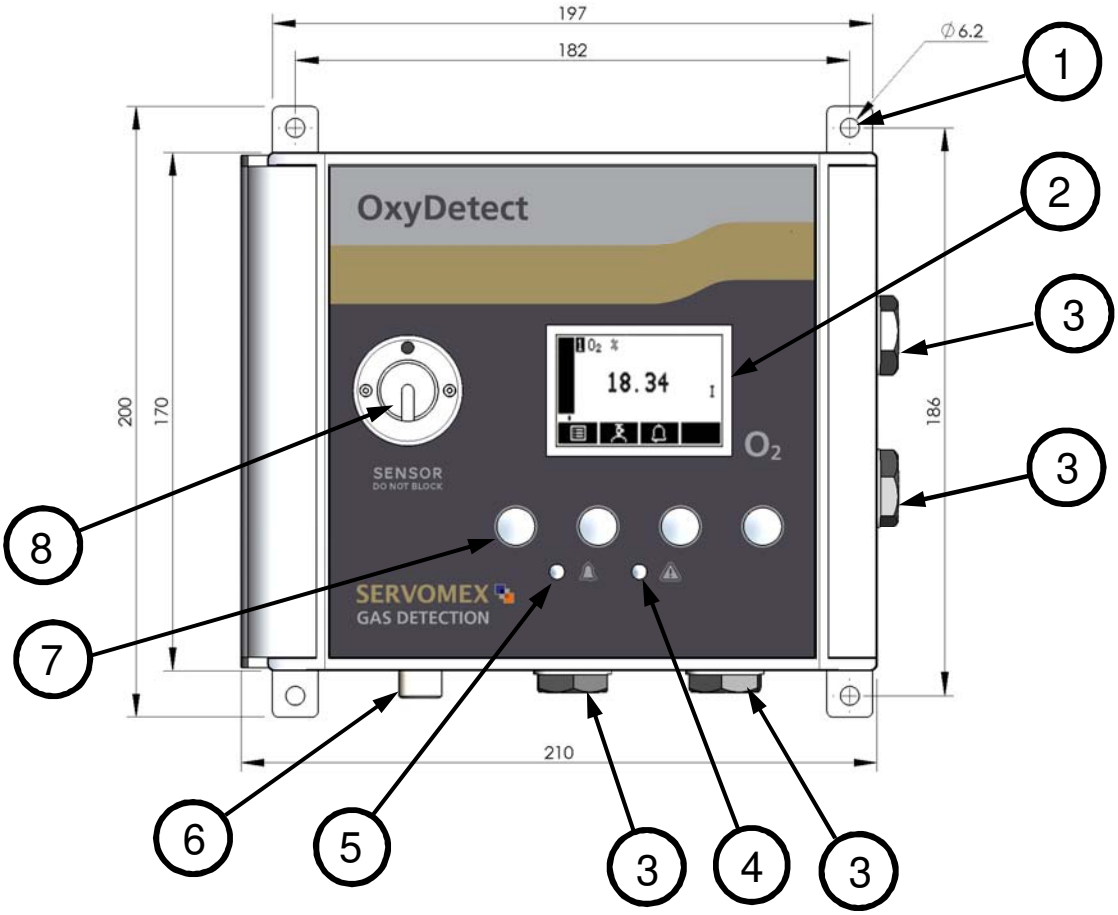
The instrument is not to be used in certified or hazardous locations (potentially explosive atmospheres)

WARNING

The instrument is not suitable for corrosive atmospheres (those atmospheres where gases and vapours are present in concentrations high enough to cause corrosion to normal industrial appliances or where specialised coatings, materials or finishes would normally be specified to avoid corrosion)

1.4 Ordering options

For the latest ordering options please contact your local Servomex agent or visit www.servomex.com.



Key	Description
1.	4 x mounting holes for M6 fixings
2.	Display
3.	Gland entries holes diameter 22mm
4.	Fault LED (amber)

Key	Description
5.	Alarm LED (red
6.	Enclosure breather (do not block)
7.	Soft key 1, from left to right soft keys 1, 2, 3 and 4
8.	Senor cover and calibration cap mounting nozzle

Figure 1 – Front of the instrument

2 SPECIFICATION

WARNING

The protection, accuracy, operation and condition of the equipment may be impaired if the instrument is not installed in accordance with the requirements of this and subsequent sections of the manual.

2.1 General

Dimensions: length x height x width	210 x 200 x 106 mm
Mass	<2 kg

2.2 Environmental limits

Equipment is suitable for indoor use only

Ambient temperature range	
Operation	5 to 45 °C (41 to 113 °F)
Storage	-5 to 50 °C (23 to 122 °F)
Operating pressure range	Ambient
Operating ambient humidity range	10 to 90% RH, non-condensing
Operating altitude range	–500 * to 4000 † metres (-1600 * to 13000 † feet)
Ingress protection	IP40

The instrument is rated Pollution Degree 2

* Below sea level.
† Above sea level.

WARNING

If the ambient temperature falls below 0°C (32°F) the instrument should be recalibrated to ensure correct operation

3 UNPACK THE INSTRUMENT

WARNING

The instrument is delicate and care must be taken when handling.

1. Remove the instrument and any other equipment from its packaging.

☞ It is advisable that the glad entry plugs are only removed just prior to fitting.

2. Inspect the instrument and the other items supplied, and check that they are not damaged. If any item is damaged, immediately contact Servomex or your local Servomex agent.
3. Check that you have received all of the items that you ordered. If any item is missing, immediately contact Servomex or your local Servomex agent.
4. If you do not intend to use the instrument immediately:
   - Refit any protective plastic covers.
   - Place the instrument and any other equipment supplied back in its protective packaging.
   - Store the instrument as described in Section 9.1.

   Otherwise, read Section 4 (Instrument user interface), and then continue at Section 5 onwards to install, set up, and use the instrument.

☞ Retain the shipping documentation and packaging for future use (for example, return of the instrument to Servomex for servicing or repair).

4 INSTRUMENT USER INTERFACE

4.1 Introduction

The instrument user interface comprises the following (shown on Figure 1):

Display	Shows various screens: see Section 4.2 onwards
Soft keys	The function of each of the soft keys depends on the screen currently being shown on the display: see Section 4.2
Alarm LED	On when an alarm condition exists: see Section 5.5
Fault LED	On when a fault condition exists: see Section 8

4.2 Start-up and measurement screens

When you first switch on the instrument, a 'start-up screen' is displayed while the instrument carries out a self-test.

The start-up screen shows the Servomex name, a 'self-test time elapsed/remaining' indicator, and messages identifying the tasks being carried out as part of the self-test.

The screen will initially display the "System Check" task message. The measurement screen is then displayed, as shown in Figure 2 below.

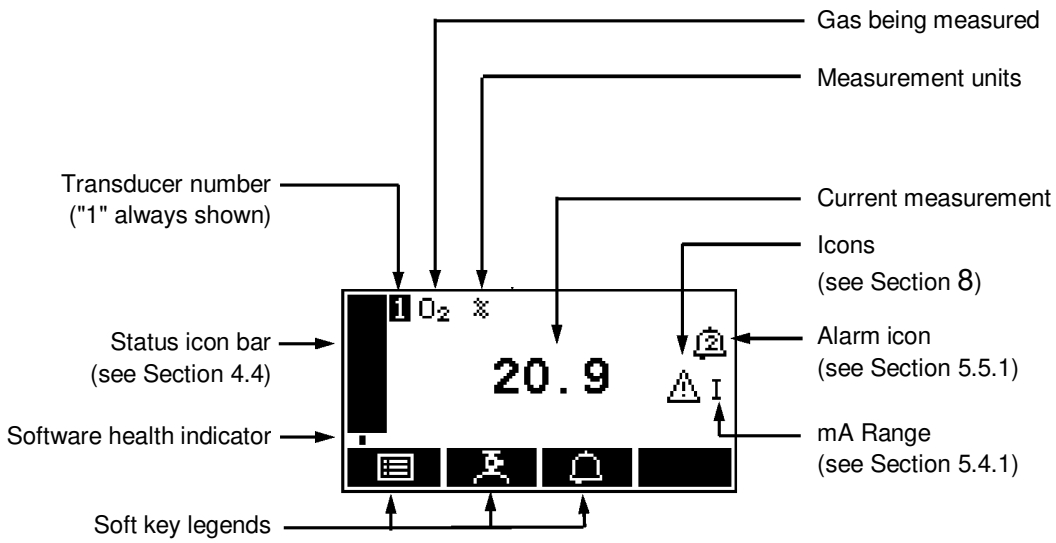


Figure 2 – The measurement screen

☞ During normal instrument operation, the software health indicator continuously moves from left to right and then back again, below the status icon bar. If the indicator stops moving, this means that the instrument is not operating correctly, and you must refer to Section 8.

☞ If no soft key is pressed for 10 minutes, the measurement screen will be automatically displayed. (You will also then have to enter the password again to access any password-protected screens.

4.3 Soft key legends

The four soft key legends at the bottom of the measurement screen (Figure 2) correspond to the four soft keys on the front of the instrument. (The first, left-most, legend corresponds to the function of soft key 1, the second legend corresponds to the function of soft key 2, and so on.) On the measurement screen, the soft key functions are as follows:

Legend	Meaning	Function (when soft key pressed)
	Menu	Displays the menu screen: see Section 4
	Calibrate *	Displays the calibrate screen: see Sections 6
	Alarm *	Displays the alarm option screen: see Section 5.5.1
	–	None (no effect)

* These soft keys are 'shortcuts' to the described functions, which are also accessible from the menu structure.

Other soft key legends which are used on the various screens are as follows:

Legend	Meaning	Function (when soft key pressed)
	Back	Cancels the current screen and displays the previous screen in the menu structure
	Accept	Accepts the currently selected option or data. (A new screen may be displayed accordingly.)
	Edit	Allows the highlighted data to be edited
	Up	Moves the cursor up a list (or increases a digit during editing)
	Down	Moves the cursor down a list (or decreases a digit during editing)
	Left	Moves the cursor left
	Right	Moves the cursor right

4.4 System and measurement status icons

System status is on the status icon bar and can be shown with a fault icon or a maintenance required icon, see table below.

Measurement status is on the right hand side of the measurement reading and can be shown with a fault icon or maintenance required icon, see table below.

Icon	Meaning
	Indicates that a **fault** has been detected
	Indicates that **maintenance is required**

To determine the cause of these status icons, see Section 8.2.

4.5 Scroll bars

On some screens (for example, see Figure 3), there may be more options available than can be shown on the screen, and you have to scroll down the screen to view all of the options: this is identified by a scroll bar at the right-hand side of the screen.

The height of the wide part of the scroll bar gives an indication of what proportion (of all the options) are currently shown on the screen. As you scroll up or down the options (using the △ and ▽ soft keys), the wide part of the scroll bar will also move on the screen, indicating approximately where the currently displayed options are, within the complete list of options.

4.6 Menu options/screens and password protection

When an option/screen is password protected, this means that the correct corresponding password has to be entered before the option/screen can be accessed. See Section 5.3.1 for details on how to set the security level.

Password protection operates as follows:

☞ As supplied, the security level is set to 'high', the supervisor password is set to "2000" and the operator password is set to "1000".

- The first time you try to access a password-protected option/screen, you will be prompted for the corresponding password. You must then enter the correct password (using the editing method described in Section 4.10) before the option/screen can be displayed.
- If you have already entered the corresponding password, you will gain access to all options/screens protected by that password immediately (you do not need to enter the password again).

☞ Once you have entered a password, it remains active until 10 minutes after the last soft key is pressed. After this, the password becomes inactive; you must re-enter the password to access password-protected options/screens again.

To change the passwords see Section 5.3.3.

4.7 The menu screen

The menu screen provides access to other screens in the menu structure, and is displayed by pressing the soft key when the measurement screen is displayed.

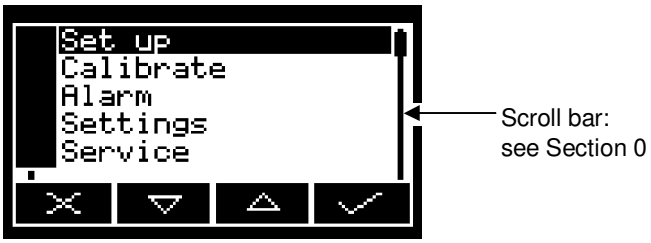


Figure 3 – The menu screen

Use the and soft keys to highlight the required screen option, then press the soft key to display the selected screen:

Screen	Use [refer to section]
Set up	Select this screen to set up the mA output parameters and range [5.4].
Calibrate	Select this screen to calibrate instrument [6]
Alarm	Select this screen to set up the measurement alarms and set the alarm follow options [5.5.1], unlatch alarms [5.5.2] and view the measurement alarm status [5.5.4]. Alarms will only light the front panel LED, they will not affect the mA output nor can they be connected to external sounders or beacons.
Settings	Select this screen to change instrument settings (password, display language and so on).
Service	Select this screen to calibrate[5.4.4]/check the mA outputs [7.1]
Status	Select this screen to view active and historical fault and maintenance required messages [8.2].

Alternatively, press the soft key to display the measurement screen again.

4.8 The settings screen

Use the △ and ▽ soft keys to highlight the required screen option, then press the ✓ soft key to display the selected screen, as shown below:

Figure 4 – The Settings screen

Screen	Use [refer to section]
Password	Changing the password [5.3.3]
Clock	Setting the clock time and/or date [5.3.6]
Regional	Changing regional settings (language and so on) [5.3.7]
Backlight	Adjusting the backlight timer duration [5.3.5]
Contrast	Adjusting the contrast of the screen [5.3.4]
Security	Selecting the security level [5.3.2]
Information	Viewing instrument system information [4.9]

Alternatively, press the ✕ soft key to display the menu screen again.

4.9 The information screen

This screen shows information (such as the instrument serial number and the version of the operating software embedded in the instrument) which is useful to the Servomex support team.

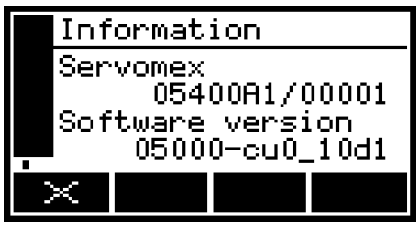


Figure 5 – Typical information screen

Note that the information shown on the screen will vary, depending on the instrument model.

After viewing (and if necessary recording) the information shown on the screen, press the ✕ soft key to display the settings screen again, or press and hold the ✕ soft key to show the measurement screen again.

☞ You may be asked to provide the information from this screen to the Servomex support team; for example, as an aid to fault diagnosis.

4.10 Editing on-screen data

A common method is used for editing data shown on all of the different screens.

When you press the soft key to edit an item of data, the screen changes to show the corresponding edit screen, with the first digit highlighted:

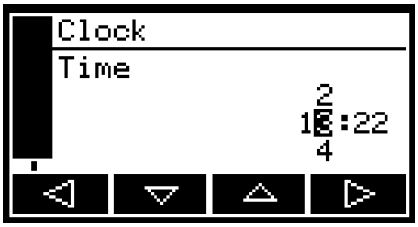


Figure 6 – A typical edit screen

When the first digit is highlighted, press the soft key to exit the menu without changing the data.

Alternatively, use the soft keys to edit the data as follows:

Soft key	Function
	Increases the highlighted digit by 1
	Decreases the highlighted digit by 1
	Moves the cursor left to the previous digit
	Moves the cursor right to the next digit

Note that the figures above and below the highlighted digit show the digits above and below the currently highlighted value.

When the last digit is highlighted, press the soft key to enter the new data.

☞ When editing numerical values, the decimal point appears between digits "9" and "0".

5 INSTALLATION AND SET-UP

WARNING

The instrument must be installed by a suitably skilled and competent person. The following procedure must be followed to prevent a hazard.

WARNING

The instrument is only suitable for installation in indoor general purpose areas.

WARNING

Gases have differing densities and can rise or sink in ambient air. The instrument must be installed in a suitable location relative to the gas hazard. A suitable hazard assessment must be carried out before installing the instrument.

CAUTION

Do not install the instrument where it is subjected to high levels of vibration or large variations in ambient temperature as these may cause false alarms.

5.1 Mechanical installation

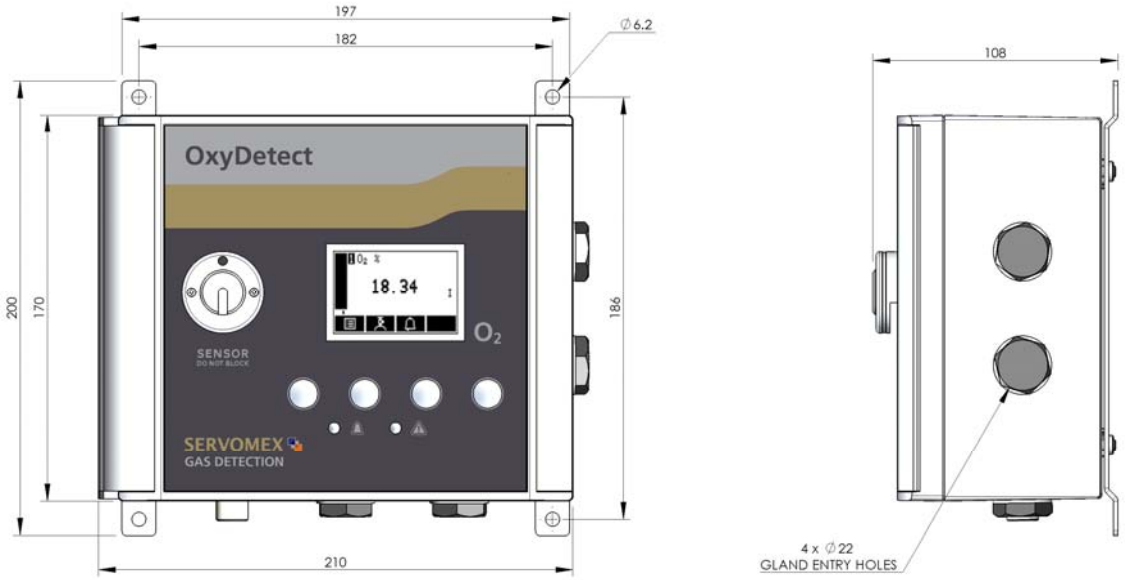


Figure 7 – OxyDetect dimensions

☞ Use 4 x M6 or similar fixings to secure the instrument to a suitably ridged wall or ridged mounting bracket.

☞ Leave access to either the side or bottom gland entry holes, which are 22mm in diameter.

☞ Leave access so that the door may be fully opened after installation.

5.2 Electrical Installation

5.2.1 Electrical Safety

WARNING

Ensure that the electrical installation of the instrument conforms with all applicable local and national electrical safety requirements.

WARNING

Obey the safety instructions given below when you install the instrument; if you do not, the instrument warranty may be invalidated, the instrument may not operate correctly, or it may be damaged.

WARNING

Ensure that the cables that you connect to the instrument are routed so that they do not present a trip hazard.

5.2.2 Electrical data

Electrical supply	
Voltage	24 Vdc (10Vminimum; 28Vmaximum)
Fuse rating / type	T 1 A / 250 V size: 20 x 5 mm
Maximum power consumption	3VA
mA output	
Maximum load resistance	1 K Ohms
Isolation voltage (to earth)	500 V (dc or ac)
Output range	
Recommended mA range	4 to 20 mA
Recommended Fault indication	0 mA (Jam low)
Under range	0 – 4 mA

Terminals suitable for

Conductors	0.2 to 4.0 mm² (30 to 12 AWG)

WARNING

The instrument allows configuration to 0-20mA. It is strongly recommended that the instrument is not configured to use the 0-20mA option when used in a safety related system, as the gas detection system in which the instrument is integrated must utilise the 0mA signal (Jam Low) of the 4-20mA signal as a measurement fault indication.

WARNING

It is strongly recommended that monitoring systems use latching alarms that can only be manually reset after the hazard has been assessed and eliminated.

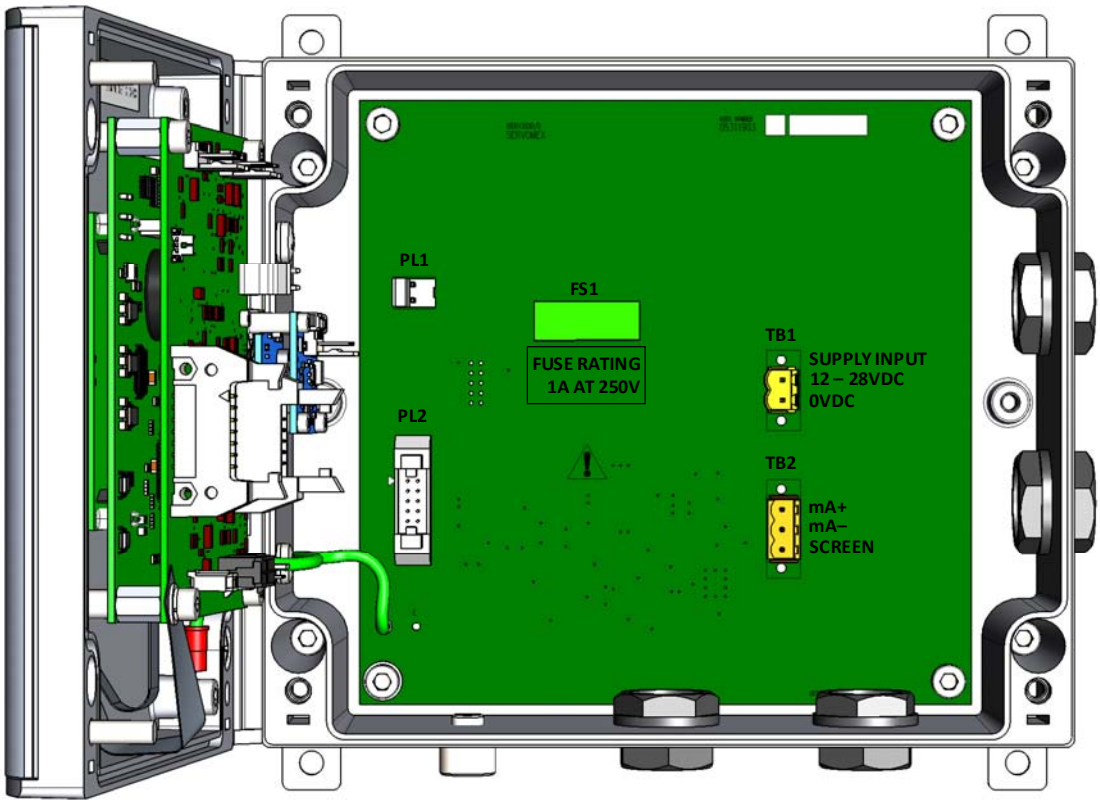
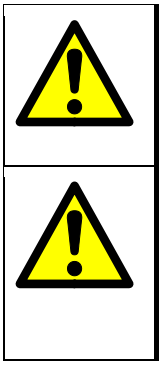


Figure 8 – Electrical Connections

5.2.3 Connect the electrical supply



WARNING
The terminals of all equipment connected to the OxyDetect by the user shall be separated from mains voltages by at least reinforced insulation.

WARNING

Ensure that your external electrical supply outlet is isolated and locked out before you connect the conductors in the electrical supply cable.

CAUTION

Ensure that the instrument is suitable for use with your electrical supply. If the instrument is not suitable, the instrument may not operate correctly, or it may be damaged when you operate it.

1. Connect the wires in your cable to the screw terminals on TB1 see Figure 8.

5.2.4 Analogue output connections

WARNING

The terminals of all equipment connected to the OxyDetect by the user shall be separated from mains voltages by at least reinforced insulation.

CAUTION

To comply with EMC requirements, twisted pair screened cables must be used to connect the analogue outputs.

1. Connect the wires in your cable to the screw terminals on TB2 see Figure 8.

5.3 Switch on/set-up

CAUTION

Ensure the instrument door is closed and screws tightened before the unit is powered.

☞ When the electrical supply to the instrument is switched on, the Alarm LED and the Fault LED will both go on for 1 second to demonstrate that they are functioning correctly, and will then go off.

When you switch on the electrical supply to the instrument, a 'start-up screen' is first displayed (see Section 4.2), and then the measurement screen (Figure 2) is displayed.

When the measurement screen is displayed, you can set up the instrument as described below.

5.3.1 Selecting the security level and password(s)

You can configure the instrument to provide any of three levels of security:

Security level	Function
Low	None of the options/screens are password protected *
Standard	Some of the options/screens are protected by a supervisor password
High	Some of the options/screens are protected by a supervisor password and some of the options/screens are protected by an operator password †

* Except for the 'change the password(s)' and 'select the security level' options/screens: see notes below.

† The supervisor password can also be used to access options/screens protected by the operator password: see notes below.

☞ The 'change the password(s)' and 'select the security level' screens/options are always protected by the supervisor password, regardless of the security level selected. This is to ensure that unauthorised personnel cannot change the security level and password(s) and so lock out the instrument from other users.

☞ The supervisor password provides access to all password protected options/screens. That is, if you have selected the 'high' security level and are prompted to enter the operator password, you can also access the option/ screen by entering the supervisor password.

☞ Password protection can be used to prevent adjustment of the clock by unauthorised persons, so ensuring the validity of measurement times and the 'time since last calibration' history.

5.3.2 Selecting the security level

☞ As supplied, the security level is set to 'high', the supervisor password is set to "2000" and the operator password is set to "1000".

Before the instrument is used for sample measurement, we recommend that you select the security level (low, standard or high: see Section 4.6) most suitable for the way in which the instrument will be used by you and/or your personnel.

Use the following procedure to select the required security level:

1. Select ⇨ Settings ⇨Security.
2. To change the security level, press the soft key. You will then be prompted to enter the supervisor password.
3. Once the supervisor password has been entered correctly, the security select screen will be displayed (see Figure 9), with the currently selected security level highlighted.
4. To change the security level, use the and soft keys to highlight the required level, then press the soft key. The security level screen will then be displayed again, showing the newly selected security level.
5. Once the supervisor password has been entered correctly, the security select screen will be displayed (see Figure 10), with the currently selected security level highlighted.
6. Press the soft key twice to display the menus screen again.

Figure 9 – The security level screen

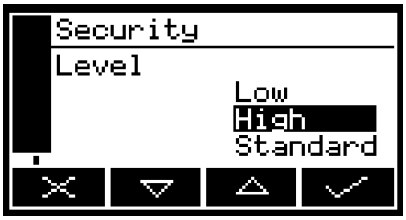


Figure 10 – The security select screen

5.3.3 Changing passwords

☞ If you change a password, ensure that you record the new password somewhere safe. Otherwise, if you cannot recall the new password, you will have to contact Servomex or your local Servomex agent for assistance.

Use the following procedure to change the supervisor and operator passwords:

1. Select ▤ ⇨Settings ⇨Password.
2. To change the supervisor password, press the ✎ soft key, then enter the new password: use the editing method described in Section 4.10.
3. To change the operator password, press the ▽ soft key to display the edit operator password screen, press the ✎ soft key, then enter the new password: Press the ✕ soft key to display the settings screen again

Figure 11 – The edit supervisor password screen

5.3.4 Adjusting the contrast

1. Select ▤ ⇨Settings ⇨Contrast.
2. Use the △ and ▽ soft keys to increase or decrease the contrast to the required level, then press the ✓ soft key.

Figure 12 – The contrast screen

☞ Hold the △ or ▽ soft key pressed in to adjust the contrast quickly.

5.3.5 Adjusting the backlight timer

When the instrument is first switched on, the backlight goes on to illuminate the screen. If no soft key is pressed, the backlight will remain on for the preset 'backlight time', and will then go off. The timer associated with the backlight time is restarted whenever a soft key is pressed (that is, the backlight remains on for the backlight time after the last soft key press). To adjust the backlight time:

1. Select ⇨Settings ⇨Backlight.
2. Change the backlight time (duration) setting as required, then press the soft key.

Figure 13 – The backlight timer screen

☞ The backlight time (duration) can be set between 0 and 999 seconds. Set the backlight time (duration) to 0 seconds to leave the backlight permanently switched on.

5.3.6 Setting the clock

☞ The time and date will remain set for approximately 1 week if the power supply to the instrument is switched off.

Use the following procedure to set the date and time:

1. Select ⇨Settings ⇨Clock.
2. Edit the displayed time as described in Section 4.10.

Figure 14 – The clock (time) screen

3. Edit the displayed date as described in Section 4.10.
4. The date format can be set to your regional preference ('day/month/year' or 'month/day/year'): refer to Section 5.3.7.

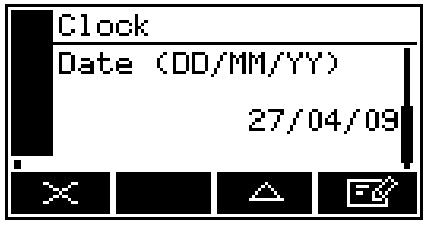


Figure 15 – The clock (date) screen

5.3.7 Changing regional settings

You can configure the following instrument regional settings so that the information shown on the various screens is better suited to your local conventions:

Setting	Options available
Language	Various languages are supported
Date format	Day/Month/Year * or Month/Day/Year
Decimal format	Use of "." * (full stop) or "," (comma) as the decimal point

* Default option.

To change the regional settings:

1. Select ⇨Settings ⇨Regional.
2. This screen shows the first regional option (Language).

Figure 16 – The regional settings (language) option screen

5.4 Configuring and using the mA outputs (option)

5.4.1 Overview

The instrument is supplied with a mA output for the gas measurement.

The mA output provides a constantly updated output, in which the current represents the value of the gas sample measurement.

The instrument allows you to specify two separate range configurations per measurement for the mA outputs: range 1 and range 2. The current range is shown on the measurement screen (see Figure 2):

I is shown if range 1 is selected.

II is shown if range 2 is selected.

The mA output can be selected as:

- 0 to 20 mA, where 0 mA represents the lowest sample measurement and 20 mA represents the highest sample measurement in the range you have specified.
- 4 to 20 mA, where 4 mA represents the lowest sample measurement and 20 mA represents the highest sample measurement in the range you have specified.

In addition to the above, you can specify how the mA output will operate during calibration, fault conditions and under-range conditions. Details of the output parameters for the mA outputs are given in Section 5.4.2. Set up, configure, check, calibrate and use the mA outputs as described in Section 5.4.4.

5.4.2 Introduction to the mA output parameters

The mA output parameters that you must set up are as follows:

Parameter	Values/options
Range	The selected option determines the mA output range associated with a measurement: Range 1 The output is set to use range 1 Range 2 The output is set to use range 2

WARNING

To avoid accidental changes between range 1 and range 2 they should be set at the same levels. Range 1 should be used and the option to switch between ranges password protected

Parameter	Values/options	
Range 1 low level	The range 1 lowest sample measurement	
Range 1 high level	The range 1 highest sample measurement (span) *	
Range 2 low level	The range 2 lowest sample measurement	
Range 2 high level	The range 2 highest sample measurement (span) *	
During calibration	The selected option determines how the mA output will operate during calibration:	
	Freeze	As soon as the calibration screen is displayed, the mA output will 'freeze' at its last output value. The output will only be updated to reflect subsequent measurements when calibration screen has been exited.
	Follow	The mA output value will reflect the measurement value, even during calibration.
Jam condition	The selected option determines how the mA output will operate during a fault condition:	
	High	The output value will be held at 21.5 mA (suitable for trace measurements)
	Low	The output value will be held at 0 mA (suitable for purity measurements)
	None	The output values will continue to be derived from the sample gas measurements, even though these output values may be erroneous.
mA output range	0 – 20 mA or 4 – 20 mA	
Underrange	Any value below 4 mA #	

Only available if the 4 – 20 mA output range is selected; this sets the lowest output current during normal operation, and allows out of range and negative gas concentrations to be monitored through the mA output. For example, with an under-range setting of 3.8 mA, the mA output can be less than 4 mA (which indicates a the Range low level), down to a minimum of 3.8 mA, where an output between 3.8 mA and 4 mA indicates a gas concentration below the range low level.

WARNING

The mA Jam condition should be set to low so that the monitoring system can detect instrument faults.

5.4.3 Setting up the mA output parameters

1. Select ⇨ Set up ⇨ mA output.
2. Select the required measurement range option.

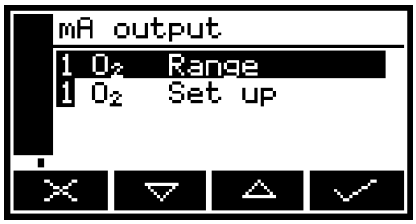


Figure 17 – The mA configuration screen (one measurement instrument)

3. Select the range option you want the output to use (range 1, range 2 or auto).

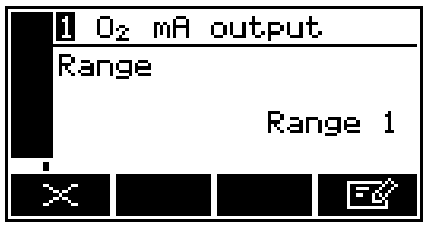


Figure 18 – The mA range screen

4. Return to the mA configuration screen (Figure 17) and select 'Set up' option.
5. Edit the range high level and low level.

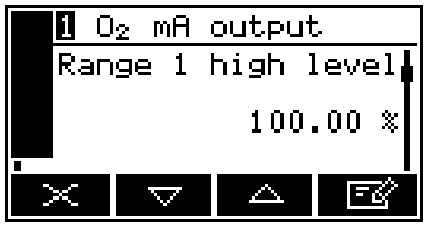


Figure 19 – The mA output high level screen

6. You can select the during calibration option to 'Freeze' or 'Follow'.

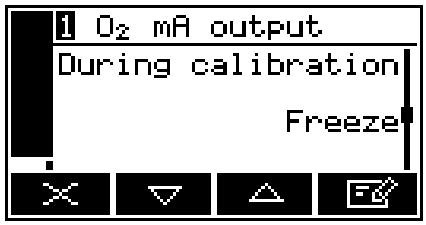


Figure 20 – The during calibration screen

7. You can then select the Jam condition to 'High', 'Low' or 'None'.

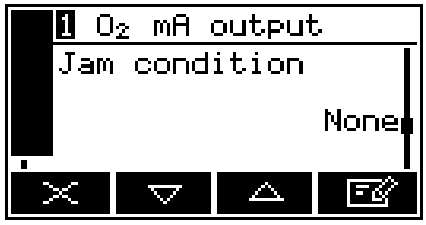


Figure 21 – The jam condition screen

8. You can then select the range that you would like to use: 0 – 20 mA or 4 – 20 mA.

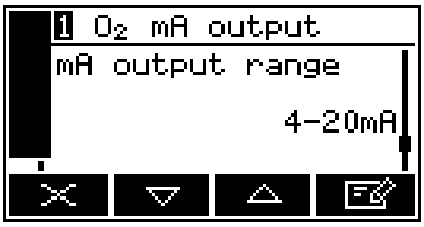


Figure 22 – The mA output range screen

9. You can then select the underrange value. An underrange setting of 4 mA means there is effectively no underrange.

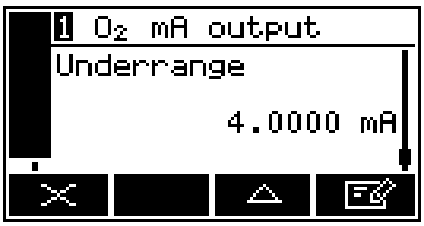


Figure 23 – The mA underrange screen

5.4.4 Calibrating the mA output

Use the following procedure to calibrate the mA output:

1. Select ⇨ Service ⇨ mA output.

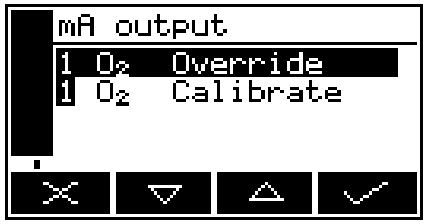


Figure 24 – The mA output service screen

2. Select the required 'Calibrate' option.

Figure 25 – The mA output calibrate screen

3. As soon as the mA output calibrate screen is shown, the nominal mA output value is set to 20 mA:
   - Use your control/monitoring equipment (connected to the instrument) to monitor the actual output value.
   - Use the △ and ▽ soft keys to increase or decrease the actual output value until your control/monitoring equipment indicates 20 mA output.
4. When the mA output has been correctly calibrated, press the ✓ soft key: the mA output service screen (Figure 24) will then be displayed again.

☞ The actual mA output value is controlled from the mA output calibrate screen as long as the screen is displayed. As soon as the mA service screen is no longer displayed, the mA output value will be updated to reflect the corresponding gas measurement.

5.5 Configuring the measurement alarms

CAUTION

The alarms are displayed on the keypad as an orange LED and on the display as icons. They do not interface with the monitoring system.

The monitoring system must be set-up to utilise the mA signal from the instrument and interpret this as an oxygen concentration; it is the monitoring system that must be used to make the required warning audible and visible actions.

5.5.1 Alarm modes and levels

Two separate measurement alarms are available for the sample gas measurement, and you can configure each alarm to operate in one of three modes:

Alarm mode	Operation
None	The alarm is not used (that is, an alarm condition will not be activated under any circumstances)
Low alarm	An alarm condition will be activated when a sample measurement is lower than the preset alarm level *
High alarm	An alarm condition will be activated when a sample measurement is higher than the preset alarm level *

* During a calibration, an alarm will only be activated if the alarm 'Follow' option is set to yes.

While a measurement alarm condition is activated:

- An 'alarm' icon is shown on the measurement screen (see Section 4.2). The number ("1" or "2") in the icon will identify the alarm which has been triggered.
- The alarm LED on the front of the instrument (see Figure 1) flashes on and off.

You can view the details of the activated alarm: see Section 5.5.4.

☞ Ensure that the measurement alarm and hysteresis levels are not too close to the expected sample measurements. (If they are, minor – and acceptable – variations in your sample gas concentrations will result in spurious alarms.)

1. Select 🔔 ⇨ Set up.
2. Select the required transducer and alarm.

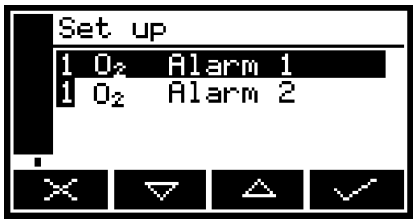


Figure 26 – The alarm set up screen

3. Select the required mode (none, low or high), then press the ✓ soft key.

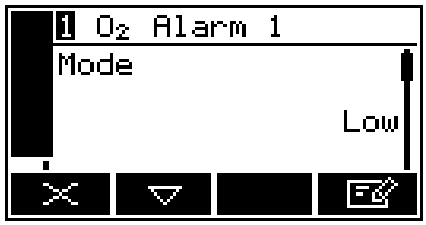


Figure 27 – The alarm mode screen

4. Scroll up or down to edit the appropriate settings (using the method described in Section 4.10):
   - Latching (Section 5.5.2)
   - Level (sets the gas concentration level at which the alarm is to trigger)
   - Hysteresis (Section 5.5.3).

Each measurement has a 'Follow' option:

- If the 'Follow' option is set to 'No', the alarm will be inhibited during calibration.
- If the 'Follow' option is set to 'Yes', the alarm will not be inhibited during calibration.

1. Select 🔔 ⇨ Follow.
2. Select the required alarm.

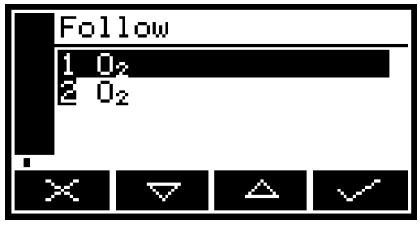


Figure 28 – The alarm follow screen

3. Select the correct option: "Yes" or "No".

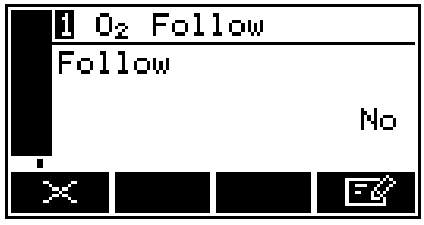


Figure 29 – The alarm follow options screen

5.5.2 Latching/non-latching alarms

You can configure each of the two measurement alarms to be either latching or not latching:

Select ⇨ Set up.

Alarm setting	Meaning
Latching	Once the alarm condition has been activated, the alarm condition remains activated (even if subsequent sample measurements would not trigger the alarm) until the alarm is manually unlatched
Not latching	Once the alarm condition has been activated, the alarm condition remains activated only until a subsequent sample measurement which would not trigger the alarm is made. The alarm condition is then deactivated

When necessary, use the following procedure to unlatch any 'latched' measurement alarm(s):

1. On the measurement screen, press the soft key; the alarm option screen (Figure 30) will then be displayed.
2. With the 'Unlatch' option highlighted, press the soft key. All latched alarms will then be unlatched and the measurement screen will be displayed again

5.5.3 Hysteresis levels

The hysteresis level associated with a measurement alarm determines when an alarm condition (once activated) is deactivated, and this depends on the alarm mode, as follows:

Select ⇨ Set up.

Alarm mode	Effect of hysteresis
Low alarm	Once the low alarm condition has been activated, the alarm condition will not be deactivated until a sample measurement is above (alarm level + hysteresis level)
High alarm	Once the high alarm condition has been activated, the alarm condition will not be deactivated until a sample measurement is below (alarm level – hysteresis level)

For example:

- If a 'low' alarm has an alarm level of 98% and a hysteresis level of 1%, the alarm will be activated when a sample measurement is < 98%, and the alarm will not be deactivated until a sample measurement is > 99%.
- If a 'high' alarm has an alarm level of 3 ppm and a hysteresis level of 1 ppm, the alarm will be activated when a sample measurement is 3 ppm, and the alarm will not be deactivated until a sample measurement is 2 ppm.

5.5.4 Viewing the measurement alarm status

1. Select 🔔 ⇨ View.
2. In the alarm status screen shown in Figure 30, both measurement alarms are shown as 'Inactive'; that is, either the mode of each alarm is set to 'none', or no alarm condition currently exists.

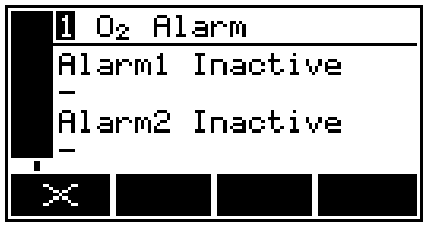


Figure 30 – The alarm status screen

☞ If your instrument is configured to provide 2 sample gas measurements, a vertical scroll bar will be shown at the right of the screen, and a ▽ soft key will be shown. Press the ▽ soft key to view the measurement alarm status for the second sample measurement.

If a measurement alarm condition exists when you view this screen, the screen will show:

- The alarm number ('1' or '2').
- The sample reading which triggered the alarm condition.
- The alarm mode (where '<' indicates a low alarm and '>' indicates a high alarm).
- The alarm level.

6 CALIBRATION

CAUTION **During calibration it is good practice to perform a low (Lo) calibration followed by a high (Hi) calibration.**
CAUTION **It is recommended that calibration gas flow is monitored or routinely checked to ensure a representative sample is being supplied to the instrument.**
CAUTION **During the first week of operation the instrument measurement may drift slightly more than in subsequent weeks. It is recommended that at initial start up the instrument is left to stabilise for 1 hour and calibrated, then calibrated after one week of operation and then routinely calibrated every three months. Depending on site experience this final routine interval can be extended to a maximum of six months.**
CAUTION **The instrument should be calibrated after a power cycle to ensure correct operation.**
CAUTION **The calibration gases must be clean, non corrosive, free from oil and condensates.**
CAUTION **The calibration gases must be similar in temperature to the ambient temperature of the instrument. Gases taken from a cold or hot storage location should be allowed warm or cool prior to use.**
CAUTION **For optimal performance the instrument should be calibrated if exposed to temperature swings of greater than 10°C (18°C).**

Calibration gas flow rate	300ml/min ± 50ml/min
High calibration set-point	
Supplied via the calibration cap	21 ± 0.5% O_2 Balance N_2 (synthetic air)
Optional – ambient air by diffusion	20.9% O_2
Low calibration set-point	0% O_2 (zero grade nitrogen recommended)
Optional – Validation check gas	17 to 18% O_2 ± 0.5% O_2 Balance N_2
Minimum difference between low calibration and high calibration points	20%

☞ Always use the certified concentration as supplied with the gas cylinder as the low and high calibration set-points.

6.1 Connecting the calibration gas cap

WARNING

Low calibration gases is asphyxiant:

- Ensure that the instrument is used in a sufficiently well-ventilated environment, to prevent the build-up of asphyxiant gas.

Ensure that the pipes that you connect to the instrument are routed so that they do not present a hazard to people.

WARNING

Always remove the calibration cap after use to leave the front nozzle free of any restriction. Failure to remove the calibration cap will impair the instruments function and significantly increase the instruments response time.

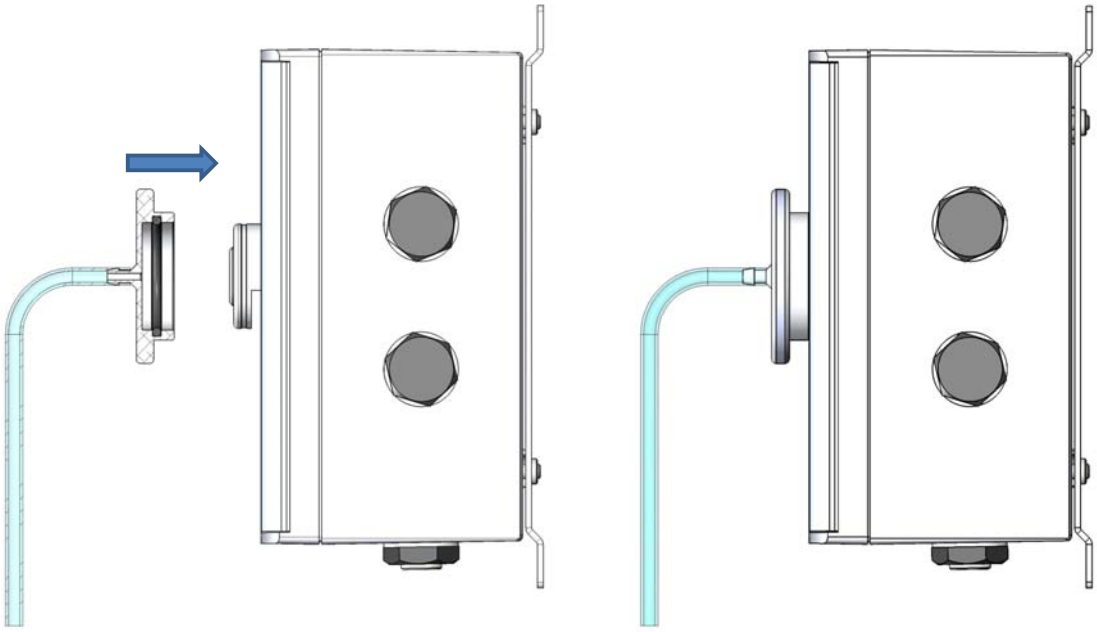


Figure 31 – Calibration gas cap connection

The instrument is supplied with a calibration cap and tube.

1. Push one end of the tube onto the calibration cap and connect the other end onto a suitable supply of calibration gas. Calibration gas cylinders are available from Servomex. For the latest ordering options please contact your local Servomex agent or visit www.servomex.com
2. Firmly push the calibration cap onto the front nozzle of the instrument. You cannot push the cap too far onto the instrument and you should feel the cap push on and locate on the o-ring grove. It should be firmly in place after fitting.
3. To remove the calibration cap, grip firmly around the knurled bezel and twist and pull gently until it is removed. Do not remove the cap by pulling on the tube.

☞ The calibration cap may be stiff and slightly difficult to remove when first fitted. This is normal and will ease with use.

☞ You must switch on the electrical supply and leave the instrument for at least 1 hour before you calibrate the instrument.

6.2 Manual calibration

You **must** manually calibrate the instrument as part of the initial set up.

Manually calibrate the instrument as follows:

1. Ensure that your equipment is configured to correctly route your calibration gas supply to the instrument sample gas inlet.
2. Select ⇨ Calibrate.

Figure 32 – The calibrate screen

Note that the "9999d" field of the screen shown in Figure 32 will identify the period of time that has elapsed since the last calibration, and can be in any of the following forms:

- 9999d specifying days
- 9999h specifying hours
- 9999m specifying minutes
- Any combination of these.

3. Use the △ and ▽ soft keys to select the required calibration, that is:
   - 'Lo' (low calibration gas).
   - 'Hi' (high calibration gas).
4. Press the ✓ soft key. The Calibrate target value screen will then be shown (see Figure 33), identifying the target value and the current reading.

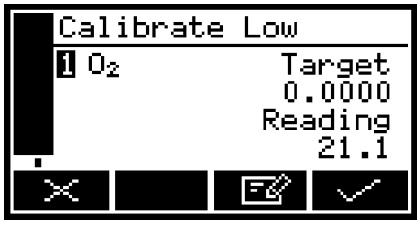


Figure 33 – The calibrate target value screen

5. If the target value is not correct for the calibration gas which you are using, change the target value to the required value: use the edit method shown in Section 4.10.
6. When the current reading is stable, wait a further 3 minutes, then press the ✓ soft key. The instrument will then carry out the specified calibration.
7. Repeat steps 1 to 8 of this section for the second calibration.
8. Press the ✕ soft key to display the measurement screen again.

7 ROUTINE MAINTENANCE

7.1 Inspecting the calibration cap

Before each use inspect the calibration cap and oring for signs of wear. Check that the hose connection is tight and that all parts are clean. If necessary purchase a new calibration cap from Servomex or your Servomex agent.

7.2 Checking the mA output

If required, use the following procedure at any time to perform a check on a mA output:

1. Select ⇨ Service ⇨ mA output.
2. Select the required 'Override' option.
3. Edit the displayed override value as described in Section 4.10.
4. Press the soft key: an acceptance screen showing "No" will then be displayed. Select "Yes" to apply the override.

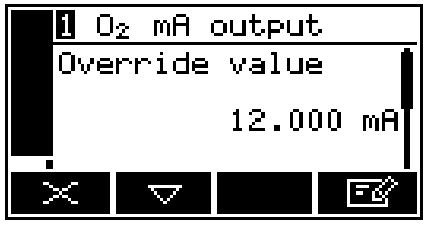


Figure 34 – The mA output override screen

5. The mA output will now be set to the override value you have selected. Use your control/monitoring equipment (connected to the instrument) to check that the output is correct.

☞ The milliAmp output freezes at the override value as long as the 'Override' screen is displayed. As soon as another screen is displayed, the milliAmp output value will be updated to reflect the corresponding gas measurement.

7.3 Cleaning the instrument

When necessary, use a damp (but not wet) cloth to wipe clean the outer surfaces of the instrument (to prevent the entry of dust or other particulates into the interior of the instrument).

7.4 Preventative maintenance

To minimise unscheduled instrument downtime, ensure the proper operation of the instrument and to comply with the guidelines of applicable regulatory bodies, we recommend that you utilise the SERVOSURE annual preventative maintenance program for your instrument.

The preventative maintenance program consists of a yearly inspection of the instrument, and repair of any faults, to ensure that the instrument meets its original factory specification. Once inspection and repair are complete, you will be provided with a full SERVOSURE report.

Note that you will always be informed in advance if any repairs or new parts are required for your instrument.

Contact Servomex or your local Servomex agent to arrange for a preventative maintenance contract.

8 FAULT FINDING

8.1 Fault, maintenance required and SIP statuses

8.1.1 Status definitions

The status definitions are as follows:

- Fault – A serious fault has been detected.
- Maintenance required – A maintenance required status has been raised, the instrument requires attention.
- Service in Progress (SIP) – During service operations (calibration, auto validation, I/O overriding) a service in progress status will be raised.

8.1.2 Status annunciations

Condition	LCD Icon	LED annunciation	Relay annunciation
Fault	⚠	Orange fault LED	Fault relay deenergised
Maintenance	🔧	None	Maintenance required relay energised

☞ The LCD icons are displayed on the measurement screen only (see Figure 2).

Message	Measurement screen icon	Recommended actions
Calibration fault		Recalibrate (both low and high) as described in Section 6, also check calibration gas has been allowed to flow through the instrument for the recommended time. If the fault persists, contact Servomex or your local Servomex agent for assistance.
Code fault		Contact Servomex or your local Servomex agent for assistance.
Communication fail		Turn the instrument off, and then turn it on again. If the fault message is then displayed again, contact Servomex or your local Servomex agent for assistance.
Database fault		Turn the instrument off, and then turn it on again. If the fault message is then displayed again, contact Servomex or your local Servomex agent for assistance.
Date/Time invalid		This usually occurs because the electrical supply to the instrument has been switched off for more than a week. Switch on the electrical supply, then set the date/time as described in Section 5.3.6. If the fault persists, contact Servomex or your local Servomex agent for assistance.
Fatal fault		Contact Servomex or your local Servomex agent for assistance.
mA fault		Ensure that the electrical cabling connected to the instrument is not open circuit. Turn the instrument off, and then turn it on again. If the fault persists, contact Servomex or your local Servomex agent for assistance.
mA not detected		Contact Servomex or your local Servomex agent for assistance.
mA reset		Contact Servomex or your local Servomex agent for assistance.
Power config fault		Contact Servomex or your local Servomex agent for assistance.

Message	Measurement screen icon	Recommended actions
Static RAM fault	⚠	Turn the instrument off, and then turn it on again. If the fault message is then displayed again, contact Servomex or your local Servomex agent for assistance.
Sw IP not detected	⚠	Contact Servomex or your local Servomex agent for assistance.
Temperature fault	⚠	Reduce temperature to within environmental limits or contact Servomex or your local Servomex agent for assistance.
Transducer error	⚠	Ensure that you are using the instrument in the specified operating conditions (refer to Section 2). If the fault persists, contact Servomex or your local Servomex agent for assistance.
Tx incorrect type	⚠	Contact Servomex or your local Servomex agent for assistance.
Tx Maintenance	🔧	Check that the sample gas concentration is not higher than the transducer full scale range. Recalibrate (both low and high) as described in Section 6. If this does not clear the fault, turn the instrument off, and then turn it on again. If the fault message is then displayed again, contact Servomex or your local Servomex agent for assistance.
Tx not detected	⚠	Contact Servomex or your local Servomex agent for assistance.

8.2 Viewing messages

8.2.1 Active messages

1. Select ⇨ Status ⇨ Active.
2. Each message status screen shows:
   - Date and time of message
   - The message type ("Fault", "Maintenance rqd" or "Service in Progress")
   - The message itself.

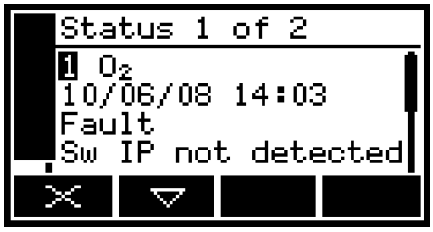


Figure 35 – The message status screen

3. Refer to Section 8.1 for the recommended actions associated with the displayed messages.

8.2.2 View history messages

1. Select ⇨ Status ⇨ View history.
2. Each message shows:
   - Date and time of message.
   - The message type ("Fault", "Maintenance rqd" or "Service in Progress").
   - The message itself.
   - The status of the entry "ON" or "OFF".

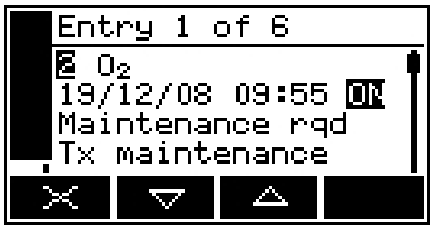


Figure 36 – The message status screen

Refer to Section 8.1 for the recommended actions associated with the displayed messages.

☞ A maximum of 100 status messages can be stored.

8.3 General fault finding

For general instrument fault finding, refer to the table on the following pages.

If you have read through the table and still cannot rectify a fault, or cannot identify the cause of a fault, contact Servomex or your local Servomex agent for assistance.

Fault symptom	Recommended actions
The fault LED is on.	Check any current fault messages (see Section 8.2), and carry out the recommended actions (see Section 8.1). If there are no applicable fault messages stored, or if you cannot rectify the fault after you have carried out the recommended actions: • Switch off the instrument, then switch it on again. • If the fault persists, contact Servomex or your local Servomex agent for assistance.
The software health indicator is not moving on the display.	Carry out the recommended actions for the "The fault LED is on" symptom above.
" - - - - - " is displayed instead of a sample measurement.	This indicates a possible measurement error, or a communications error between the transducer and the instrument controller. Check that the instrument is not being knocked, moved, or subjected to high levels of vibration during sample measurements. If the instrument is not being knocked, moved or subjected to vibration and the fault persists, contact Servomex or your local Servomex agent for assistance.
Instrument response is slow.	Check that the sample gas inlet is not blocked.
Instrument measurements are unstable.	Check that the instrument is not being subjected to high levels of vibration and ensure there are no leaks.

Fault symptom	Recommended actions
The instrument will not calibrate.	Check that the correct low and high calibration gases are being used
The instrument will not switch on.	Check that the external supply is switched on, and that no fuse or over-current device in the external supply has operated to switch off the supply. If the external electrical supply is correct, switch off and isolate the supply and check that the supply is correctly connected to the instrument: see Section 5.2. If the supply is correctly connected, an operating fuse may have failed; inspect and replace the fuses if necessary.
The instrument display is blank or is too dark.	Check that the ambient temperature is within the valid instrument operating temperature range: refer to Section 2.2. Check that the display contrast adjustment has been correctly set (refer to Section 5.3.4), and has not been altered.
The measurement alarms are activating more often than expected.	Check that the instrument is not being knocked, moved, or subjected to high levels of vibration during sample measurements. Check that the alarm modes, alarm levels and hysteresis levels have been correctly set: refer to Section 5.5.
The milliAmp output is at 0 or 21.5 mA.	If you have configured the mA output to jam high or jam low, check whether a fault condition exists. Otherwise, contact Servomex or your local Servomex agent for assistance.
The milliAmp output is not as expected.	Ensure that the electrical cabling connected to the instrument is not open circuit. Check that the mA output is calibrated correctly (see Section 5.4.4). Check that you have selected the correct Range (see Section 0).

9 STORAGE AND DISPOSAL

9.1 Storage

Refit any protective plastic covers and place the instrument and any associated equipment in its original packaging before storage. Alternatively, seal it inside a waterproof plastic bag, sack, or storage box.

Store the instrument and any associated equipment in a clean, dry area. Do not subject it to excessively hot, cold, or humid conditions: see Section 2.2.

9.2 Disposal

Dispose of the instrument and any associated equipment safely, and in accordance with all of your local and national safety and environmental requirements.

☞ The instrument is not suitable for disposal in municipal waste streams (such as landfill sites, domestic recycling centres and so on).

☞ If you send the instrument to Servomex or your local Servomex agent for disposal, it must be accompanied by a correctly completed decontamination certificate.

10 SPARES

WARNING

Do not use spares other than those specified below, and do not attempt to carry out any maintenance procedures other than those specified in this manual. If you do, you can damage the instrument and invalidate any warranty.

The standard spares available for the instrument are shown below. You can order these spares from Servomex or your Servomex agent.

Spare	Part Number
Spare calibration cap assembly (inclusive of calibration cap, o-ring and tube)	S5311990
Spare fuse pack (5 off T 1A / 250 V size: 20 x 5 mm)	S5311901

APPENDIX

A1 PERFORMANCE DATA

Performance data has been determined in accordance with EN61207.

Display indication	% O_2
Measurement range	0 to 25% O_2 (for oxygen deficiency)
Intrinsic error (accuracy)	<± 0.2% O_2
Zero drift per month	<± 0.2% O_2
Ambient pressure effects	<0.04% reading per 1% change in ambient pressure
Zero temperature coefficient	<± 0.5% O_2 per 10 °C