

1 INTRODUCTION

1.1 WARNINGS, CAUTIONS AND NOTES

This publication includes WARNINGS, CAUTIONS AND NOTES which provide information relating to the following:

WARNINGS

Hazards which could result in personal injury or death.

CAUTIONS

Hazards which could result in equipment or property damage.

NOTES

Alert the user to pertinent facts and conditions.

1.2 Scope of this manual

This manual covers installation, normal operation and routine maintenance of the general purpose version of the Servomex *1440 Gas Analyser*.

- Addresses for technical assistance and spares are given on the rear cover.
- A service manual is available for use by qualified personnel, part number 01440002AS.
- For additional technical details refer to the Technical Data Sheet.

About this manual:

Ref: 01440/003AS/2
order as part 01440003AS

NOTE

As standard, the Analyser will be supplied with Electrical Plugs and Sockets to facilitate user connections to the rear of the unit.

KEY TO FIGURES

Figure A Mounting details - Double Unit (Dimensions in mm)

1. Panel cutout detail for flush panel mounting

Figure B Mounting details - Single Unit (Dimensions in mm)

1. Panel cutout detail for flush panel mounting

Figure C Rear Panel; Electrical and Sample Connections

- | | |
|--|--------------------------------|
| 1. IEC Power supply connection | 5. Alarm relay outputs |
| 2. Earth stud (M5) | 6. Gas outlet, 6.4mm (1/4") OD |
| 3. Automatic flow control access | 7. Gas inlet, 6.4mm (1/4") OD |
| 4. Voltage, current and range change O/P | |

Figure D Optional Back Pressure Regulator Connections

- | | |
|-------------------------------|--------------------------------|
| 1. Gas inlet, 6.4mm (1/4") OD | 2. Gas outlet, 6.4mm (1/4") OD |
|-------------------------------|--------------------------------|

Figure E Link settings

- | | |
|--------------------------|---------------------------------|
| 1. Alarm 2 link location | 5. Link for Alarm OFF |
| 2. Alarm 1 link location | 6. Link for Alarm HIGH (rising) |
| 3. Range 1 link location | 7. Link for Alarm LOW (falling) |
| 4. Range 2 link location | |

Figure F Front Panel; Controls

- | | |
|-------------------------------------|----------------------------------|
| 1. 3.5 digit LED display | 6. Sample flow failure indicator |
| 2. Range label (in integral pocket) | 7. Alarm set button and LED |
| 3. Range indicators | 8. Alarm setting controls |
| 4. Range selection switch | 9. Span setting control |
| 5. Instrument status indicator | 10. Zero setting control |

1.3 Unpacking

- Remove the **1440** from its packing and inspect it for damage.
- If damage has occurred, inform Servomex or its agent immediately.
- Please retain all packing and shipping information for future use.

2 INSTALLATION

2.1 Location

The **1440** can be installed in a 19" rack, in a bench top case, or be flush panel mounted. See Figure (A) for dimensions of the full width 'double' analyser and Figure (B) for details of the single unit which comes with rubber feet and front handles as standard.

The location should be vibration free and subject to minimal fluctuations in ambient temperature. Avoid severe draughts.

There should be access to the rear of the analyser for gas and electrical connections.

The **1440** complies with the 'Low Voltage Directive' and is rated in accordance with:

IEC 644 for; 'INSTALLATION CATEGORY II' which is characterised as being local level (ie not distribution level), appliances and portable equipment with over-voltage impulse withstand up to 2500 V.

and EN 50081-1: 1992, emission standard (for residential, commercial
EN 50082-1: 1992, immunity standard and light industry)

2.2 Conditions for Safe Use

WARNINGS

- The **1440** is suitable for installation in a safe non-hazardous area.
- The 1440C STD is not suitable for use with flammable or toxic sample gases. If your sample is such then the 1440C FTX Gas Analyser for Toxic/Flammable Samples must be used.

2.3 Electrical installation

WARNINGS

- The installer must be satisfied that the **1440** installation conforms to the relevant safety requirements, National Electrical Code and any other local regulations, and that the installation is safe for any extremes of conditions which may be experienced in the operating environment of the analyser.
- This appliance must be connected to a protective earth.
- The electrical installation must include a means of isolating electrical power by a switch or circuit breaker external to the analyser and within easy reach of the operator. It must be marked as the disconnecting device for the equipment.
- It is essential that only suitably trained and competent personnel are allowed to access hazardous live parts by removing or opening covers of the analyser.
- To comply with the European Community EMC Directives for industrial environments the interconnecting cables used for the mains supply, relay contact outputs and/or analogue output signals should be screened or provide equivalent protection.

CAUTION

The relay outputs are designed to provide 'volt free' contacts, connections to these terminals, on SK5 and PL5, should not exceed 110 V RMS or 28 V dc to earth when connected to associated equipment.

- Electrical power should be supplied at 88 to 264 V, 47 to 63 Hz. Connection is made to an IEC type connector.
- Do not exceed the maximum current output load impedance of 600 Ohms.
- All change-over contacts require a minimum of 100mA/5V DC.
- All electrical connections are made to the rear of the analyser. Refer to Figure (C) for details. Full specifications are given in the following table.

Power Connection		Terminal
Electrical Power, 88V to 264Vac 47 / 63 Hz, 50VA maximum	Protective Earth Neutral Live	'E' 'N' 'L'

Alarm Connection		Terminal
Concentration Alarm 1 110Vac, 1A 28Vdc, 1A	Closes on Alarm 1 or Power Fail Opens on Alarm 1 or Power Fail Common	PL5-4 PL5-5 PL5-12
Concentration Alarm 2 110Vac, 1A 28Vdc, 1A	Closes on Alarm 2 or Power Fail Opens on Alarm 2 or Power Fail Common	PL5-7 PL5-8 PL5-15
Flow Fail Alarm 110Vac, 1A 28Vdc, 1A	Closes on Flow Failure or Power Fail Opens on Flow Failure or Power Fail Common	PL5-1 PL5-2 PL5-9

Range Selected Output Connection		Terminal
Range 1 selected 110Vac, 1A 28Vdc, 1A	Closes on Range 1 or Power Fail Opens on Range 1 or Power Fail Common	SK5-2 SK5-9 SK5-1

Analogue Output Signal Connection		Terminal
0 to 1Vdc Oxygen or Carbon Dioxide output signal, dependant on range selected, (non-isolated), output impedance 470 Ohms typical	+ ve - ve	SK5-15 SK5-8
4 to 20 mA Oxygen or Carbon Dioxide output signal, dependant on range selected, (isolated), maximum load impedance 600 Ohms	+ ve - ve	SK5-12 SK5-5

NOTE
<ul style="list-style-type: none"> The 0-1 V output is ground referenced at the instrument. Any measuring system must be configured as Non-Referenced Differential to avoid ground loops being created.

2.4 Sample gas connection

CAUTION

- The sample gas must not be admitted to the analyser until a period of 1 hour has been allowed for warm up, this will prevent condensation of the sample in the measuring cell.
- The sample gas must not exceed the specified pressure or flow rate or damage could occur.
- When pressurising the sample system for the purpose of leak testing ensure that pressure is increased and decreased slowly. High internal flow rates created when the pressure is changed rapidly will damage the measuring cell.

1440 - Sample Condition Requirements		
Sample	Base Analyser	+ Back Pressure Regulator (additional option)
Inlet / Outlet Connections	6.4mm (1/4") OD tube DO NOT RESTRICT ANALYSER VENT	
Inlet Pressure	1 to 10 psig 7 to 70 kPag	17 to 20 psia 120 to 140 kPaa
Flow Rate	1 to 6 l / min	1 to 2 l / min
Dew point	At least 5°C below ambient temperature	
Temperature	Nominally at ambient temperature	
Particulates	< 3 µ m (micro metres), an internal, replaceable, 0.6 µ m filter is fitted as standard	
Condition	Clean, non-flammable, non-toxic *, non-corrosive, oil free	
* If the sample gas is flammable or toxic, use the 1440 FTX version		

- If an external sample pump is used it may be necessary to reduce pressure pulsing with a reservoir.
- The sample exhaust from the analyser should be vented freely to atmosphere.
- Sample inlet and outlet connection sizes and location are shown in Figure (C), for the 'Base Analyser', and in Figure (D) for the 'Back Pressure Regulator' option.
- The red 'flow' alarm indicator will flash if the sample flow falls below a satisfactory level and the relevant relay will go to the alarm condition. This alarm is automatically cleared when flow returns to normal.

WARNING

- Verify that connections are leak free at full operating pressure before applying sample or calibration gases. These gases may be asphyxiant.
- Consideration should be given to the asphyxiant nature of the sample gas when selecting a vent location.

2.5 Shut down procedure

Before removing power from the analyser disconnect the sample gas and flush the analyser with dry nitrogen or good quality instrument air for 10 minutes.

3 SETTING UP

3.1 Configuration

The analyser is supplied configured as follows (refer to Figure (E)):

(Link)	Parameter	Setting
(AL 1)	Alarm 1	High = Nominally Full Scale
(AL 2)	Alarm 2	Low = Nominally Zero
Oxygen:	Range 1	0 - 100% Oxygen
	Range 2	0 - 25% Oxygen
Carbon Dioxide:	Range 1	Specified at time of order, see below
	Range 2	0 - 80% of Range 1, see below

Transducer, 01520/...	709	708	707	706	705	704	703	702	701
Range 1, %	0.25	0.5	1	2.5	5	10	25	50	100
Range 2, %	0.2	0.4	0.8	2	4	8	20	40	80

The Carbon Dioxide range parameters **must not be adjusted**. To change other configuration parameters:

1. Remove all sources of electrical power from the unit (including relay connections).
2. Remove the unit from its case by removing the eight cross-headed screws (four at the front, four at the rear) and disconnect the earth bonding wire.
3. Alarms and Ranges are set by links. These are located on the 01420915 control PCB towards the front of the unit, refer to Figure (E).
4. The routine for setting Alarm 1 and Alarm 2 is the same and each alarm may be configured to function either HI, LO or OFF, refer to Figure (E).
5. Oxygen Ranges may be selected from 0-5, 10, 20, 25, 50 and 100% Oxygen. With reference to Figure (E), unless identical, Range 1 must be set higher than Range 2 in order to utilise the range labels supplied. The correct label should then be fixed to the label carrier (access pocket from top).
6. Reassemble units, ensure that earth bonding wire is re-connected.

NOTE

- When Alarms are set to the OFF position, the associated relays will effectively operate as 'power failure' alarms.

3.2 Alarm Set Point Adjustment

1. Open the hinged flip down panel below the analyser display - see Figure (F).
2. Press and hold down the 'Alarm' button on the front panel; an LED beside one of the alarm setting controls will light continuously. Adjust this control until the desired alarm level is shown on the display.
3. Release and press the 'Alarm' button again, an LED beside the other control will now illuminate. Adjust the alarm set point displayed to the desired level.

In the alarm condition the red LED incorporated in the 'Alarm' button will flash. An LED beside the relevant alarm control will also flash, this will also indicate whether the alarm is configured to be a High or Low alarm. The relevant relay will also go into the alarm condition.

Alarms are cleared when the concentration returns to a non-alarming value.

3.3 Instrument Status Indicator

The measuring transducer is heated. A yellow 'Instrument' indicator on the front panel (refer to Figure (F)) illuminates when power is first applied to the unit. This will remain on continuously during warm up. Once the transducer reaches temperature, the indicator will flash.

4 CALIBRATION

4.1 Zero and Span adjustment

The analyser should have been running for at least one hour before calibrating.

1. To set the zero, introduce calibration gas, (high purity nitrogen (>99.9%) is recommended). Once the reading has stabilised, adjust the zero control (behind the flip down panel, see Figure (F)) so that the display reads 0.0 % oxygen or 0.0%, 0.00% or .000% carbon dioxide depending on transducer full scale.
2. To set the span, introduce span calibration gas, for oxygen units this can be good quality clean dry instrument air (nominally 20.9% oxygen), however a suitable certified calibration gas is essential for carbon dioxide units. Once the reading has stabilised, adjust the span control (again, behind the flip down panel, see Figure (F)) so that the display indicates the correct span value.

The frequency of calibration required will depend upon the operating requirement for accuracy and upon environmental conditions. The following is a guide which can be modified in the light of operating experience in particular circumstances:

Oxygen: weekly adjust the span; monthly adjust the zero then the span

Carbon Dioxide: weekly adjust the zero then the span

4.2 Effect of Background Gases on Reading

The composition of the background gas in the sample may have an effect on the analyser reading. These effects can be compensated by either using the background gas as a zero or by offsetting the nitrogen zero point by the amount of error induced by the background gas. For an oxygen unit zeroed on nitrogen the errors are:

100% Argon	-0.2%	100% Neon	+0.2%
100% Carbon Dioxide	-0.3%	100% Nitric Oxide	+48.4%
100% Helium	+0.3%	100% Nitrogen Dioxide	+20.0%
100% Krypton	-0.5%	100% Xenon	-1.0%

(A more comprehensive list is available from Servomex, ref part no. 7986-0073)

5 ROUTINE MAINTENANCE

Replace the filter element, located in the Automatic flow control device on the rear panel, reference Figure (C) at 3 month intervals. This period may be extended for clean samples.

6 SPARES

The following spares are required to maintain normal operation of the analyser.

Part No.	Description - <i>Servomex 1440</i>	Quantity
S1800985	AFCD filter element kit (10 off)	1 pkt.

The following spares are required for comprehensive servicing of each analyser module. Refer also to Service Manual, part no. 01440002AS.

Part No.	Description - <i>Servomex 1440</i>	Quantity
S1420904B	Front 'switching' PCB	1 off
S1420915	Main control PCB	1 off
S1420906	Alarm relay PCB	1 off
S1420927	Power supply, complete with IEC connector	1 off
01800925	Low flow sensor	1 off
S1420935	Automatic flow control device	1 off
2531-2654	AC supply fuse (T) 2A	5 off
2553-7332	LED display module	1 off
S1440999	Sample plumbing kit	1 off
5984-7706	Back Pressure Regulator (if fitted to existing unit)	1 off
The following items depend on the measurement:		
01155B000	Paramagnetic Oxygen Transducer	1 off
2653-2518	Heater disc for oxygen transducer	1 off
01420928	Thermal fuse assembly for oxygen transducer	1 off
01520/70X	Carbon Dioxide transducer, refer to Section 3.1	1 off
01415930	Interface PCB for carbon dioxide transducers	1 off

7 TECHNICAL SPECIFICATION - *Servomex 1440*

Parameter	Oxygen	Carbon Dioxide
Ambient Temperature range (reduces in bench top case to)	0 - 45°C, 32 - 113°F (0 - 40°C, 0 - 104°F)	
Relative Humidity	0 - 90% non-condensing	
Storage Temperature range	-20 to +70°C (-4 to 158°F)	
Ambient Temperature Coefficient, per 10°C within operating range	±0.05% Oxygen ±0.3% reading	±1.0% Full Scale ±3.0% reading
Ambient Pressure range (see *MAX note below)	80 - 110 kPaa (0.8 - 1.1 bara)	90 - 110 kPaa (0.9 - 1.1 bara)
Ambient Pressure Coefficient (With Back Pressure regulation) *MAX Ambient pressure limit reduces to 108kPaa (1.08 bara)	Directly proportional (0.025% reading/mbar)	0.15% reading/mbar (0.025% reading/mbar)
Flow Effect, over full inlet range	< 0.2% Oxygen	< 1.0% reading
Warm up time	1 hour	
Repeatability (at the 1v output)	±0.1% Oxygen	±1.0% Full Scale
Linearity Error	±0.1% Oxygen	±1.0% Full Scale
Response Time, T₉₀, normal (@ flow alarm trip level)	typically less than 10 seconds (approximately 50 seconds)	
Case Rating	IP 20 (IEC 529)	
weight: Single unit Double unit Double unit in bench top case	5.5 kg (12 lb) typical 12 kg (26 lb) typical 20 kg (44 lb) typical	
Materials in contact with sample (Note:Back Pressure regulation adds; copper, PVC, PVDF and beryllium copper)	platinum, nickel, borosilicate glass	sapphire, epoxy resin
	St. steel, Viton, bonded glass fibre, nylon, neoprene, gold on silver, brass monel, polypropylene, ruby, acetyl	

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1440C

Gas Analyser for Toxic/Flammable samples

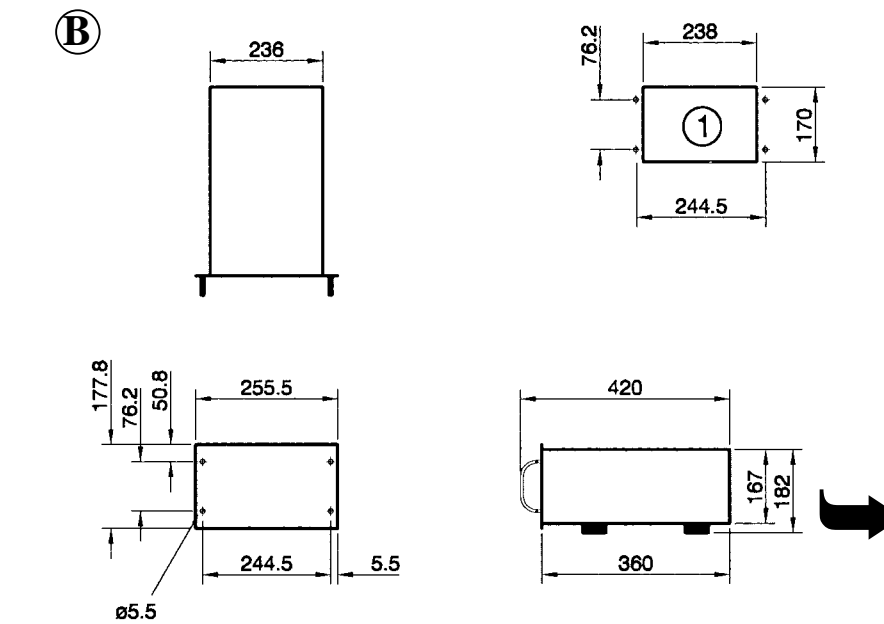
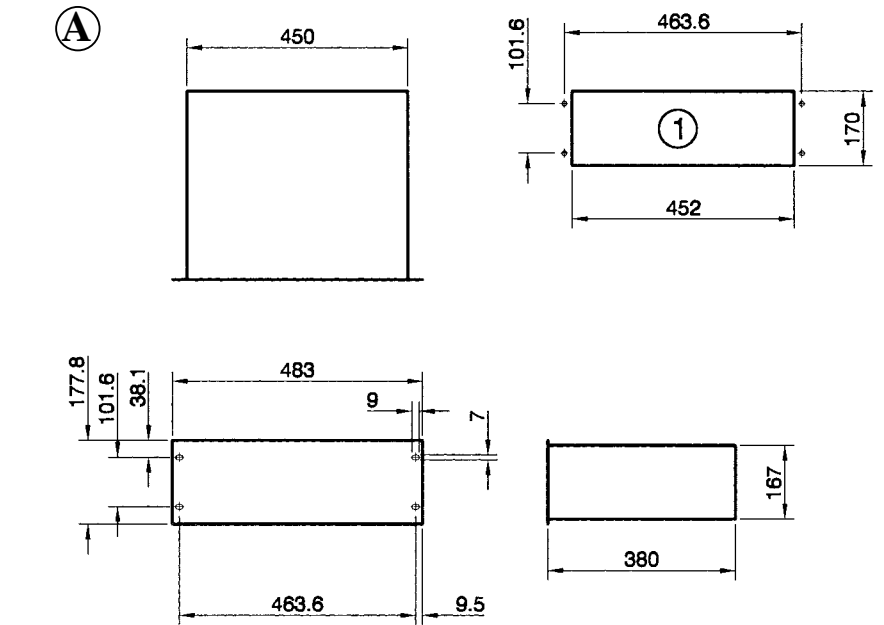
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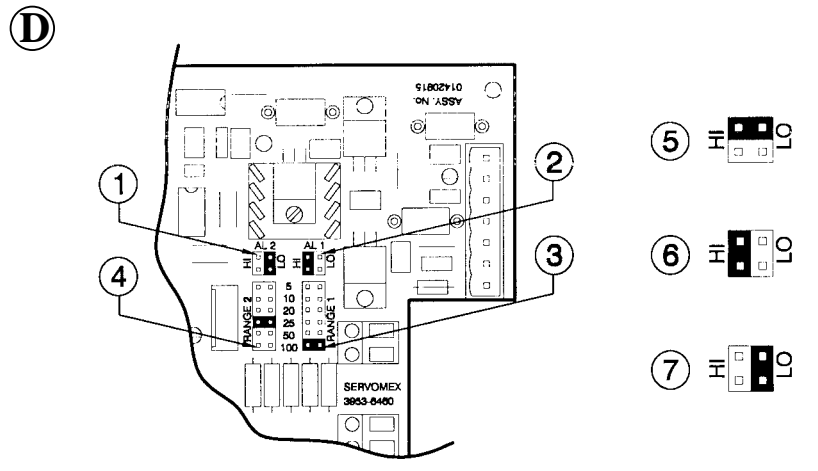
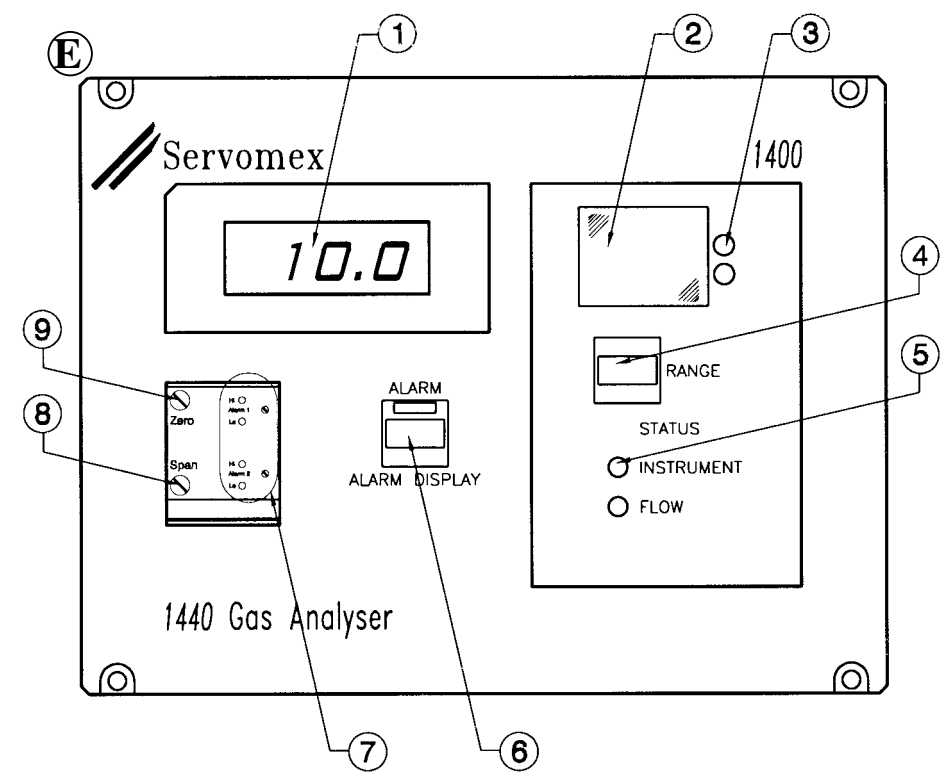
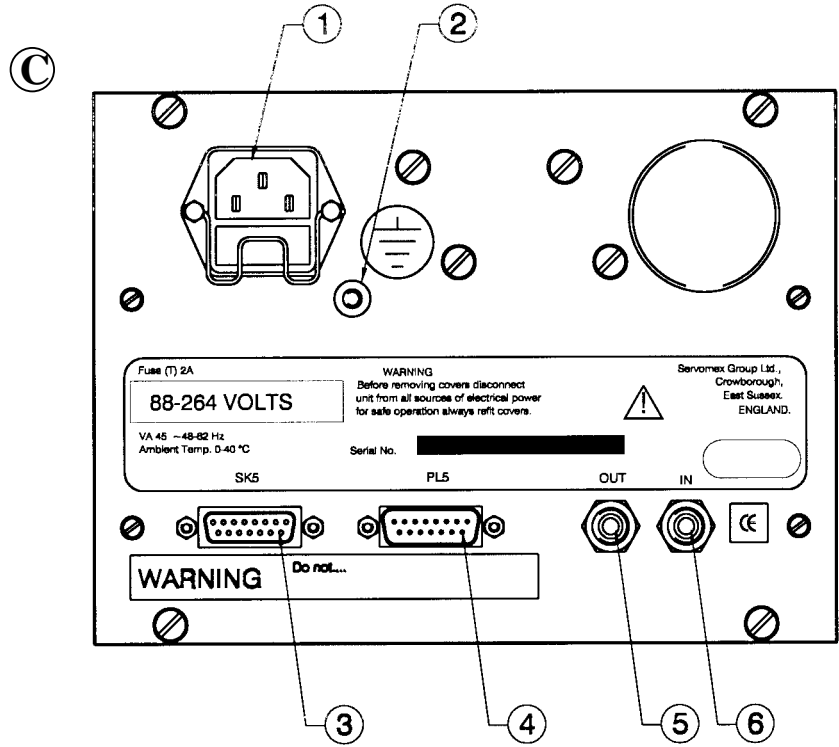
Part number	
Serial number	
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Certificate No. 005166
 BS EN ISO 9001

- (GB) OPERATING INSTRUCTIONS
- (I) ISTRUZIONI PER L'USO
- (D) BEDIENUNGSANLEITUNG
- (F) MODE D'EMPLOI
- (E) MANUAL DE INSTRUCCIONES
- (P) MANUAL DE INSTRUCCOES
- (J) 運転指針
- (C) 中文 操作指導





- 5 HI LO
- 6 HI LO
- 7 HI LO