SERVOMEX
ANALYZERS
HIGH-PERFORMANCE GAS ANALYSIS

SERVOMEX OxyDetect

OPERATOR MANUAL

Part Number: **05311001B**
Revision: **4**
Language: **UK English**

IMPORTANT INFORMATION

Continued safe and reliable operation of this equipment is conditional on all installation, operation and maintenance procedures being carried out in accordance with the appropriate manuals, by personnel having appropriate qualifications, experience and training.

Poursuite de l'exploitation sûre et fiable de cet équipement est subordonné à toutes les procédures d'installation, de fonctionnement et d'entretien étant effectué en conformité avec les manuels appropriés, par un personnel ayant les qualifications appropriées, l'expérience et la formation.

Failure to observe the requirements of the manual may result in the user being held responsible for the consequences and may invalidate any warranty.

Servomex will accept no liability for unauthorised modifications to Servomex supplied equipment.

Servomex has paid particular attention to Health & Safety throughout the manual. Where special precautions need to be taken due to the nature of the equipment or product, an appropriate safety icon and warning message is shown. Special attention should be made to Section 1.2, where all such messages are summarized.

In line with our continuous policy of research and development, we reserve the right to amend models and specifications without prior notice.

This manual is accurate at the date of printing, but will be superseded and should be disregarded if specifications or appearance are changed.

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CONTENTS

1 DESCRIPTION AND DEFINITIONS

1.1 Scope of this manual

This manual provides installation, operation and routine maintenance instructions for the 05311B1 OxyDetect - Oxygen Deficiency Fixed Gas Detector, abbreviated to "instrument" or “unit” 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:

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

Avertissements soulignent les dangers spécifiques qui, si pas pris en compte, peut entraîner des blessures ou la mort.

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

Précautions soulignent les dangers qui, si pas pris en compte, peut entraîner des dommages à l'instrument ou à un autre appareil ou d'un bien.

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. Additionally, three changeover relays are provided to signal the following detector statuses.

- Measurement alarm level 1 (user configurable)
- Measurement alarm level 2 (user configurable)
- Instrument Fault and Oxygen measurement >23%

These outputs must be integrated into a gas detection management system as the instrument gives no direct visible or audible warning or alarm of an oxygen-deficient environment (internal audible alarm or visual beacon), 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 4-20mA milliamp (mA) signal and / or gas sample alarm levels indicted by relay status, to a gas detection management system.

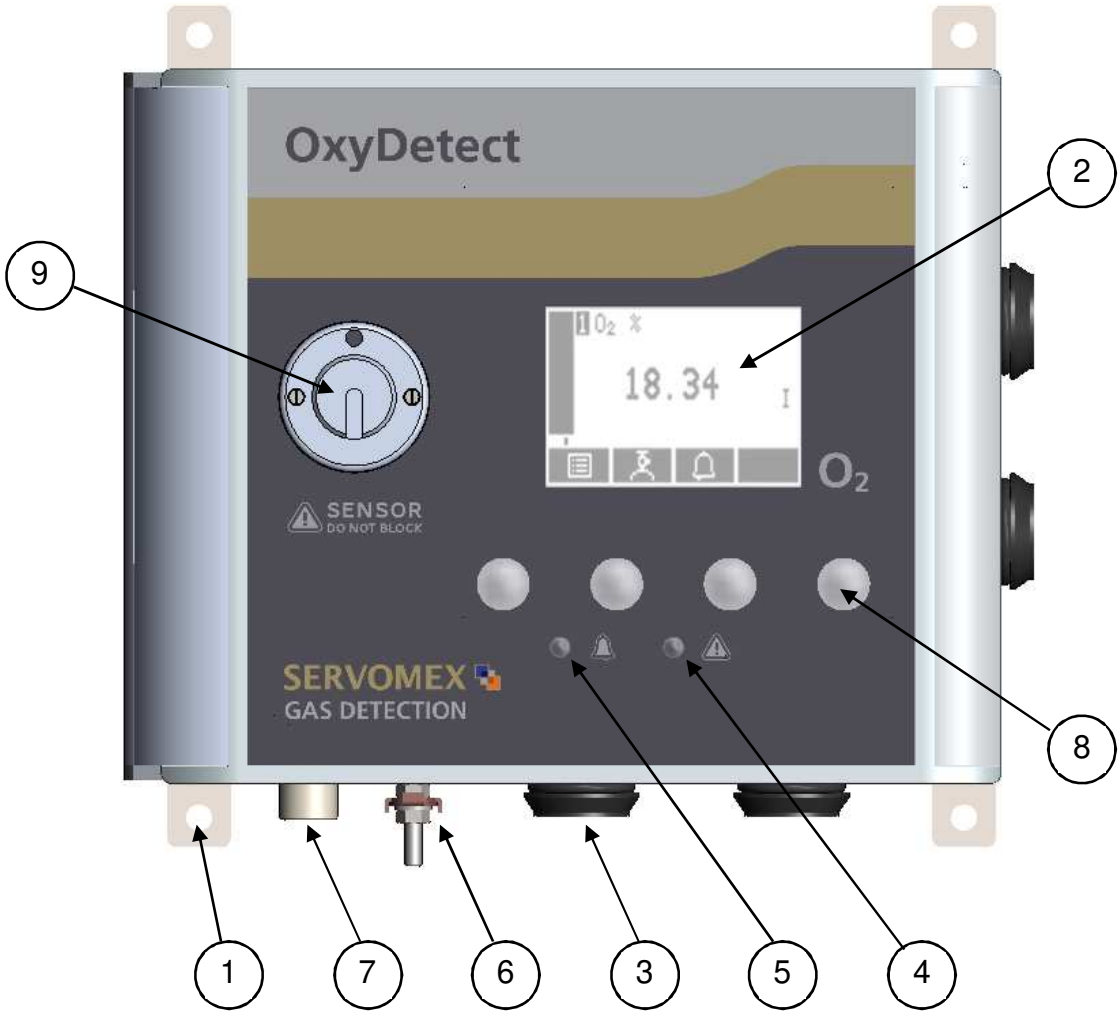
The instrument requires little routine maintenance, other than calibration which is essential for the accuracy of the gas measurements.

	**The instrument is not to be used for process control or process monitoring** **L'instrument ne doit pas être utilisé pour le contrôle des processus ou la surveillance de processus**
	**The OxyDetect is not a medical device as defined in the medical devices directive 93/42/EEC and is not intended to be used on human beings for the diagnosis, prevention, monitoring, treatment or alleviation of disease. Injury or replacement or modification of the anatomy** **Le OxyDetect est pas un dispositif médical tel que défini dans les dispositifs médicaux de la directive 93/42 / CEE et ne sont pas destinés à être utilisés sur des êtres humains pour le diagnostic, la prévention, contrôle, traitement ou atténuation d'une maladie. Blessure ou de remplacement ou modification de l'anatomie.**

	**The safe area version is not to be used in certified or hazardous locations (potentially explosive atmospheres)** **La version de zone de sécurité ne doit pas être utilisé dans des endroits certifiés ou dangereux (atmosphères explosibles)**
	**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)** **L'instrument ne convient pas pour les atmosphères corrosives (ces atmosphères gaz et les vapeurs sont présents dans des concentrations suffisamment élevées pour provoquer la corrosion des appareils industriels ou normales où devraient normalement être précisées revêtements spécialisés, des matériaux ou finitions pour éviter la 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.	4 x Gland entries holes diameter 22mm
4.	Fault LED (amber)
5.	Measurement alarm LED (red)

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

Figure 1 - Front of Instrument

1.5 Certification

1.5.1 Hazardous area certification

	**Do not modify the unit, either mechanically or electrically, as the certification of the instrument will be invalidated and it may not operate safely.** **Ne modifiez pas l'unité, soit mécaniquement ou électriquement, ou la certification de l'instrument sera invalidée et il ne peut pas fonctionner en toute sécurité.**
	**Hazardous area certification is restricted to the use of the unit in atmospheres at normal oxygen concentration and normal atmospheric pressures. The oxygen measurement range for hazardous area versions is 0 to 21%.** **Certification de zone dangereuse est limitée à l'utilisation de l'appareil dans des atmosphères à la concentration d'oxygène normale et des pressions atmosphériques normales . plage de mesure de l'oxygène pour les versions en zone dangereuse est 0 à 21 %.**
	**Exposure to some chemicals may degrade the sealing properties of materials used in the following devices.** **K1: Relay from Customer Interface Board - Sealed Device** **K2: Relay from Customer Interface Board - Sealed Device** **K3: Relay from Customer Interface Board - Sealed Device** **L'exposition à certains produits chimiques mai dégrader la fermeture des propriétés des matériaux utilisés dans les appareils suivants: (Amérique du Nord uniquement).** **K1: Relais de Carte Interface HM - Sealed Device** **K2: Relais de Carte Interface HM - Sealed Device** **K3: Relais de Carte Interface HM - Sealed Device**
	**Substitution of the following components may impair suitability for Division 2 (North America only).** **K1: Relay from Customer Interface Board - Sealed Device** **K2: Relay from Customer Interface Board - Sealed Device** **K3: Relay from Customer Interface Board - Sealed Device** **La substitution de composants suivants peut render ce matériel inacceptable pour les emplacements de Classe 1, Division 2: (Amérique du Nord uniquement).**

	K1: Relais de Carte Interface HM - Sealed Device K2: Relais de Carte Interface HM - Sealed Device K3: Relais de Carte Interface HM - Sealed Device
	**EXPLOSION HAZARD - Substitution of components may impair suitability for CL I, Div 2. (North America only)** **RISQUE D'EXPLOSION – La substitution de composants peut render ce matériel inacceptable pour les emplacements de Classe I, Division 2. (Amérique du Nord uniquement)**
	**Make sure that the operating environment is within the limits specified in the product data (section 3.2).** **Assurez-vous que l'environnement d'exploitation est dans les limites spécifiées dans les données du produit (section 3.2).**
	**Do not open the enclosure if an explosive atmosphere is present.** **Ne pas ouvrir en atmosphère explosive.**
	**Do not open the enclosure if the instrument is energized.** **Ne pas ouvrir sous tension.**
	**It is a condition of certification that the unit must be installed following the appropriate national or international legislation or codes of practice. In particular, you must make sure that the correct glands are fitted to cable entries and that you do not compromise the weatherproofing of the enclosure.** **C'est une condition de la certification que l'unité doit être installée en respectant la législation ou des codes de pratique nationale ou internationale approprié. En particulier, vous devez vous assurer que les glandes appropriés sont installés aux entrées de câble et que vous ne compromettent pas l'étanchéité de l'enceinte.**
	**All of the monitor electrical connections are considered to be incendive and therefore must only be connected to safe area equipment.** **Tous les moniteurs connexions électriques sont considérés comme incendiaire et donc ne doit être connecté à l'équipement des zones de sécurité.**

	**Only use a soft, clean cloth moistened with water to wipe clean the outside of the enclosure.** **Utilisez uniquement un chiffon doux et propre humidifié avec de l'eau pour nettoyer l'extérieur de l'enceinte.**
	**The equipment is incapable of passing the dielectric strength test prescribed by the standards, and so this must be taken into account during installation.** **L'équipement est incapable de passer le test de rigidité diélectrique prescrite par les normes, et si cela doit être pris en compte lors de l'installation.**
	**The equipment shall be used in an area not exceeding Pollution Degree 2 as defined in IEC 60664-1.** **L'équipement doit être utilisé dans une zone ne dépassant pas 2 degré de pollution tel que défini dans la norme CEI 60664-1.**

1.6 Markings

The instrument includes these external markings. Their details are shown in Section **Error! Reference source not found.**.

Follow the appropriate safety instructions and be aware of any warnings about potential hazards.

1.6.1 Label locations

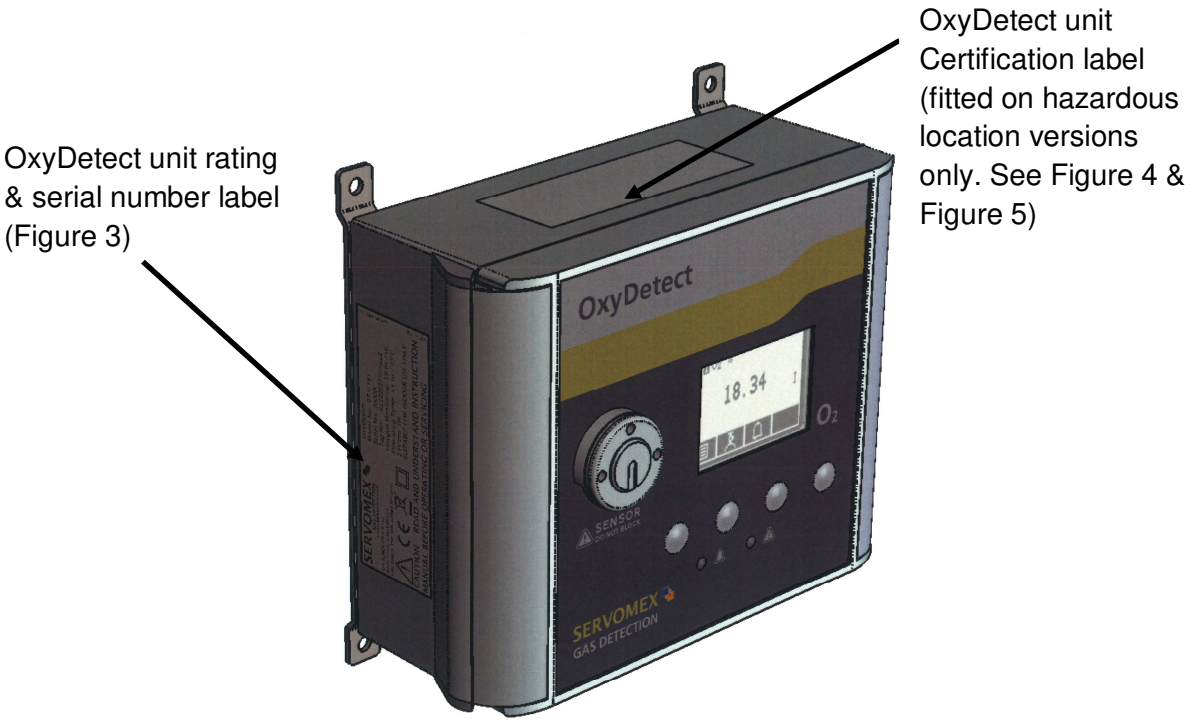


Figure 2 - OxyDetect unit label locations

2 CERTIFICATION INFORMATION

2.1 Hazardous area approval and certification

2.1.1 Equipment certification standards

The standards to which the equipment has been certified are listed below:

ATEX
EN 60079-0:2012 + A11 :2013
EN 60079-7 :2015
EN 60079-11:2012
EN 60079-15:2010

IECEx
IEC 60079-0:2011 Edition 6
IEC 60079-7 :2015 Edition 5
IEC 60079-11:2011 Edition 6
IEC 60079-15:2010 Edition 4

2.1.2 Europe and IECEx

ATEX	Ⓔx II 3G
Coding (ATEX and IECEx)	Ex ic ec nC IIC T4 Gc
Ambient Temperature range	-5 °C to +45 °C
Certification number (ATEX)	Baseefa15ATEX0165X
Certification number (IECEx)	IECEx BAS 15.0112X
Conditions of safe use (ATEX & IECEx)	1. Possible electrostatic risk - clean only with a damp cloth. 2. The equipment is not capable of passing the dielectric strength test prescribed by the standards, and so this must be taken into account during installation. 3. The equipment shall be used in an area not exceeding pollution degree 2 as defined in IEC 60664-1. 4. All cable entries must utilise a suitably certified cable gland or, in the case of any unused entries, a suitably certified blanking element in order to maintain the pollution degree level and ingress protection IP66 of the equipment.

2.1.3 North America

Coding	Class I, Division 2, Groups A-D; T4 Class I, Zone 2, Group IIC; T4
Ambient Temperature range	-5 °C to +45 °C
SGS Contract No.	710216
SGS Certificate Reference	SGSNA/19/SUW/00043

2.1.4 Label information

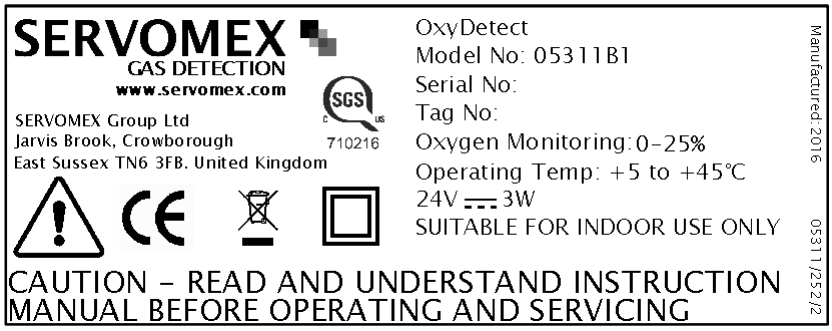


Figure 3 - OxyDetect Rating Label

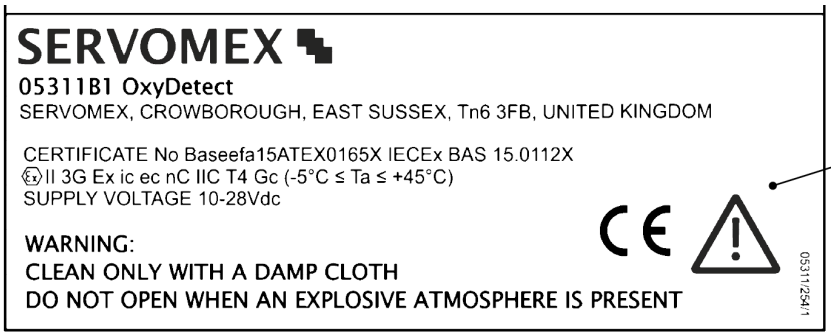


Figure 4 - OxyDetect ATEX / IECEx Certification label

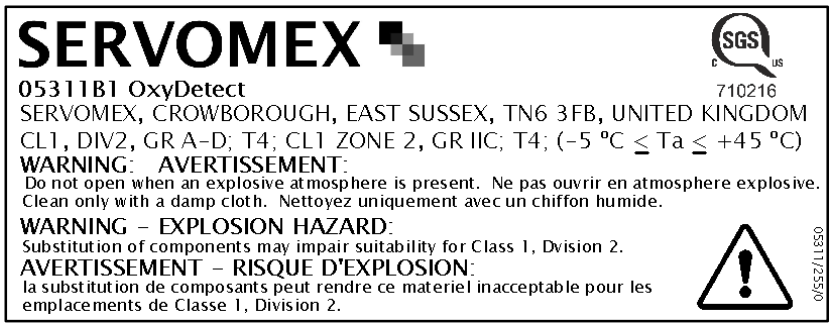


Figure 5 - OxyDetect North America
CL1 Div 2 Certification label

3 SPECIFICATION

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.

La protection, la précision, le fonctionnement et l'état de l'équipement peut être altérée si l'instrument n'a pas été installé en conformité avec les exigences du présent et les sections suivantes du manuel.

3.1 General

Dimensions: length x height x width	210 x 200 x 106 mm (8.3” x 7.9” x 4.2”)
Mass	<2.5 kg (5.5lbs)

3.2 Environmental limits

Equipment is suitable for indoor use only

Ambient temperature range	
Operational	+5 °C to +45 °C (+41 °F to +113 °F)
Hazardous location certified	-5 °C to +45 °C (+23 °F to +113 °F)
Storage	-5 °C to +50 °C (+23 °F to +122 °F)
Operating pressure range	Ambient 80 to 110 kPa (11.6 to 16 psi) Hazardous Areas
Operating ambient humidity range	10 to 80% RH, non-condensing
Operating altitude range	–500 * to 2000 † metres (-1600 * to 6500 † feet)
Ingress protection	IP66** (IP40 sensor)

The instrument is rated Pollution Degree 2

* Below sea level.
† Above sea level.

** The OxyDetect enclosure is designed such that it achieves IP66 ingress protection. However, in operational use consideration must be made for the protection of the sensor opening which is rated to IP40. Therefore, the instrument should not be exposed to washing with liquid jets. The instrument is for indoor use only.

** L'enceinte OxyDetect est conçue de telle sorte qu'elle réalise IP66 protection d'entrée. Cependant, dans l'utilisation opérationnelle examen doit être fait pour la protection de l'ouverture du capteur qui est évalué à IP40. Par conséquent, l'instrument ne doit pas être exposé à un lavage avec jets de liquide. L'instrument est destiné à être utilisé en intérieur.

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

Si la température ambiante descend en dessous de 0 °C (32 °F) l'instrument doit être recalibré pour assurer un fonctionnement correct.

4 UNPACK THE INSTRUMENT

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

L'instrument est délicate et il faut prendre soin lors de la manipulation.

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

☞ It is advisable that the gland entry blanking plugs are only removed just prior to product installation.

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 10.1.

   Otherwise, read Section 5 (Instrument user interface), and then continue at Section 6 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).

5 INSTRUMENT USER INTERFACE

5.1 Introduction

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

Display	Shows various screens: see Section 5.2 onwards
Soft keys	The function of each of the soft keys depends on the screen currently being shown on the display: see Section 5.2
Alarm LED	On when an alarm condition exists: see Section 6.5
Fault LED	On when a fault condition exists: see Section 9.1

5.2 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 6 below.

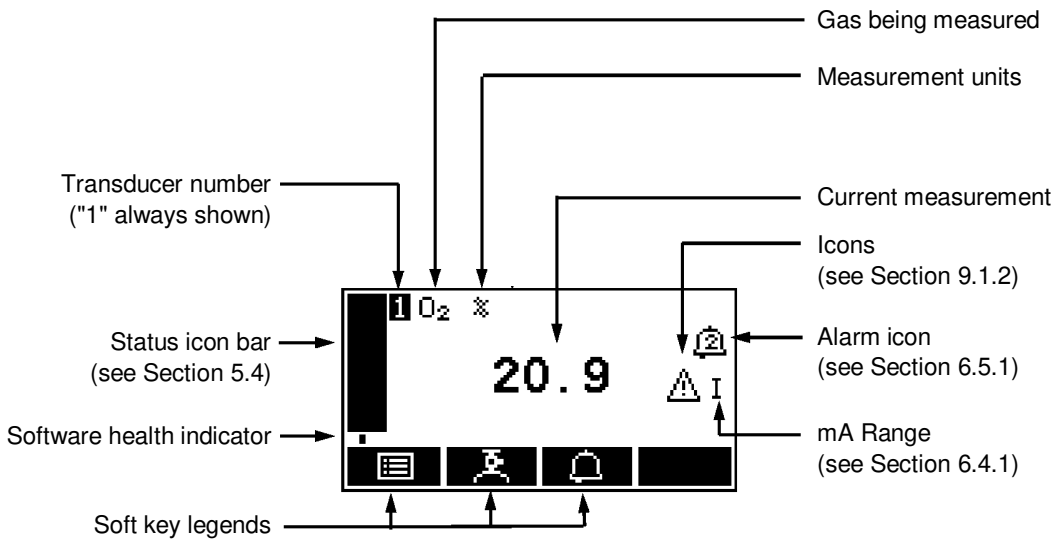


Figure 6 - The measurement screen

☞ 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 9.

☞ 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).

5.3 Soft key legends

The four soft key legends at the bottom of the measurement screen Figure 6 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 5
	Calibrate *	Displays the calibrate screen: see Sections 7
	Alarm *	Displays the alarm option screen: see Section 6.5.1
	–	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/Quit	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

5.4 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 9.2.

5.5 Scroll bars

On some screens (for example, see Figure 7), 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.

5.6 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 6.3.1 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 5.10) 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 6.3.3.

5.7 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.

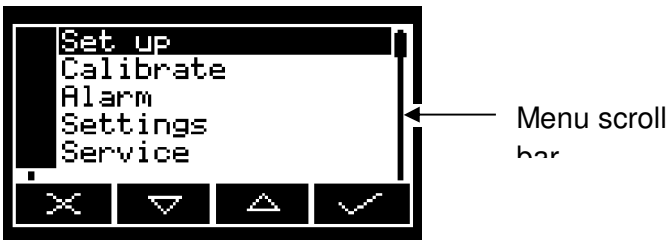


Figure 7 - The menu screen

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 [6.4].
Calibrate	Select this screen to calibrate instrument [7].
Alarm	Select this screen to set up the measurement alarms and set the alarm follow options [6.5.1], unlatch alarms [6.5.2] and view the measurement alarm status [6.5.4].
Settings	Select this screen to change instrument settings (password, display language and so on) [5.8].

Service	Select this screen to calibrate [6.4.4]/check the mA outputs [8.2] & check status relay operation [8.3].
Status	Select this screen to view active and historical fault and maintenance required messages [9.2].

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

5.8 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:

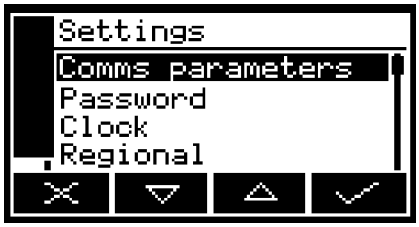


Figure 8 - The settings screen

Screen	Use [refer to section]
Password	Changing the password [6.3.3]
Clock	Setting the clock time and/or date [6.3.6]
Regional	Changing regional settings (language and so on) [6.3.7]
Backlight	Adjusting the backlight timer duration [6.3.5]
Contrast	Adjusting the contrast of the screen [6.3.4]
Security	Selecting the security level [6.3.2]
Information	Viewing instrument system information [5.9]

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

5.9 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.

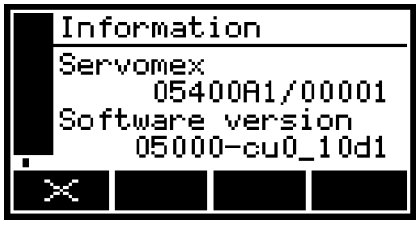


Figure 9 - Typical information screen

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.

5.10 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:

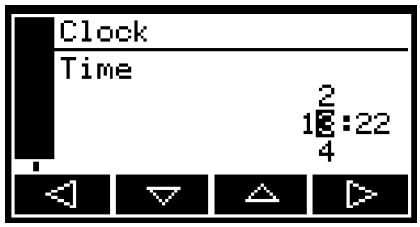


Figure 10 - A typical edit screen

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".

6 INSTALLATION AND SET-UP

	**The instrument must be installed by a suitably skilled and competent person. The following procedure must be followed to prevent a hazard.** **L'appareil doit être installé par un convenablement qualifiée et personne compétente. La procédure suivante doit être suivie pour éviter un danger.**
	**Make sure the OxyDetect is suitably approved for the location in which it is to be installed and used.** **Assurez-vous que le OxyDetect est convenablement approuvé pour l'endroit où il doit être installé et utilisé.**
	**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.** **Gaz ont des densités différentes et peuvent monter ou descendre dans l'air ambiant. L'appareil doit être installé dans un endroit approprié par rapport au danger de gaz. Une évaluation des risques appropriée doit être effectuée avant l'installation de l'instrument.**

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.

Ne pas installer l'instrument où il est soumis à des niveaux élevés de vibrations ou de grandes variations de la température ambiante, car ils peuvent causer des fausses alarmes.

Do not install the instrument where it is subjected to very high levels of magnetic fields or large variation in magnetic field intensity as these may cause the incorrect reporting of oxygen levels.

N'installez pas l'instrument là où il est soumis à de très hauts niveaux de champs magnétiques ou à de fortes variations d'intensité de champ magnétique, car cela pourrait entraîner une signalisation incorrecte des niveaux d'oxygène.

6.1 Mechanical installation

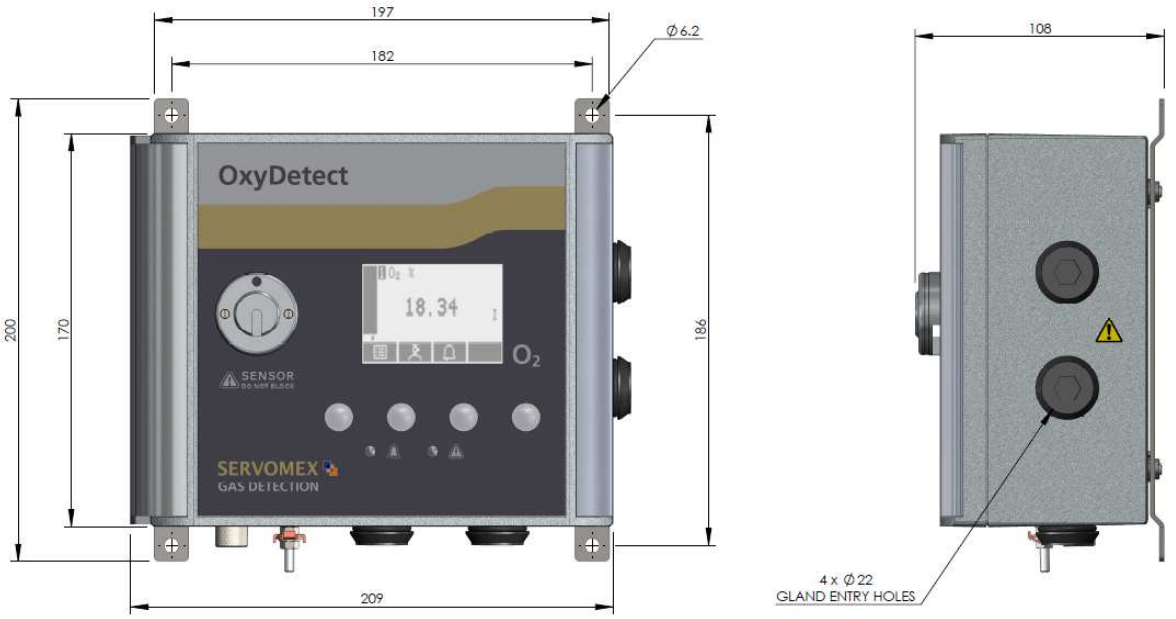


Figure 11 - OxyDetect dimensions (in millimeters)

☞ 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.

6.2 Electrical Installation

6.2.1 Electrical Safety

⚠	**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.** **Respectez les consignes de sécurité indiquées ci-dessous lorsque vous installez l'instrument; si vous ne faites pas, la garantie de l'instrument peut être invalidé, l'instrument peut ne pas fonctionner correctement, ou il peut être endommagé.**

	**Ensure that the electrical installation of the instrument conforms with all applicable local and national electrical safety requirements.** **Assurez-vous que l'installation électrique de l'appareil est conforme à toutes les exigences locales et nationales applicables sécurité électrique.**
	**Ensure that the cables that you connect to the instrument are routed so that they do not present a trip hazard.** **Vérifiez que les câbles que vous connectez à l'instrument sont acheminés pour qu'ils ne présentent pas un risque de trébucher.**
	**The OxyDetect does not incorporate an integral on/off switch. You must provide a means of externally isolating the electrical supply from the OxyDetect monitor. Use a suitable switch or circuit breaker located close to the monitor clearly marked as the disconnecting device for the monitor. This must also incorporate a suitable fuse or over-current protection device, set to or rated at no more than 3A. To comply with the relevant safety requirements this power disconnection device must be approved to:** • **UL 489 for equipment used in the USA.** • **CSA C22.2 No. 5.1 for equipment used in Canada.** • **IEC 60497 for equipment used in the EU and the rest of the world.** **Le OxyDetect ne tient pas compte d'un commutateur intégré marche / arrêt. Vous devez fournir un moyen d'isoler l'alimentation électrique externe du moniteur de OxyDetect. Utilisez un coupe-circuit ou un interrupteur approprié situé près du moniteur qui soit marqué comme dispositif de déconnexion de l'écran. Cela doit également intégrer un fusible approprié ou surintensité dispositif de protection, définir ou évalué à pas plus de 3A. Pour se conformer aux exigences de sécurité en vigueur de ce dispositif le pouvoir de coupure doit être approuvée à:** • **UL 489 pour les équipements utilisés aux Etats-Unis.** • **CSA C22.2 No 5.1 pour les équipements utilisés au Canada.** • **IEC 60497 pour les équipements utilisés dans l'UE et le reste du monde.**

To meet IEC61010 the cables glands used with the 05311 OxyDetect Oxygen Monitor must:

- **Be made of metal or have a flammability rating of V-1 or better.**
- **Be rated for temperatures from +5 °C to +45 °C (+41 °F to +113 °F).**
- **Be selected to provide cable strain relief. The effectiveness of the strain relief must withstand pulling and twisting as specified in the relevant safety standard applicable to the installation.**
- **Maintain a minimum of IP40 level of environmental protection classification specified for the 05311 Oxygen monitor for safe area installations.**
- **Maintain a minimum of IP54 level of environmental protection classification specified for the 05311 Oxygen monitor for hazardous area installations.**

Remove all the blanking plugs supplied by Servomex with the OxyDetect. Fit suitable blanking plugs to any unused cable entries. These must be made of metal or have a flammability rating of V-1 or better and maintain the IP40 level of environmental protection.

Pour répondre à IEC61010 les glandes câbles utilisés avec le Moniteur d'oxygène de 05311 OxyDetect doit:

- **Être faite de métal ou d'avoir un indice d'inflammabilité de V-1 ou mieux**
- **Être conçus pour des températures de +5 °C à +45 °C (41 °F à 113 °F)**
- **Être sélectionné pour fournir le câble décharge de traction. L'efficacité de la décharge de traction doit résister à la traction et la torsion comme spécifié dans la norme de sécurité pertinente applicable à l'installation**
- **Maintenir un minimum de niveau IP40 de la classification de protection de l'environnement spécifiée pour le moniteur 05311 d'oxygène pour les installations de la zone de sécurité.**
- **Maintenir un minimum de niveau IP54 de la classification de protection de l'environnement spécifiée pour le moniteur 05311 en oxygène pour les installations en zone dangereuse.**

Retirez tous les bouchons d'obturation fournis par Servomex avec le OxyDetect. Monter les bouchons d'obturation adaptées à toutes les entrées de câble inutilisées. Ceux-ci doivent être en

	métal ou en avoir un indice d'inflammabilité de V-1 ou mieux et maintenir le niveau IP40 de protection de l'environnement.

6.2.2 Electrical data

Electrical supply

Voltage	24 Vdc (10Vminimum; 28Vmaximum)
Fuse rating / type	T 2 A / 250 V size: 20 x 5 mm
Maximum power consumption	3 VA

mA output

Maximum load resistance	1 K Ohms
Isolation voltage (to earth)	500 V (dc or ac)
Output range	0-25% Oxygen
Recommended mA range	4 to 20 mA
Recommended Fault indication	0 mA (Jam low on fault condition)

Interface Relays

Configuration*	3 SPCO relay contacts allocated to • Fault & O_2 >23% • Measurement alarm 1 • Measurement alarm 2
Maximum Rating	250 Vac, 3 A or 28 Vdc, 1 A (non-inductive)
Minimum Load	5 V, 10 mA AC or DC

***The relay output signals are volt-free signals and factory configured to be fail safe (de-energised on alarm condition).**

	**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.** **L'instrument permet la configuration de 0-20 mA. Il est fortement recommandé que l'instrument ne soit pas configuré pour utiliser l'option 0-20 lorsqu'il est utilisé dans un système de sécurité liées, comme le système de détection de gaz dans lequel l'instrument est intégré doivent utiliser le signal de 0 mA (Jam Low) de l'4-20 mA signal comme une indication de défaut de la mesure.**
	**It is strongly recommended that monitoring systems use latching alarms that can only be manually reset after the hazard has been assessed and eliminated.** **Il est fortement recommandé que les systèmes de verrouillage surveillance de l'utilisation des alarmes qui peuvent être réinitialisés que manuellement après le risque a été évalué et éliminé.**
	**The optional Modbus TCPIP communications output is not to be used as the primary safety indication of measured oxygen levels to the gas alarm management system. The Modbus TCPIP option is provided for diagnostics and secondary indication of detector status only.** **The primary safety indication of measured oxygen is provided by the mA output and status relays.** **La sortie de communication Modbus TCPIP option ne doit pas être utilisé comme une indication de sécurité primaire des niveaux d'oxygène mesurées dans le système de gestion des alarmes de gaz. L'option Modbus TCPIP est prévu pour le diagnostic et l'indication secondaire de l'état du détecteur seulement.** **L'indication de la sécurité primaire d'oxygène mesurée est fourni par la sortie et état relais mA.**

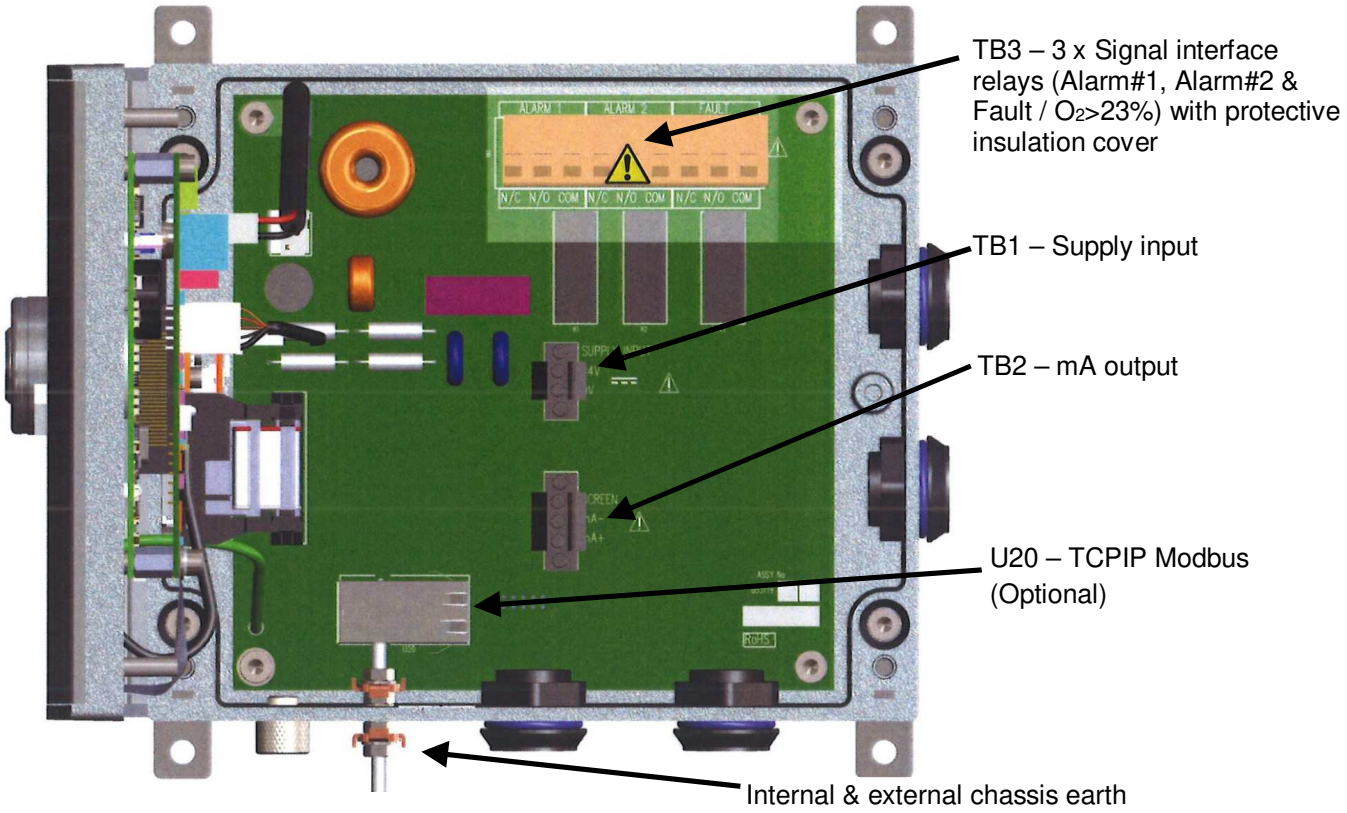


Figure 12 - Electrical connections

6.2.3 Connect the electrical supply

⚠	**The terminals of all equipment connected to the OxyDetect by the user shall be separated from mains voltages by at least reinforced insulation.** **Les bornes de tous les équipements connectés à l'OxyDetect par l'utilisateur doivent être séparés des tensions d'alimentation par une isolation au moins renforcée.**
⚠	**Make sure that the electrical supply voltage shown on the rating label is correct for the available electrical supply. Do not install the equipment if the incorrect voltage is shown and contact Servomex or your local Servomex agent immediately.** **Assurez-vous que la tension d'alimentation électrique indiqué sur l'étiquette de note est correcte pour l'alimentation électrique disponible. Ne pas installer l'appareil si la tension incorrecte est affiché et contacter Servomex ou votre agent Servomex locale immédiatement.**

	**Ensure that your external electrical supply outlet is isolated and locked out before you connect the conductors in the electrical supply cable.** **Assurez-vous que votre prise d'alimentation électrique externe est isolé et verrouillé avant de connecter les conducteurs dans le câble d'alimentation électrique.**
	**Make sure that the dc power for the OxyDetect is not derived directly from an ac supply that is rated at more than 253 Vac.** **Assurez-vous que l'alimentation en courant continu pour le OxyDetect ne proviennent pas directement d'une alimentation en courant alternatif qui est évalué à plus de 253 Vac.**
	**Make sure that the dc power for the OxyDetect is suitably approved for the environment in which it is to be installed and used.** **Assurez-vous que l'alimentation en courant continu pour le OxyDetect est convenablement approuvé pour l'environnement dans lequel il doit être installé et utilisé.**
	**The OxyDetect milliamp and MODBUS screens are connected to the instrument enclosure by design. In order to prevent large ground loops the 24Vdc PSU should be installed as close as possible to the OxyDetect and good electrical installation practice followed.** **L'alimentation OxyDetect 0V (TB1-2) est relié à l'enceinte de l'instrument par la conception . Afin d'éviter grand terrain boucle le 24V PSU doit être installé aussi près que possible de la OxyDetect et de bonnes pratiques d'installation électrique suivie.**

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.

Assurez-vous que l'instrument est adapté pour une utilisation avec votre alimentation électrique. Si l'instrument ne convient pas, l'instrument peut ne pas fonctionner correctement, ou il peut être endommagé lorsque vous utilisez il.

1. Connect the wires in your cable to the screw terminals on TB1 see Figure 12.

Terminal	Use
TB1-1	+24V dc
TB1-2	0V dc

Table 1 – Electrical supply connection

TB1 dc power supply connection cable specifications	
Cable type	Unscreened
Number of cores required	2
Rating (temperature)	+5 °C to +45 °C (+41 °F to +113 °F)
Flammability rating	VW-1
Approvals	Relevant to local requirements
Cable external diameter	Within the range specified for the selected cable gland
Conductors	0.2 to 2.5mm^2 / 26 to 12 AWG Strip length 7mm
Terminal screws	0.4 to 0.5 Nm tightening torque
Screwdriver blade	0.6 x 3.5, PH 0, PZ 0

Table 2 - TB1 dc power supply connection cable specifications

6.2.4 Analogue output connections

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

Les bornes de tous les équipements connectés à l'OxyDetect par l'utilisateur doivent être séparés des tensions d'alimentation par une isolation au moins renforcée.

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

Pour répondre aux exigences CEM, paire câbles blindés torsadés doivent être utilisés pour connecter les sorties analogiques.

1. Connect the wires in your cable to the screw terminals on TB2 see Figure 12.

Terminal	Use
TB2-1	Screen
TB2-2	mA -
TB2-3	mA +

Table 3 - Analogue Output connections

TB2 mA output connection cable specifications	
Cable type	Screened
Number of cores required	2 (plus screen)
Rating (temperature)	+5 °C to +45 °C (+41 °F to +113 °F)
Flammability rating	VW-1
Approvals	Relevant to local requirements
Cable external diameter	Within the range specified for the selected cable gland
Conductors	0.2 to 2.5mm^2 / 26 to 12 AWG Strip length 7mm
Terminal screws	0.4 to 0.5 Nm tightening torque
Screwdriver blade	0.6 x 3.5, PH 0, PZ 0

Table 4 - TB2 mA output connection cable specifications

6.2.5 Interface Relay connections

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

Les bornes de tous les équipements basse tension relié à la OxyDetect par l'utilisateur doivent être séparés des tensions d'alimentation par une isolation au moins renforcée.

The detector comes with a fault / O_2 >23% relay and two user configurable alarm status relays. These can be used to provide an output to your alarm management system to indicate a fault condition within the detector, high measurement level >23% O_2, or to indicate a user configurable measurement alarm (1 or 2) has been raised.

1. Connect the wires in your cable to the screw terminals on TB3 see Figure 12. It is necessary to remove the polycarbonate protective cover to access the terminal block by releasing the M5 x 20mm screw. On completion of electrical connections the polycarbonate cover should be replaced. The screw should be tightened to a torque of 0.8Nm.
2. TB3 – 7 & 9 are connected during a fault condition. TB3 – 8 & 9 are connected when no fault is present. During a power failure the fault relay will be in a fault condition (failsafe).
3. TB3 – 1 & 3 are connected if measurement alarm 1 is active.
4. TB3 – 4 & 6 are connected if measurement alarm 2 is active.

Relay	Signal	Terminal pin	Use
Alarm 1*	N/C	TB3 – 1	**Closed** indicates an alarm condition
	N/O	TB3 – 2	**Open** indicates an alarm condition
	COM	TB3 – 3	Common
Alarm 2*	N/C	TB3 – 4	**Closed** indicates an alarm condition
	N/O	TB3 - 5	**Open** indicates an alarm condition
	COM	TB3 – 6	Common
Fault *	N/C	TB3 – 7	**Closed** indicates a fault condition
	N/O	TB3 – 8	**Open** indicates a fault condition
	COM	TB3 – 9	Common

*As default the relays are configured 'Fail Safe', i.e. is permanently energised in normal operation, de-energised in fault or alarm conditions.

Table 5 - Interface relay connections

TB3 Relay output connection cable specifications	
Cable type	Unscreened
Number of cores required	2 to 6 cores as required
Rating (temperature)	+5 °C to +45 °C (+41 °F to +113 °F)
Flammability rating	VW-1
Approvals	Relevant to local requirements
Cable external diameter	Within the range specified for the selected cable gland
Conductors	0.2 to 2.5mm^2 / 26 to 12 AWG Strip length 10mm
Terminal screws	0.4 to 0.5 Nm tightening torque
Screwdriver blade	0.6 x 3.5, PH 0, PZ 0

Table 6 – TB3 Relay output connection cable details

6.2.6 Modbus Ethernet connection (option)

The digital communications terminals are separated from the analyser main circuit by reinforced insulation. The terminals must only be connected to circuits that are themselves separated from mains voltages by an isolation method that provides at least this level of protection.

Les terminaux de communication numériques sont séparés du circuit principal analyseur par une isolation renforcée. Les bornes ne doivent être raccordés à des circuits qui sont eux-mêmes séparés des tensions d'alimentation par une méthode d'isolement qui fournit au moins ce niveau de protection.

The instrument can be supplied with Ethernet digital communications as an option. For a full list of what can be communicated over the Modbus communications see Appendix 13A3.

If Modbus Ethernet option is supplied:

1. The cable should not leave the building in which it is installed without suitable isolation.
2. The cable must be shielded CAT5E with standard RJ45 connectors.

6.3 Switch on/set-up

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

Assurer la porte de l'appareil est fermé et vis serrée avant l'appareil est alimenté.

☞ 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.

☞ If the detector has been unpowered for a period of time longer than 1 week, then it may be necessary to reset the date and time in order to clear the initial *date/time invalid* fault condition. See section 6.3.6.

When you switch on the electrical supply to the instrument, a 'start-up screen' is first displayed (see Section 5.2), and then the measurement screen (Figure 6) is displayed.

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

6.3.1 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.

6.3.2 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 5.6) 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 14), with the currently selected security level highlighted.

Figure 13 - The security level screen

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 14), with the currently selected security level highlighted.
6. Press the soft key twice to display the menus screen again.

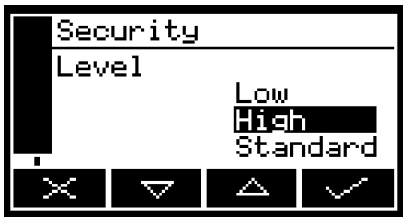


Figure 14 - The security select screen

6.3.3 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 5.10.
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 15 - The edit supervisor password screen

6.3.4 Adjusting the screen contrast

In poor ambient lighting conditions the screen contrast can be adjusted so that the display is at maximum clarity to the user.

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 16 - The contrast screen

☞ Hold the ▲ or ▼ soft key pressed in to adjust the contrast quickly.

6.3.5 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 pre-set '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).

Note: The OxyDetect is factory configured for the backlight to remain on continuously (000). Should the end user require the backlight to switch off after a timed period of inactivity please follow the procedure as described below.

To adjust the backlight time:

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

Figure 17 - 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.

6.3.6 Setting the clock

☞ The time and date will remain set for approximately 1 week if the power supply to the instrument is switched off. After this period, it will be necessary to reset the date and time in order to clear the *date/time invalid* fault condition.

Use the following procedure to set the date and time:

1. Select ⇨Settings ⇨Clock.
2. Edit the displayed time as described in Section 5.10.

Figure 18 - The clock 9time) screen

3. Edit the displayed date as described in Section 5.10.
4. The date format can be set to your regional preference ('day/month/year' or 'month/day/year'): refer to Section 6.3.7.

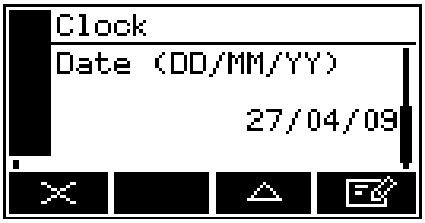


Figure 19 - The clock (date) screen

6.3.7 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 20 - The regional settings (language) option screen

6.4 Configuring and using the mA outputs (option)

6.4.1 Overview

The instrument is supplied factory configured with a 4-20mA output scaled 0-25% for the gas measurement on both range 1 & 2.

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 6):

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 6.4.2. Set up, configure, check, calibrate and use the mA outputs as described in Section 6.4.4.

6.4.2 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

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.

Pour éviter les modifications accidentelles entre la plage et la plage 1 2 ils doivent être réglés au même niveau. Range 1 doit être utilisé et la possibilité de basculer entre les gammes mot de passe protégé.

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.

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

La condition mA Jam devrait être réglé à basse afin que le système de surveillance permet de détecter les défauts d'instrument.

6.4.3 Setting up the mA output parameters

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

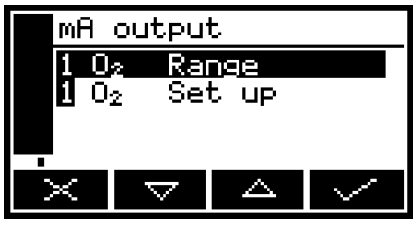


Figure 21 -The mA configuration screen (one measurement instrument)

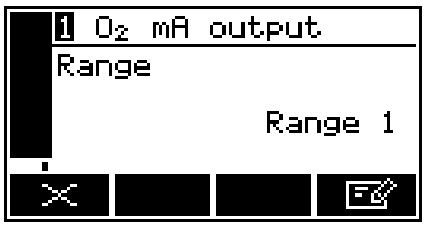


Figure 22 - The mA range screen

3. Return to the mA configuration screen (Figure 21) and select 'Set up' option.
4. Edit the range high level and low level.

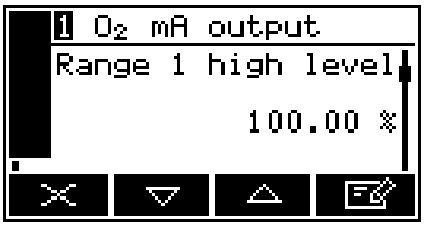


Figure 23 - The mA output high level screen

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

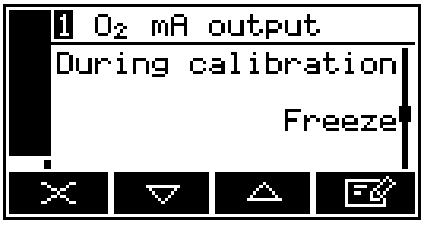


Figure 24 - The during calibration screen

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

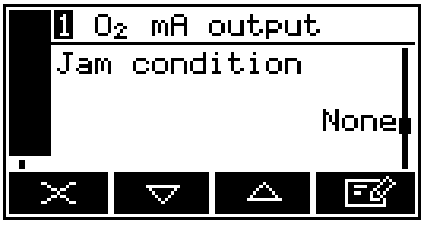


Figure 25 - The jam condition screen

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

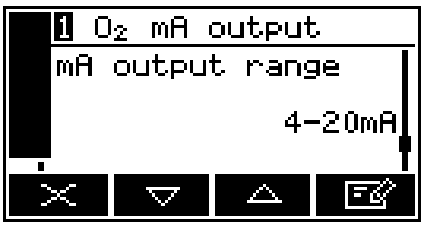


Figure 26 - The mA output range screen

8. You can then select the under range value. An under range setting of 4 mA means there is effectively no under range.

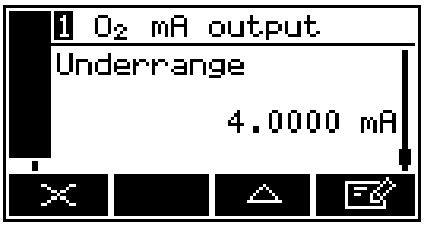


Figure 27 - The mA under range screen

6.4.4 Calibrating the mA output

Use the following procedure to calibrate the mA output:

1. Select ⇨ Service ⇨ mA output.

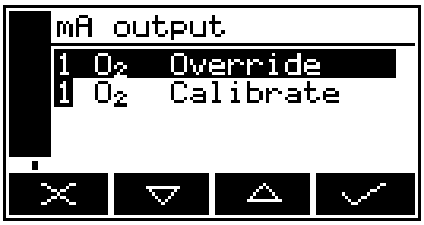


Figure 28 - The mA output service screen

2. Select the required 'Calibrate' option.

Figure 29 - 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 28) 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.

6.5 Configuring the measurement alarms

6.5.1 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 pre-set alarm level *
High alarm	An alarm condition will be activated when a sample measurement is higher than the pre-set alarm level *

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

☞ The OxyDetect alarm levels are pre-set in the factory as follows;

ALARM 1, Low alarm, 19.5%, Non-latching, hysteresis 0.5%.

ALARM 2, Low alarm, 18.0%, Latching, hysteresis 0.5%.

Refer to Appendix 13A2 if settings are changed.

While a measurement alarm condition is activated:

- An 'alarm' icon is shown on the measurement screen (see Section 5.2). The number ("1" or "2") in the icon will identify the alarm which has been triggered.
- The red alarm LED on the front of the instrument (see Figure 1) flashes on and off.
- The associated relay will de-energise to signal measurement alarm condition.

You can view the details of the activated alarm: see Section 6.5.4.

☞ 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.

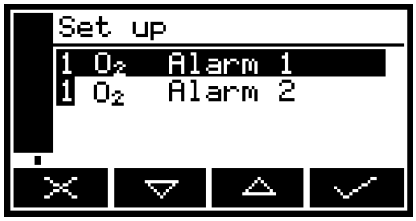


Figure 30 - The alarm set up screen

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

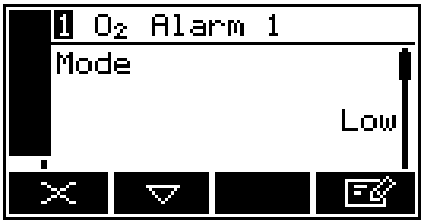


Figure 31 - The alarm mode screen

4. Scroll up or down to edit the appropriate settings (using the method described in Section 5.10):
   - Latching (Section 6.5.2)
   - Level (sets the gas concentration level at which the alarm is to trigger)
   - Hysteresis (Section 6.5.3).

The measurement alarm(s) has a 'Follow' option:

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

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

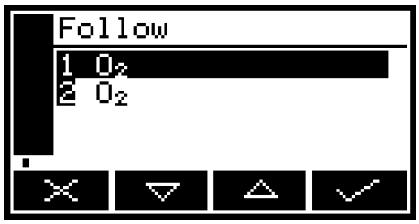


Figure 32 - The alarm follow screen

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

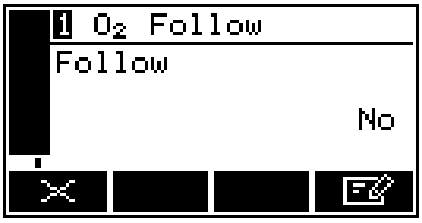


Figure 33 - The alarm follow options screen

6.5.2 Latching/non-latching alarms

You can configure the 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 using the instrument user interface.
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 34) 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

6.5.3 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 19% and a hysteresis level of 0.5%, the alarm will be activated when a sample measurement is < 19%, and the alarm will not be deactivated until a sample measurement is > 19.5%.
- If a 'high' alarm has an alarm level of 23% and a hysteresis level of 1%, the alarm will be activated when a sample measurement is > 23%, and the alarm will not be deactivated until a sample measurement is < 22%.

6.5.4 Viewing the measurement alarm status

1. Select 🔔 ⇨ View.
2. In the alarm status screen shown in Figure 34, 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.

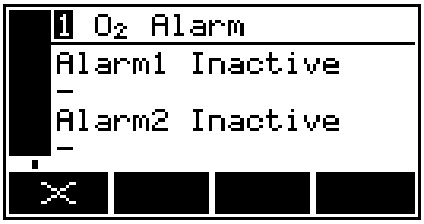


Figure 34 - The alarm status screen

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.

7 CALIBRATION

During calibration it is good practice to perform a low (Lo) calibration followed by a high (Hi) calibration.

Lors de l'étalonnage, il est de bonne pratique pour effectuer une (Lo) calibration bas suivi d'un étalonnage haute (Salut).

It is recommended that calibration gas flow is monitored or routinely checked to ensure a representative sample is being supplied to the instrument.

Il est recommandé que le flux de gaz d'étalonnage est contrôlé ou vérifié régulièrement pour assurer un échantillon représentatif est fourni à l'instrument.

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.

Pendant la première semaine de l'opération de mesure de l'instrument peut dériver légèrement plus que dans les semaines suivantes. Il est recommandé qu'au démarrage initial de l'instrument est laissé à stabiliser pendant 1 heure et calibré, puis calibrée après une semaine de fonctionnement et un étalonnage de routine tous les trois mois. Selon l'expérience du site cet intervalle de routine final peut être prolongé jusqu'à un maximum de six mois.

The instrument should be calibrated after a power cycle to ensure correct operation.

L'instrument doit être étalonné après un cycle d'alimentation pour assurer un fonctionnement correct.

The calibration gases must be clean, non-corrosive, free from oil and condensates.

Les gaz d'étalonnage doivent être propres, non corrosif, exempt d'huile et de condensats.

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.

Les gaz d'étalonnage doivent être semblables à température ambiante à la température de l'instrument. Gaz prises à partir d'un emplacement de stockage froid ou à chaud devraient être autorisés chaude ou froide avant de l'utiliser.

For optimal performance the instrument should be calibrated if exposed to temperature swings of greater than 10 °C (18 °C).

Pour une performance optimale de l'instrument doit être étalonné si elle est exposée aux fluctuations de température de plus de 10 °C (18 °C).

It is recommended the instrument is recalibrated if it suffers a shock such as an accidental knock or impact.

Il est recommandé de recalibrer l'instrument s'il subit un choc tel qu'un choc ou un impact accidentel.

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.

7.1 Connecting the calibration gas cap

	**Low calibration gases are asphyxiants:** **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.** **Gaz à faible d'étalonnage est asphyxiant:** **Assurez-vous que l'instrument est utilisé dans un environnement suffisamment bien aéré, pour éviter l'accumulation de gaz asphyxiant.** **Veiller à ce que les tuyaux que vous connectez à l'instrument sont acheminés pour qu'ils ne présentent pas de danger pour les personnes.**
	**<u>Always</u> 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.** **Toujours retirer le capuchon de calibrage après usage de quitter la buse avant libre de toute restriction. Ne pas retirer le bouchon de calibrage sera entraver le fonctionnement des instruments et d'augmenter considérablement le temps de réponse des instruments.**

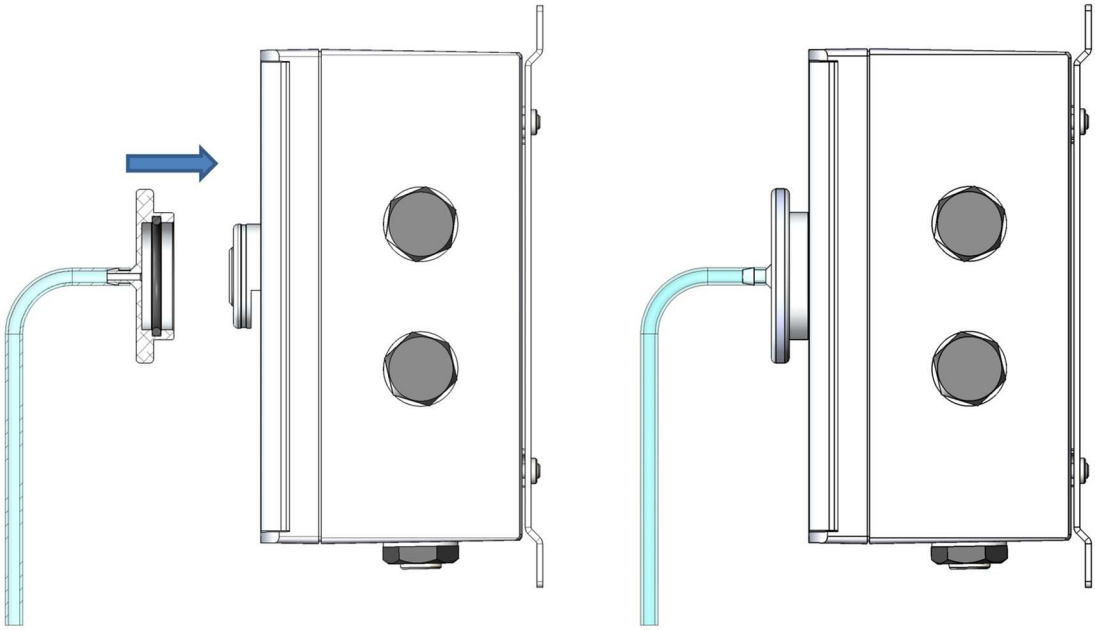


Figure 35 - Calibration gas cap connection

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 to stabilise before you calibrate the instrument.

7.2 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.

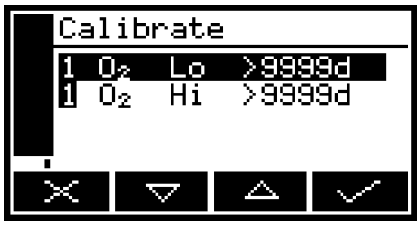


Figure 36 - The calibrate screen

Note that the "9999d" field of the screen shown in Figure 36 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.

Use the ▲ and ▼ soft keys to select the required calibration, that is:

- 'Lo' (low calibration gas).
- 'Hi' (high calibration gas).

3. Press the ✓ soft key. The Calibrate target value screen will then be shown (see Figure 37), identifying the target value and the current reading.

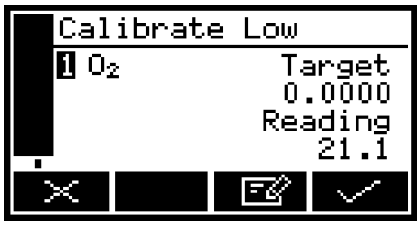


Figure 37 - The calibrate target value screen

4. 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 5.10.
5. 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.
6. Repeat steps 1 to 8 of this section for the second calibration.
7. Press the ✕ soft key to display the measurement screen again.

8 ROUTINE MAINTENANCE

8.1 Inspecting the calibration cap

Before each use inspect the calibration cap and its internal o-ring for signs of wear or damage. 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.

8.2 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 5.10.
4. Press the soft key: an acceptance screen showing "No" will then be displayed. Select "Yes" to apply the override.

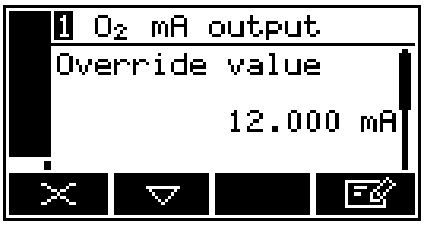


Figure 38 - The mA override screen

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.

8.3 Checking the relays

If required, use the following procedure at any time to perform a check on the outputs of the signal relays fitted to the analyser:

1. Select ⇨ Service ⇨ Relay.
2. Figure 39 shows the relay state (energised or de-energised) that the relay signals outputs will be set to when the override is active. Edit if required.

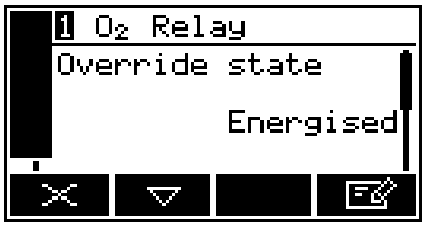


Figure 39 - The relay override state screen

☞ When a relay is energised, the N/C-Common contacts will be open, and the N/O-Common contacts will be closed. The converse is true when the relay is de-energised.

3. Scroll to the relay override screen (0).
4. Select the 'Yes' option, then press the ✓ soft key. The relay outputs will now be set to the selected override state, and you can use your control/monitoring equipment (connected to the analyser) to monitor the relay signal outputs.

Figure 40 - The relay override action screen

☞ The relay signal outputs freeze at the selected override signal state as long as the 'Override action' screen is displayed. As soon as another screen is displayed, the relay signal outputs will be updated to reflect the corresponding alarm, fault and range states.

8.4 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).

8.5 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.

9 FAULT FINDING

9.1 Fault, maintenance required and SIP statuses

9.1.1 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.

9.1.2 Status annunciations

Condition	LCD Icon	LED annunciation	Relay annunciation
Fault	⚠	Amber fault LED	Fault relay deenergised
Maintenance	🔧	None	none

☞ The LCD icons are displayed on the measurement screen only (see Figure 6).

Message	Measurement screen icon	Recommended actions
Calibration fault	🔧	Recalibrate (both low and high) as described in Section 7, 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.
Reading too high	⚠	Recalibrate (both low and high) as described in Section 7. If the fault persists, contact Servomex or your local Servomex agent for assistance.

Message	Measurement screen icon	Recommended actions
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 6.3.6. 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.
Relays 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.
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.

Message	Measurement screen icon	Recommended actions
Transducer error	⚠	Ensure that you are using the instrument in the specified operating conditions (refer to Section 3). 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 7. 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.

9.2 Viewing messages

9.2.1 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.

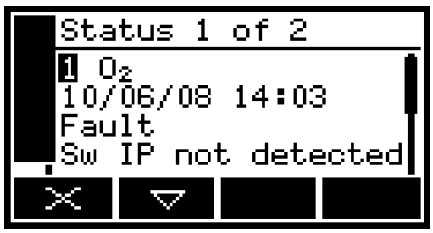


Figure 41 - The message status screen

3. Refer to Section 9.1 for the recommended actions associated with the displayed messages.

9.2.2 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".

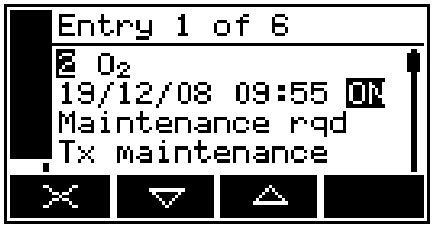


Figure 42 - The message status screen

Refer to Section 9.1 for the recommended actions associated with the displayed messages.

☞ A maximum of 100 status messages can be stored.

9.3 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 9.2), and carry out the recommended actions (see Section 9.1). 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.

Fault symptom	Recommended actions
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. Note this fault symptom may be displayed for 2-3 seconds at start-up. This is whilst communications to the transducer is first established.
Instrument measurement 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.
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 6.2. 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 3.2. Check that the display contrast adjustment has been correctly set (refer to Section 6.3.4), and has not been altered.

Fault symptom	Recommended actions
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 6.5.
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 6.4.4). Check that you have selected the correct Range (see Section 6.4).
A relay signal output is not as expected.	Check that the signal cable is correctly connected to the analyser: refer to Section 6.2.5.

10 STORAGE AND DISPOSAL

10.1 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 3.2.

10.2 Disposal

Dispose of the instrument and any associated equipment safely, and in accordance with all your local and national safety and environmental requirements. Refer to Appendix 12 where WEEE directive is applicable.

☞ 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.

11 SPARES

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.

Ne pas utiliser de pièces de rechange autres que celles spécifiées ci-dessous, et ne tentez pas d'effectuer les procédures de maintenance autres que celles spécifiées dans ce manuel. Si vous le faites, vous risquez d'endommager l'appareil et annuler la garantie.

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 2A / 250 V size: 20 x 5 mm)	S5311902

12 DISPOSAL IN ACCORDANCE WITH THE WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE) DIRECTIVE

The label shown in Figure A1 is fitted to the analyser.

Figure A1 – The WEEE label

This label identifies that:

- The analyser is considered to be within the scope of the Waste Electrical and Electronic Equipment (WEEE).
- The analyser is not intended for disposal in a municipal waste stream, but shall be submitted for material recovery and recycling in accordance with the local regulations which implement the WEEE Directive.

For additional information and advice on the disposal of the analyser in accordance with the requirements of the WEEE Directive, contact Servomex or your local Servomex agent.

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

13 APPENDIX

A1 PERFORMANCE DATA

☞ Performance data has been determined in accordance with EN61207.

Display indication	% O_2
Measurement range limits	0 to 25% O_2 (Safe area installations)
	0 to 21% O_2 (Hazardous area installations)
Intrinsic error (accuracy)	<± 0.2% O_2*
Response time (T10)	<6 seconds
Response time (T63)	<30 seconds
Response time (T90)	<75 seconds
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

*An additional error of up to 0.2% O2 may be observed at some frequencies under the influence of radiated RF fields specified for industrial environments.

A2 Factory Configuration settings

☞ The OxyDetect is factory configured with parameters typical for an oxygen deficiency detector (measurement alarms 1 & 2 and the mA output). The end user is able to adjust these settings to suit the specific requirements of the gas alarm system as detailed in section 6. If adjustments are made they should be noted in the column space provided for future reference.

Factory set parameters

OxyDetect serial number		
Installation location		
Measurement alarm 1	**Factory Setting**	**As Installed**
Mode	Low	
Latching	No	
Level	19.5%	
Hysteresis	0.5%	
Measurement alarm 2	**Factory Setting**	**As Installed**
Mode	Low	
Latching	Yes	
Level	18.0%	
Hysteresis	0.5%	
Milliamp output	**Factory Setting**	**As Installed**
mA Range	4 – 20mA	
Range 1	0 – 25%	
Range 2	0 – 25%	
Jam condition	Low	
Display Backlight	**Factory Setting**	**As Installed**
Time	000 (always on)	

Installation notes

A3 IMPLEMENTATION GUIDE FOR MODBUS ETHERNET COMMUNICATIONS (OPTION)

A3.1 Introduction

This appendix details the implementation and use of the Modbus protocol in the Servomex OxyDetect.

A3.2 References

Document "MODBUS over Serial Line Specification & Implementation guide V1.0 Nov 02" Modbus web site modbus.org.

A3.3 Supported function codes

For simplicity, only the following function codes will be supported.

Function	Description	Usage
01	Read coils	Read calibration status, etc.
02	Read discrete inputs	Read faults and alarm states.
03	Read holding registers	Read settings.
04	Read input registers	Read measurements, units, etc.
05	Write single coil	Change modes, perform calibration etc.
06	Write single register	Change single setting.
08	Sub Function 00 = Return query data	Diagnostic to test communications.
16	Write multiple registers	Change multiple settings.

A3.4 Exception codes

If an error should occur while processing a message one of the following exception codes will be returned by the instrument.

Code	Condition	Meaning
01	Illegal function	Requested function code is not supported.
02	Illegal data address	The combination of data address and transfer length is invalid for this function.
03	Illegal data value	A value contained in the query data field is not an allowable value. This indicates a fault in the structure of the remainder of a complex request.

		This does NOT mean that a value to be stored in a register is incorrect as Modbus has no means of determining what is legal for any particular register.
04	Slave device failure	An unrecoverable error occurred while the unit was attempting to perform the requested action.

A3.5 Addressing

Addresses in Modbus ADU (application data unit), run from 1 – N, whereas addresses in the Modbus PDU (protocol data unit) run from 0 – N. This appendix gives addresses in the ADU model. Depending on the particular Modbus master, addresses may have to be entered as they are given or have 1 subtracted from them. For example to read register 101 an address of 100 may be needed.

A3.6 Floating point numbers

Floating point numbers (e.g. 12.34, –1012.32, etc.), are digitally represented using the IEEE–754 format. Single precision floating point numbers are used throughout, and they require 32 bits of data. Since a Modbus register holds 16 bits it takes 2 registers to represent a floating-point number. We default to having the most significant word of the float, bits 16 – 31, in the first register, and the least significant word, bits 0 – 15, in the next register. This order can be reversed by setting a coil in the system control mapping (Appendix A3.13).

A3.7 System data mapping

Read-only access to system data will be provided in a block of 100 registers. These can be accessed as input registers using function code 04.

Register	Name	Comments
1 – 7	Serial number	ASCII text, 14 characters max, terminated by a zero.
8 – 15	Software version	ASCII text, 16 characters max, terminated by a zero.

A3.8 Transducer data mapping

The transducer will provide read-only access to its measurements and associated data in blocks of input registers that can be read with function code 04.

The first block of registers provides just the measurement data from all transducers allowing all measurements to be obtained with a single request. Each register provides 2 bytes of data, so it takes 2 registers each to store a 4 byte floating point measurement value.

Register	Name	Comments
5001 – 5002	Transducer 1	Floating point number

A block of 100 registers is allocated for the transducer to provide the means of supplying the measurement and other transducer related data as follows:

Register	Name	Comments
101 – 200	Transducer 1	Measurements and data for each transducer

The following table shows the assignment for transducer 1. Each register provides 2 bytes of data.

☞ Greyed out registers are not relevant to the OxyDetect operation and should not be used in communications.

Register	Name	Comments
101 – 102	Measurement	As seen on the measurement display. Floating point number.
103 – 104	Filtered measurement	Basic measurement, filtered. Floating point number.
105 – 106	Pressure compensated measurement	Filtered and pressure compensated measurement. Floating point number.
107 – 108	PMR	Primary measurement range.
109	Warming state	0 = not warming, 1 = warming.
110 – 112	Formula	Gas formula. ASCII text, 5 characters max, terminated by a zero.
113 – 116	Units	Measurement units. ASCII text, 7 characters max, terminated by a zero.
117	Auto val state	0 = idle, 1 = pre-warning, 2 = inerting, 3 = flushing, 4 = validating/calibrating.
118	Auto val gas	0 = low gas, 1 = high gas, 2 = sample gas.
119	Auto val finishing	0 = not finishing, 1 = finishing.
120	Auto val fail state	0 = auto validation OK, 1 = auto validation. failed
121	Active analogue output range	0 = range 1, 1 = range 2.
122	Flow	Current flow through the sample line in percent.

A3.9 System Fault Mapping

Read-only access to system fault information will be provided in a block of 100 registers. These can be accessed as discrete inputs using function code 02 or as input registers using function code 04. Reading them as discrete inputs provides a simple bit result for each, 0 for off and 1 for on. Reading them as input registers provides information on their NAMUR status, as follows:

- 0 = off
- 1 = fault
- 2 = maintenance required
- 3 = service in progress

The fault, maintenance required, and service in progress faults provide a summary of the other states and can only be off or on. The registers are assigned as follows:

Register	Name	Comments
1001	Fault	If any system fault exists.
1002	Maintenance required	If any system maintenance required status exists.
1003	Service in progress	If any system service in progress status exists.
1004	Charging time out	The batteries have taken too long to charge.
1005	Date/Time invalid	System clock needs setting.
1006	Code fault	The programmed software has become corrupted.
1007	Database fault	A fault occurred when using the database.
1011	Power configuration fault	Incorrect power type configured.
1012	Static RAM fault	A fault in the internal memory has been detected.

A3.10 Transducer fault and alarm mapping

Read-only access to transducer fault and alarm information will be provided in a block of 100 registers and coils. These can be accessed as discrete inputs using function code 02 or as input registers using function code 04. Reading them as discrete inputs provides a simple bit result for each, 0 for off and 1 for on. Reading them as input registers provides information on their NAMUR status, as follows:

- 0 = off,
- 1 = fault,
- 2 = maintenance required,
- 3 = service in progress.

Alarm 1 and alarm 2 aren't faults and can only be off or on.

The fault, maintenance required, and service in progress faults provide a summary of the other states and can only be off or on.

The registers are assigned as follows:

Register	Name	Comments
1101 – 1200	Transducer 1	Measurements and data for transducer 1

Each input within the block for transducer 1 is assigned as follows:

Register	Name	Comments
1101	Alarm 1	Alarm 1 is active or latched.
1102	Alarm 2	Alarm 2 is active or latched.
1103	Fault	If any transducer fault exists.
1104	Maintenance required	If any maintenance required status exists.
1105	Service in progress	If any service in progress status exists.
1106	Transducer maintenance fault	Internal transducer fault.
1107	Transducer error	Internal transducer fault.
1108	Transducer fatal fault	Internal transducer fault.
1109	Heater fault	Transducer heating has failed.
1110	Sample heater fault	Transducer sample heating has failed.
1111	Calibration fault	Transducer needs calibrating.
1112	Communication fail	Transducer not responding.

Register	Name	Comments
1113	Incorrect transducer type	Incorrect type of transducer fitted.
1114	Transducer not detected	Transducer is unplugged or broken.
1115	Low calibration fail	Auto cal low failed.
1116	High calibration fail	Auto cal high failed.
1117	Low validation fail	Auto val low failed.
1118	High validation fail	Auto val high failed.
1119	Remote low cal denied	Remote low calibration denied.
1120	Remote high cal denied	Remote high calibration denied.
1121	mA fault	Hardware fault detected.
1122	mA not detected	Card is missing or the incorrect type has been fitted.
1123	mA reset	A time out occurred on the milliamp card.
1124	Volt fault	Hardware fault detected.
1125	Volt not detected	Card missing or the incorrect type has been fitted.
1126	Volt reset	A time out occurred on the volt card.
1127	Pressure calibration	Pressure needs calibrating.
1128	Pressure fail	Hardware fault detected.
1129	Pressure low	Pressure low fault.
1130	Pressure high	Pressure high fault.
1131	Relay not detected	Card missing or incorrect type has been fitted.
1132	Switch input not detected	Card missing or incorrect type has been fitted.
1133	Flow fail	Hardware fault detected.
1134	Low flow alarm 1	Flow is below is below the low flow 1 alarm level
1135	Low flow alarm 2	Flow is below is below the low flow 2 alarm level
1136	Remote service in progress	Switch input has activated service in progress.
1137	Transducer calibration mode	Calibration mode is active.

Register	Name	Comments
1138	Auto validation/calibration.	Sequence is in progress.
1139	mA service in progress	Calibration or override in progress.
1140	Volt service in progress	Calibration or override in progress.
1141	Pressure service in progress	Calibration in progress.
1142	Relay service in progress	Override in progress.
1143	Flow service in progress	Calibration in progress.
1144	No Profibus module	Hardware fault or card missing
1145	High flow alarm	Flow is above the high flow alarm level
1146	Flow temperature fault	Flow hardware has a temperature fault
1147	Flow cal high diff	Zero and normal flow calibration points are too far apart
1148	Flow cal low diff	Zero and normal flow calibration points are too close together
1149	Transducer error	Transducer error
1150	Temperature fault	Temperature fault

A3.11 System set-up mapping

System data will be available with read-write access in blocks of holding registers. This data can be read with function code 03 and written with function codes 06 and 16.

Register	Name	Comments
Clock		
1	Year	0 – 99
2	Month	1 – 12
3	Date	1 – 31
4	Hour	0 – 23
5	Minute	0 – 59
6	Second	0 – 59
Calibration set up		
7	Linked	0 = no, 1 = yes.
Switch input		
8	Switch input function	0 = disabled, 1 = remote cal, 2 = auto val.

A3.12 Transducer set-up mapping

Each transducer will provide read-write access to various set-up data in blocks of holding registers that can be read with function code 03 and written with function codes 06 and 16.

Each register provides 2 bytes of data so it takes 2 registers each to store a 4 byte floating point measurement value.

A block of 100 registers is allocated for each transducer to provide the means of supplying the transducer related set-up data as follows:

Register	Name	Comments
101 – 200	Transducer 1	Transducer 1 related data.

The following table shows the assignment for transducer 1. Each register provides 2 bytes of data.

Register	Name	Comments
Analogue Output		
101 – 102	Range 1 low	Float.
103 – 104	Range 1 high	Float.
105 – 106	Range 2 low	Float.
107 – 108	Range 2 high	Float.
109	Range mode	0 = range 1, 1 = range 2, 2 = auto range.
110	Freeze	0 = Follow, 1 = Freeze.
111	Jam	0 = None, 1 = low, 2 = high.
112	Output range	0 = 0 – 20 mA, (0 – 10 V), 1 = 4 – 20 mA.
113 – 114	Under range	Float.
Calibration		
121 – 122	Low target	Float. Also calibration target.
123 – 124	Low tolerance	Float.
125 – 126	High target	Float. Also calibration target.
127 – 128	High tolerance	Float.
Alarm set up		
145	Alarm 1 mode	0 = none, 1 = low, 2 = high.
146	Alarm 1 latching	0 = no, 1 = yes.

Register	Name	Comments
147 – 148	Alarm 1 level	Float.
149 – 150	Alarm 1 hysteresis	Float.
151	Alarm 2 mode	0 = none, 1 = low, 2 = high.
152	Alarm 2 latching	0 = no, 1 = yes.
153 – 154	Alarm 2 level	Float.
155 – 156	Alarm 2 hysteresis	Float.

A3.13 System control

System control will be provided using a block of coils that can be written to using function code 05. Reading the same coils with function code 01 provides status information.

Coil	Name	Comments
1	Floating point order	Changes the order of the Modbus registers when dealing with 32-bit floating point numbers. 0 = big-endian, e.g. 40001 = high word, 40002 = low word (default). 1 = little-endian, e.g. 40001 = low word, 40002 = high word.
2	User interface busy	0 = idle (on main screen), 1 = busy, user interface is in use. Write 1 to stop the user interface (keys) being used.

A3.14 Transducer control

Transducer control will be provided using a block of coils that can be written to using function code 05. Reading the same coils with function code 01 provides status information. A block of 100 coils is reserved for each transducer as follows:

Coil	Name	Comments
101 – 200	Transducer 1	

The coils for transducer 1 are shown in the following table:

Coil	Name	Comments
Measurement		
101	Calibration mode on/off	0 = off (normal), 1 = on (alarms masked, jamming etc). Write 1 to turn calibration mode on.
102	Low calibration gas	0 = sample gas, 1 = low calibration gas.
103	High calibration gas	0 = sample gas, 1 = high calibration gas.
104	Low calibrate	0 = idle, 1 = low calibration in progress. Write 1 to initiate low calibration.
105	High calibrate	0 = idle, 1 = high calibration in progress. Write 1 to initiate a high calibration.
Analogue output		
114	Calibration mode	0 = normal, 1 = calibration mode
115	Decrease output level	1 = step down
116	Increase output level	1 = step up
Relays		
117	Service mode	0 = normal, 1 = service mode
118	Relay state during service	0 = deenergised, 1 = energised
Remote service in progress		
119	Remote service in progress	0 = inactive, 1 = active

A4 CONFIGURING THE MODBUS PARAMETERS (OPTION)

If your analyser has the Modbus Ethernet output, you must configure the communications parameters to suit the requirements of the network to which you have connected the analyser.

The cable connections are shown in Section 6.2.

☞ All screen shots show the default setting.

These values are supervisor password protected. Your network administrator will advise you of the necessary parameters that will be required to be entered.

A4.1 TCP (Ethernet) Communications parameters

1. Select ⇨ Settings ⇨ Comms parameters.
2. The first screen requests the IP address, (always communicates in RTU mode). Use the and soft keys to select the correct value.

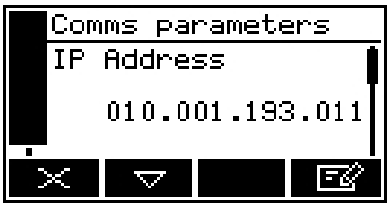


Figure A2 – Comms parameters IP address screen - example

☞ The IP address must be set to a unique value in the network.

3. Use the and soft keys to select the next parameter:
4. Subnet mask, sets the subnet mask for the network. A provisional mask is generated automatically by the control unit whenever a new IP address is entered that falls into a different class. The mask may then be altered manually if required by clicking soft key.

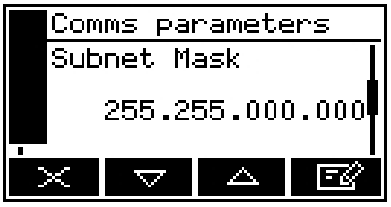


Figure A3 – Comms parameters subnet mask screen - example

5. Use the △ and ▽ soft keys to select the next parameter:
6. Gateway address, or router, allows communication to other LAN segments. The gateway address should be the IP address of the router connected to the same LAN segment as the unit. The gateway address must be within the local network.

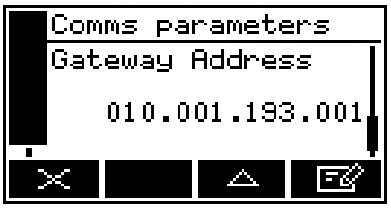


Figure A4 – Comms parameters gateway address screen - example

A5 CROSS INTERFERENCE OFFSETS

For a paramagnetic oxygen measurement, the composition of any typical background gas in the gas sample will have a small effect on the analyser oxygen measurement.

The following table gives 4 examples of cross-interference errors (O_2 measurement errors) in atmospheres which contain 100% of a specific background gas, for an analyser which has been 'Lo' calibrated with N_2 (nitrogen) and 'Hi' calibrated with 21% O_2 / balance N_2 (air), at 20 °C temperature.

Background gas	Error	Background gas	Error
Argon	–0.22%	Krypton	–0.49%
Carbon dioxide	–0.26%	Helium	+0.29%

Note that the error is directly proportional to the concentration of the background gas in the sample being measured, and in most cases can be ignored. Most gases will slightly reduce the measured oxygen concentration further than the actual reduction of oxygen levels caused by the displacement of oxygen in the atmosphere.

☞ Example: If you are measuring 21% O_2 (oxygen) in air (typical room atmosphere) and a leak of argon occurred reducing the oxygen levels by 3% in the local area, then the paramagnetic cell would measure the direct decrease in oxygen, plus a very small measurement offset caused by the argon now being present.

Before: 21% oxygen, 78% nitrogen, 1% argon

After: 18% oxygen, 67% nitrogen, **15% argon**,*

*quoted percentages rounded to simplify example.

The actual oxygen measurement would incur an additional measurement offset caused by the contribution of 14% argon gas. This can be calculated as ((-0.22 / 100) x 14) = -0.031%. The argon will further reduce the oxygen reading by -0.031%.

Therefore, the measured oxygen concentration would actually be reported by the OxyDetect as 18.0 – 0.031 = 17.97% O_2. In reality this measurement error caused by background gas effects is within the stated accuracy of the OxyDetect and below the resolution of the display, so though it should be considered, it can usually be discounted in most applications.

☞ A full list of cross-interference offsets (O_2 measurement errors) are given in Appendix A5. For the OxyDetect the offset should be taken from the 20 °C.

Pure Gas	Formula	Molar mag.susc x 10^{-6}	Cross interference offsets	
			Ambient Temperature	
			20 °C	50 °C
Acetaldehyde	CH_2CHO	–22.70	–0.31	–0.34
Acetic acid	CH_3CO_2H	–31.50	–0.56	–0.62
Acetone	CH_3COCH_3	–33.70	–0.63	–0.69
Acetylene	HCCH	–20.80	–0.25	–0.28
Acrylonitrile	CH_2=CHCN	–24.10	–0.35	–0.39
Allyl alcohol	CH_2CHCH_2OH	–36.70	–0.71	–0.79
Ammonia	NH_3	–18.00	–0.17	–0.19
Argon	Ar	–19.60	–0.22	–0.24
Benzene	C_6H_6	–54.84	–1.24	–1.36
Boron chloride	BCl_3	–59.90	–1.38	–1.53
Boron trifluoride	BF_3	–19.00	–0.20	–0.22
Bromine	Br_2	–73.50	–1.78	–1.96
1,2 Butadiene	C_4H_6	–35.60	–0.68	–0.75
1,3 Butadiene	C_4H_6	–30.60	–0.54	–0.59
N-Butane	C_4H_{10}	–50.30	–1.11	–1.22
iso-Butane	$(CH_3)_2CHCH_2$	–51.70	–1.15	–1.26
1 Butene	$CH_3CH_2CH=CH_2$	–41.10	–0.84	–0.93
N–Butyl acetate	$CH_3COOC_4H_9$	–77.50	–1.89	–2.09
iso–Butylene	$(CH_3)_2CH=CH_2$	–44.40	–0.94	–1.03
1 Butyne (Ethylacetylene)	$CH_3C_3H_2$	–43.50	–0.91	–1.00
Carbon dioxide	CO_2	–21.00	–0.26	–0.29
Carbon disulphide	CS_2	–42.20	–0.87	–0.96
Carbon monoxide	CO	–9.80	0.06	0.07
Carbon tetrachloride	CCl_4	–66.60	–1.58	–1.74
Carbon tetrafluoride	CF_4	–31.20	–0.55	–0.61
Chlorine	Cl_2	–40.50	–0.82	–0.91
Chloro ethanol	$ClCH_2CH_2OH$	–51.40	–1.14	–1.25
Chloroform	$CHCl_3$	–59.30	–1.37	–1.51
Cumene	$(CH_3)_2CHC_6H_5$	–89.53	–2.24	–2.47
Cyclohexane	C_6H_{12}	–68.13	–1.62	–1.79
Cyclopentane	C_5H_{10}	–59.18	–1.36	–1.50
Cyclopropane	C_3H_6	–39.90	–0.81	–0.89
Diacetylene	C_4H_2	–37.50	–0.74	–0.81
Dichloroethylene	$(CHCl)_2$	–49.20	–1.07	–1.18
Diethyl ether	$(C_2H_5)_2O$	–55.10	–1.25	–1.37
2,2 Difluoro 1 chloroethane	$CClH_2CHF_2$	–52.40	–1.17	–1.29
1,2 Difluoro 1,2 dichloroethylene	CFCl=CFCl	–60.00	–1.39	–1.53
Difluoro dichloro methane (Freon 12)	CCl_2F_2	–52.20	–1.16	–1.28
Dimethoxy methane	$CH_2(OCH_3)_2$	–47.30	–1.02	–1.12
Dimethylamine	$(CH_3)_2NH$	–39.90	–0.81	–0.89
Dimethylether	CH_3OCH_3	–26.30	–0.41	–0.46
Dimethylethylamine	$(CH_3)_2NC_2H_5$	–63.60	–1.49	–1.64

Pure Gas	Formula	Molar mag.susc x 10^{-6}	Cross interference offsets	
			Ambient Temperature	
			20 °C	50 °C
Enflurane (Ethrane)	$C_3H_2F_5ClO$	–80.10	–1.97	–2.17
Ethane	C_2H_6	–26.80	–0.43	–0.47
Ethanol	C_2H_5OH	–33.60	–0.62	–0.69
Ethyl acetate	$CH_3COOC_2H_5$	–54.20	–1.22	–1.34
Ethyl amine	$C_2H_5NH_2$	–39.90	–0.81	–0.89
Ethyl benzene	$C_6H_5C_2H_5$	–77.20	–1.88	–2.08
Ethyl bromide	C_2H_5Br	–54.70	–1.23	–1.36
Ethyl chloride	C_2H_5Cl	–46.00	–0.98	–1.08
Ethylene	C_2H_4	–18.80	–0.20	–0.22
Ethylene glycol	$(CH_2OH)_2$	–38.80	–0.77	–0.85
Ethylene oxide	$(CH_2)_2O$	–30.70	–0.54	–0.60
Ethyl mercaptan	$C_2H_5OSO_3H$	–47.00	–1.01	–1.11
Fluorochlorobromomethane	CFClBr	–58.00	–1.33	–1.46
Fluorodichloromethane (Freon 21)	$CHCl_2F$	–48.80	–1.06	–1.17
Fluroxene	$CF_3CH_2OCHCH_2$	–56.70	–1.29	–1.42
Freon 114	$C_2Cl_2F_4$	–77.40	–1.89	–2.08
Furan	C_4H_4O	–43.09	–0.90	–0.99
Germanium tetrachloride	$GeCl_4$	–72.00	–1.73	–1.91
Halothane	$C_2HBrClF_3$	–78.80	–1.93	–2.13
Helium	He	–1.88	0.29	0.32
N–Heptane	C_7H_{16}	–85.24	–2.12	–2.33
N–Hexane	C_6H_{14}	–73.60	–1.78	–1.96
Hydrogen	H_2	–3.98	0.23	0.26
Hydrogen bromide	Br	–35.30	–0.67	–0.74
Hydrogen chloride	HCl	–22.60	–0.31	–0.34
Hydrogen cyanide	HCN	–14.50	–0.07	–0.08
Hydrogen iodide	HI	–48.20	–1.05	–1.15
Hydrogen selenide	H_2Se	–39.20	–0.79	–0.87
Hydrogen sulphide	H_2S	–25.50	–0.39	–0.43
Isoflurane (Forane)	$C_3H_2F_5ClO$	–80.10	–1.97	–2.17
Isoprene	C_5H_8	–44.80	–0.95	–1.04
Ketene	CH_2CO	–15.70	–0.11	–0.12
Krypton	Kr	–28.80	–0.49	–0.54
Methane	CH_4	–17.40	–0.16	–0.17
Methanol	CH_3OH	–21.40	–0.27	–0.30
Methoxyfluorane	$CHCl_2CF_2OCH_3$	–87.10	–2.17	–2.39
Methyl acetate	CH_3COCH_3	–42.60	–0.88	–0.97
Methyl cyclopentane	C_6H_{12}	–70.20	–1.68	–1.85
Methylene chloride	CH_2Cl_2	–46.60	–1.00	–1.10
Methylethlyketone	$CH_3COCH_2CH_3$	–45.50	–0.97	–1.07
Methyl fluoride	CH_3F	–25.50	–0.39	–0.43
Methyl formate	$HCOOCH_3$	–32.00	–0.58	–0.64
Methyl iodide	CH_3I	–57.20	–1.31	–1.44
Methyl iso–butyl ketone (MIBK)	$C_4H_9COCH_3$	–69.30	–1.66	–1.82
Methyl mercaptan	CH_3SH	–35.30	–0.67	–0.74
Molybdenum hexafluoride	MoF_6	–26.00	–0.40	–0.45
Monochlorobenzene	C_6H_5Cl	–70.00	–1.68	–1.85

Pure Gas	Formula	Molar mag.susc x 10^{-6}	Cross interference offsets	
			Ambient Temperature	
			20 °C	50 °C
Neon	Ne	–6.70	0.15	0.17
Nitric oxide	NO	1461.00	42.56	42.96
Nitrobenzene	$C_6H_5NO_2$	–61.80	–1.44	–1.59
Nitrogen	N_2	–12.00	0.00	0.00
Nitrogen dioxide	NO_2	150.00	5.00	16.00
Ortho–Nitrotoluene	$C_6H_4CH_3NO_2$	–72.30	–1.74	–1.92
para–Nitrotoluene	$C_6H_4CH_3NO_2$	–76.90	–1.88	–2.07
Nitrous oxide	N_2O	–18.90	–0.20	–0.22
N–Nonane	C_9H_{20}	–108.13	–2.78	–3.06
N–Octane	C_8H_{18}	–96.63	–2.45	–2.70
Oxygen	O_2	3449.00	100.0	100.0
Ozone	O_3	6.70	0.54	0.60
iso–Pentane	C_5H_{12}	–64.40	–1.51	–1.67
N–Pentane	C_5H_{12}	–63.10	–1.48	–1.63
0.01%Phenol	C_6H_5OH	–60.21	–1.39	–1.54
Phosphine	PH_3	–26.00	–0.40	–0.45
Phosphorous oxychloride	$POCl_3$	–69.00	–1.65	–1.82
Propane	C_3H_8	–38.60	–0.77	–0.85
iso–Propanol	$(CH_3)_2CHOH$	–47.60	–1.03	–1.13
Propene	$CH_3CH=CH_2$	–31.50	–0.56	–0.62
N–Propyl acetate	$CH_3COOC_3H_7$	–65.90	–1.56	–1.72
Propyl amine	$C_3H_7NH_2$	–52.40	–1.17	–1.29
Propyl chloride	C_3H_7Cl	–56.10	–1.27	–1.40
Propylene	C_3H_6	–31.50	–0.56	–0.62
Propylene oxide	OCH_2CHCH_3	–42.50	–0.88	–0.97
iso–Propyl ether	$(CH_3)_4CHOCH$	–79.40	–1.95	–2.15
Propyl fluoride	C_3H_7F	–52.20	–1.16	–1.28
Pyridine	$N(CH)_5$	–49.21	–1.08	–1.19
Silane	SiH_4	–20.50	–0.25	–0.27
Silicon tetrachloride	$SiCl_4$	–88.30	–2.20	–2.43
Styrene	$C_6H_5CH=CH_2$	–68.20	–1.62	–1.79
Sulphur dioxide	SO_2	–18.20	–0.18	–0.20
Sulphur hexafluoride	SF_6	–44.00	–0.92	–1.02
Tetrachoroethylene	$Cl_2C=CCl_2$	–81.60	–2.01	–2.22
Tetrahydrofuran	C_4H_8O	–52.00	–1.16	–1.27
Toluene	$C_6H_5CH_3$	–66.11	–1.56	–1.72
1,1,2 Trichloroethane (Freon 113)	$CHCl_2CH_2Cl$	–66.20	–1.57	–1.73
Trichloroethylene	$CHCl=CCl_2$	–65.80	–1.55	–1.71
Trifluorochloroethylene	C_2F_3Cl	–49.10	–1.07	–1.18
Trimethylamine	$(CH_3)_3N$	–51.70	–1.15	–1.26
Tungsten fluoride	WF_6	–40.00	–0.81	–0.89
Urethane	$CO(NH_2)OC_2H_5$	–57.00	–1.30	–1.43
Vacuum	–	0.00	0.35	0.38
Vinyl bromide	$CH_2=CHBr$	–44.80	–0.95	–1.04
Vinyl chloride	$CH_2=CHCl$	–35.60	–0.68	–0.75
Vinyl fluoride	$CH_2=CHF$	–28.80	–0.49	–0.54
Water	H_2O	–13.00	–0.03	–0.03
Xenon	Xe	–43.90	–0.92	–1.02
Xylene	$(CH_3)_2C_6H_4$	–77.78	–1.90	–2.09

A6 End User Notes