SERVOMEX
PROCESS ANALYSERS

SERVOTOUGH 1900 Digital Gas Analyser

Operator Manual

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SERVOMEX
A MEASURABLE ADVANTAGE

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EC DECLARATION OF CONFORMITY

We, Servomex Group Limited of the above address declare that the:

01910A and 01920A DIGITAL ANALYSER SERIES

Conform to the requirements of:

ATEX Directive, Council Directive 94/9/EC by the application of the following standards:

EN 60079-0:2004	Electrical apparatus for explosive gas atmospheres. General requirements
EN 60079-1:2004	Electrical apparatus for explosive gas atmospheres. Flameproof enclosures 'd'
EN 50020:2002	Electrical apparatus for potentially explosive atmospheres. Intrinsic safety 'i'
EC Type Examination Certificate:	Baseefa06ATEX0050
IEC 61010-1:2001 (2nd edition) EN 61010-1:2001 (2nd edition)	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements
Type Examination Report References:	Intertek Testing and Certification Ltd. Report No. 06019011
	Servomex report No. 01900IR-D-063

EMC Directive, Council Directive 89/336/EEC (amended by Directives 92/31/EEC and 93/68/EEC) by the application of the following standard:

EN61326:1997 +A1:1998 +A2:2001	Electrical equipment for measurement, control and laboratory use - EMC requirements
Test Report References:	Intertek Testing and Certification Ltd. EM 06019149
	Servomex report No. 01900IR-D-062

Dated: 20 March 2007

J. Hobby
Director of Technology

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® Chemraz is a registered trademark of Greene, Tweed.
® Viton is a registered trademark of Dupont.

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1 DESCRIPTION AND DEFINITIONS

1.1 Scope of this manual

This manual provides installation, operation and routine maintenance instructions for the Servomex 1900 Digital O_2 Gas Analyser, abbreviated to "analyser" 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 analyser. Important safety information is highlighted in this manual as WARNINGs and CAUTIONs, which are used as follows:

WARNING

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

CAUTION

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

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

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

1.3 Description

The analyser provides stable, accurate and specific gas concentration measurements, and is suitable for use in hazardous areas.

The analyser uses a paramagnetic transducer to determine the oxygen (O_2) content of gas samples in concentrations of up to 21%.

The analyser is simple to operate, with an intuitive user interface (see Section 4).

Gas sample measurements are shown on the analyser display, and are also provided as milliAmp outputs. The analyser also provides fault, alarm and milliAmp range change signal outputs.

The analyser requires little routine maintenance (see Section 7), other than calibration (which is essential for the accuracy of sample gas measurements) and regular inspection of the optional inlet filter.

1.4 Construction

The analyser comprises an aluminium enclosure, with Viton®/silicone rubber seals.

Refer to Figure 1. The analyser has two internal compartments:

- Sample/control compartment

  This compartment (shown in Figure 3, page 5) contains intrinsically safe components such as the sample measurement transducer and the heater. The heater maintains a stable temperature of 60 °C within the compartment, to ensure stability of sample measurements.

  The sample gas inlet and outlet connections on the base of the analyser (see Figure 2) are piped into/from this compartment.

  This compartment is accessed through the hinged door (1), on which the display (2) and soft keys (9, 10, 12, 14) are mounted.

- Power/signal compartment

  This explosion-proof compartment (shown in Figure 4, page 6) contains the components which supply power to the rest of the analyser, and the components to interface the analyser to your control/monitoring system.

  The analyser electrical supply cable, and the communications cables to your control/monitoring system, must be connected (through the cable entry holes on the base of the analyser) to the terminals in this compartment.

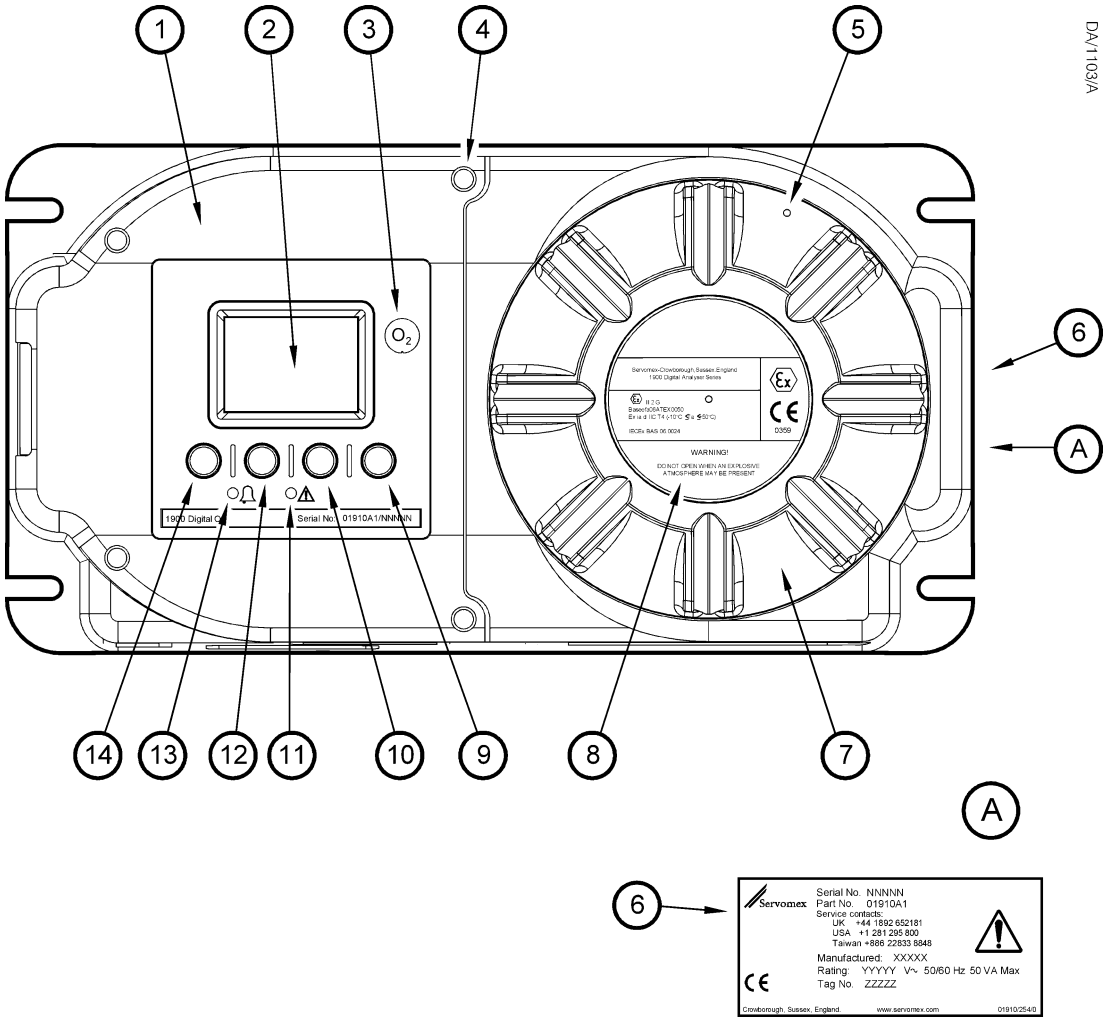
  You must remove the threaded cover (Figure 1, item 7) to access this compartment.

1.5 Analyser options

The standard analyser can be supplied with the following options:

- With an inlet filter.
- With an internal high flow bypass, for high sample flows.
- With Viton® pipelines, or with stainless steel pipelines.
- With a solvent resistant transducer.

Note that an analyser with a solvent-resistant transducer always has stainless steel pipelines, together with Chemraz® and PTFE seals.



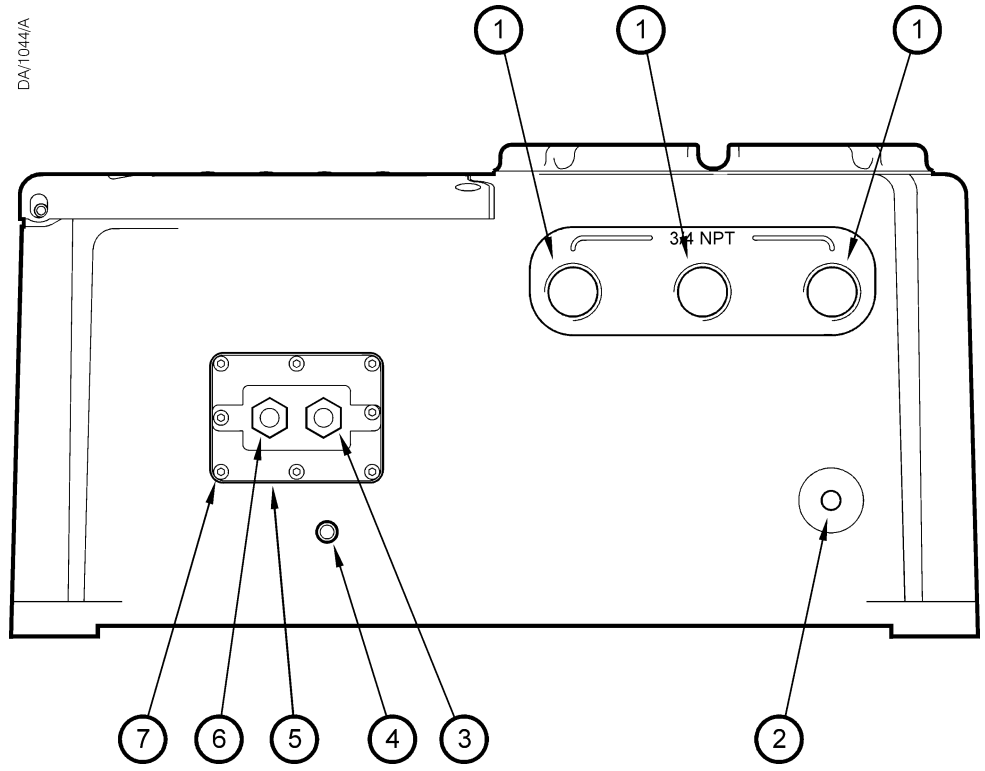
Key	Description
1.	Hinged cover
2.	Display
3.	Sample gas label
4.	Locking screws (4 off)
5.	Locking screw *
6.	Identification/rating label †
7.	Threaded cover

Key	Description
8.	Certification label
9.	Soft key 4
10.	Soft key 3
11.	Fault LED (red)
12.	Soft key 2
13.	Alarm LED (yellow)
14.	Soft key 1

* The locking screw may be in a different orientation with respect to the cover (6), depending on how the cover has been fitted.

† On the side of the analyser.

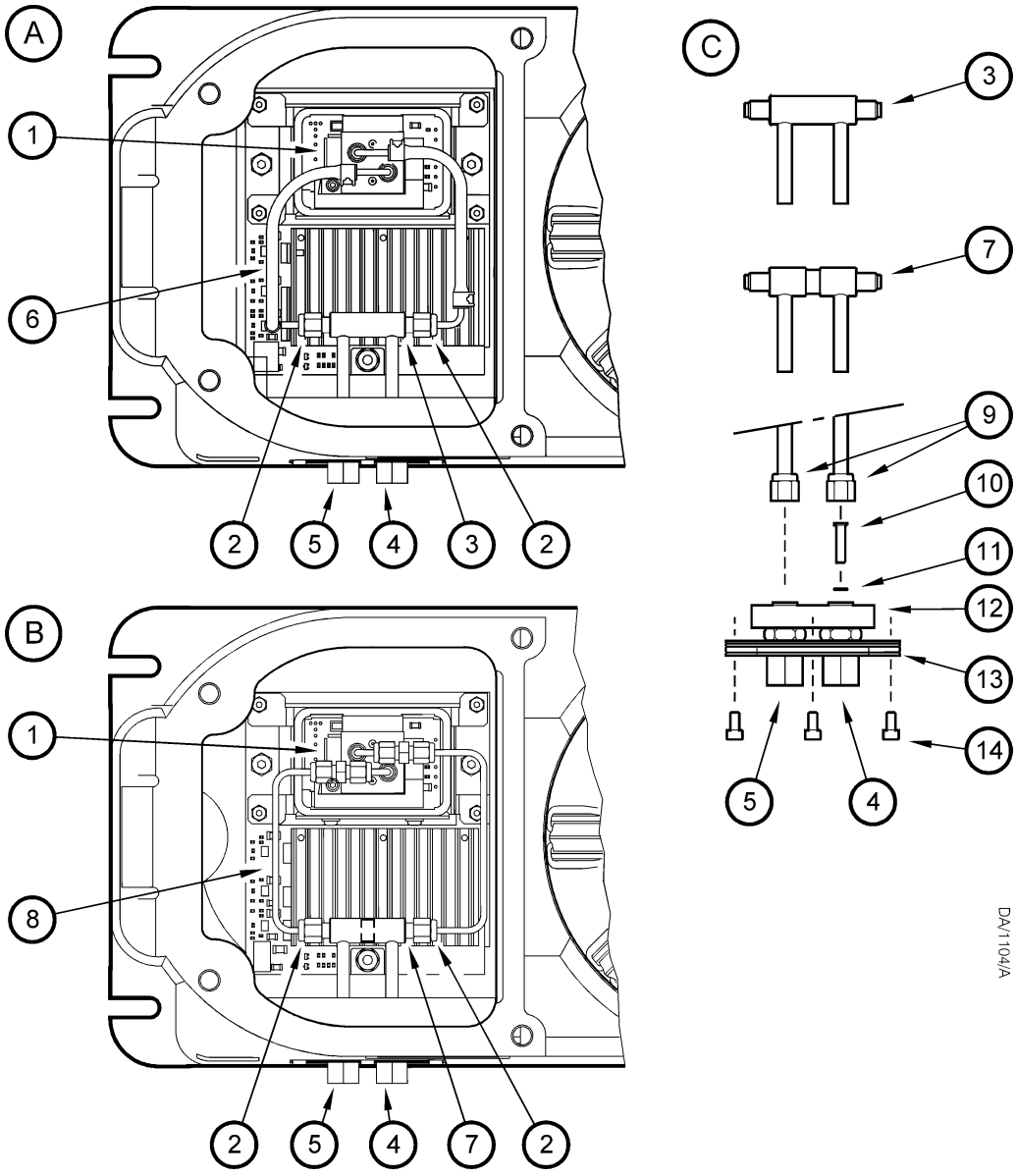
Figure 1 - Front of the analyser



Key	Description
1.	Cable entry holes (3 off)
2.	Earth (ground) terminal
3.	Sample gas inlet
4.	Breather vent

Key	Description
5.	Inlet/outlet bulkhead
6.	Sample gas outlet
7.	M4 screws (8 off)

Figure 2 - Base of the analyser

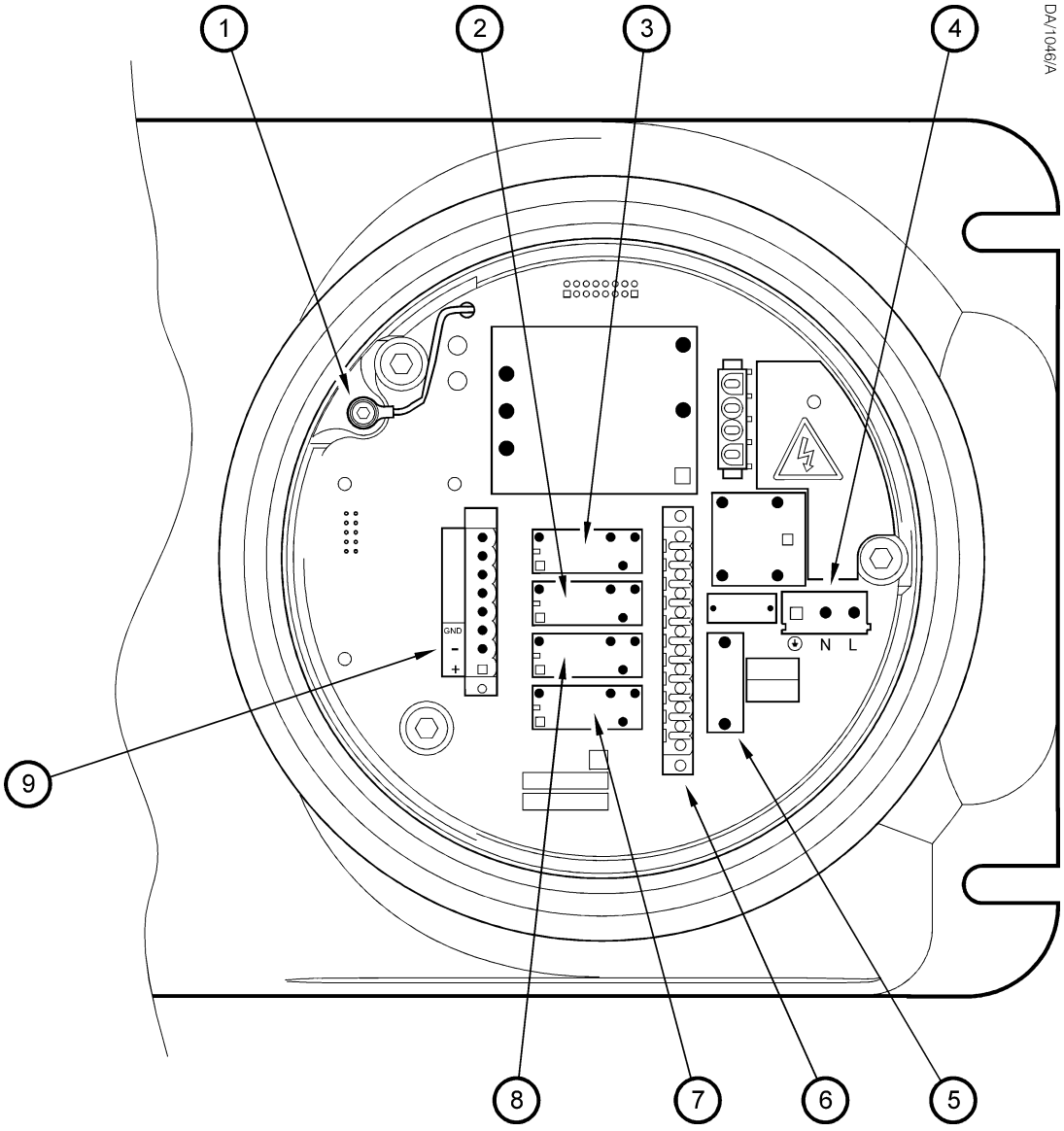


A. With Viton pipelines and standard inlet/outlet ‘T’ piece
B. With stainless steel pipelines and optional high flow bypass ‘T’ piece
C. Replacing the optional inlet filter

Key	Description
1.	Transducer
2.	Pipe connector nuts (2 off)
3.	High flow bypass ‘T’ piece
4.	Sample gas inlet
5.	Sample gas outlet
6.	Viton pipelines
7.	Standard inlet/outlet ‘T’ piece

Key	Description
8.	Stainless steel pipelines
9.	‘T’ piece connector nuts
10.	Inlet filter
11.	‘O’ ring
12.	Insulation
13.	Bulkhead assembly
14.	M4 screws (8 off)

Figure 3 - Sample/control compartment



Key	Description
1.	Earth (ground) connection
2.	Fault relay (relay 3)
3.	Range change relay (relay 4)
4.	Electrical supply connection terminals
5.	Fuse F101
6.	Relay terminals
7.	Alarm 1 relay (relay 1)
8.	Alarm 2 relay (relay 2)
9.	milliAmp output terminals

Figure 4 - Power/signal compartment

2 SPECIFICATION

WARNING

You must install and use the analyser in accordance with the requirements of this section and subsequent sections of the manual. If you do not, people may be injured, the protection facilities incorporated into the design of the analyser may not operate as intended, sample gas measurements may not be accurate, or the analyser may be damaged.

2.1 General

Dimensions	
Analyser	235 x 448 x 229 mm (height x width x depth)
Standard mounting	See Figure 13 (page 23)
Panel mounting	See Figure A1 (page 68)
Mass	26 kg

2.2 Sample gas

WARNING

The analyser is not suitable for use with oxygen enriched sample gases.

☞ The sample gases must be clean, non-corrosive, free from oil/condensates and compatible with the materials listed in Appendix A3.

Flow rate *	
Standard inlet/outlet 'T' piece	50 to 250 ml min^{-1}
High flow bypass 'T' piece	50 to 70 l h^{-1} (60 l h^{-1} nominal)
Pressure range *	0.3 to 0.4 kPa gauge above ambient pressure † (0.04 to 0.05 psig above ambient pressure †)
Dew point	5 °C below ambient temperature (minimum)
Temperature	< ambient temperature
Particulate size	< 3 μm (3 micron)

* The pressure and flow rate of the sample gases must be externally regulated to meet the above requirements.

† Refer to Section 2.4 for the ambient pressure range.

2.3 Calibration gases

☞ The calibration gases must be clean, non-corrosive, free from oil/ condensates and compatible with the materials listed in Appendix A3.

Low calibration gas	Clean, dry nitrogen, 99.9% pure
High calibration gas	Clean gas supply with nominal 'atmospheric' oxygen concentration (20.95%). *
Pressure	As for sample gas pressure: see Section 2.2
Flow rate	As for sample gas flow rate: see Section 2.2

* For example, you could use good quality, clean, dry instrument air.

2.4 Environmental limits

WARNING

The installation of the analyser in a hazardous area must comply with any 'Special conditions for safe use' and/or 'Schedules of Limitations' as specified in the safety certification.

WARNING

The analyser is not suitable for use in oxygen enriched atmospheres.

Ambient temperature range	
Operation	-10 to 50 °C
Storage	-20 to 60 °C
Operating ambient pressure range	79 to 124 kPa (11 to 18 psi absolute)
Operating ambient humidity range	0 to 95% RH, non-condensing
Operating altitude range	-500 * to 2000 † meters
Ingress protection	IP65

* Below sea level.
† Above sea level.

2.5 Electrical data

Electrical supply	
Voltage	100 to 120 V a.c. or 220 to 240 V a.c. *
Frequency	50 to 60 Hz
Maximum power consumption	50 VA
Internal fuse rating	
100 to 120 V supply	T 2.0 A H 250 V
220 to 240 V supply	T 1.0 A H 250 V
Electrical supply terminals suitable for	
Flexible conductors	0.5 to 1.5 mm^2 (20 to 16 AWG)
Solid conductors	0.5 to 2.5 mm^2 (20 to 14 AWG)
Interface signal relay ratings ‡	250 V a.c., 3 A, 28 V d.c. 1 A
milliAmp output	
Maximum load resistance	600 Ω
Minimum isolation voltage	500 V
Output range	
Normal sample measurement	0 to 20 mA or 4 to 20 mA †
Fault condition	0 mA or 21.5 mA †
Under range #	< 4 mA
Signal/milliAmp output terminals suitable for	
Flexible conductors	0.5 to 1.5 mm^2 (20 to 16 AWG)
Solid conductors	0.5 to 1.0 mm^2 (20 to 18 AWG)

* The analyser is supplied configured for operation with one of these voltage ranges. You must specify the voltage range when you order the analyser.
‡ The relay output signals are volt-free signals.
† User selectable: see Sections 6.5.2 and 6.5.3.
# Only available when the 4 to 20 mA output range is selected: see Sections 6.5.2 and 6.5.3.

2.6 Performance

☞ The display indications given below are the default indications. You can configure the analyser to provide other display indications (see Section 6.3).

Display indication	Measured volume % oxygen
Targeted measurement range	0 to 21% oxygen
Linearity	< 0.02% oxygen (inherently linear)
Intrinsic error (accuracy)	< 0.05% oxygen
Zero drift per week	< 0.05% oxygen
Output fluctuation	< 0.01% oxygen
Response time *	< 6 seconds
Flow effect †	< 0.1%oxygen
Zero temperature coefficient ‡	0.03% oxygen per 10 °C change in temperature
Pressure effects	1% of measurement per 1% change in ambient barometric pressure

* T_{90} at maximum sample gas supply flow rate specified in Section 2.2.
† Within sample gas supply pressure range specified in Section 2.2.
‡ In the range -10 to 50 °C.

2.7 Hazardous area certification

When correctly installed as described in this manual, the analyser is certified to operate in the following hazardous areas (as specified by the certification label fitted to the analyser, see Figure 5):

- Europe

  The analyser is ATEX approved to ⟨Ex⟩ II 2G Ex ia d IIC T4 (-10 °C ≤ Ta ≤ +50 °C)

  Certificate number: Baseefa 06ATEX0050 (see Appendix A6)

- International

  The analyser is IECEx approved to Ex d ia IIC T4 (-10 °C ≤ Ta ≤ +50 °C)

  Certificate number: IECEx BAS06.0024

Figure 5 - Certification label

- North America

  The analyser is CSA approved for use in USA and Canada in the following locations:

  Class I, Division 1, Groups A, B, C, D T4 (-10 °C ≤ Ta ≤ +50 °C)

  Class I, Zone 1, Ex ia d IIC T4 (-10 °C ≤ Ta ≤ +50 °C)

  Class I, Zone 1, AEx ia d IIC T4 (-10 °C ≤ Ta ≤ +50 °C)

  Certificate number: CSA 08.1961540

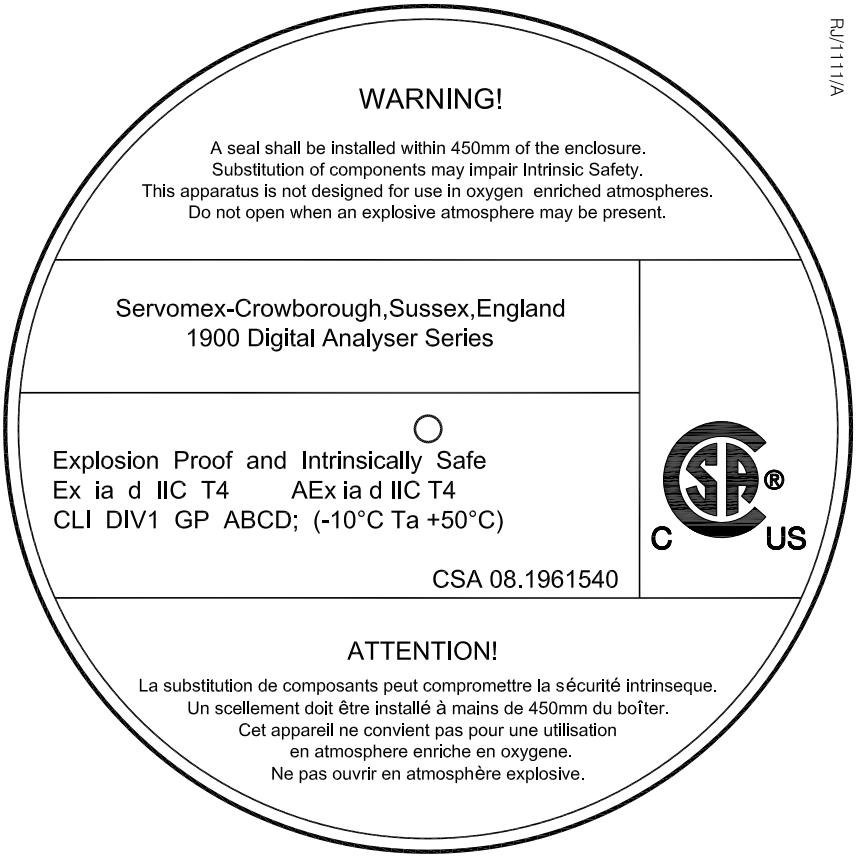
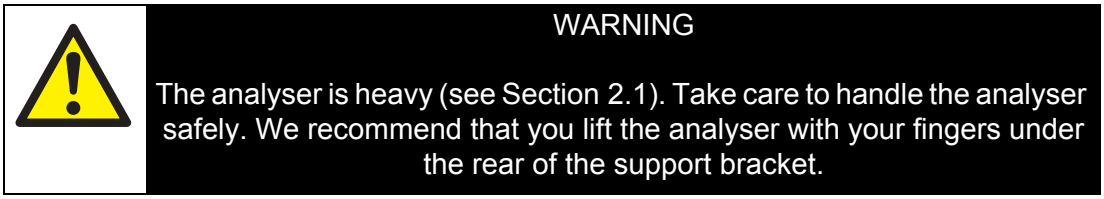


Figure 6 - Certification label

3 UNPACK THE ANALYSER



1. Remove the analyser and any other equipment from its packaging.
2. Remove any protective plastic covers from the sample gas inlet and outlet on the base of the analyser (see Figure 2).
3. Inspect the analyser 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.
4. 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.
5. Check that you have also received an accessory kit, containing the following:

Quantity	Item	Check (✓)
1	2 mm hexagonal key	❑
1	5 mm hexagonal key	❑
2	Spare fuses	❑

   If the accessory kit is missing, or any item is missing from the kit, immediately contact Servomex or your local Servomex agent.

6. Check that the electrical supply voltage (shown on the rating label) is correct for your electrical supply. If the incorrect voltage is shown, do not continue to install the analyser; instead, contact Servomex or your Servomex agent.
7. If you do not intend to use the analyser immediately:
   - Refit any protective plastic covers.
   - Place the analyser and any other equipment supplied back in its protective packaging.
   - Store the analyser as described in Section 9.1.

   Otherwise, read Section 4 (User Interface), then continue at Sections 5 onwards to install, set up, and use the analyser.

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

4 ANALYSER USER INTERFACE

☞ Throughout this manual, reference is made to product options which must be specified at the time of purchase. Associated menus and menu options will not be available if your analyser does not have the corresponding product options.

4.1 Introduction

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

Display	Shows various screens: see Section 4.2 onwards.
Soft keys	The function of each of the soft keys depends on the screen currently being shown on the display: see Section 4.2.
Alarm LED	On when an alarm condition exists: see Section 6.4.4.
Fault LED	On when a fault condition exists: see Section 8.

4.2 Start-up and measurement screens

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

The start-up screen shows the Servomex name, the message "System Check" and a ‘self-test time elapsed/remaining’ indicator, identifying the progress of the tasks being carried out as part of the self-test:

(Continued on page 15)

The Measurement screen is then displayed, as shown in Figure 7 below.

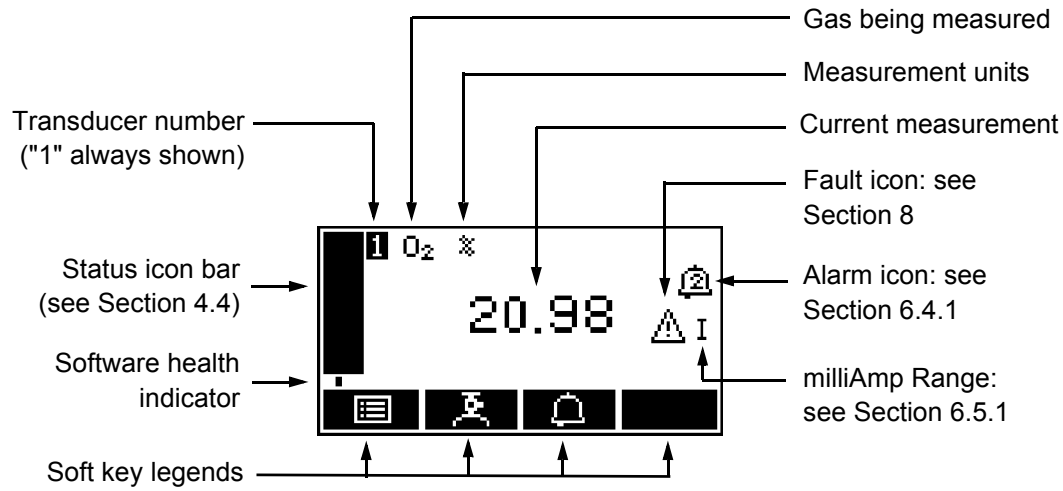


Figure 7 - The Measurement screen

☞ During normal analyser 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 analyser is not operating correctly, and you must refer to Section 8.

☞ If no soft key is pressed for 10 minutes, the Measurement screen will be automatically displayed. (You will also then have to enter the password again to access any password-protected screens: refer to Figure 8 and to Section 4.6.)

4.3 Soft key legends

The four soft key legends at the bottom of the Measurement screen (Figure 7) correspond to the four soft keys on the front of the analyser. (The first, left-most, legend corresponds to the function of soft key 1, the second legend corresponds to the function of soft key 2, and so on). On the Measurement screen, the soft key functions are as follows:

Legend	Meaning	Function (when soft key pressed)
	Menu	Displays the Menu screen: see Section 4.7.
	Calibrate *	Displays the Calibrate screen: see Section 6.1.
	Alarm *	Displays the Alarm option screen: see Section 6.4.4.
	-	None (no effect).

* These soft keys are ‘shortcuts’ to these menus, which can also be selected by pressing the  soft key with the corresponding menu option highlighted on the Menu screen: see Section 4.7.

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

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

4.4 Status icon bar

The status icon bar appears on all screens. The icons which can be shown and their meanings are as follows:

Icon	Meaning
	Indicates that a fault has been detected by the analyser: refer to Section 8.
	Indicates that the heater is warming up.

4.5 Scroll bars

On some screens (for example, see Figure 9), 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. For example, compare the scroll bars in Figures 9 and 16.

4.6 Menu options/screens and password protection

The menu structure of the analyser is shown in Figure 8, which indicates that some of the options/screens are password protected.

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.

Password protection operates as follows:

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

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

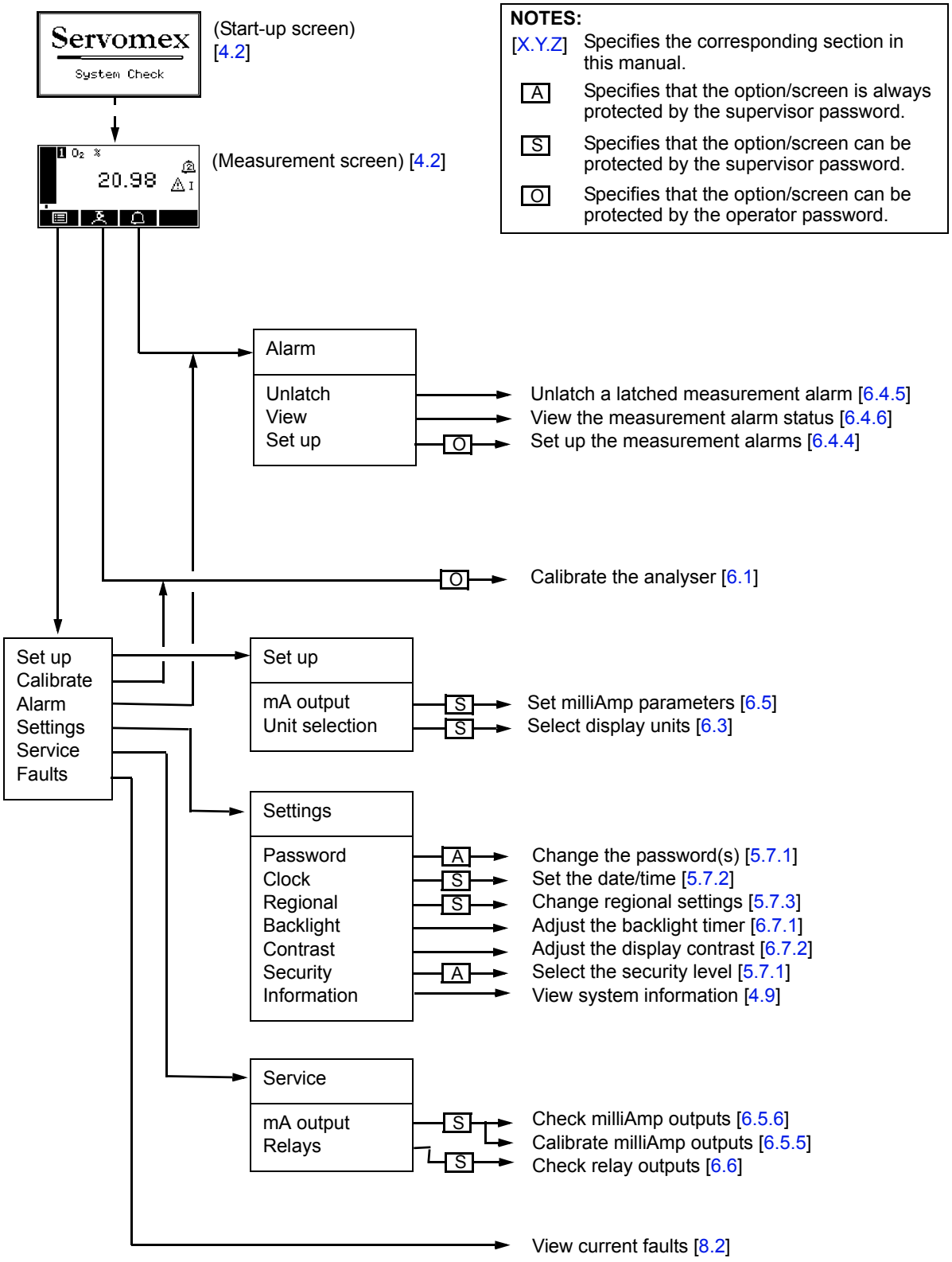


Figure 8 - The analyser menu structure

4.7 The Menu screen

☞ Some of the menu screens referenced below may not be available: refer to the note at the start of Section 4.

The Menu screen (see Figure 9) provides access to other screens in the menu structure, and is displayed by pressing the soft key when the Measurement screen is displayed.

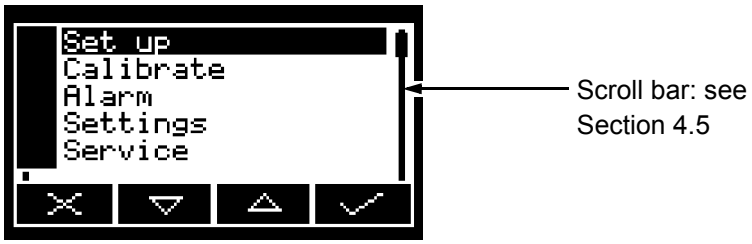


Figure 9 - The Menu screen

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

Screen	Use	Section
Set up	Select this screen to configure the milliAmp outputs or select the display units.	6.5.3, 6.3
Calibrate	Select this screen to calibrate the analyser.	6.1
Alarm	Select this screen to set up the measurement alarms.	6.4.4
Settings	Select this screen to change analyser settings (password, display language and so on).	4.8
Service	Select this screen to calibrate or check the milliAmp outputs, and to check the relay signal outputs.	6.5.5, 6.5.6, 6.6
Faults	Select this screen to view current faults.	8.2

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

4.8 The Settings screen

The Settings screen is shown in Figure 10.

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 10 - The Settings screen

Screen	Use	Section
Password	Changing the password.	5.7.1
Clock	Setting the clock time and/or date.	5.7.2
Regional	Changing regional settings (language and so on).	5.7.3
Backlight	Adjusting the backlight timer duration.	6.7.1
Contrast	Adjusting the contrast of the screen.	6.7.2
Security	Selecting the security level.	5.7.1
Information	Viewing analyser system information.	4.9

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

4.9 The Information screen

A typical Information screen is shown in Figure 11.

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

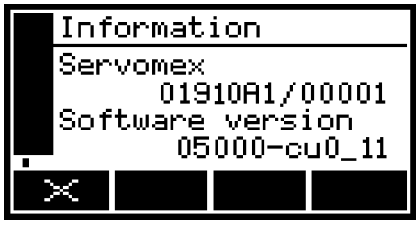


Figure 11 - Typical information screen

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

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

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

4.10 Editing on-screen data

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

When you press the soft key to edit an item of data, the screen changes to show the corresponding edit screen, with the first digit highlighted; a typical edit screen is shown in Figure 12:

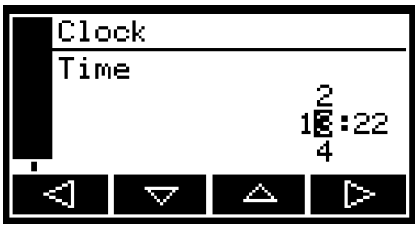


Figure 12 - A typical edit screen

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

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

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

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

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

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

5 INSTALLATION AND SET-UP

WARNING

You must not modify the analyser in any way (either mechanically or electrically). If you do, the certification of the analyser will be invalidated, and it may not operate safely.

WARNING

The analyser must be installed by a suitable skilled and competent technician or engineer.

5.1 Mechanical installation

WARNING

The analyser is not suitable for use in oxygen enriched atmospheres.

CAUTION

Do not install the analyser on a surface which is subject to high levels of vibration or sudden jolts. If you do, sample measurements may not be accurate, or the analyser may be damaged.

You must mount the analyser on a suitable rigid vertical surface (or within a panel frame) which is capable of supporting the mass of the analyser (refer to Section 2.1).

You must ensure that, when the analyser is in its installation location:

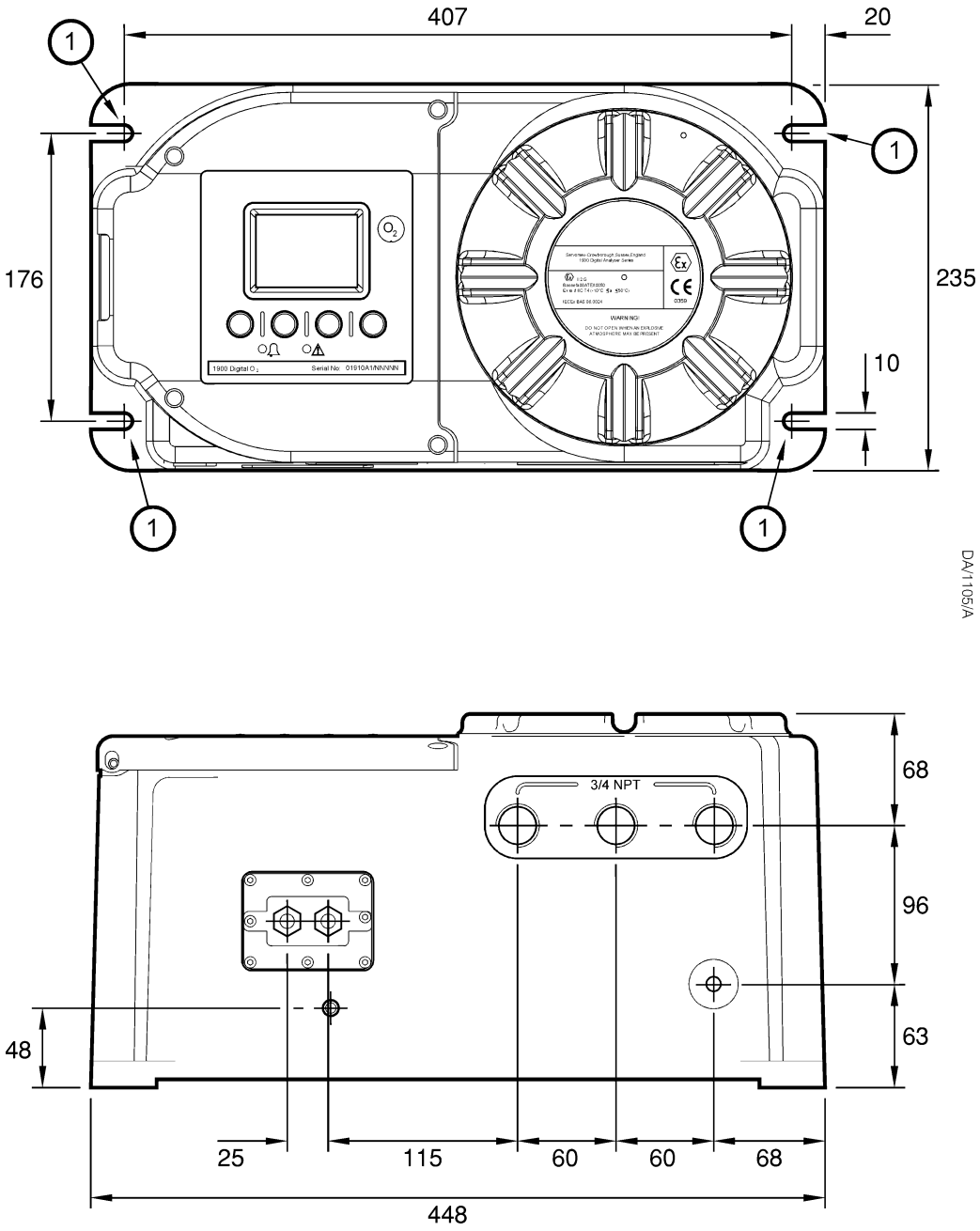
- The operating environment is within the limits specified in Section 2.4.
- There is sufficient space around the analyser to install and connect the electrical supply and interface signal cables, and the sample inlet and outlet pipes.
- There is sufficient space to access the internal compartments for maintenance.

Note the following when you install a sample conditioning system:

- Locate the sample conditioning system below the analyser, to prevent the carry-over of condensate into the analyser sample measurement transducer.
- Ensure that the sample conditioning system will not impact on the environmental limits of the analyser (see Section 2.4).

To mount the analyser on a rigid vertical surface, attach the fixing lugs on the analyser to suitable bolts or hooks to securely mount the analyser: refer to Figure 13 (page 23) for the fixing dimensions.

To panel mount the analyser, refer to Appendix A2 (page 67).



Key	Description
1.	Fixing lugs (4 off)

Figure 13 - Fixing dimensions (mm)

5.2 Remove the power/interface compartment cover

WARNING

The power/interface compartment cover is heavy. Ensure that you do not drop the cover once it is disengaged from the body of the analyser. If you do, you may injure yourself or damage other equipment.

CAUTION

Place the cover carefully on a clean surface, resting on the exterior of the cover, so that the pregreased threads do not become contaminated.

1. Refer to Figure 1 (page 3). Use the 2 mm hexagonal key supplied to loosen the locking screw (5) which secures the cover (7).
2. Unscrew the cover (7); that is, turn it anticlockwise. If necessary, fit a suitable metal bar between the protruding fins on the front of the cover to provide additional leverage.
3. When the cover is fully disengaged from the body of the analyser, remove it and place it carefully on a clean surface: see the caution above.

5.3 Electrical supply and interface signal connections

5.3.1 Electrical safety

WARNING

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

WARNING

Obey the safety instructions given below when you install the analyser; if you do not, the analyser certification may be invalidated, the analyser may not operate correctly, or it may be damaged:

- All cables connected to the power/signal compartment must be connected to equipment which is not supplied from, or contain in normal or abnormal operating conditions, a source of potential with respect to earth (ground) higher than 253 V a.c. or 253 V d.c.
- The analyser does not incorporate an integral on/off switch. You must provide a means of externally isolating the electrical supply from the analyser: use a suitable switch or circuit breaker located close to the analyser, clearly marked as the disconnecting device for the analyser.

- The volt-free relay contacts are isolated from the analyser mains circuits and from each other, so that either mains voltage circuits or signal voltage circuits can be connected to the contacts.
- The milliAmp output and (where enabled) RS485 terminals are separated from the analyser mains circuits by reinforced insulation. The terminals must only be connected to circuits that are themselves separated from mains voltages by at least reinforced insulation.
- The electrical supply circuit must incorporate a suitable fuse or over-current protection device, set to or rated at no more than 10 A.
- Ensure that your electrical supply can provide the necessary maximum power consumption: refer to Section 2.5.
- All signal and electrical supply cables must be rated for temperatures of 70 ^{o}C or higher.
- Ensure that the cables that you connect to the analyser are routed so that they do not present a trip hazard.
- When you carry out insulation testing, disconnect all cables from the analyser.

5.3.2 Configure the cable entry hole(s)

WARNING

If the analyser is installed in a hazardous area, all cable-glands, adaptors and blanking plugs must be suitably approved.

The analyser has three $^{3}/_{4}$ inch NPT cable entry holes. As supplied, two of these holes are fitted with blanking plugs (rated to IP65).

If necessary, reconfigure the analyser so that the entry hole(s) that you will use for the electrical supply and signal connection cables have suitable cable-glands (and/or adaptors) fitted, and so that any unused entry hole has a blanking plug fitted.

All cable-glands/adaptors and plugs used must provide ingress protection to IP65 or better.

☞ Accessories/spares are available to convert the cable entry holes: refer to Section 10 for details.

5.3.3 Interface signal connections

WARNING

All of the analyser interface signal outputs are considered to be incendive and therefore must only be connected to safe area equipment.

CAUTION

To comply with EMC requirements, you must use screened 4 to 20 mA cables to connect to the milliAmp outputs.

Connect the wires in your cables to the appropriate terminals as described below:

1. Pass your signal cable(s) through one or two of the cable-glands fitted to the base of the power/interface compartment.
2. Refer to Figure 4. Connect the milliAmp output wires in your cables to the corresponding terminal pins of the milliAmp terminals (9), as follows:

Signal	Terminal pin
+ve	P103 +
-ve	P103 -
Ground/screen	P103 GND

3. Refer to Figure 4 (page 6). Connect the relay signal output wires in your cables to the appropriate terminals for the corresponding relay, as shown below. Note that both N/O (normally open) and N/C (normally closed) signals are available for each relay.

Relay	Signal	Terminal pin	Use
Alarm 1	N/O COM N/C	P102 N/O 1 P102 COM 1 P102 N/C 1	Closed indicates an alarm condition (Common) Open indicates an alarm condition
Alarm 2	N/O COM N/C	P102 N/O 2 P102 COM 2 P102 N/C 2	Closed indicates an alarm condition (Common) Open indicates an alarm condition
Fault	N/O COM N/C	P102 N/O 3 P102 COM 3 P102 N/C 3	Open indicates a fault condition (Common) Closed indicates a fault condition
Range change	N/O COM N/C	P102 N/O 4 P102 COM 4 P102 N/C 4	Open = Range 1, Closed = Range 2 (Common) Closed = Range 1, Open = Range 2

5.3.4 Mains electrical supply connection

CAUTION

Ensure that the analyser as supplied is correctly configured for your mains electrical supply voltage. If the analyser is not correctly configured for your mains electrical supply voltage, the analyser may not operate correctly, or it may be damaged when you operate it.

When you make your mains electrical supply cable, ensure that the earth (ground) conductor is longer than the live and neutral conductors. This will ensure that if the cable is accidentally dragged and the strain relief on the cable-gland fails, the earth (ground) conductor will be the last conductor to be pulled from the analyser.

Connect your mains electrical supply cable to the analyser as follows:

1. Pass your mains electrical supply cable through one of the cable-glands fitted to the base of the power/interface compartment.
2. Refer to Figure 4. Connect the wires in the supply cable to the appropriate electrical supply terminals (4), as follows:

Signal	Terminal pin
Live	P101 L
Neutral	P101 N
Earth (ground)	P101 ⏚

5.4 Refit the power/interface compartment cover

WARNING

The power/interface compartment cover is heavy. Ensure that you do not drop the cover when you refit it to the body of the analyser. If you do, you may injure yourself or damage other equipment.

CAUTION

Ensure that the pregreased threads of the cover do not become contaminated.

☞ The threads on the cover are pregreased. You do not need to add any grease or sealant to the threads before you refit the cover.

1. Tighten the strain relief on all of the cable-glands fitted to the base of the analyser.
2. Refer to Figure 1 (page 3). Carefully refit the cover (7) to the body of the analyser, so that the threads on the rear of the cover are correctly aligned with the threads in the 1900I: pick the cover up by its exterior, and do not touch or contaminate the pregreased threads on the cover.
3. Screw on the cover (that is, turn the cover clockwise) to secure it to the analyser.
4. Fully tighten the cover. If necessary, fit a suitable metal bar between the protruding fins on the front of the cover to provide additional leverage.
5. Use the 2 mm hexagonal key supplied to tighten the locking screw (5) which secures the cover (7).
6. Ensure that the certification label (8) is in the correct orientation. If necessary, press and turn the label until it is in the correct orientation.

5.5 External earth (ground) connection

WARNING

When the analyser is installed in a hazardous area, you must correctly connect the external earth (ground) terminal in compliance with all relevant local, national and international standards, to ensure that the installation is safe.

CAUTION

To comply with the EMC emissions and susceptibility standards, the functional earth (ground) terminal on the base of the analyser must always be connected to a local EMC earth (ground). The conductor that you use must not exceed 2 metres in length.

Use a suitable conductor to connect the analyser external earth (ground) terminal (Figure 2, item 2) to a local EMC earth (ground) point: see the caution above. You can use flexible or solid conductors, up to 10 mm^2.

5.6 Connect the sample/calibration gas pipe(s)

WARNING

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

WARNING

Sample and calibration gases may be toxic, asphyxiant or flammable. Ensure that the external connections are leak free at full operating pressure before you use sample or calibration gases.

WARNING

Sample and calibration gases may be toxic, asphyxiant or flammable. Ensure that the sample outlet pipe is vented to an area where the gases will not be a hazard to people.

WARNING

Sample and calibration gases may be toxic, asphyxiant or flammable. To prevent the build-up of such gases, ensure that the analyser is used in a sufficiently well-ventilated environment.

CAUTION

When you carry out a leak test, do not exceed a maximum pressure of 34.5 kPa gauge (0.35 bar gauge, 5 psig) and do not introduce a sudden change of pressure into the analyser. If you do, you can damage it.

CAUTION

If you use a liquid to assist in leak testing, do not spill liquid onto any of the electrical components in the sample/control compartment.

Connect your sample/calibration gas inlet and outlet pipes to the sample gas inlet and outlet on the base of the analyser (see Figure 2). The inlet/outlet fittings on the analyser are $^1/_8$ inch NPT (F).

Refer to Section 2.2 for the sample gas requirements, and refer to Section 2.3 for the calibration gas requirements

Locate your gas selection valves (to direct sample or calibration gas into the analyser) as close as possible to the analyser.

☞ Do not introduce calibration or sample gases into the analyser yet. You must switch on the electrical supply and leave the analyser for at least 4 hours before you allow calibration or sample gases into the analyser. Refer to the Caution at the start of Section 6 (page 35).

5.7 Switch on/set-up

☞ When the electrical supply to the analyser 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 again.

When you switch on the electrical supply to the analyser, a 'start-up screen' is first displayed (see Section 4.2), then the Measurement screen (Figure 7) is displayed.

When the Measurement screen is displayed, you can set up the analyser as described below.

5.7.1 Selecting the security level and changing the password(s)

Introduction to security levels/passwords

You can configure the analyser 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 analyser 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.

Figure 8 shows the options/screens which can be password-protected within the menu structure.

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". We recommend that you select your required security level and change the password(s) as described below to provide additional protection.

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

Use the following procedure to select the required security level:

1. With the Settings screen displayed, use the ▵ and ▽ soft keys to highlight the "Security" menu option, then press the ✓ soft key. The Security level screen will then be displayed showing the currently selected level: see Figure 14.

Figure 14 - The Security level screen

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 15), with the currently selected security level highlighted.

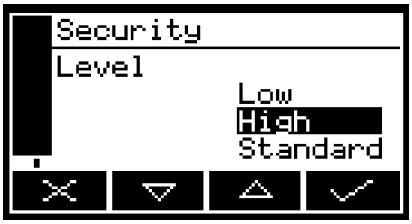


Figure 15 - The Security select screen

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. Press the ✕ soft key twice to display the Menus screen again.

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. With the Measurement screen displayed, press the soft key to display the Menu screen, use the and soft keys to highlight the "Settings" menu option, then press the soft key. The Settings screen will then be displayed (see Figure 10).
2. Use the and soft keys to highlight the "Password" menu option, then press the soft key. The Edit supervisor password screen will then be displayed with the supervisor password shown, as shown in Figure 16.

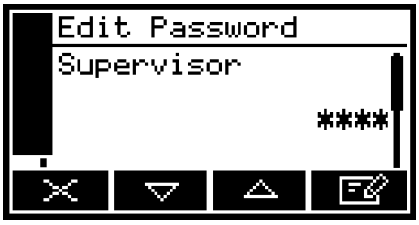


Figure 16 - The Edit supervisor password screen

3. To change the supervisor password, press the soft key, then enter the new password: use the editing method described in Section 4.10.
4. When you enter the last digit, the soft key changes to the soft key. Press the soft key to enter the new supervisor password value.
5. 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: use the editing method described in Section 4.10.
6. When you enter the last digit, the soft key changes to the soft key. Press the soft key to enter the new operator password value.
7. Press the soft key to display the Settings screen again.

5.7.2 Setting the clock

Use the following procedure to set the date and time:

1. Press the soft key to display the Menu screen, use the and soft keys to highlight the "Settings" menu option, then press the soft key. The Settings screen will then be displayed.
2. Use the and soft keys to highlight the "Clock" menu option, then press the soft key. The Clock (time) screen will then be displayed, as shown in Figure 17.

☞ Time is always shown in 24-hour format.

Figure 17 - The Clock (time) screen

3. Press the soft key, then edit the displayed time as described in Section 4.10. When you change the last digit, the soft key changes to the soft key. Press the soft key to show the Clock (time) screen again.
4. Press the soft key to show the Clock (date) screen, as shown in Figure 18.

☞ You can change this format from day/month/year to month/day/year: refer to Section 5.7.3.

Figure 18 - The Clock (date) screen

5. To change the date, press the soft key, then edit the displayed date as described in Section 4.10. When you change the last digit, the soft key changes to the soft key. Press the soft key to show the Clock (date) screen again.
6. Press the soft key twice to display the Menus screen.

☞ The date format can be set to your regional preference (’day/month/year’ or ’month/day/year’ format): refer to Section 5.7.3.

☞ Once set, date and time will remain set until approximately 1 week after the the electrical supply to the analyser has been switched off. If the electrical supply is left switched on, date and time will remain set indefinitely.

5.7.3 Changing regional settings

You can configure the following analyser 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. With the Settings screen displayed, use the ▵ and ▿ soft keys to highlight the "Regional" menu option, then press the ✓ soft key. The first Regional settings option screen will then be displayed, as shown in Figure 19.

Figure 19 - The Regional settings (language) option screen

2. This screen shows the first regional option (Language). If necessary, press the ✎ soft key, use the ▵ and ▿ soft keys to highlight the required display language, then press the ✓ soft key.
3. If required, for each of the other two selectable options (date format and decimal format):
   - Use the ▵ and ▿ soft keys to select the corresponding option screen.
   - Press the ✎ soft key.
   - Use the ▵ and ▿ soft keys to highlight the required option, then press the ✓ soft key.

6 GENERAL OPERATION

CAUTION

Sample and calibration gases must be as specified in Sections 2.2 and 2.3. If the gas pressures and/or flow rates are above those specified in Sections 2.2 and 2.3, you must regulate the gases externally, before they enter the analyser.

CAUTION

You must leave the analyser (with the electrical supply switched on) for at least 4 hours before you allow sample or calibration gases into the analyser. If you do not, the gas may condense inside the transducer.

6.1 Calibrating the analyser

☞ The required frequency of calibration depends on the reliance that you place upon the accuracy and consistency of the measurements made by the analyser. Adjust the frequency according to your requirements/experience.

☞ For optimum measurement accuracy, perform Low **and** High calibrations.

You must calibrate the analyser as part of the initial set up (see Section 5.7), and whenever ambient conditions have changed. We also recommend that you calibrate the analyser regularly during normal operation, and that you keep a record of the calibration errors. Use the errors to adjust the required calibration frequency.

Calibrate the analyser as follows:

1. Configure your gas selection valves to connect your calibration gas supply to the analyser sample gas inlet: refer to Section 5.6.
2. Press the soft key on the Measurement screen (or select the "Calibrate" option from the Menu screen) to display the Calibrate screen (see Figure 20).

Figure 20 - The Calibrate screen

Note that the "9999d" field of the screen shown in Figure 20 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.

4. Use the ▲ and ▼ soft keys to select the required calibration, that is:
   - 'Lo' (low calibration gas).
   - 'Hi' (high calibration gas)
5. Press the ✓ soft key. The Calibrate target value screen will then be shown (see Figure 21), identifying the target value and the current reading.

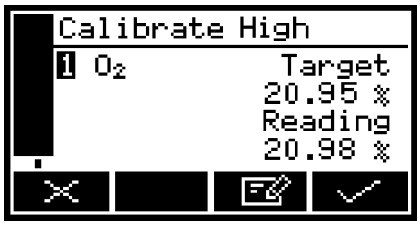


Figure 21 - The Calibrate target value screen

6. On the 'High' calibrate target value screen, if the target value is not that for the calibration gas which you are using, change the target value to the required value: press the ✎ soft key and use the edit method in Section 4.10.

   ☞ On the 'Low' calibrate target value screen, the target is shown as "0.0000" and the ✎ soft key is not shown. That is, you cannot change the target value for low calibration.

   ☞ Refer to Sections 2.2 and 2.3 for the required pressures, flow rates (if applicable) and concentrations of the calibration gases.

7. When the current reading is stable, press the ✓ soft key. The analyser will then carry out the specified calibration.
8. Configure your gas selection valves to disconnect the calibration gas supply from the sample gas inlet.
9. Repeat Steps 1 to 8 of this section for the second calibration for the specific sample gas.
10. Press the ✕ soft key to display the Measurement screen again.

6.2 Taking sample readings

☞ Depending on how you have configured the measurement alarms, and on how you connect the sample gases to the analyser, a measurement alarm may occur when you change sample gases as described below.

1. If necessary, calibrate the analyser: see Section 6.1.
2. Ensure that the Measurement screen is displayed: see Section 4.
3. Configure your gas selection valves to connect your sample gas supply to the analyser sample gas inlet: refer to Section 5.6.
4. Wait until the measurement shown on the screen has stabilised, then take note of the reading if required.
5. Configure your gas selection valves to disconnect the sample gas supply from the analyser sample gas inlet.

Repeat Steps 3 to 5 as necessary, for different gas samples to be measured.

6.3 Selecting display units

You can change the measurement units shown on the display. The following display units are supported:

Units	Meaning
%	volume %
ppm	parts per million
vpm	volume parts per million
mg/m3	mg m^{-3} (milligrams per normal cubic metre)
mol/mol	mols per mol (or moles per mole)
% LEL	volume % of the Lower Explosive Limit

☞ When you select display units other than the measurement default units, you must also enter the units conversion factor: refer to Appendix A1 to determine the units conversion factor for your specific application.

☞ If you select the "off" option on the units selection screen, the display units revert to the measurement default units as supplied.

☞ Converting from one measurement unit to a different display measurement unit may reduce the resolution of the displayed measurements.

Use the following procedure to select the displayed units, and to change the units conversion factor:

1. Press the soft key to display the Menu screen, use the and soft keys to highlight the "Set up" menu option, then press the soft key. The Set up screen will then be displayed, as shown in Figure 22.

Figure 22 - The Set-up screen

2. Use the ▲ and ▼ soft keys to highlight the "Unit selection" menu option, then press the ✓ soft key. The Currently selected units screen will then be displayed, as shown in Figure 23.

Figure 23 - The Currently selected units screen

3. If you want to view or change the units conversion factor, continue at Step 6.
4. If you want to change the currently displayed units, press the ✎ soft key: the Units selection screen will then be displayed, as shown in Figure 24.
5. Use the ▲ and ▼ soft keys to highlight the required units, then press the ✓ soft key to select the units. The Currently selected units screen will then be displayed again, with the newly selected units shown.

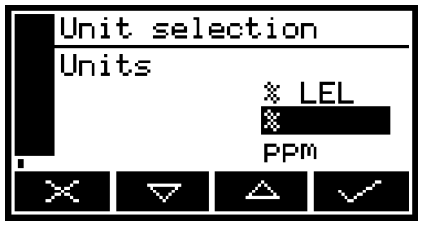


Figure 24 - The Units selection screen

6. With the Currently selected units screen (Figure 23) shown, press the ▼ soft key. The Units conversion factor screen will then be displayed, as shown in Figure 25.

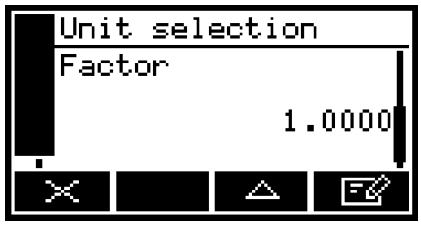


Figure 25 - The Units conversion factor screen

7. If you want to change the units conversion factor, press the ✎ soft key, then edit the displayed offset as described in Section 4.10.

6.4 Configuring the measurement alarms

6.4.1 Alarm modes and levels

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

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

While a measurement alarm condition is activated:

- An ‘alarm’ icon is shown on the measurement screen (see Section 4.2). The number ("1" or "2") in the icon will identify the alarm which has been triggered.
- The alarm LED on the front of the analyser (see Figure 1) flashes on and off.
- You can view the details of the activated alarm: see Section 6.4.6.

6.4.2 Latching/non-latching alarms

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

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: see Section 6.4.5.
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.

6.4.3 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:

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 18% and a hysteresis level of 1%, the alarm will be activated when a sample measurement is < 18%, and the alarm will not be deactivated until a sample measurement is > 19%.
- If a ‘high’ alarm has an alarm level of 20% and a hysteresis level of 2%, the alarm will be activated when a sample measurement is > 20%, and the alarm will not be deactivated until a sample measurement is < 18%.

6.4.4 Setting the measurement alarm levels and modes

☞ 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.)

☞ If you configure one measurement alarm as 'low' and configure the other alarm as 'high', ensure that the 'high' alarm and hysteresis levels are higher than the 'low' alarm and hysteresis levels. (If you do not, the analyser can be permanently in an alarm condition, until you correct the levels.)

Before you start to take sample readings, you must ensure that the measurement alarms are correctly configured for your sample gases.

1. On the Measurement screen, press the soft key. The Alarm option screen will then be displayed, as shown in Figure 26.
2. Highlight the "Set up" menu option, then press the soft key. The Alarm set up screen will then be displayed, as shown in Figure 27.
3. Use the and soft keys to highlight the required alarm, then press the soft key. The Alarm mode screen will then be displayed, as shown in Figure 28.
4. If the alarm mode is not the required mode, press the soft key, use the and soft keys to select the required mode (none, low or high), then press the soft key.

Figure 26 - The Alarm option screen

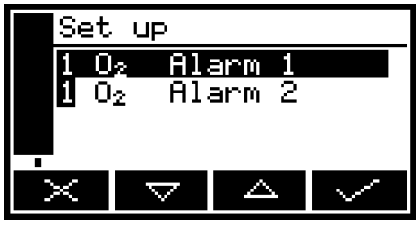


Figure 27 - The Alarm set up screen

Figure 28 - The Alarm mode screen

5. On the Alarm mode screen, use the and soft keys to highlight each of the following alarm options, and select the required option (using the method in Step 4 above) or enter the appropriate levels (using the method described in Section 4.10):
   - Latching
   - Level
   - Hysteresis.

6.4.5 Unlatching measurement alarms

When necessary, use the following procedure to unlatch any ‘latched’ measurement alarm(s) (see Section 6.4.2):

1. On the Measurement screen, press the soft key; the Alarm option screen (Figure 26) 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.

6.4.6 Viewing the measurement alarm status

1. On the Measurement screen, press the soft key; the Alarm option screen (see Figure 26) will then be displayed.
2. With the "View" option highlighted, press the soft key. The Alarm status screen will then be displayed (see Figure 29).

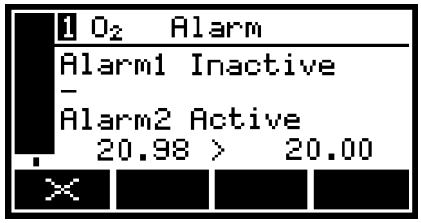


Figure 29 - The Alarm status screen

In the Alarm status screen shown in Figure 29:

- Measurement alarm 1 is shown as "Inactive"; that is, either the mode of the alarm is set to ‘none’, or no alarm condition currently exists.
- Measurement alarm 2 is shown as "Active"; that is, a high alarm condition has been detected, with the sample reading (20.98) above the alarm level (20.00).

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

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

6.5 Configuring and using the milliAmp output

6.5.1 Overview

The analyser is supplied with a milliAmp output facility. The milliAmp output provides a constantly updated output (through a signal cable connected to the analyser), in which the current represents the value of gas sample measurements.

The analyser allows you to specify two separate output configurations for the milliAmp outputs: Range 1 and Range 2. The Range with which the sample measurement is currently associated is shown on the Measurement screen (see Figure 7):

I is shown if Range 1 is selected.

II is shown if Range 2 is selected.

The milliAmp output provides one of the following selectable output current ranges, for gas sample measurements:

- 0 to 20 mA, where 0 mA represents a sample measurement of 0 (zero) and 20 mA represents a user selected highest sample measurement (the span).
- 4 to 20 mA, where 4 mA represents a sample measurement of 0 (zero) and 20 mA represents a user selected highest sample measurement (the span).

In addition to the above, you can specify how the milliAmp output will operate during calibration, during a fault condition, and during under-range conditions.

Details of the output parameters for the milliAmp outputs are given in Section 6.5.2. Set up, configure, check, calibrate and use the milliAmp outputs as described in Sections 6.5.3 to 6.5.6.

☞ The milliAmp outputs can only be configured with zero-based ranges. Zero elevation or suppression based outputs are not available.

6.5.2 Introduction to the milliAmp output parameters

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

Parameter	Values/options
Range 1 high level	The Range 1 highest sample measurement (span) *.
Range 2 high level	The Range 2 highest sample measurement (span) *.
During calibration	The selected option determines how the milliAmp output will operate during calibration:
	Freeze — As soon as the calibration screen is displayed, the milliAmp output will 'freeze' at its last output value. The output will only be updated to reflect subsequent measurements when calibration has been completed.
	Follow — The milliAmp output value will reflect the measurement value, even during calibration.
Jam condition	The selected option determines how the milliAmp output will operate during a fault condition:
	High — The output value will be held at 21.5 mA.
	Low — The output value will be held at 0 mA.
	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, configurable from 0% up to 100% oxygen
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 negative gas concentrations to be monitored through the milliAmp output. For example, with an underrange setting of 3.8 mA, the milliAmp output can be less than 4 mA (which indicates a zero gas concentration), down to a minimum of 3.8 mA, where an output between 3.8 mA and 4 mA indicates a negative gas concentration.

6.5.3 Setting up the milliAmp output parameters

Use the following procedure to set up the milliAmp output parameters:

1. Press the soft key to display the Menu screen, use the and soft keys to highlight the "Set up" menu option, then press the soft key. The Set up screen will then be displayed (see Figure 22).
2. Use the and soft keys to highlight the "mA output" menu option, then press the soft key: the mA configuration screen is then shown (see Figure 30).

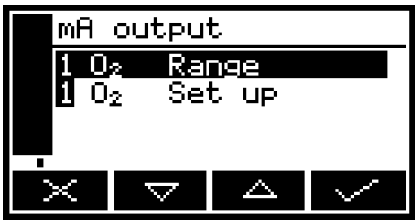


Figure 30 - The mA configuration screen

3. Use the and soft keys to highlight the required "Set up" option, then press the soft key: the corresponding mA output high level screen will then be shown: see Figure 31.

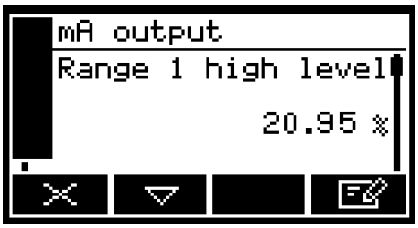


Figure 31 - The mA output high level screen

4. If necessary, change the displayed parameter using the edit method described in Section 4.10.
5. For each of the other milliAmp parameters (see Section 6.5.2):
   - Use the and soft keys to select the corresponding parameter screen.
   - Change the parameter as necessary: press the soft key then use the and soft keys to select the required option, or edit the data as described in Section 4.10.

☞ You cannot enter a high level (span) value higher than the maximum measurement that the corresponding gas sensor can determine (refer to Section 2.6).

6.5.4 Selecting the Range associated with a measurement

Use the following procedure at any time during sampling to change the Range (see Section 6.5.1) associated with a gas measurement:

1. Press the soft key to display the Menu screen, use the and soft keys to highlight the "Set up" menu option, then press the soft key. The Set up screen will then be displayed (see Figure 22).
2. Use the and soft keys to highlight the "mA output" menu option, then press the soft key: the mA configuration screen is then shown (see Figure 30).
3. Use the and soft keys to highlight the required gas Range option, then press the soft key: the mA range screen will then be displayed, as shown in Figure 32.

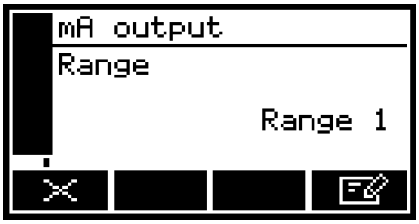


Figure 32 - The mA range screen

4. To change the selected Range:
   - Press the soft key, then use the and soft keys to highlight the alternative Range option (Range 1 or Range 2).

Press the soft key: the mA Range screen will then be displayed again, with the new Range shown.

6.5.5 Calibrating the milliAmp output

Use the following procedure to calibrate the milliAmp output:

1. Press the soft key to display the Menu screen.
2. Use the and soft keys to highlight the "Service" menu option, then press the soft key.

   The Service screen will then be displayed, as shown in Figure 33.

Figure 33 - The Service screen

3. Select the "mA output" menu option, then press the soft key.

   The mA output service screen will then be displayed, as shown in Figure 34.

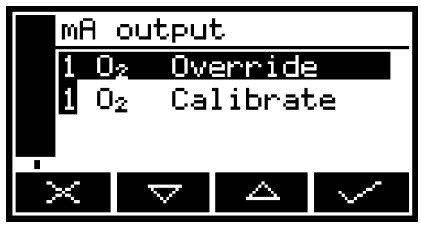


Figure 34 - The mA output service screen

4. Select the required 'Calibrate' option, then press the soft key. The mA output calibrate screen will then be displayed, as shown in Figure 35.

Figure 35 - The mA output calibrate screen

5. As soon as the mA output calibrate screen is shown, the nominal milliAmp output value is set to 20 mA:
   - Use your control/monitoring equipment (connected to the analyser) 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.
6. When the milliAmp output has been correctly calibrated, press the soft key: the mA output service screen (Figure 34) will then be displayed again.

☞ The actual milliAmp 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 displayed, the milliAmp output value will be updated to reflect the corresponding gas measurement.

6.5.6 Checking the milliAmp output

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

1. Press the soft key to display the Menu screen, use the and soft keys to highlight the "Service" menu option, then press the soft key. The Service screen will then be displayed, as shown in Figure 33.
2. Select the "mA output" menu option, then press the soft key. The mA output service screen will then be displayed: see Figure 34.
3. Select the required ‘Override’ option, then press the soft key. The mA output override screen will then be displayed, as shown in Figure 36.

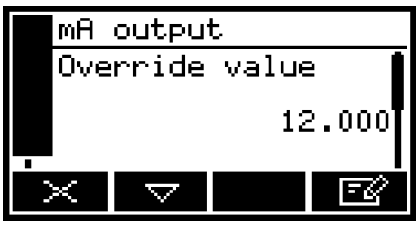


Figure 36 - The mA output override screen

4. Edit the displayed override value as described in Section 4.10.
5. Press the soft key: an acceptance screen showing "No" will then be displayed.
6. To apply the override, press the soft key: an ‘Override’ screen will then be shown. Use the and soft keys to highlight the "Yes" option, then press the soft key.

   The milliAmp output will now be set to the override value you have selected. Use your control/monitoring equipment (connected to the analyser) to check that the output is correct.
7. If required, repeat Steps 3 to 6 above to check for other milliAmp output values, or press the soft key to display the mA output service screen again.

☞ 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.

6.6 Checking the relay signal outputs

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

1. Press the soft key to display the Menu screen, use the and soft keys to highlight the "Service" menu option, then press the soft key. The Service screen will then be displayed, as shown in Figure 33.
2. Select the "Relay" menu option, then press the soft key. The Relay override state screen will then be displayed: see Figure 37.

Figure 37 - Relay override state screen

3. Figure 37 shows the relay state (Energised or Deenergised) that the four relay signals outputs will be set to when override is selected. If this is the correct state, continue at Step 5, otherwise continue at Step 4.

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

4. If you want to override the relays with the alternative signal state, press the soft key, use the and soft keys to highlight the alternative signal state, then press the soft key to display the Relay override state screen again.
5. With the Relay override state screen displayed, press the soft key; the Relay override action screen will then be displayed, as shown in Figure 38.

Figure 38 - The Relay override action screen

6. Use the and soft keys to highlight the "Yes" option, then press the soft key. The four 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.

☞ 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.

6.7 Adjusting the display

At any time, you can adjust the screen display to suit the ambient light conditions, as described in Sections 6.7.1 and 6.7.2.

6.7.1 Adjusting the backlight timer

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

1. On the Settings screen, highlight the "Backlight" option, then press the ✓ soft key. The Backlight timer screen will then be displayed, as shown in Figure 39.
2. Change the backlight time (Duration) setting as required, then press the ✓ soft key.

Figure 39 - 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.

6.7.2 Adjusting the contrast

1. On the Settings screen, highlight the "Contrast" option, then press the ✓ soft key. The Contrast screen will then be displayed, as shown in Figure 40.

Figure 40 - The Contrast screen

2. Use the △ and ▽ soft keys to increase or decrease the contrast to the required level, then press the ✓ soft key.

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

6.8 Switching off the analyser

Switch off the external electrical supply to the analyser to switch off the analyser.

After you have switched off the analyser, when required or as necessary (for example, if you need to carry out plant/factory maintenance and will not use the analyser for several days):

- Disconnect the pipes from the sample gas inlet and outlet on the base of the analyser (see Figure 1) .
- Fit protective plastic caps to the sample gas inlet and outlet.
- Isolate/lockout the external electrical supply, then remove the power/interface compartment cover (refer to Section 5.2) and disconnect the electrical supply cable from the analyser.

7 ROUTINE MAINTENANCE

WARNING

The analyser must be maintained by a suitable skilled and competent technician or engineer.

WARNING

Sample and calibration gases may be toxic, asphyxiant or flammable. Never inspect the inlet filter, open the front cover of the sample/control compartment, or service or repair the analyser while such gases are still connected to it.

WARNING

Sample and calibration gases may be toxic, asphyxiant or flammable and hazardous concentrations may accumulate within the analyser during use. Always open the front cover of the sample/control compartment in a force-ventilated enclosure with a minimum volume of 17 m^3, or in another appropriate environment, in which any hazardous gases are directed away from you.

7.1 Cleaning the analyser

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

7.2 Replacing the inlet filter

WARNING

Do not open the hinged door of the sample/control compartment if an explosive atmosphere may be present.

☞ New inlet filters and 'O' rings are available as spares: see Section 10. On an analyser with a solvent-resistant transducer, ensure that you fit the correct type of inlet filter 'O' ring, otherwise the 'O' ring may fail during operation.

If you only use the analyser on applications which use clean, dry gases, you will only need to inspect the inlet filter every 3 months. On other applications, we recommend that you inspect the inlet filter more frequently.

1. Ensure that the sample gases are isolated from the analyser.
2. Ensure that the electrical supply to the analyser is switched off/locked out.
3. Refer to Figure 1 (page 3). Use the 5 mm hexagonal key supplied to undo the four locking screws (4) on the door of the sample/control compartment.
4. Open the hinged door (1) of the sample/control compartment.
5. Refer to Figure 3 detail A or B (page 5). Undo the two nuts (2) and disconnect the transducer inlet/outlet pipes from the inlet/outlet 'T' piece (3 or 7).
6. Refer to detail C. Undo and remove the eight M4 screws (14), then remove the bulkhead (13) together with the sample gas inlet and outlet (4, 5) from the base of the analyser.
7. Remove the 'O' ring (11) and used inlet filter (10) from the sample gas inlet (4).
8. Dispose of the 'O' ring and the used inlet filter: refer to Section 9.2.
9. Fit a new 'O' ring (11) and inlet filter (10) to the sample gas inlet (4).
10. Ensure that the insulation (12) is correctly positioned, then refit the bulkhead (13) together with the sample gas inlet and outlet (4, 5) to the base of the analyser and secure with the eight M4 screws (14).
11. Reconnect the two nuts (2) to connect the transducer inlet/outlet pipes to the inlet/outlet 'T' piece (3 or 7).
12. Refer to Figure 1 (page 3). Close the hinged door (1) of the sample/control compartment.
13. Use the 5 mm hexagonal key supplied to tighten the four locking screws (4).

CAUTION

If your sample gas contains particulates, do not operate the analyser with the inlet filter removed. If you do, particulates in the sample gas will seriously damage the analyser.

7.3 Inspecting/replacing the fuse (when necessary)

7.3.1 Removing the cover and replacing the fuse

WARNING

Ensure that the electrical supply is isolated/locked out from the analyser. If you do not, there will be a danger of injury or death from electric shock.

WARNING

Do not remove the cover of the power/signal compartment if an explosive atmosphere may be present.

WARNING

The power/interface compartment cover is heavy. Ensure that you do not drop the cover once it is disengaged from the body of the analyser. If you do, you may injure yourself or damage other equipment.

CAUTION

Place the cover carefully on a clean surface, resting on the exterior of the cover, so that the pregreased threads do not become contaminated.

If you suspect that the internal fuse has failed, use the following procedure to inspect it and replace it if necessary:

1. Ensure that the external electrical supply is switched off and is isolated/locked out from the analyser.
2. Refer to Figure 1 (page 3). Use the 2 mm hexagonal key supplied to loosen the locking screw (5) which secures the cover (7).
3. Unscrew the cover (7); that is, turn it anticlockwise. If necessary, fit a suitable metal bar between the protruding fins on the front of the cover to provide additional leverage.
4. When the cover is fully disengaged from the body of the analyser, remove it and place it carefully on a clean surface: see the caution above.
5. Refer to Figure 4 (page 6). Remove the fuse (5, F101) and check the continuity across the fuse:
   - If there is continuity, the fuse has not failed: refit the fuse.
   - If there is no continuity, the fuse has failed: fit a new fuse of the correct type and rating.

7.3.2 Refitting the cover

WARNING

The power/interface compartment cover is heavy. Ensure that you do not drop the cover when you refit it to the body of the analyser. If you do, you may injure yourself or damage other equipment.

CAUTION

Ensure that the pregreased threads of the cover do not become contaminated.

☞ The threads on the cover are pregreased. You do not need to add any grease or sealant to the threads before you refit the cover.

1. Refer to Figure 1 (page 3). Refit the cover (7) to the body of the analyser, so that the threads on the rear of the cover are correctly aligned with the threads in the analyser.
2. Screw on the cover (that is, turn the cover clockwise) to secure it to the analyser: pick the cover up by its exterior, and do not touch or contaminate the pregreased threads on the cover.
3. Fully tighten the cover. If necessary, fit a suitable metal bar between the protruding fins on the front of the cover to provide additional leverage.
4. Use the 2 mm hexagonal key supplied to tighten the locking screw (5) which secures the cover (7).
5. Ensure that the certification label (8) is in the correct orientation. If necessary, press and turn the label until it is in the correct orientation.

☞ If a new fuse fails immediately after you have fitted it, there may be an electrical fault in the analyser: contact Servomex or your Servomex agent.

7.4 Use of the analyser with toxic gases

WARNING

If you use the analyser to sample toxic gases, the concentrations of the gases sampled or used for calibration of the analyser may be above their respective threshold limit values. You must therefore regularly leak-test the analyser and associated equipment. If any leaks are found, do not continue to use the analyser or associated equipment until the leaks have been sealed.

CAUTION

When you carry out a leak test, do not exceed a maximum pressure of 34.5 kPa gauge (0.35 bar gauge, 5 psig) and do not introduce a sudden change of pressure into the analyser. If you do, you may damage it.

CAUTION

If you use a liquid to assist in leak testing, do not spill liquid onto any of the electrical components in the sample/control compartment.

If you use the analyser for toxic gas sample measurements, you must regularly leak-test the analyser and the associated sample inlet and outlet pipelines or hoses.

We recommend that you leak-test the analyser at least once every 6 months:

- If there are leaks within the analyser, it must be returned to Servomex for repair. Do not continue to use the analyser.
- You must seal any leaks in your sample pipelines or system.

When you leak-test, ensure that you do not exceed the maximum pressure, and do not increase the pressure in the analyser too quickly (see the caution above): we recommend that you allow at least 30 seconds to fully pressurise the analyser to the maximum pressure.

7.5 Preventative maintenance

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

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

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

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

8 FAULT FINDING

8.1 Introduction to faults and fault messages

When the analyser internal self-test facilities detect a fault:

- The red fault LED (see Figure 1) goes on.
- A fault icon is shown on the measurement screen (see Figure 7).
- An appropriate fault message is stored.

You can view the current faults as described in Section 8.2. The fault messages which can be shown - together with the recommended actions you should take - are listed (in alphabetical order) in the table below:

Fault message	Recommended actions
Calibration fault	Recalibrate (both low and high) as described in Section 6.1. 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 analyser off, and then turn it on again. If the fault message is then displayed again, contact Servomex or your local Servomex agent for assistance.
Database fault	Contact Servomex or your local Servomex agent for assistance.
Date/Time invalid	This usually occurs because the electrical supply to the analyser has been switched off for more than a week. Switch on the electrical supply, then set the date/time as described in Section 5.7.2. If the fault persists, contact Servomex or your local Servomex agent for assistance.
Fatal fault	Contact Servomex or your local Servomex agent for assistance.
Heater fault	Contact Servomex or your local Servomex agent for assistance.

Fault messages (Sheet 1 of 2)

Fault message	Recommended actions
mA fault	Ensure that the electrical cabling connected to the analyser is not open circuit. Turn the analyser off, and then turn it on again. If the fault persists, contact Servomex or your local Servomex agent for assistance.
mA not detected	Contact Servomex or your local Servomex agent for assistance.
mA reset	Contact Servomex or your local Servomex agent for assistance.
Power Config fault	Contact Servomex or your local Servomex agent for assistance.
Static RAM fault	Turn the analyser off, and then turn it on again. If the fault message is then displayed again, contact Servomex or your local Servomex agent for assistance.
Transducer error	Ensure that you are using the analyser in the specified operating conditions (refer to Section 2). If the fault persists, contact Servomex or your local Servomex agent for assistance.
Tx incorrect type	Contact Servomex or your local Servomex agent for assistance.
Tx Maintenance	Check that the sample gas concentration is not higher than the transducer Full Scale Range. Recalibrate (both low and high) as described in Section 6.1. If this does not clear the fault, turn the analyser 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.

Fault messages (Sheet 2 of 2)

8.2 Viewing fault messages

If you want to view details of faults currently detected by the analyser, use the △ and ▽ soft keys to highlight the "Faults" option on the Menu screen, then press the ✓ soft key. The Fault status screen will then be displayed as shown in Figure 41.

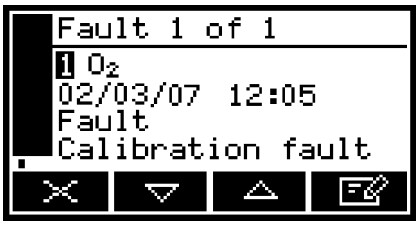


Figure 41 - The Fault status screen

If there is more than one currently detected fault, this will be indicated by the screen heading and by the scroll bar at the right of the screen. If required you can use the △ and ▽ soft keys to scroll through and view all of the current faults.

Each fault status screen shows:

- Date and time of fault
- Fault indicator
- Fault message.

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

8.3 General fault finding

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

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

Fault symptom	Recommended actions
The Fault LED is on.	Check any current fault messages (see Section 8.2), and carry out the recommended actions (see Section 8.1). If there are no applicable fault messages stored, or if you cannot rectify the fault after you have carried out the recommended actions: • Switch off the analyser, then switch it on again. • If the fault persists, contact Servomex or your local Servomex agent for assistance.
The software health indicator is not moving on the display.	Carry out the recommended actions for the "The Fault LED is on" symptom above.
" - - - - - " is displayed instead of a sample measurement.	This indicates a possible measurement error, or a communications error between the transducer and the analyser controller. Check that the analyser is not being knocked, moved, or subjected to high levels of vibration during sample measurements. If the analyser is not being knocked, moved or subjected to vibration and the fault persists, contact Servomex or your local Servomex agent for assistance.
analyser response is slow.	Check that the sample gas inlet is not blocked, and that the sample gas supply to the analyser is not restricted. Check that the sample gas outlet is not blocked, and that any pipes connected to the outlet are not restricted. Inspect the inlet filter element and replace it if necessary: refer to Section 7.2. Check that the sample gas supply pressure is correct: refer to Section 2.2.

General fault finding (Sheet 1 of 3)

Fault symptom	Recommended actions
analyser measurements are not as expected.	Check that the correct display units have been selected, and that the units conversion factor has been correctly entered (see Section 6.3).
analyser measurements are unstable.	Check that the sample gas supply pressure is correct: refer to Section 2.2. Check that the analyser is not being subjected to high levels of vibration. Check that the sample gas inlet is not blocked, and that the sample gas supply to the analyser is not restricted. Check that the sample gas outlet is not blocked, and that any pipes connected to the outlet are not restricted. Inspect the filter element and replace it if necessary: refer to Section 7.2.
The analyser will not calibrate.	Check that the correct low and high calibration gases are being used: refer to Section 2.3. Check that the sample gas inlet is not blocked, and that the sample gas supply to the analyser is not restricted. Check that the sample gas outlet is not blocked, and that any pipes connected to the outlet are not restricted. Inspect the filter element and replace it if necessary: refer to Section 7.2.
The analyser will not switch on.	Check that the external electrical 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 analyser: refer to Section 5.3.4. If the supply is correctly connected, check that fuse F101 has not failed; inspect and replace the fuse if necessary: refer to Section 7.3.

General fault finding (Sheet 2 of 3)

Fault symptom	Recommended actions
The analyser display is blank or is too dark.	Check that the ambient temperature is within the valid analyser operating temperature range: refer to Section 2.4. Check that the display contrast adjustment has been correctly set (refer to Section 6.7.2), and has not been altered.
The measurement alarms are activating more often than expected.	Check that the analyser 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 6.4.4.
The milliAmp output is at 0 or 21.5 A.	If you have configured the milliAmp output to jam high or jam low, check whether a fault condition exists (see Section 6.5.2). 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 analyser is not open circuit. Check that the milliAmp output is calibrated correctly (see Section 6.5.5). Check that you have selected the correct Range (see Section 6.5.1).
A relay signal output is not as expected.	Check that the signal cable is correctly connected to the analyser: refer to Section 5.3.3.

General fault finding (Sheet 3 of 3)

9 STORAGE AND DISPOSAL

9.1 Storage

Refit any protective plastic covers (see Section 3) and place the analyser and any associated equipment in its original packaging before storage. Alternatively, seal it inside a waterproof plastic bag, sack, or storage box.

Store the analyser and any associated equipment in a clean, dry area. Do not subject it to excessively hot, cold, or humid conditions: see Section 2.4.

9.2 Disposal

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

☞ The analyser is not suitable for disposal in municipal waste streams (such as landfill sites, domestic recycling centres and so on): refer to Appendix A4.

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

10 SPARES

WARNING

Do not use spares other than those specified below, and do not attempt to carry out any maintenance procedures other than those specified in this manual. If you do, you can damage the analyser and invalidate its certification, and use of the analyser in a hazardous area may result in a risk of fire or explosion.

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

Spare	Part Number
Inlet filter: 20 μm, stainless steel	2377-3862
Inlet filter 'O' ring: Viton® *	2323-7803
Inlet filter 'O' ring: Chemraz® †	2323-7928
Fuse F101: 2 A for 100-120 V operation	204629
Fuse F101: 1 A for 220-240 V operation	2531-2630
Adaptor: $^1/_4$ inch outside diameter, stainless steel	2344-2054
Adaptor: 6 mm outside diameter, stainless steel	2346-3073
Panel mounting kit	S1800990

* For an analyser with a standard oxygen transducer.

† For an analyser with a solvent-resistant oxygen transducer.

☞ We recommend that you maintain a stock of inlet filters, so that you can replace them when necessary: see Section 7.2.

APPENDIX

A1 DISPLAY UNIT CONVERSION FACTORS

When you select display units as described in Section 6.3, you must ensure that you also enter the correct units conversion factor, as shown in the table below:

To convert from *	to †	use the units conversion factor	applicable gas(es)
%	ppm	10000	any
ppm	%	0.0001	any
ppm	vpm	1	any
ppm	mg/m3	1.2492	CO
"	"	1.9631	CO_2
"	"	1.4277	O_2
%	mg/m3	12492	CO
"	"	19631	CO_2
"	"	14277	O_2
ppm	%LEL	0.0008	CO
%	%LEL	8	CO
%	mol/mol	0.01	any
ppm	mol/mol	#	#

* Measurement default units.
† Selected display units
# This conversion is not supported.

☞ To return to the measurement default units, select the "off" units selection option and set the units conversion factor to "1": see Section 6.3.

APPENDIX

A2 PANEL MOUNTING THE ANALYSER

A2.1 Introduction

To panel mount the analyser, you will need a panel mounting kit, available as an option (see Section 10). Use the procedures in the following sections to unpack the kit and to use the kit to mount the analyser.

A2.2 Unpacking

1. Remove the mounting kit from its packaging.
2. Inspect the components 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 listed below. If any item is missing from the kit, immediately contact Servomex or your local Servomex agent.

Quantity	Item	Figure A1 key	Check (✓)
1	Front panel assembly	6, 9	❑
2	Mounting brackets	4	❑
8	M8 x 20 cap head screws	7	❑
4	M8 x 35 hex head bolts	1	❑
8	M8 full nuts	3	❑
20	M8 washers	2	❑

4. If you do not intend to use the mounting kit immediately, place the mounting kit back in its protective packaging and store it as described in Section 9.1.

   Otherwise, continue at Section A2.3 to install the analyser with the mounting kit.

A2.3 Fit the analyser with the mounting kit

1. Refer to Figure A1. Prepare a cutout (with dimensions as shown in detail B) in a suitable panel.
2. Use the hex head bolts (1), washers (2) and nuts (3) to secure the two mounting brackets (4) to the analyser (8).
3. Use the cap head screws (7) and washers (2) to fit the front panel assembly (6) to the two mounting brackets (4).
4. Use the cap head screws (7), washers (2) and nuts (3) to secure the front panel assmembly (with the analyser fitted) to your panel frame (5).

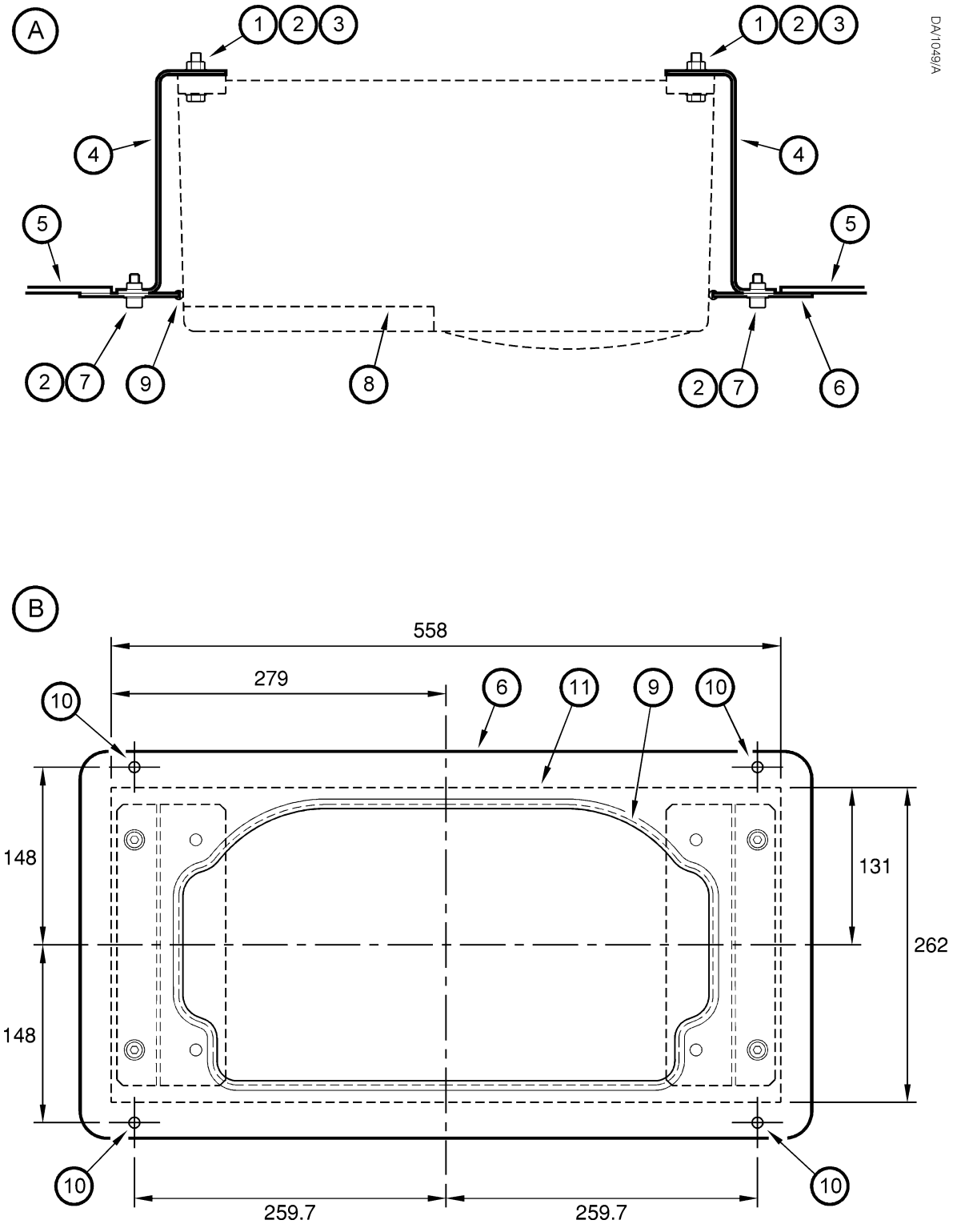
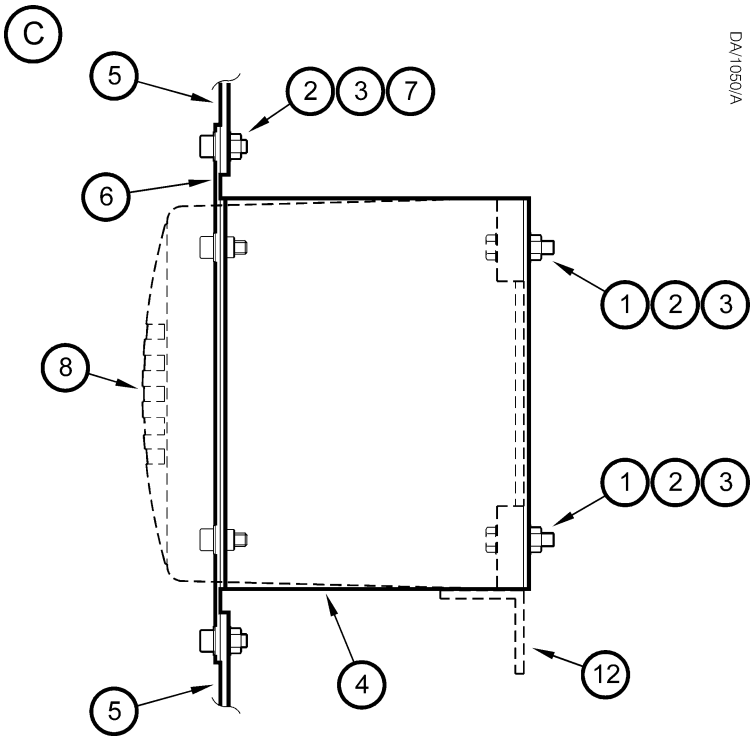


Figure A1 - Panel mounting arrangement/dimensions (mm): sheet 1 of 2



A. Plan view, showing analyser and mounting assembly
B. Front view, showing cutout and fixing dimensions
C. Side view, showing optional additional support

Key	Description
1.	M8 x 35 hex head bolt
2.	M8 washer
3.	M8 full nut
4.	Side bracket
5.	Panel frame *
6.	Front panel

Key	Description
7.	M8 x 20 cap head screw
8.	analyser mounting position
9.	Protective strip †
10.	Fixing hole: ∅9
11.	Cutout (in item 5*)
12.	Additional support *

* Not supplied.
† Length = 1215.

Figure A1 - Panel mounting arrangement/dimensions (mm): sheet 2 of 2

APPENDIX

A3 MATERIALS IN CONTACT WITH SAMPLE AND CALIBRATION GASES

The materials of the parts of the analyser in contact with the sample and calibration gases are listed below. These materials have a wide range of chemical compatibility and corrosion resistance.

Analyser with standard transducer:

316 stainless steel
Gold
Nickel
Sapphire
Viton®

Analyser with solvent-resistant transducer:

316 stainless steel
Gold
Nickel
Sapphire
Chemraz®
PTFE

APPENDIX

A4 PRODUCT DISPOSAL/APPLICABILITY OF THE WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE) DIRECTIVE 2002/96/EC

The analyser is not considered to be within the scope of the Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC.

The analyser is not intended for disposal in a municipal waste stream, but shall be submitted for material recovery and recycling in accordance with any appropriate local regulations.

For additional information and advice on the disposal of the analyser, contact Servomex:

Servomex Group Limited,
Jarvis Brook,
Crowborough,
East Sussex,
TN6 3DU,
England

Tel: (44) 1892 652181
Fax: (44) 1892 662253
Global email: info@servomex.com

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

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APPENDIX

A5 COMPLIANCE AND STANDARDS INFORMATION

- The analyser complies with the European Community "Electromagnetic Compatibility Directive", 89/336/EEC (as amended by 92/31/EEC and 93/68/EEC) by the application of the following standard:

  EN 61326: 1997 + A1: 1998 + A2: 2001 +A3: 2004, referencing:

  Emissions: Table 3, Class A. Equipment used in establishments other than domestic, and those directly connected to a low voltage supply which supplies buildings for domestic purposes.

  Immunity: Table A1 - Industrial Environments.

- The analyser complies with the European Community ATEX Directive, 94/9/EC.
- The analyser complies with the European Community
- The analyser has been assessed to IEC 61010-1:2001 (+Corr 1: 2002 + Corr 2:2003) for electrical safety, rated in accordance to IEC 60664-3 Category II, Pollution Degree 2.
- Servomex Group Ltd is a BS EN ISO 9001 and BS EN ISO 14001 certified organisation.

APPENDIX

A6 ATEX CERTIFICATES

The ATEX certificates for the analyser are shown on the following pages.

Certificate Number
Baseefa06ATEX0050

Baseefa

Issued 12th May 2006
Page 1 of 3

1 **EC - TYPE EXAMINATION CERTIFICATE**

2 **Equipment or Protective System Intended for use in Potentially Explosive Atmospheres Directive 94/9/EC**

3 EC - Type Examination Certificate Number: **Baseefa06ATEX0050**

4 Equipment or Protective System: **1900 Digital Analyser Series**

5 Manufacturer: **Servomex Limited**

6 Address: **Crowborough, East Sussex, TN6 3DU**

7 This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 Baseefa (2001) Ltd., Notified Body number 1180, in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential Report No. **05(C)0500-1 and 05(C)0500-2**

9 Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0: 2004 **EN 60079-1: 2004** **EN 50020: 2002**

except in respect of those requirements listed at item 18 of the Schedule.

10 If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.

11 This EC - TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified equipment or protective system. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.

12 The marking of the equipment or protective system shall include the following :

Ⓔx II 2G Ex ia d IIC T4 (–10°C ≤ Ta ≤ +50°C)

This certificate may only be reproduced in its entirety, without any change, schedule included.

Baseefa Customer Reference No. **0965**

Project File No. **05/0500**

This certificate is granted subject to the general terms and conditions of Baseefa (2001) Ltd. It does not necessarily indicate that the equipment may be used in particular industries or circumstances.

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DIRECTOR
On behalf of
Baseefa (2001) Ltd.

Re-issued 11th July 2006 to replace original.
Change to lower operating ambient temperature from -20°C to -10°C

13 **Schedule**

14 **Certificate Number Baseefa06ATEX0050**

15 Description of Equipment or Protective System

The 1900 Digital Analyser Series is designed for measuring gas concentrations using the different transducers. Model 1910 uses a paramagnetic transducer for measuring oxygen and model 1920 uses an infra-red transducer for measuring other gases. The analyser is mains powered.

The analyser comprises an enclosure with two compartments, one of which is Ex d and contains a user interface board, power supply board and barrier board. The second compartment contains the intrinsically safe circuits comprising; distribution board, CPU board, display and keypad board, heater and component certified gas sensor. The circuits within the two compartments are connected together by means of a cable that leaves one compartment and goes outside the equipment then enters the second compartment. There is no direct connection between the two compartments.

Electrical connections are made to the analyser in the Ex d compartment on the user interface board by means of screw terminals.

User Terminals in Ex d compartment

U_m = 253Vrms

16 Report Number

05(C)0500-1 Intrinsic Safety Assessment

05(C)0500-2 Flameproof Assessment

17 Special Conditions for Safe Use

None

18 Essential Health and Safety Requirements

All relevant Essential Health and Safety Requirements are covered by the standards listed at item 9.

19 Drawings and Documents

Document No.	Sheets	Document Title	Issue	Date (yyyy/mm/dd)
01910/881/0	1 of 1	1910 Block Diagram IS Version	0	2006/04/27
01910/852X/0	1 of 1	Approval, Power Supply Board Circuit	0	2006/04/27
01910/852/0	1 to 2	Approval Drawing, Power Supply Board - Assembly	0	2006/04/27
01910/852Z/0	1 of 1	Approval Drawing, Power Supply Board – Layer A	0	2006/04/27
01910/852Y/0	1 of 1	Approval Drawing, Power Supply Board – Layer B	0	2006/04/27
01910/853X/0	1 to 2	Approval, Barrier Board Circuit Diagram	0	2006/04/27
01910/853/0	1 to 2	Approval Drawing, Barrier Board - Assembly	0	2006/04/27
01910/853Z/0	1 of 1	Approval Drawing, Barrier Board – Layer A	0	2006/04/27
01910/853Y/0	1 of 1	Approval Drawing, Barrier Board – Layer B	0	2006/04/27
01910/854X/0	1 of 1	Approval, Distribution Board Circuit Diagram	0	2006/04/27
01910/854/0	1 of 1	Approval Drawing, Distribution Board – Assembly	0	2006/04/27
01910/854Z/0	1 of 1	Approval Drawing, Distribution Board – Layer A	0	2006/04/27
01910/854Y/0	1 of 1	Approval Drawing, Distribution Board – Layer B	0	2006/04/27

Certificate Number
Baseefa06ATEX0050

Baseefa

Issued 12th May 2006
Page 3 of 3

Document No.	Sheets	Document Title	Issue	Date (yyyy/mm/dd)
05000/851X/0	1 to 3	Approval 5000 Series, Microcontroller Module	0	2006/05/04
05000/851/0	1 of 1	Approval Drawing, Microcontroller Board - Assembly	0	2006/05/04
05000/851Z/0	1 of 1	Approval Drawing, Microcontroller Board – Layer A	0	2006/05/04
05000/851W/0	1 of 1	Approval Drawing, Microcontroller Board – Layer B	0	2006/05/04
05000/851V/0	1 of 1	Approval Drawing, Microcontroller Board – Layer C	0	2006/05/04
05000/851Y/0	1 of 1	Approval Drawing, Microcontroller Board – Layer D	0	2006/05/04
01910/855X/0	1 of 1	Approval, Heater Board Circuit Diagram	0	2006/04/27
01910/855/0	1 of 1	Approval Drawing, Heater Board - Assembly	0	2006/04/27
01910/855Z/0	1 of 1	Approval Drawing, Heater Board – Layer A	0	2006/04/27
01910/855W/0	1 of 1	Approval Drawing, Heater Board – Layer B	0	2006/04/27
01910/855V/0	1 of 1	Approval Drawing, Heater Board – Layer C	0	2006/04/27
01910/855Y/0	1 of 1	Approval Drawing, Heater Board – Layer D	0	2006/04/27
01910/865X/0	1 of 1	Approval, Heater Board Circuit Diagram	0	2006/04/27
01910/865/0	1 of 1	Approval Drawing, Heater Board - Assembly	0	2006/04/27
01910/865Z/0	1 of 1	Approval Drawing, Heater Board – Layer A	0	2006/04/27
01910/865W/0	1 of 1	Approval Drawing, Heater Board – Layer B	0	2006/04/27
01910/865V/0	1 of 1	Approval Drawing, Heater Board – Layer C	0	2006/04/27
01910/865Y/0	1 of 1	Approval Drawing, Heater Board – Layer D	0	2006/04/27
01910/871/0	1 of 1	Approval Enclosure Machining	0	2006/04/13
01910/872/0	1 of 1	Approval, Membrane Keypad	0	2006/05/08
01910/874/0	1 of 1	Flame Proof Compartment	0	2006/04/13
01910/875/0	1 of 2	Sample Compartment Assembly	0	2006/05/08
01910/875/0	2 of 2	Sample Compartment Assembly	0	2006/05/08
01910/876/0	1 of 1	ATEX Approval Label	0	2006/04/13
01910/877/0	1 of 1	Approval Flame Proof Lid Machining	0	2006/04/13
01910/878/0	1 of 1	Mains Transformer	0	2006/05/08
01910/879/0	1 of 1	Cover Plate	0	2006/05/10
01910/880/0	1 of 1	Interconnect Cable Assembly	0	2006/04/13
01910/884/0	1 of 1	Core Instrument Assembly	0	2006/05/08
01910/885/0	1 of 1	Cable Assemblies	0	2006/05/08
01910/886/0	1 of 1	Transducer Mounting Bracket Type 1	0	2006/05/08
01910/887/0	1 of 1	Transducer Mounting Bracket Type 2	0	2006/05/08
01910/889/0	1 of 1	Heatsink	0	2006/05/08

All the above drawings are associated and held with IECEx BAS 06.0024

Certificate Number
Baseefa06ATEX0050/1

Baseefa

Issued 9 August 2006
Page 1 of 2

1 **SUPPLEMENTARY EC - TYPE EXAMINATION CERTIFICATE**

2 **Equipment or Protective System Intended for use in Potentially Explosive Atmospheres Directive 94/9/EC**

3	Supplementary EC - Type Examination Certificate Number:	**Baseefa06ATEX0050/1**
4	Equipment or Protective System:	**1900 Digital Analyser Series**
5	Manufacturer:	**Servomex Limited**
6	Address:	**Crowborough, East Sussex, TN6 3DU**

7 This supplementary certificate extends EC – Type Examination Certificate No. Baseefa06ATEX0050 to apply to equipment or protective systems designed and constructed in accordance with the specification set out in the Schedule of the said certificate but having any variations specified in the Schedule attached to this certificate and the documents therein referred to.

This supplementary certificate shall be held with the original certificate.

This certificate may only be reproduced in its entirety, without any change, schedule included.

Baseefa Customer Reference No. **0965**

Project File No. **06/0638**

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Certificate Number
Baseefa06ATEX0050/1

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Issued 9 August 2006
Page 2 of 2

13 **Schedule**

14 **Certificate Number Baseefa06ATEX0050/1**

15 **Description of the variation to the Equipment or Protective System**

Variation 1.1

The aluminium alloys specified for the cover are now aligned with those for the enclosure.

16 **Report Number**

Baseefa Certification Report GB/BAS/ExTR06.0088/00

17 **Special Conditions for Safe Use**

None

18 **Essential Health and Safety Requirements**

Compliance with the Essential Health and Safety Requirements is not affected by this variation.

19 **Drawings and Documents**

Number	Sheet	Issue	Date	Description
01910/877/1	1 of 1	1	07/08/06	Flameproof lid - machining

Certificate Number
Baseefa06ATEX0050/2

Baseefa

Issued 9 October 2006
Page 1 of 2

1 **SUPPLEMENTARY EC - TYPE EXAMINATION CERTIFICATE**

2 **Equipment or Protective System Intended for use in Potentially Explosive Atmospheres Directive 94/9/EC**

3 Supplementary EC - Type Examination Certificate Number: **Baseefa06ATEX0050/2**

4 Equipment or Protective System: **1900 Digital Analyser Series**

5 Manufacturer: **Servomex Limited**

6 Address: **Crowborough, East Sussex, TN6 3DU**

7 This supplementary certificate extends EC – Type Examination Certificate No. Baseefa06ATEX0050 to apply to equipment or protective systems designed and constructed in accordance with the specification set out in the Schedule of the said certificate but having any variations specified in the Schedule attached to this certificate and the documents therein referred to.

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Baseefa Customer Reference No. **0965**

Project File No. **06/0845**

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Certificate Number
Baseefa06ATEX0050/2

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Issued 9 October 2006
Page 2 of 2

13 **Schedule**

14 **Certificate Number Baseefa06ATEX0050/2**

15 **Description of the variation to the Equipment or Protective System**

Variation 2.1

- Minor corrections to report 05(C)0500-1 which is replaced with report number 06(C)0845.
- To permit a minor electrical change that does not affect the intrinsic safety of the apparatus.

16 **Report Number**

06(C)0845

17 **Special Conditions for Safe Use**

None

18 **Essential Health and Safety Requirements**

Compliance with the Essential Health and Safety Requirements is not affected by this variation.

19 **Drawings and Documents**

Number	Sheet	Issue	Date	Description
01910/853X/1	1 to 2	1	2006/10/05	Approval, Barrier Board Circuit Diagram

The above drawings are associated and held with IECEx BAS 06.0024.