SERVOMEX
PROCESS ANALYSERS

SERVOTOUGH FluegasExact Gas Analyser

Installation Manual

Part Number: 02700005D
Revision: 6
Language: UK English

SERVOMEX
A MEASURABLE ADVANTAGE

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IMPORTANT INFORMATION

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

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

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

Servomex has paid particular attention to Health and Safety throughout this manual. Where special precautions need to be taken due to the nature of the equipment or product, an appropriate safety icon and warning message is shown. Special attention should be made to Section 2 – Safety, where all such messages are summarized.

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

This handbook is accurate at the date of printing, but will be superseded and should be disregarded if specifications or appearance are changed.

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1 Introduction

1.1 Warnings, cautions and notes

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 and NOTES, 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.

NOTES

Alerts the user to pertinent facts and conditions.

1.2 Scope of this manual

This manual covers the installation of the SERVOTOUGH FluegasExact Combustion Gas Analyser, abbreviated to "the analyser" in the remainder of this manual, and the various options that are available.

Refer to Section 8 of this manual for the latest technical specification.

Addresses for technical assistance and spares are given on the rear cover.

A QuickStart Manual is available, part number **02700003D**.

A Service Manual is available for use by qualified personnel, part number **02700002D**.

About this manual

Reference: 02700/005D/6

Order as part number: 02700005D

1.3 General safety information

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.

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

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.

The sensor head is heated and may be attached to a hot flue. Consequently, the temperature of the sensor head may exceed 100°C. To avoid a risk of burns, appropriate protective equipment must be used when handling the sensor head, even when it is unpowered.

The sensor head aspirator supply must not contain flammable gases.

The sensor head is not suitable for use in hazardous areas / locations without the use of appropriate safety purge equipment.

Servomex 2700 EU2/UK2/FM2/CS2/NA2 approved control units must be used if the installation is in a Zone 2 / Division 2 hazardous area / location.

Flanges and flange adaptors supplied by Servomex DO NOT conform to ANSI or any other Standards body and must only be used in Servomex specified applications with process pressure not greater than 0.34 barg (5 psig).

CAUTION

The analyser may fail if used with sample streams containing substances not compatible with those listed in Section 8.6 Materials in contact with the sample.

The combustibles measurement is not promoted or recommended as a primary safety measurement, e.g. for use in electrostatic precipitator (ESP) protection or coal mill applications.

1.4 Hazardous Area approval and certification

Copies of all hazardous area certificates are provided in the Certificate Manual (part number 02700008D) which is supplied with each hazardous area certified unit.

1.5 Unpacking

WARNING

The sensor head and control unit weigh approximately 17Kg (37.5lb) and 11Kg (24.3lb) respectively and care must be taken when handling.

Remove the analyser components from their packing and inspect for obvious external damage.

If damage has occurred, inform Servomex or its agent immediately.

Retain all packing and shipping information for future use.

2 Analyser Overview

2.1 Overview

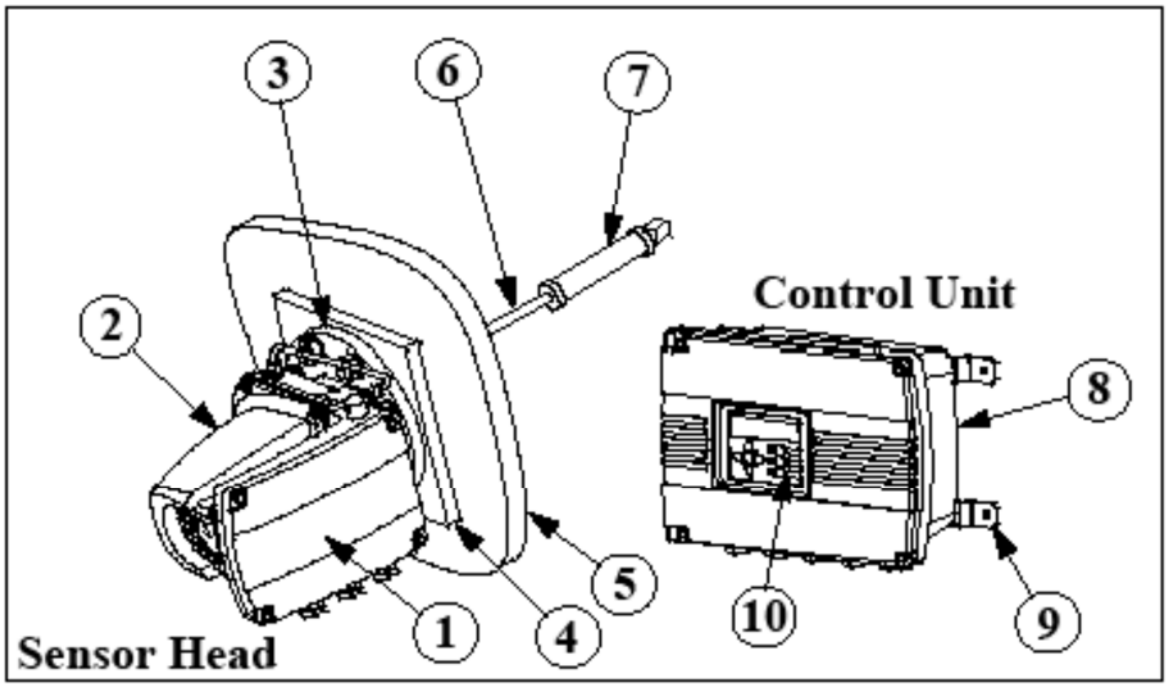


Figure 1 Analyser sensor head and control unit overview

1	Terminal enclosure cover	6	Sample probe
2	Sensor head cover	7	Sample probe filter
3	4” mounting flange	8	Control unit
4	4” weld-on flange	9	Wall mounting brackets
5	Flue/process wall	10	Keypad and display

The SERVOTOUGH FluegasExact Combustion Gas Analyser measures the oxygen concentration and/or the level of unburned combustibles. The analyser comprises two separate units which may be mounted up to 300m (975ft) apart for oxygen only and 100m (325ft) apart whenever the combustibles measurement option is fitted.

An overall system will consist of sensor head/sample probe/filter mounted directly onto the flue wall and a control unit mounted remotely from the sensor head. The user must

ensure that both the sensor head and control unit have their own separate power supply. Also required is a compressed air supply with a pressure regulator to control the aspirator air supply.

Optional utility units are available to supply the sensor head with compressed air, or compressed air and calibration gases. Details of these units can be found in the User and Installation manual for the Utilities Unit, part number 02730001A.

An optional sample flow alarm is also available with an external flow alarm relay box.

2.2 Sensor head description

The sensor head is flange mounted on to the flue wall and houses the measurement sensors in a heated enclosure. A probe tube projects through the duct wall into the process gas to extract a gas sample for analysis. A comprehensive range of sample probes and filters are available to enable the analyser to be used in a wide range of applications and process conditions. Electrical connections are made to a terminal box located on the side of the sensor head.

2.3 Control unit description

The control unit houses the drive electronics, microprocessor, keypad, display and user wiring connections. The control unit may be either wall, surface or panel mounted. Electrical connections are made via conduit entries located on the bottom of the control unit enclosure.

2.4 Sample flow alarm

The optional flow alarm consists of three key parts:

- Modified sensor head with flow sensor and signal amplifier
- External flow alarm relay box
- Aspirator air isolation valve (supplied by customer)

It is design to detect and indicate a low flow condition in the sample stream. Relay contacts are provided for indicating low flow and flow fault conditions.

3 Installation of Sensor Head and Probe Tube

3.1 Installation location

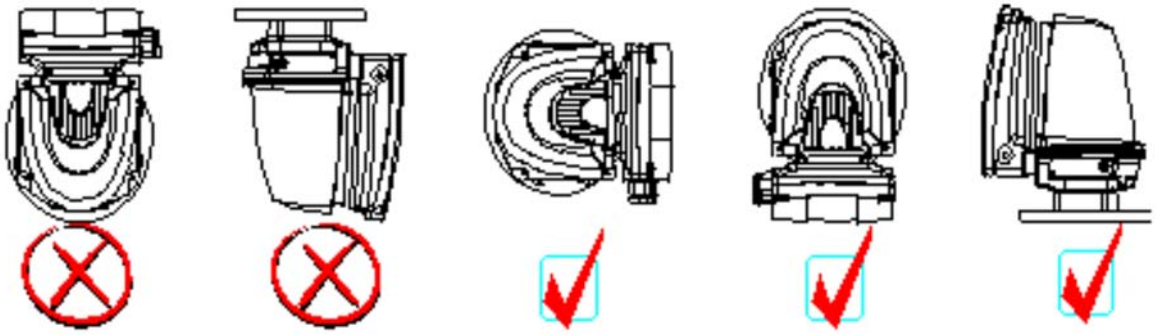
Refer to Figure 2.

NOTE

All Servomex adaptor flanges, interface flanges, probe support tubes, stand-offs and thermal spacers, including the integral flange on the sensor head, are suitable for fitting onto the standard flanges (raised face [<1.6mm] or flat faced). They do not comply with any national or international standards and the analyser's maximum process pressure is limited to 0.34 barg (5 psig).

Select a location which allows convenient access for installation and maintenance to the terminal box enclosure. The sensor head is supplied with a 4" flange for direct attachment to a flue wall.

The Sensor Head may be mounted in any orientation, except with the terminals box directly above the sensor enclosure or with the mounting flange facing directly upwards.



Ensure that the operating ambient temperature is in the range of –20°C to +70°C and that the Sensor Head is protected from radiant heat sources or from direct sunlight (in ambient temperatures over 30°C). This can be achieved by installing a Heat Shield between the Sensor Head and the source; a thin metal sheet is usually adequate.

Operating environment conditions for the sensor head are given in Table 1.

Item	Specification
Ambient operating temperature	-20°C to +70°C (-4°F to +158°F)
Storage temperature	-30°C to +80°C (-22°F to +176°F)
Ingress protection	IP66
AC power supply Factory set for either a) 100-120Vac 50/60Hz b) 220-240Vac 50/60Hz	 a) 100-120Vac -15% +10% (Min. 85V – Max. 132V) b) 220-240Vac -15% +10% (Min. 187V – Max. 264V)
Altitude	Up to 2000m
Overvoltage category	Category II.
Pollution degree	The sensor head/terminal box is rated Pollution Degree 2. The sample probe protruding into the flue and the adjacent face of the flange is rated Pollution Degree 4. *See Note 1*
Relative humidity	0 to 80% RH

Note 1: Where the installation is such that the enclosure ingress protection IP66 is maintained and the covers remain securely fitted, the apparatus is suitable for use in locations where there may be significant deposits of nonflammable dusts or fibres (Pollution Degree 4) and/or where there may be drips, splashes of water, prolonged exposure to rain or subjected to hose down.

The covers may be removed during installation or servicing only if there is negligible risk of pollution or contamination of the electronic circuits contained within the enclosures and if the covers are securely replaced immediately after the operation is completed. Refer to Section 7.

Table 1. Sensor head operating environment

WARNINGS

When fitted with a sample probe and interconnecting cables the sensor head may weigh over 18 kg with the load being unbalanced. Consequently, the following precautions shall be taken before and during its installation:

The sensor head is heated and may be attached to a hot flue and so the appropriate protective equipment shall be worn to minimise the risk of burns.

Installers shall be appropriately trained in manual handling.

The work shall be planned to minimise any stooping, stretching or reaching above shoulder height or sideways twisting of the body.

Floors or platforms shall be clean and free of obstruction with sufficient space to move freely and change posture.

Lifting aids or larger lifting and access equipment may be required, depending upon the height of the installation.

Procedures shall comply with all relevant local regulations covering the installation process and locations.

Do not lift the sensor head by the compressed air pipe that is connected between the solenoid valve and the bulkhead fitting, or by any fitted cables.

Sample gases and calibration gases may contain hazardous components. Where these are not vented to process, they shall be vented so that they do not cause harm.

Where there is a risk associated with the release of potentially harmful gases into the operating environment suitable monitoring equipment shall be used.

CAUTION

The anti-seize compound (part number 1761-3211) and ROCOL ASP dry film anti-scuffing paste are the only recommended release compounds. The use of "Silver Goop" or other similar release agents may result in permanent damage to the combustibles sensor (if fitted).

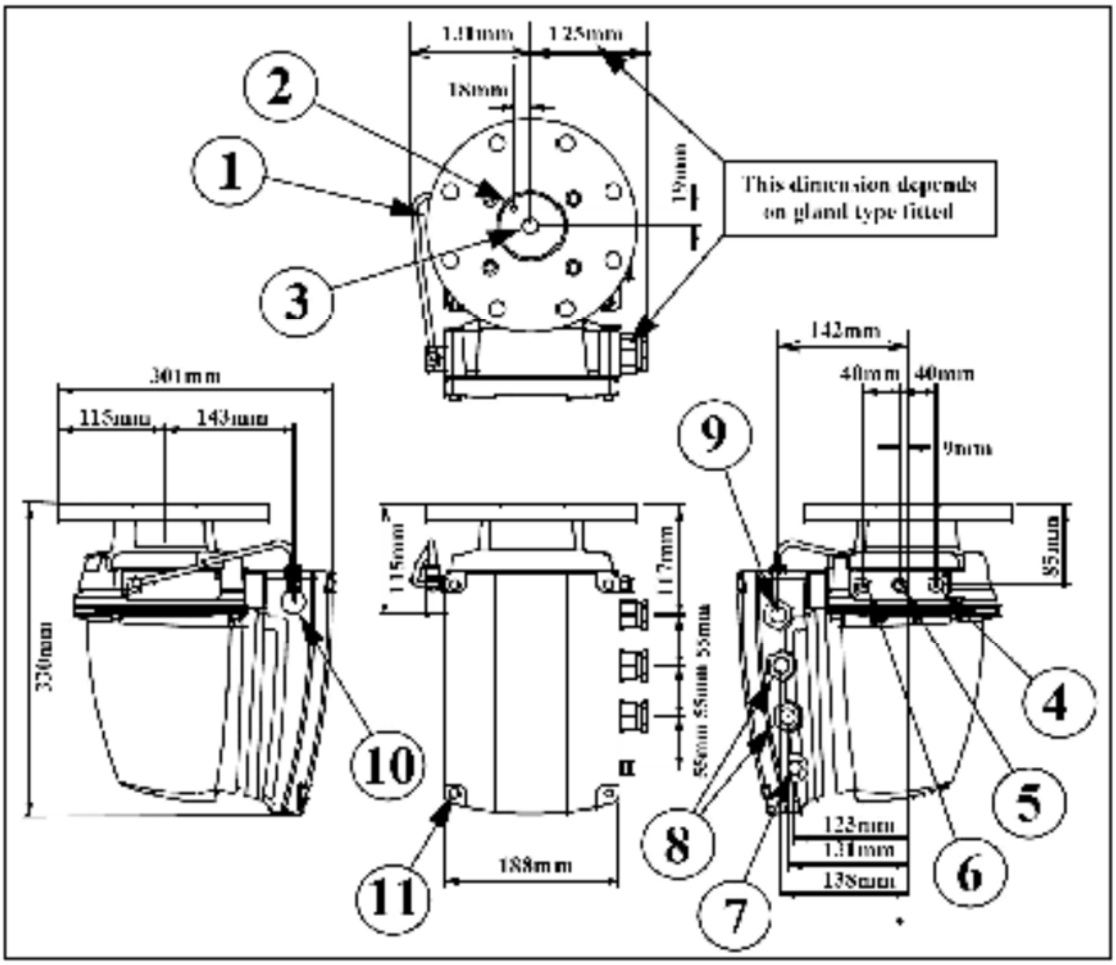


Figure 2. Sensor head dimensions (typical)

1	Analyser mounting flange 4”	**7**	Purge gas entry 1/4” NPT (INT) or blanking plug
2	Sample vent port 1/8” NPT (INT)	**8**	Signal cable entry 3/4” NPT (INT) or specified adaptor
3	Sample probe connection 1/2” NPT (INT)	**9**	Mains cable entry 3/4” NPT (INT) or specified adaptor
4	Calibration gas / blowback gas inlet 1/4” OD compression fitting	**10**	Aspirator air supply inlet 1/8” NPT (INT)
5	Purge gas exit 1/4” NPT (INT) or breather fitting	**11**	M6 screws (4 off)
6	Unused entry		

3.2 Flange mounting arrangements

WARNING

The user should ensure that the flue wall is strong enough to support the weight of the sensor head and sample probe tube.

CAUTION

When a length of stand-off tube is used to secure the mounting flange to the flue it should be insulated efficiently to prevent problems occurring due to excessive heat loss to the atmosphere.

Always minimise the length of this stand-off tube (<100mm typical).

NOTES

Ensure that mounting bolts are tightened evenly to prevent the sensor head from tilting, damaging the gasket and causing leaks.

The sensor head must not be left un-powered when mounted on an active flue. If the sensor head is not to be fitted immediately then a blanking flange should be used. Do not plug the hole with the sensor head.

Included in the installation kit is a sachet of anti-seize compound (part number 1761-3211) to be used on the sensor head mounting bolts and studs. Failure to use the anti-seize compound may make the fittings difficult to remove.

3.2.1 Standard installation

The sensor head is provided with a 4" flange. The flange has 8 off 19mm diameter holes at 45° intervals on a 190.5mm diameter pitch circle (PCD). The sensor head should be mounted to the flue with at least four M16 or 5/8" bolts or studs spaced equally around the flange. The sensor head can be mounted to an existing 4" ANSI 150 flange, a weld-on ANSI flange (see Section 3.2.2) or to an existing flange of another type (see Section 3.2.3). Thermal spacers, high temperature stand-offs and probe retention flange options are also available for extreme environments. The length of the mounting bolts required will depend on the mounting options selected. For installation on an existing 4" ANSI flange provided with clearance rather than threaded holes then at least four M16x65mm or 5/8"x2½" bolts will be required. The sensor head

will be provided with sufficient gaskets, M16 studding and M16 nuts and washers to mount the sensor head configuration supplied onto a Servomex weld on 4" flange.

3.2.2 Weld-on flange installation

If there is no existing flange available then a weld-on flange (part number 02750409) may be provided. The square (250mm x 250mm) weld-on flange is provided with 8 off M16 threaded holes at 45° intervals on a 190.5mm diameter pitch circle. Cut a hole 102mm (4 inches) to 127mm (5 inches) diameter in the wall of the duct and weld-on the flange. If no further mounting options have been ordered then screw the 4 off M16x55mm studs provided into alternate holes on the flange (at 90° intervals). Place the gasket over the locating studs, mount the sample probe onto the sensor head (see Section 3.3), and secure the sensor head onto the flange with the 4 off M16 nuts and washers.

3.2.3 Adaptor flange installation

A variety of adaptor flange kits are available (see Table 2) for fitting to flanges other than 4" ANSI 150. The flange on the process duct should be supplied with clearance holes appropriate to the flange type.

Refer to Figure 3.

Screw the flue mounting studs [8] and the four M16x55mm studs [7] into the appropriate threaded holes on the adaptor flange [3]. Ensure that the studs do not protrude through the flange as this will cause damage to the gasket/s and could cause leaks. Mount the adaptor flange [3] to the flue mounting flange [1] using the appropriate gasket [2] and secure with the nuts and washers [9] from the reverse. Attach the sample probe to the sensor head (see Section 3.3). Mount the 2700 sensor head [5] to the adaptor flange [3] using the 4" ANSI sealing gasket [4] and the 4 off M16 nuts and washers [6].

Servomex Kit No.	Mating Pattern			Mates With
	Mtg.hole	Qty	PCD	
02750992	10.8 dia	8	120.6	Servomex Model 700B /N
02750991	M16	4	152.4	3" ANSI 150
02750991	M16	4	145.0	DIN 65 PN16
02750991	M16	4	145.0	JIS 80 5Kg/cm^2
02750990	M12	4	130.0	DIN 80 PN16
02750989	M12	4	130	JIS 65 5Kg/cm^2
02750988	M16	4	168.3	3" ANSI 300
02750991	18.0 dia c/bored 38.0 dia	3	168.3	Thermox WDG IV

Table 2. Sensor head adaptor flange kits

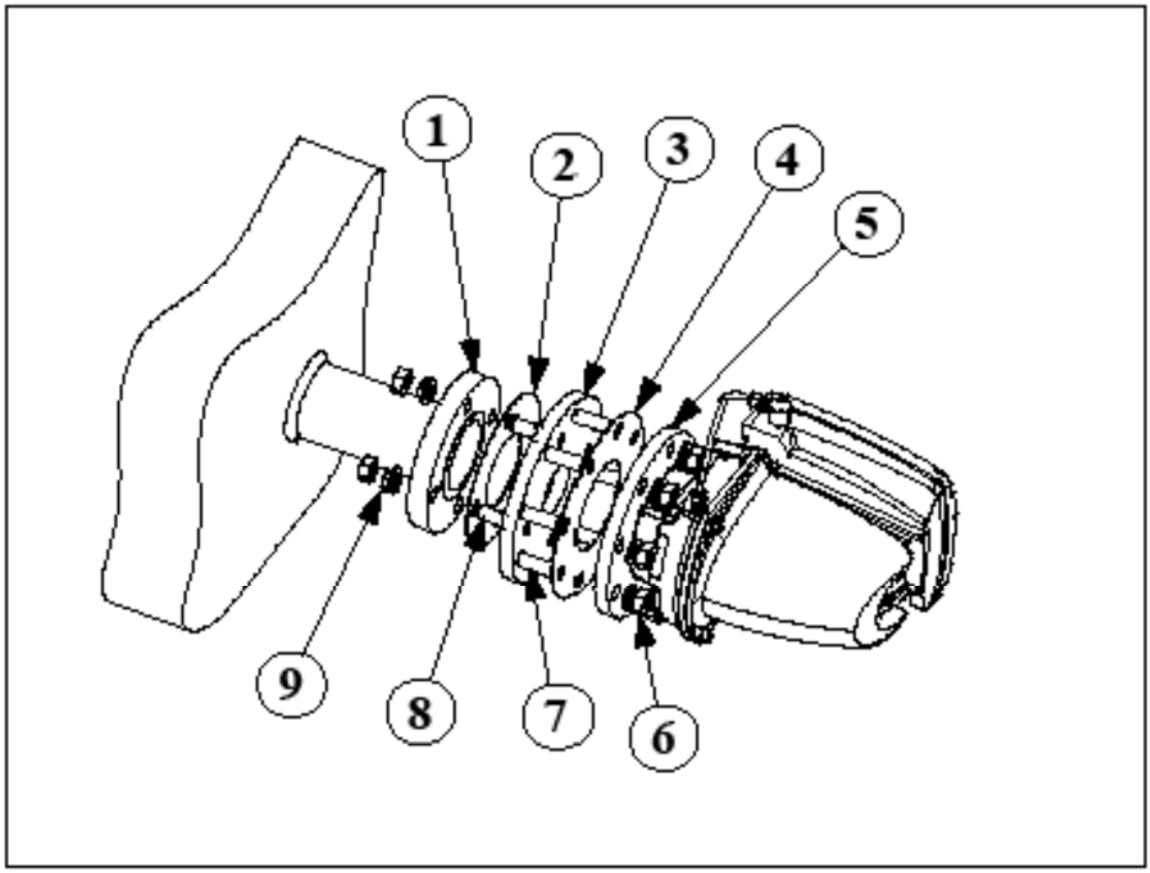


Figure 3. Adaptor flange installation

1	Mounting flange on flue	**6**	M16 nuts and washers (4 off each)
2	Gasket to suit flue mounting flange	**7**	M16 x 55mm studs (4 off)
3	Adaptor flange to suit flue mounting flange (see Table 2)	**8**	Studs (type and length specific to flue mounting flange)
4	ANSI 4” gasket	**9**	Nuts and washers (number and size to suit flue mounting flange
5	4” flange on 2700 sensor head		

3.2.4 High temperature stand-off installation

Where there may be excessive heat radiated from the flue wall (350°C to 500°C), a high temperature stand-off flange kit (part number 02750995) is available to prevent overheating of the sensor head. The high temperature stand-off is also available with a probe retention flange (part number 02750996). The high temperature stand-off consists of two 4" flanges welded onto a 102mm (4 inch) diameter pipe. Each of the flanges has four M16 threaded and four 19mm plain holes equally spaced on a 190.5mm diameter pitch circle (PCD).

Refer to Figure 4.

- Where necessary fit the weld-on flange or adaptor flanges as described in Sections 3.2.2 and 3.2.3.
- Mount the high temperature stand-off [3] onto the flue using a 4" ANSI sealing gasket [2]. If a 4" ANSI weld-on, or adaptor flange, is already fitted then screw in four of the M16x55mm studs [9] into alternate holes in the weld-on or adaptor flange [1] and attach the high temperature stand-off through the four plain holes in the stand-off flange. If the high temperature stand-off is to be attached to an existing 4" ANSI flange then use four M16x65mm (or 5/8"x2½") bolts at 90° intervals through the plain holes in the flange (bolts not supplied).
- If a probe retention flange is not required then mount the sample probe onto the sensor head (see Section 3.3). Mount the sensor head onto the high temperature stand-off using a 4" ANSI sealing gasket [4]. Screw the four M16x55 studs [7] into the threaded holes in the stand-off flange and secure the sensor head with the four M16 nuts and washers [6].
- If a probe retention flange is to be installed then screw the M16x80mm studs supplied into the threaded holes in the stand-off flange and install the probe retention flange as described in Section 3.2.6.

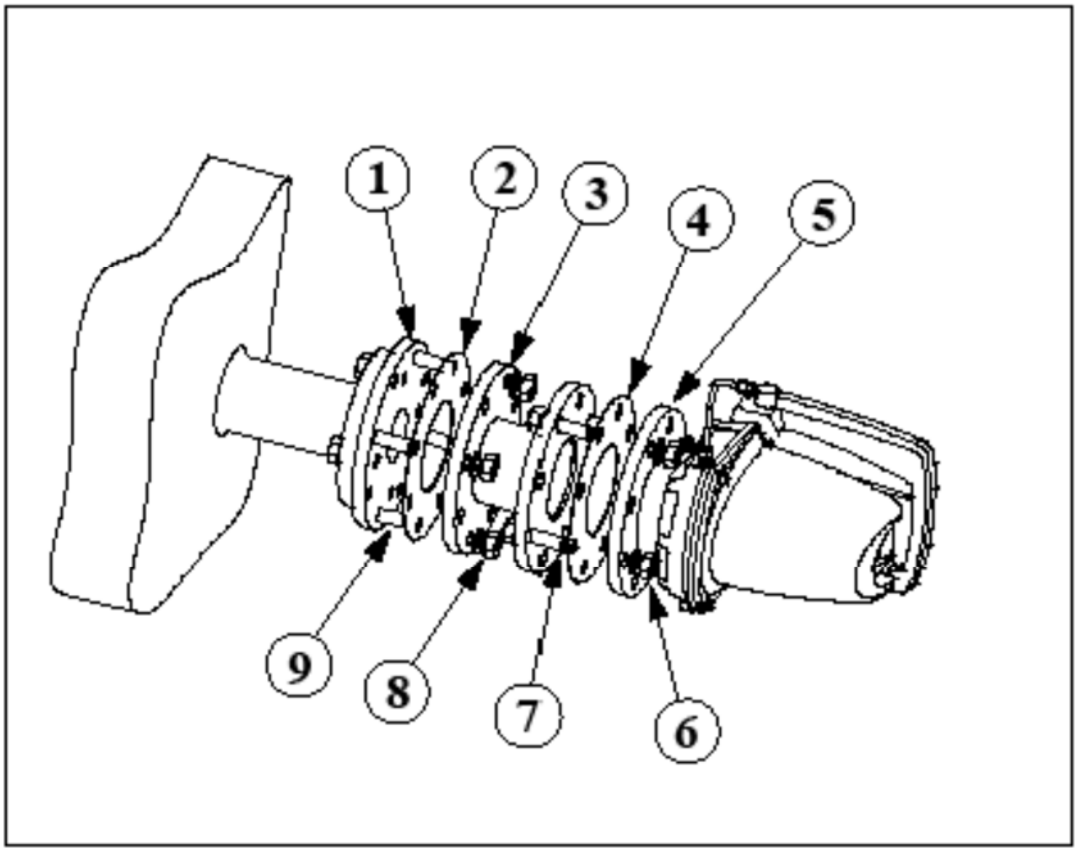


Figure 4. High temperature stand-off flange installation

1	4” ANSI flange on flue with weld-on or adaptor flange fitted where necessary	6	M16 nuts and washers (4 off each)
2	ANSI 4” gasket	7	M16 x 55mm studs (4 off)
3	High temperature stand-off	8	M16 nuts and washers (4 off each)
4	ANSI 4” gasket	9	M16 x 55mm studs (4 off)
5	4” flange on 2700 sensor head		

3.2.5 Thermal spacer installation

When the flue surface temperature is between 250°C and 500°C, a thermal spacer (part number 02750997) is available to prevent overheating the sensor head. The thermal spacer is also available with a probe retention flange (part number 02750996). The spacer is provided with eight 19mm diameter holes equally spaced on a 190.5mm diameter pitch circle (PCD).

Refer to Figure 5.

- Where necessary fit the weld-on flange or adaptor flange as described in Sections 3.2.2 and 3.2.3.
- If a weld-on flange or adaptor flange has been fitted then screw the four M16x80mm studs [7] into alternate threaded holes in the flange. Mount the thermal spacer [3] with a 4" sealing gasket at each side [2 and 6]. Mount the sample probe onto the sensor head (see Section 3.3). Secure the sensor head flange [4] to the thermal spacer with the four M16 nuts and washers [5].
- If a weld-on or adaptor flange is not fitted then replace the four M16x80mm studs with M16x100mm or 5/8"x4" bolts (not supplied).
- Identify and mark the correct orientation of the retention flange so that the sample vent hole in the flange will align with the vent hole on the sensor head when installed in its desired orientation on the flue.
- If a probe retention flange is to be installed then replace the M16x80mm studs with the M16x105mm studs supplied. Install the probe retention flange as described in Section 3.2.6.

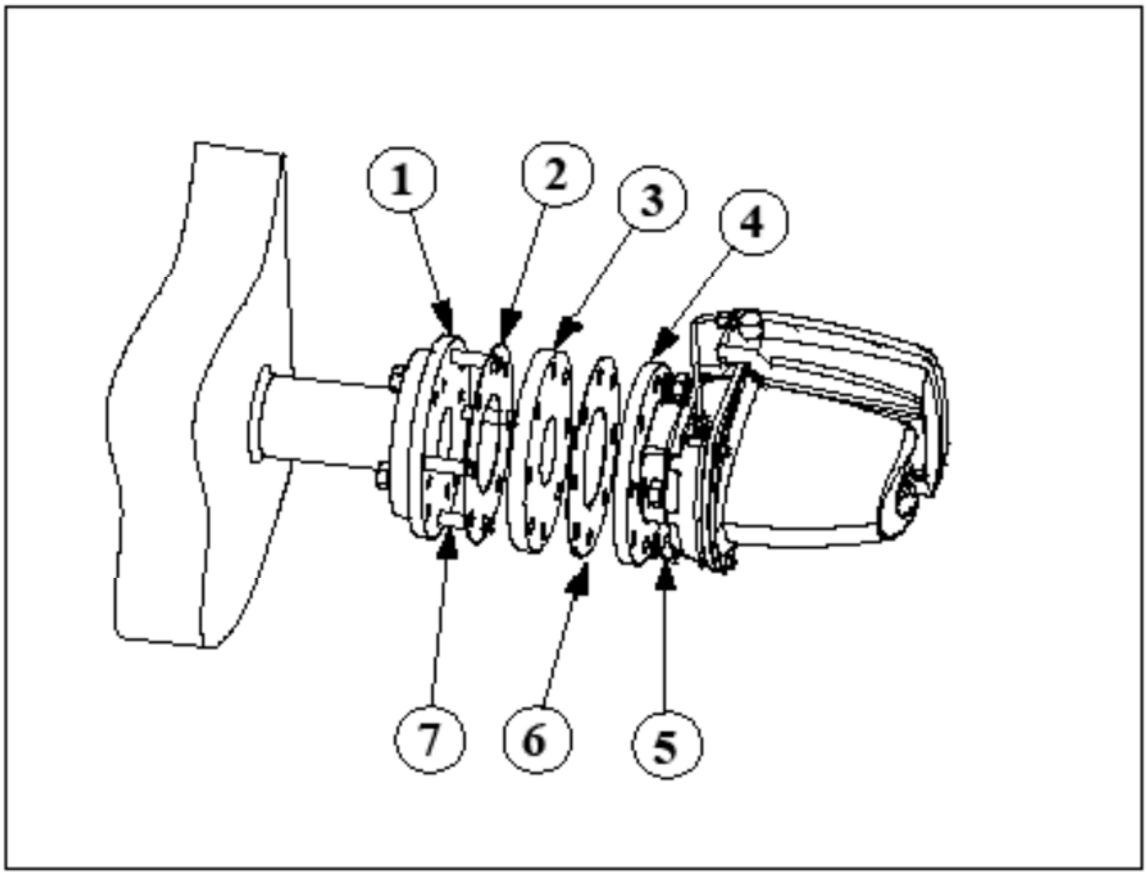


Figure 5. Thermal spacer installation

1	Mounting flange on flue. Adaptor flange fitted where necessary to provide 4” ANSI 150lb flange	5	M16 nuts and washers (4 off each)
2	ANSI 4” gasket	6	ANSI 4” gasket
3	Thermal spacer	7	M16 x 80mm studs (4 off)
4	4” flange on Servomex 2700 sensor head		

3.2.6 Probe retention flange installation

A probe retention flange (part number 02750998) is available when it is required to leave the probe in the process during servicing. This is useful when used in conjunction with a ceramic probe, so as to prevent the possibility of it being damaged during extraction. The probe retention flange is also available in conjunction with the thermal spacer and high temperature stand-off mounting options.

Refer to Figure 6.

- Where necessary fit the weld-on flange, adaptor flange, high temperature stand-off or thermal spacer as described in Sections 3.2.2, 3.2.3, 3.2.4 or 3.2.5.

- Identify and mark the correct orientation of the retention flange so that the sample vent hole in the flange will align with the vent hole on the sensor head when installed in its desired orientation on the flue.
- Attach the ceramic probe to the probe retention flange as detailed in Section 3.3.2.
- If the probe retention flange is being attached to a weld-on flange or adaptor flange [1] then screw the four M16x80mm studs [2] into alternate threaded holes in the weld-on or adaptor flange. Fit the 4" sealing gasket [4] over the protruding studs [2]. Then carefully insert the ceramic probe and retention flange through the hole in the centre of the flange/s and secure with the four M16 half nuts and washers [6]. If a weld-on or adaptor flange is not fitted then replace the four M16x80mm studs with M16x100mm bolts (not supplied).
- If the probe retention flange is being attached to a high temperature stand-off then insert the ceramic probe carefully through the hole in the high temperature stand-off and secure the probe retention flange onto the four M16x80mm studs with a 4" ANSI sealing gasket and the four M16 half nuts and washers.
- If the probe retention flange is being attached to a thermal spacer then insert the ceramic probe carefully through the hole in the thermal spacer and secure the probe retention flange onto the four M16x105mm studs with a 4" sealing gasket and the four M16 half nuts and washers.
- Mount the sensor head onto the protruding part of the mounting studs using the 4" ANSI sealing gasket [7] and the four M16 nuts and washers [8] provided. Ensure that the vent hole in the gasket and in the retention flange are aligned with the sample vent on the sensor head.

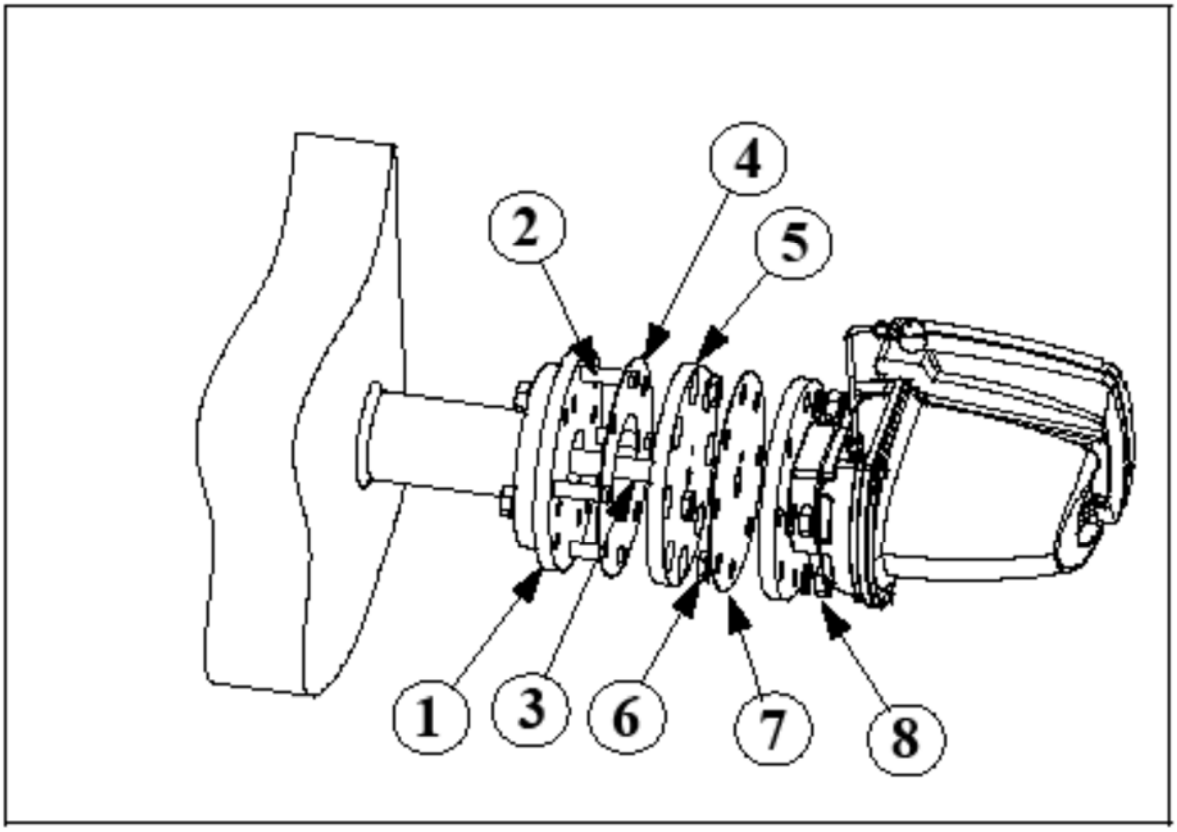


Figure 6. Probe retention flange installation

1	Adaptor flange	5	Probe retention flange
2	M16 x 80mm studs (4 off)	6	M16 half nuts and washers (4 off each)
3	Ceramic probe	7	4” ANSI sealing gasket
4	4” sealing gasket (large central hole)	8	M16 nuts and washers (4 off each)

3.3 Sample probe installation

CAUTION

If the flue is brick lined, ensure that the full diameter of the probe hole is maintained through the brickwork and is in line with the flange.

There are many possible configurations for the probe assemblies grouped into three main types:

- Open-ended sample probes (only use with internal sample filter option).
- Unsupported filtered sample probes.
- Supported filtered sample probes.

Table 3 contains a list of the different sample probes available and their part numbers. The installation of the different sample probe types is detailed in the following sections.

3.3.1 Open-ended and unsupported filtered metal probe installation

The open-ended and unsupported filter probes are available in 4 different lengths and 2 different materials depending on process conditions and flue temperature. Refer to Figure 7 for construction of the filter probe.

- Cut the probe tube to length if required. The cut should be square and any burrs and swarf should be removed.
- Fit the tube coupling to the sensor head sealing the thread with PTFE tape.
- Fit the probe tube into the coupling until the probe tube bottoms out in the sensor head. Swage the coupling ferrule onto the tube by tightening the coupling finger tight plus a further 3/4 to 1 turn.
- Insert the probe carefully through the hole in the flange gasket and attach the sensor head onto the flue. Ensure that the mounting bolts are tightened evenly.

3.3.2 Open-ended ceramic probe installation

The open-ended ceramic probe is available in three different lengths. The probe is supplied complete with a ½" NPT threaded stainless steel fitting bonded to the end of the ceramic tube. The ceramic probe may be attached directly to the sensor head (using PTFE tape to seal the thread) or to a probe retention flange. The probe retention flange is used to avoid potential damage to the fragile probe when removing the sensor head from the flue for maintenance purposes. Refer to Section 3.2.6 for probe retention flange installation.

Metallic Probes						
	0.5m	**1.0m**	**1.5m**	**2.0m**	**2.5m**	**3.0m**
	Stainless Steel, Open-Ended					
02740701	A <700**°C**	B <700**°C**	C <700**°C**	D <700**°C** *		
	Stainless Steel, Filtered					
02740702	A <700**°C**	B <700**°C**	C <700**°C**	D <700**°C** *		
	Stainless Steel, Double-Filtered					
02740712	A <700**°C**	B <700**°C**	C <700**°C**			
	Stainless Steel, Filtered, Supported					
02740703	A <700**°C**	B <700**°C**	C <700**°C**	D <700**°C**	E <700**°C**	F <700**°C**
	Stainless Steel, Double-Filtered, Supported					
02740710	A <700**°C**	B <700**°C**	C <700**°C**	D <700**°C**	E <700**°C**	F <700**°C**
	Hastelloy, Open-Ended					
02740713	A <700**°C**	B <700**°C**	C <700**°C**			
	High Temperature Alloy, Open-Ended					
02740704	A <1000**°C**	B <1000**°C**	C <800**°C**	D <700**°C** *		
	High Temperature Alloy, Filtered					
02740705	A <1000**°C**	B <1000**°C**	C <800**°C**	D <700**°C** *		
Ceramic Probes						
	0.5m	**0.6m**	**1.0m**	**1.1m**	**1.2m**	**1.5m**
	Ceramic, Open-Ended					
02740707	A <1750**°C**		B <1750**°C**		D <1750**°C**	C <1750**°C** *
	Ceramic, Filtered					

02740708	A <1750**°C**	B <1750**°C**	C <1750**°C** *

* Denotes vertical mount only

Table 3. Sample probe part numbers

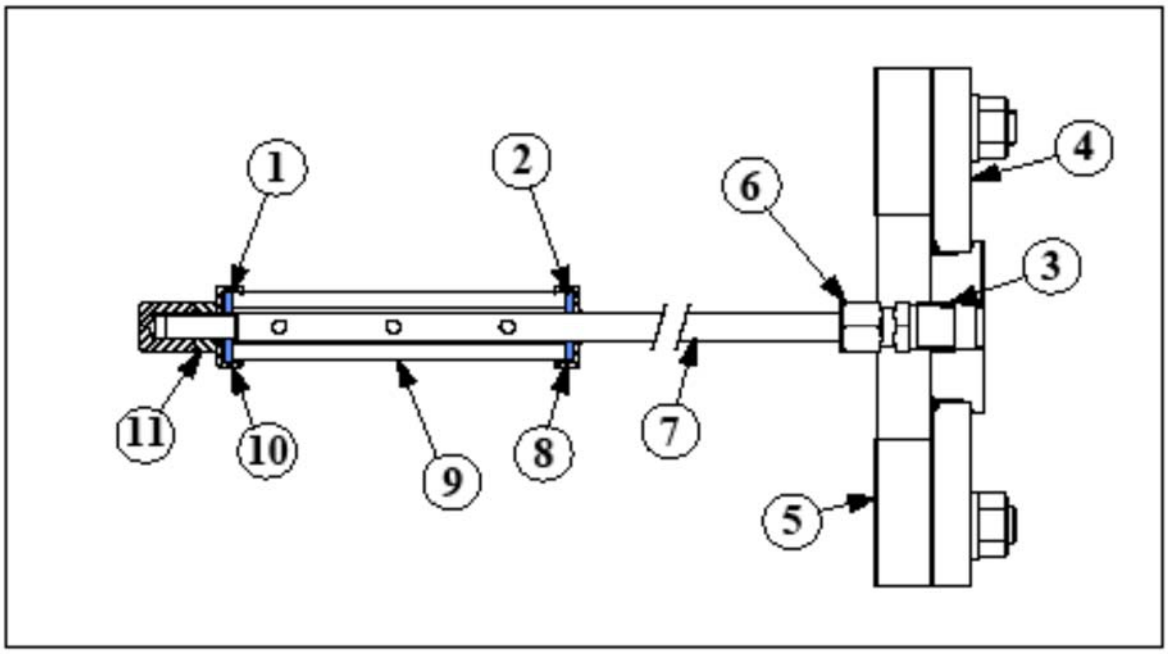


Figure 7. Sample probe and filter construction

1	Fibre sealing washer	**7**	Probe tube
2	Fibre sealing washer	**8**	Filter retaining cap
3	1/2” NPT threaded mounting hole in Servomex 2700 filter block	**9**	Silicon carbide filter element
4	2700 mounting flange	**10**	Filter retaining cap
5	Mounting flange on flue	**11**	Locking nut assembly
6	1/2” compression to 1/2” NPT adaptor		

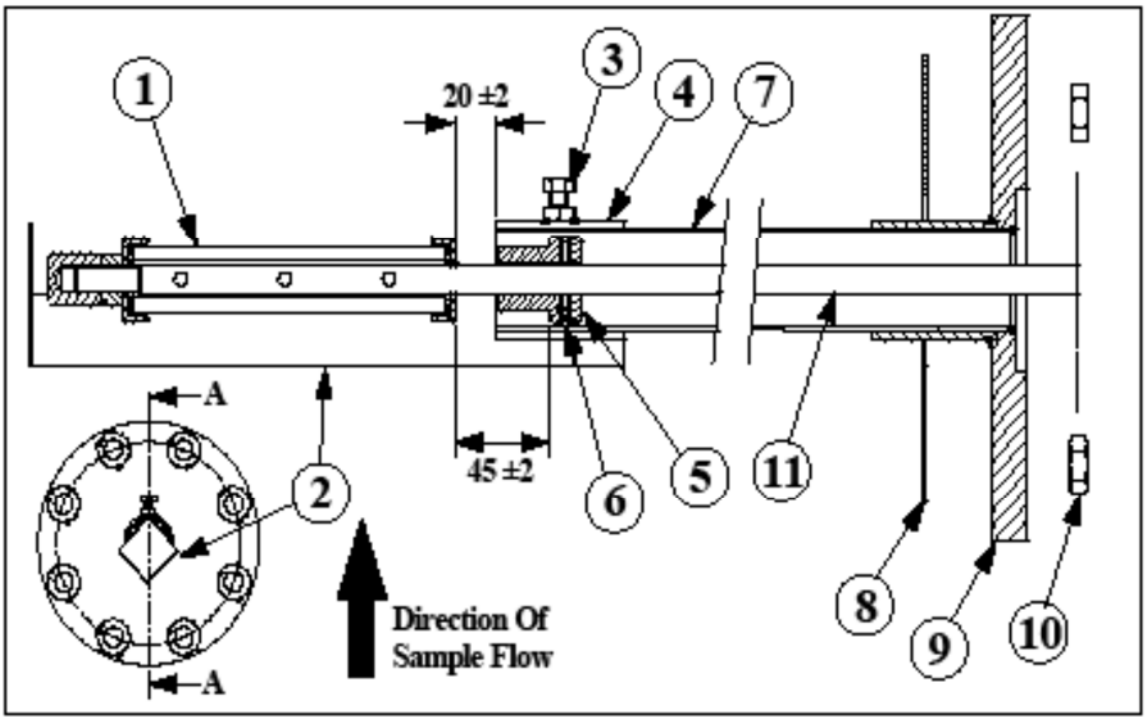


Figure 8. Supported probe construction

1	Silicon carbide filter element	7	Support tube
2	Sample filter shroud (V deflector)	8	4” sealing gasket
3	Sample filter shroud M8 x 18mm fixing screw	9	Support tube flange
4	Sample filter shroud collar	10	M16 nuts and washers (4 off each)
5	Sample probe retaining disc	11	Sample probe tube
6	Sample probe retaining disc M5 x 10mm fixing screws (2 off)		

3.3.3 Supported probe installation

The supported probe assembly is supplied in a range of lengths from 1.5m to 3.0m in 0.5m steps. The installation process may be divided into three parts.

Cutting the probe and support tubes to length

The probes are provided cut to the correct lengths for the nominal specified insertion depth. To shorten the probe assembly cut equal lengths from both the support tube and the probe tube. The cuts should be square and any burrs and swarf removed.

Installing the support tube assembly

Refer to Figure 8. Fit the sample filter shroud [2] onto the end of the support tube [7]. The sample filter shroud [2] must be positioned with respect to the direction of the sample flow as shown in Figure 8. The end of the sample filter shroud collar [4] must be flush with the end of the support tube [7]. The M8x18mm hex head shroud fixing screw [3] should then be tightened to securely locate the sample filter shroud [2] in position. Mark the support tube flange [9] to identify the orientation of the shroud and the direction of the sample flow.

Refer to Figure 9. Where necessary fit the weld-on flange or adaptor flange, as described in Sections 3.2.2 or 3.2.3. If the support tube flange is being attached to a weld-on flange or adaptor flange then screw the four M16x80mm studs into alternate threaded holes in the weld-on or adaptor flange. Secure the support tube flange with a 4" sealing gasket and the four M16 half nuts and washers. If a weld-on or adaptor flange is not fitted then replace the four M16x80mm studs with M16x100mm bolts (not supplied). Ensure the filter shroud orientation is correct with respect to the direction of sample flow in the process.

Installing the filter probe assembly

Refer to Figure 8. Fit the probe retaining disc [5] onto the sample probe tube [11]. Fix in position using the two M5x10mm grub screws [6]. The front face of the disc should be positioned approximately 20mm from the back face of the filter assembly.

Fit the tube coupling to the sensor head sealing the thread with PTFE tape.

Fit the probe tube into the coupling until the probe tube bottoms out in the sensor head. Swage the coupling ferrule onto the tube by tightening the coupling finger tight plus a further 3/4 to 1 turn. Release the union nut from the fitting in the sensor head.

Insert the sample probe into the probe support tube. Take care to leave at least 100mm protruding from the flange to allow attachment to the sensor head.

Fit a 4" sealing gasket [8] over the protruding studs from the support tube flange.

Attach the sensor head to the protruding length of the sample probe tube using the compression fitting. Attach the sensor head to the support tube flange and secure in place with the four M16 nuts and washers [10].

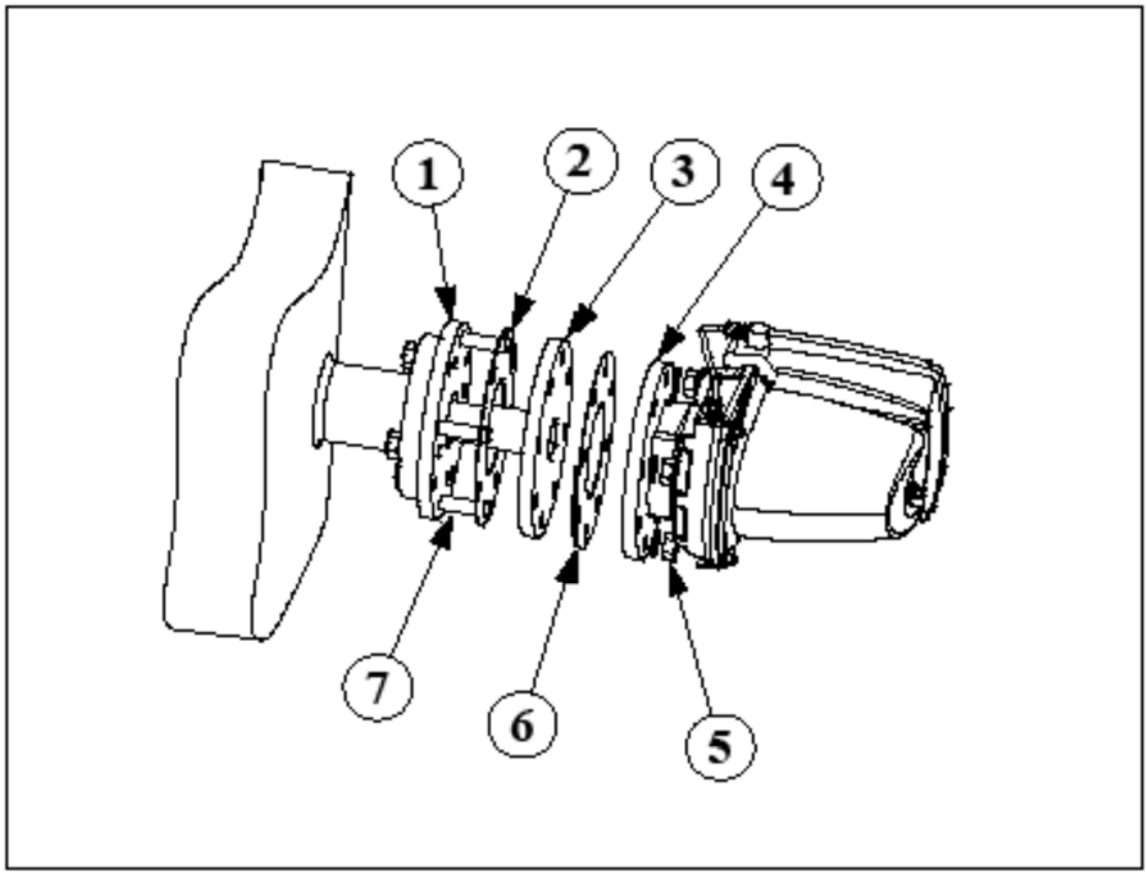


Figure 9. Probe support tube installation

1	Mounting flange on flue. Adaptor flange fitted where necessary to provide 4” ANSI 150lb flange	**5**	M16 nuts and washers (4 off each)
2	ANSI 4” gasket	**6**	ANSI 4” gasket
3	Support tube flange	**7**	M16 x 80mm studs
4	4” flange on 2700 sensor head		

3.4 Calibration and utilities supplies

Refer to Figure 2.

WARNING

The maximum pressure that should be applied to any of the analyser inlet ports is 1 barg (15psig).

Pipes connected to the sensor head shall be routed so that they do not represent a trip hazard.

Calibration gases may be toxic. The pipework connected to the sensor head shall be regularly inspected for leaks.

CAUTION

If the analyser is to be installed in a low temperature environment (-20°C) then it should be powered up for a period of two hours before the compressed air aspirator supply is applied. This prevents corrosive sample gases from condensing inside the sensor head pipe work.

Calibration gas fed to the sensor head shall not contain substances incompatible with the materials listed in Section 8.6 Materials in contact with the sample.

A number of calibration and utilities gas supplies are required by the sensor head depending on the sensor configuration used. For optimum preformance, only one analyser should be used in conjunction with an air supply or utilities unit.

All pressure regulators, flow meters and gauges exhibit variations of output with changes in ambient temperature. Care should be taken to choose products with either a good rejection to changes in ambient temerature or to install air supply units in stable ambient conditions

NOTE

If the sensor head is to be used in conjunction with the optional flow alarm, an aspirator air isolation valve must be fitted to allow zero calibration of the flow alarm. This valve must be fitted between the aspirator air regulator and the entry to the sensor head.

CAUTION

If the optional sensor head purge fittings are used then ensure that the purge gas entry and vent fittings are the correct way round. The purge gas inlet must be connected to the terminal box and not to the sensor head main body in order to avoid overheating of the terminal box PCB.

Aspirator supply	The aspirator air supply is used to extract the sample from the flue and is required for all sensor head configurations. This is an instrument grade compressed air supply provided to a 1/8" NPT (internal) threaded port (item 10) on the solenoid valve body. The compressed air supply should be clean, dry, free from oil and dirt ideally conforming to ISA-S7.0.01 1996. The aspirator pressure range required is 0.2 to 0.3 barg (3 to 5 psig). The flow rate is typically 1.5l/min under typical flue pressure conditions.
Calibration gas	Required for all sensor head configurations. Calibration gas is supplied to the sensor head via a 1/4" OD compression fitting (item 4). The calibration gas supply pressure should be regulated externally to give a flow rate to the port of 600 ml/min ±20 ml/min and a maximum pressure of 1 barg (15 psig).
Purge supply	Optional feature. Where required, the purge gas must be air from a non-hazardous area source. The purge air fittings are threaded 1/4" NPT (internal). The purge inlet is to the terminal box (item 7) and the vent is on the sensor head body (item 5). The supply should be clean, dry, free from oil and dirt ideally conforming to ISA-S7.0.01-1996 and the pressure should be regulated externally. For hazardous Areas, the purge must satisfy the area safety requirements. For corrosive purge, a flow rate of 50 to 100ml/min at 490 to 980 Pa (50 to 100 mm H_2O) is required.
Blowback	The gas used for blowback shall be non-hazardous (e.g. air, nitrogen) and should be supplied at a pressure no greater than 1 barg (15 psig). Blow back must not be used instead of a suitably specified sample probe. If you have any concerns over the included probe, consult Servomex prior to installation.
Auto Calibration	Time must be given to allow for calibration pipe work to be flushed and for the sensors to stabilise. This depends on the separation between gas supply point and the Sensor Head.

3.5 Electrical installation

WARNINGS

Ensure that the electrical installation of the sensor head conforms to all applicable local and national electrical safety requirements.

This appliance must be connected to a protective earth.

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.

Ensure that the cables connected to the sensor head are routed so that they do not represent a trip hazard.

Disconnect the mains supply to the sensor head before removing the cover of the terminal enclosure.

The covers shall only be opened if there is negligible risk of pollution of the electronic circuits from moisture, liquids, dust, or other forms of contamination.

For operation above 50°C, all cables connected to the sensor head must be rated for temperatures of at least 80°C (176°F)

CAUTION

Ensure that the rated voltage is suitable for the installation. The sensor head supply voltage is factory set for either 100-120V or 220-240V (nominal). This is not field adjustable

Ensure that the link on the terminal PCB has been set to the correct supply voltage. Refer to Figure 10. The supply voltage is set by linking together the terminals at terminal block TB9. For 220-240V operation link together terminals TB9/2 and TB9/1. For 110-120V operation link together terminals TB9/2 and TB9/3. For 100V operation link together terminals TB9/2 and TB9/4.

Terminals TB3-1 to TB3-8 and TB5-1 to TB5-13 shall only be used to connect to the control unit.

The sensor head is intended to be powered from a supply which has the 'Neutral' conductor referenced to ground. Where this is unavailable, it is recommended that a suitable isolating transformer is installed and the secondary winding is referenced to ground.

This equipment shall not be directly connected to a power supply which supplies buildings for domestic purposes.

To comply with the European Community EMC Directive the cables used to connect to the control unit and flow alarm relay box (if fitted), and mains supply cables shall be screened.

NOTES

The sensor head and control unit have independent electrical supplies.

If applicable the conduit or screen associated with the power supply should be grounded at the cable gland or conduit entry to the sensor head terminal enclosure in accordance with local wiring regulations.

The cable screens associated with the signal cable(s) connecting the control unit and sensor head do not terminate directly to ground at the sensor head. The screens should be terminated to TB5/13, TB3/9 and the stud PCB terminal – S, as detailed on the interconnection diagram and Figure 10.

Fuse F1 located in the terminal box is rated F6.3A HRC (5 x 20mm) for both 100-120V and 220-240V operation.

- The sensor head inputs and outputs shall not be subject to voltages with respect to earth (ground) which exceed the values given in section 8 Technical Specification. The maximum mains voltage with respect to earth shall be 264Vac / 264Vdc.
- The sensor head does not incorporate an integral on/off switch. You must provide a means of externally isolating the electrical supply from the sensor head. Use a suitable switch or circuit breaker located close to the sensor head, clearly marked as its disconnection device. This must also incorporate a suitable fuse or over-current protection device, set to or rated at no more than 15A. To comply with the relevant safety requirements this power disconnection device shall be approved to:
- UL 489 for equipment used in the USA.
- CSA C22.2 No. 5.1 for equipment used in Canada.
- IEC 60497 for equipment used in the EU and the rest of the world.
- Ensure that the electrical supply to the sensor head can provide the necessary maximum power.
- Electrical terminations in the sensor head are suitable for 0.5mm^2 (20 AWG) to 2.5mm^2 (14 AWG) solid conductors or 1.5mm^2 (16 AWG) stranded conductors.
- All cables connected to the sensor head must be rated for temperatures of at least 100°C (212°F).
- The mains power cable connected to the sensor head shall have a minimum conductor size of 1.5mm^2 (14 AWG).
- To comply with the relevant safety requirements the cables carrying mains power and connected to the sensor head shall be approved to:
- IEC 60227 or IEC 60245, and be designated H05VV-F for equipment used in the EU
- UL 817 or CSA C22.2 No. 21, and be designated STO for equipment used in North America.
- Gland entry sizes and positions are shown in Figure 2. Unused entries should be fitted with appropriate blanking plugs.
- All sensor head cable glands and blanking plugs shall either be made of metal or have a flammability rating of V-1 or better. They shall be rated for use in temperatures of at least 100°C (212°F).
- All sensor head cable glands and blanking plugs shall maintain the level of ingress protection specified for the sensor head (see Section 8.5).
- For installations in the USA or Canada, cable glands shall be UL or CSA approved.
- All glands shall be selected to provide cable strain relief and the effectiveness of that strain relief to withstand pulling and twisting of the cable confirmed in accordance with the relevant safety standard applicable to the installation.
- The mains power cable shall have an external diameter within the range specified for the selected cable gland.
- The mains power cable must be wired so that the protective earth conductor is the last conductor to take the strain in the event of the cable slipping in its anchorage.

- All electrical connections and access to the fuse, F1, are made to the terminal PCB inside of the terminal box enclosure. Refer to Figure 2. To gain access unscrew the four M6 [11] screws using a 5mm allen key and remove the terminal box cover. After electrical connections are complete ensure the cover is fully bolted down.
- Refer to Appendix A – Interconnecting Wiring Schedules for an interconnecting wiring schedule for the sensor head. See also the wiring diagrams in Figure 23, Figure 24, Figure 25 and Figure 26.

		Terminal
Electrical power 100-120Vac or 220-240Vac 50/60Hz, 600VA maximum	Live	TB1-L
	Neutral	TB1-N
	Protective earth	TB1-Protective ground
Note that terminal TB1-protective ground is at the right-hand side		

Table 4. Sensor head electrical power connections

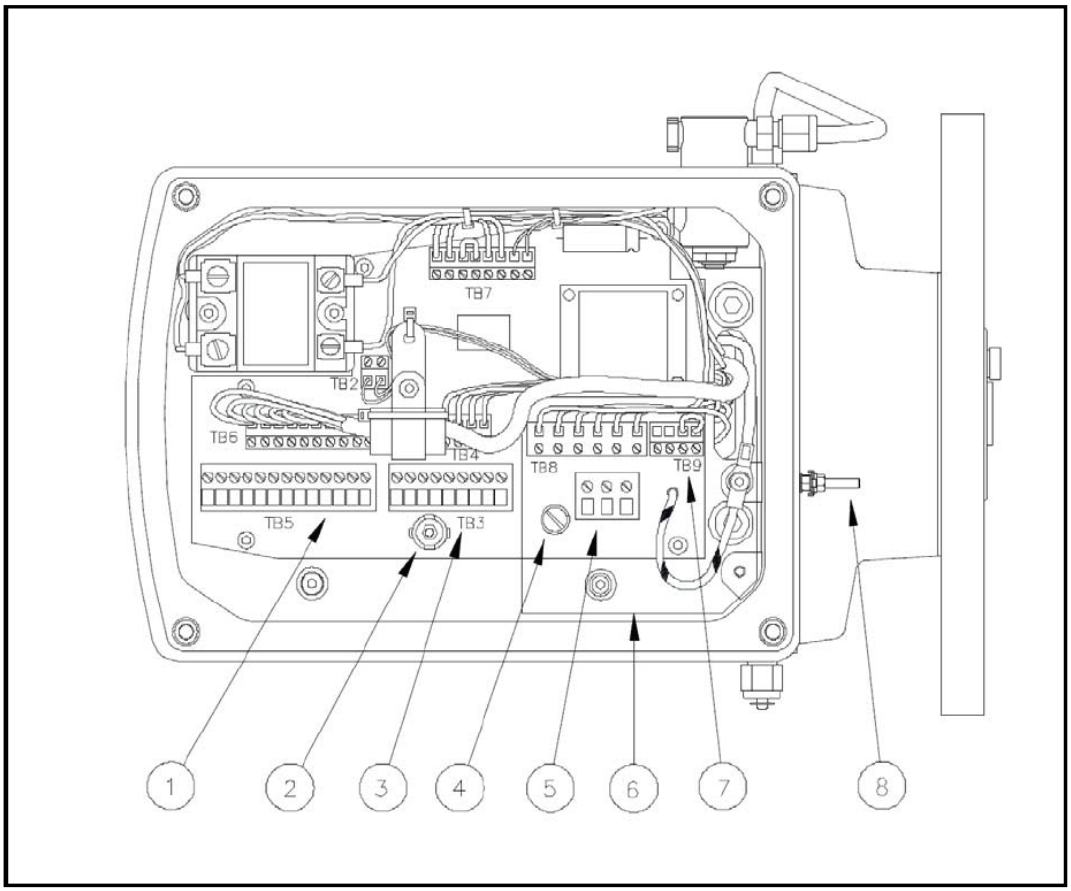


Figure 10. Sensor head terminal enclosure detail

1	Terminal block TB5 (combustibles sensor wiring) Pin 1 at right-hand side	5	Terminal block TB1 (main power wiring)
2	Stud terminal - S	6	Plastic safety cover
3	Terminal block TB3 (oxygen and sensor head temperature wiring) Pin 1 at right-hand side	7	Terminal block TB9 (mains voltage selection (Pin 1 at right-hand side
4	Fuse F1	8	External earth terminal

CAUTION

After installation, the Sensor Head should not be left on the flue unpowered for extended periods, as condensation may form within the sample pipe work. The Sensor Head should be removed from the process and protected against external contamination, or left with 600ml/min of instrument air flowing through the calibration port, until the analyser can be fully commissioned and placed online.

3.6 ATEX/IECEx special instructions for hazardous areas

1. The incoming cables and glands must be suitable for the conditions of use and must be fitted and connected so as to preserve the ingress protection (sealing) of the enclosure. For additional information on cables, glands and blanking plugs see Sections 3.1 & 3.5.
2. The enclosure is to be purged with air at a flow rate of not less than 5 l/min for a period of not less than 20 minutes when purged in leakage compensation mode or 3 l/min for a period of not less than 30 minutes when operated in continuous flow mode.
3. The pressurisation and purging system attached to the enclosure must comply with, and provide, the following:-

a. Provide the minimum purge flow rate for the required time as specified above. Monitoring of the minimum flow rate shall be made on the outlet/vent side of the enclosure (not inlet).
b. Be connected within 100m of the input and output facilities of the enclosure, with no valves or restrictions in the outlet/vent line (other than those necessary for the function and control of the purging system and certified as integral parts thereof).
c. Provide automatic closing and spark arresting devices at the purge outlet aperture.
d. Provide low and high pressure monitoring and control, set to give pressures no less than the minimum and no greater than the maximum specified above respectively within the enclosure.

e. The system must protect the enclosure from full line pressure in the event of pressure regulator failure (and any such failure should be self revealing). This may be achieved either by a redundant regulator, or a relief valve on the inlet side of the enclosure capable of venting the full flow.

4. For correct operation the on-site pressurising air supply must be capable of providing the minimum specified above for leakage compensation, or continuous flow.
5. The installer or user, as appropriate, is responsible for ensuring that this apparatus and in particular any ancillary apparatus, both inside and outside the apparatus, not included within the provisions of the Sensor Head certification, is suitable for the conditions of use. Attention is drawn to the possible lack of alignment of apparatus grouping, temperature classification and other standard requirements between the standards to which the ancillary apparatus may be certified and the standards to which the Sensor Head certificate is issued.
6. If the pipework installation is to be pressure tested with the sensor head attached then the pressure applied should be 150 millibar maximum and the leakage less than 10 l/min
7. Once installed the correct functioning of the equipment and control system assembly shall be tested with regard to the following features :-

a. Ensure that the enclosure/system leakage is within permitted parameters (at the value specified on the label, typically 4 l/min at 40 millibar, and in all cases less than 10l/min at 100 millibar)
b. Ensure that the low pressure monitoring is effective (at the value specified on the label, and in all cases greater than 0.5 millibar within the enclosure)
c. Ensure that the high pressure control is effective (at the value specified on the label, and in all cases less than 100 millibar within the enclosure)

Refer to Purge Control System manual for details.

Repeat function testing is recommended periodically following maintenance. Additional function/maintenance tests may be required by the system manufacturer as detailed in the relevant installation/maintenance instructions

8. The temperature classification of the Sensor head is defined as follows:

a. T2 within the process environment.
b. T3 to the external atmosphere when the temperature of the process flange to which the Sensor Head is attached does not exceed 170°C (338°F).
c. T2 when the temperature of the process flange to which the Sensor Head is attached does not exceed 300°C (572°F).
d. T2 when the Sensor Head is used in an extractive system.

9. The equipment may pose an electrostatic hazard and should only be cleaned with a damp cloth.
10. The Fluegas Exact Sensor head is not intended for operation with a concentration of flammable gas above 25% of LEL in the process environment. However, under abnormal conditions, the process environment may become flammable for short periods of time. The Fluegas Exact Sensor Head contains flame arrestors that prevent an ignition of a flammable sample within the Sensor

Head from propagating into the process environment. These flame arrestors have been tested to the flameproof standard EN/IEC 60079-1.

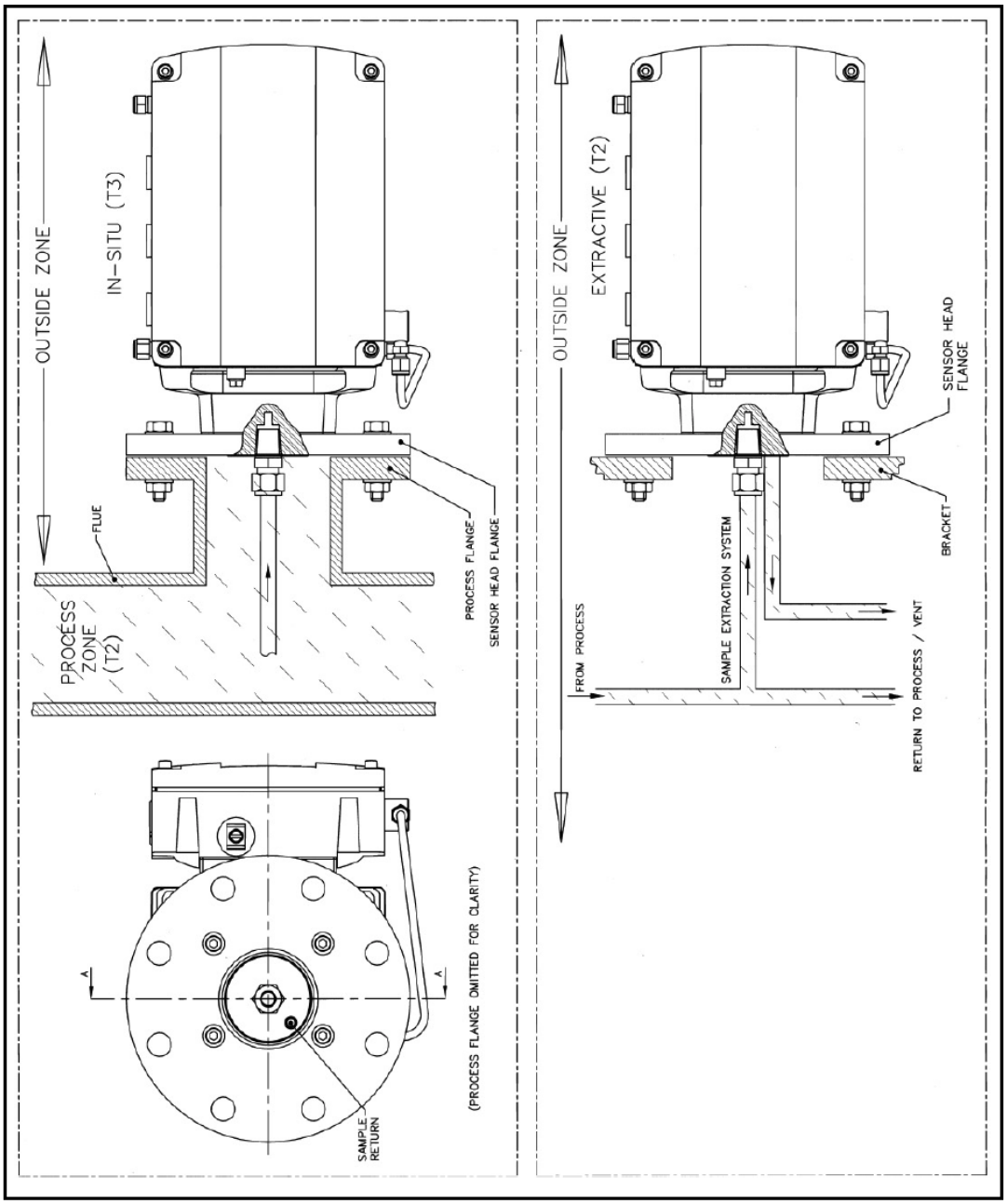


Figure 11. Typical sample arrangement

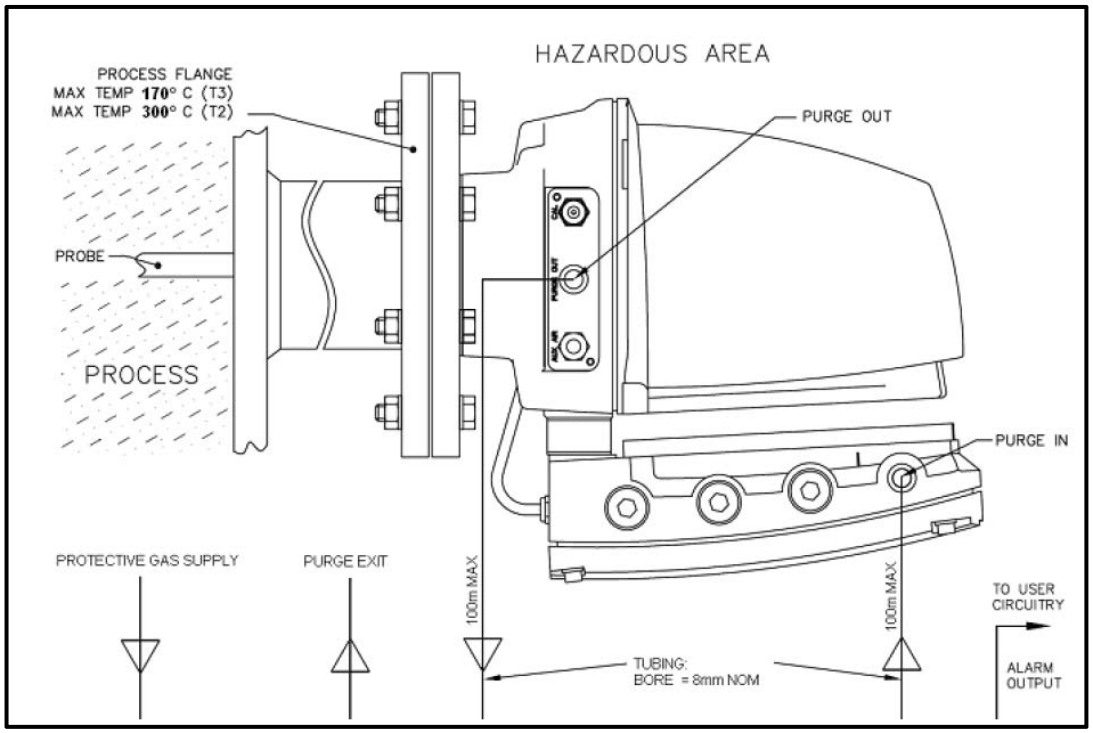


Figure 12. PCS connections

PURGE CONTROL SYSTEM (PCS)

The PCS shall be suitably certified to EN/IEC 60079-2 as type pz and shall have the following characteristics:

	Leakage Compensation	**Continuous Flow**
Protective Gas	Air / Nitrogen	Air / Nitrogen
Enclosure Volume	<8 Litres	<8 Litres
Minimum Purge Flow Rate	5 SLPM	3 SLPM
Minimum Purge Duration	20 Minutes	30 Minutes
Minimum Overpressure	50 Pa (0.5 mbar)	50 Pa (0.5 mbar)
Maximum Overpressure	10kPa (100 mbar)	10kPa (100 mbar)
Maximum Leakage Rate	10 SLPM	10 SLPM

NOTE

The sensor head may be marked with a lower maximum overpressure value and a corresponding lower maximum leakage rate, e.g. 4SLPM at 4kPa (40mbar).

3.7 North America special instructions for hazardous areas

1. The incoming cables and glands must be suitable for the conditions of use and must be fitted and connected so as to preserve the ingress protection (sealing) of the enclosure. For additional information on cables, glands and blanking plugs see Sections 3.1 & 3.5.
2. The safety of the equipment relies on the provision of proper purging and pressurizing when used in hazardous locations. It must not be put into use without "special permission" from the inspection authority having jurisdiction.
3. Power must not be restored after enclosure has been opened until enclosure has been purged for 30 minutes at a flow rate of 3 l/min minimum.
4. The Sensor Head enclosure must not be opened unless the area atmosphere is known to be below the ignitable concentration of combustible materials or unless all equipment within has been de-energized for 50 minutes while the purge system remains on.

5. The 02760 Purge Control System must be connected within 100m of the input and output facilities of the enclosure, with no valves or restrictions in the pipework between the Purge Control System and the Sensor Head. Maximum loop length 200m.
6. For correct operation the on-site pressurising air supply must be capable of providing a minimum of 10 l/min at a minimum pressure of 4 bar.
7. If the pipework installation is to be pressure tested with the sensor head attached then the pressure applied should be 100 millibar maximum and the leakage less than 10 l/min.
8. Once installed the correct functioning of the equipment and control system assembly shall be tested with regard to the following features:

a. Ensure that the enclosure/system leakage is less than 10 l/min at 100 millibar.
b. Ensure that the low pressure monitoring is greater than 0.5 millibar within the enclosure.
c. Ensure that the high pressure control is less than 100 millibar within the enclosure.

Refer to 02760 Purge Control System manual for details.

Repeat function testing is recommended periodically following maintenance.

9. The temperature classification of the Sensor head is defined as follows (Refer to installation drawing 02700/879 in Appendix E – North American – Hazardous Area Installation Drawing):

a. T3 to the external atmosphere when the temperature of the process flange to which the Sensor Head is attached does not exceed 170°C (338°F). In-situ.
b. T2 when the temperature of the process flange to which the Sensor Head is attached does not exceed 250°C (482°F). In-situ.
c. T2 when the Sensor Head is used in an extractive system.

It is the responsibility of the end user to confirm the flange/process temperature in order to determine the accurate Temperature code.

10. The equipment may pose an electrostatic hazard and should only be cleaned with a damp cloth.
11. Do not open the enclosures if an explosive atmosphere is present.
12. This system is only for flue gas monitoring where the sample gas is drawn by an aspirator mechanism in the sample return path and the sample gas will be at negative pressure within the Sensor Head during operation.
13. Under abnormal conditions, the process environment may become flammable for short periods of time. The Fluegas Exact Sensor Head contains flame arrestors that prevent an ignition of a flammable sample within the Sensor Head from propagating into the process environment. These flame arrestors have been tested to the flameproof standard EN/IEC 60079-1.

4 Installation of Flow Alarm Relay Box

4.1 Installation location

The optional Flow Alarm Relay Box houses the setup components for the flow alarm. From the Flow Alarm Relay Box, the flow alarm is calibrated, the low flow alarm threshold set, the fault/alarm relays enabled/disabled and their failure state inverted, and the fault/alarm conditions indicated via volt free changeover relays.

The Flow Alarm Relay Box should be located in a suitable area, ideally within easy reach of the sensor head / utilities control. Select a location that allows convenient access for installation and for initial adjustment. The box should be mounted with the electrical entries on the underside.

Ensure that the operating environment conditions are followed as given in Table 5.

Item	Specification
General	Suitable for indoor and outdoor locations
Operating temperature	-10 to 50°C (14°F to 122°F), in sheltered location
Storage temperature	-20 to 70°C (-4°F to 158°F)
Ingress protection	IP66. IP20 minimum with lid removed
Relative humidity	95% RH maximum, non-condensing
Atmospheric pressure	76 to 112 kPa (absolute) (11 to 16.2 psia)
Altitude	2000m maximum
Overvoltage category	Category II
Pollution degree	Pollution Degree 2

Table 5. Flow alarm relay box operating environment

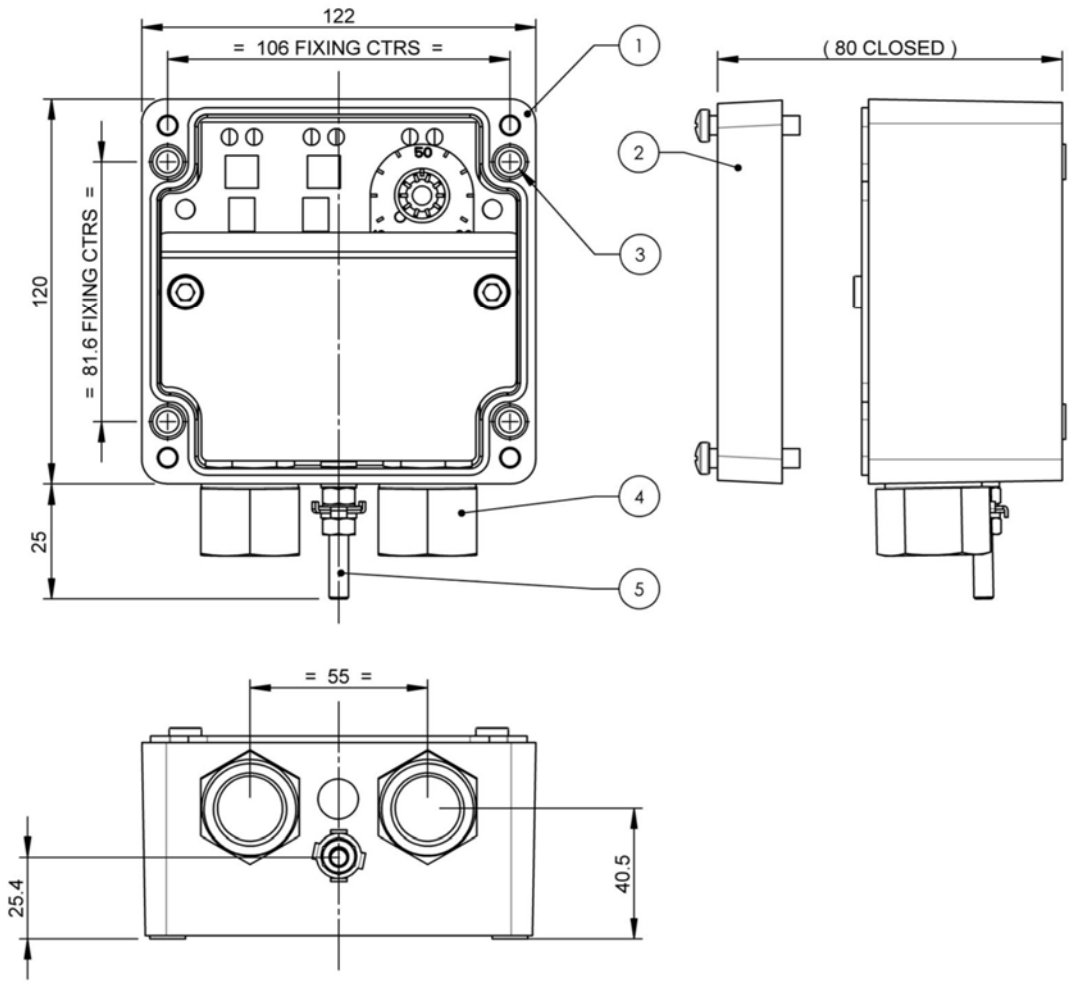


Figure 13. Flow alarm relay box installation

1	Flow alarm relay box	**4**	Gland entries M20 x 1.5 with 3/4” NPT adaptors
2	Box lid	**5**	EMC earth terminal
3	Mounting holes (for 4 off M6 bolts)		

4.2 Electrical installation

Figure 14. Flow alarm relay box terminals

Item	Specification
Terminals	TB1, TB2
Terminal Type	TOP 1.5 GS
Wire Size, TB1	0.13 to 1.5 mm2 (26 to 16 AWG)
Wire Size, TB2	0.13 to 2.5 mm2 (26 to 14 AWG)
Stripping Length	10mm
Tightening Torque	0.4 - 0.5 Nm

Table 6. Relay box terminal information

Item	Specification
Configuration	2 SPCO relay contacts allocated to Fault and Flow
Maximum Rating	250VAC, 3A / 28VDC, 1A (non-inductive)
Minimum Load	5V, 10mA AC or DC

Table 7. Relay contact specification

User connections to the relay outputs are given in Table 8 and Table 9.

Low flow	N/C	TB2-6	OPEN=Low flow
	Common	TB2-4	
	N/O	TB2-5	CLOSED=Low flow
Fault	N/C	TB2-3	OPEN=Fault
	Common	TB2-1	
	N/O	TB2-2	CLOSED=Fault

Table 8. Flow alarm relay box terminals - DIRECT mode

Low flow	N/C	TB2-6	CLOSED=Low flow
	Common	TB2-4	
	N/O	TB2-5	OPEN=Low flow
Fault	N/C	TB2-3	CLOSED=Fault
	Common	TB2-1	
	N/O	TB2-2	OPEN=Fault

Table 9. Flow alarm relay box terminals - INVERSE mode

CAUTION

Terminals TB1-1 to TB1-4 shall only be used to connect the relay box to the sensor head.

NOTE

It is recommended that the relays are set to INVERSE functionality as a fail safe precaution i.e. if power to the Flow Alarm Relay Box is interrupted, a "Flow Fault" status and "Low Flow" alarm will activate.

- The flow alarm relay box inputs and outputs shall not be subject to voltages with respect to earth (ground) which exceed the values given in Section 8 Technical Specification.
- The cable connected to the flow alarm relay contacts shall have a conductor size appropriate to the intended current.
- To comply with the relevant safety requirements any cable carrying mains power and connected to the flow alarm relay box shall be approved to:
    - IEC 60227 or IEC 60245, and be designated H05VV-F for equipment used in the EU
    - UL 817 or CSA C22.2 No. 21, and be designated STO for equipment used in North America.
- Gland entry sizes and positions are shown in Figure 13.
- All flow alarm relay box cable glands shall either be made of metal or have a flammability rating of V-1 or better.
- All flow alarm relay box cable glands shall maintain the level of ingress protection specified for the relay box (see section 8.5).
- Any cable carrying hazardous live voltages shall have an external diameter within the range specified for the selected cable gland.
- For installations in the USA or Canada, cable glands shall be UL or CSA approved.
- All glands shall be selected to provide cable strain relief and the effectiveness of that strain relief to withstand pulling and twisting of the cable confirmed in accordance with the relevant safety standard applicable to the installation.

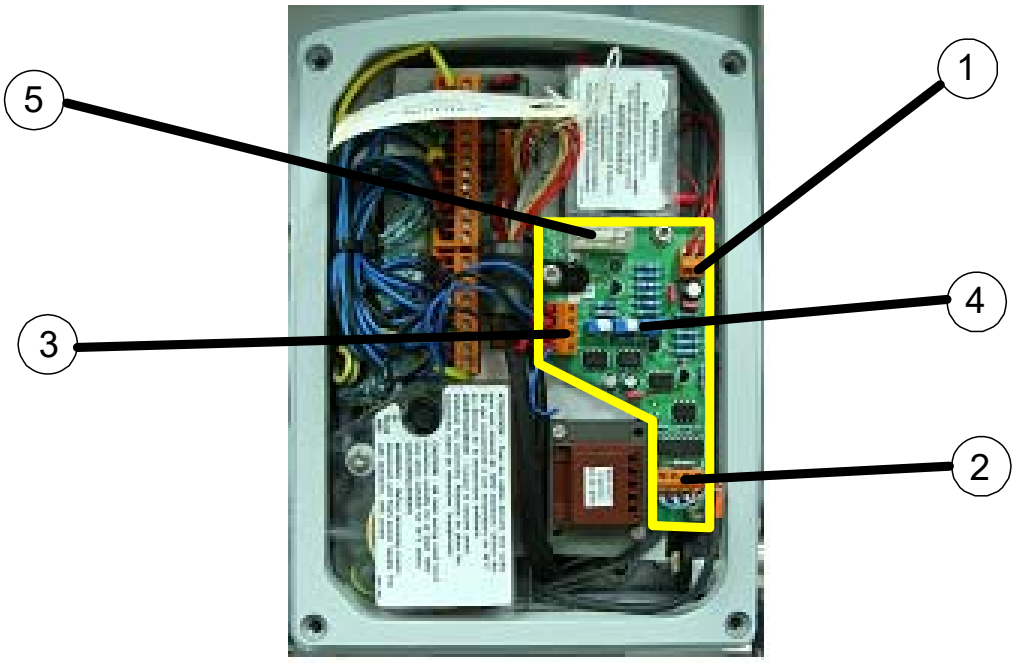


Figure 15. Flow sensor signal amplifier board

1	TB1 – Power supply to signal amplifier board	**4**	Flow sensor tuning potentiometers
2	TB2 – Flow sensor terminals	**5**	Fuse FS11 (see Section 7.2)
3	TB3 – Flow alarm relay box terminals		

Item	Specification
Terminal Type:	MK8/135
Wire Size:	0.13 to 1.5 mm2 (26 to 16 AWG)
Stripping Length:	6mm
Tightening Torque:	0.4 Nm

Table 10. Flow sensor signal amplifier board terminal information

CAUTION

The terminals TB3 on the Flow Sensor Signal Amplifier Board in the Sensor Head shall only be used to connect to a Servomex Flow Alarm Relay Box.

NOTE

Item 4 - "Flow Sensor Tuning Potentiometers" are not to be adjusted. These are factory set to tune the Signal Amplifier Board to the response of the Flow Sensor.

WARNINGS

For operation above 50°C, all cables connected to the flow alarm relay box must be rated for temperatures of at least 80°C (176°F)

5 Installation of Control Unit

5.1 Installation location

Refer to Figure 16.

Analyser Control Units and air supplies (utilities units) should, ideally, be mounted within easy reach of one another to aid routine calibration. They should also be mounted as close as possible to the Sensor Head to minimise the analyser's response time to calibration gases, to help maintain the stability of the air supply units and to minimise the effects of pressure drops.

Select a location which allows convenient access for installation, maintenance and will minimise ambient temperature fluctuations and vibration. The control unit should be mounted horizontally with the electrical entries on the underside. The operating environment conditions for the control unit are in Table 11.

Ensure the ambient temperature does not exceed specification. The control unit and display may require protection from direct sunlight and local radiant heat sources. This can be achieved by the installation of a heat shield between the control unit and the heat source; a thin metal sheet is usually adequate.

The Control Unit is essentially an aluminium enclosure finished with a protective epoxy powder paint. A polycarbonate window facilitates viewing the integral display and the user interface is via a polyester keypad. All weatherproof seals are silicone rubber.

WARNINGS

If the control unit is to be installed in an area which may be hazardous due to the presence of flammable gases or dusts then any "Special Conditions for Safe Use" and/or "Schedules of Limitation", as detailed in the Safety Certification, must be followed.

The control unit shall only be mounted on a wall that is suitable to support a weight of at least 10 kg.

The control unit shall not be lifted by means of any fitted cables.

NOTE

Allow 365mm at the front and 250mm to the left hand side for service access.

The control unit may be mounted either to a rigid vertical surface (wall mounted) capable of supporting the weight of the enclosure or panel mounted.

For the wall mounting option two metal mounting brackets are fitted to the rear of the control unit using four M8 by 20mm screws and washers. Four 12mm diameter holes are provided for mounting the control unit to the wall. Servomex recommend the use of M8 or 3/8" bolts to fix the control unit to the wall.

For the panel mounting option the control unit is inserted through the large hole in the mounting bracket and secured using four M8 by 20mm screws and washers. The size of the mounting panel is designed to fit standard 19" rack mounting systems. The mounting panel is provided with eight 6.5mm slots for attachment to the rack or panel.

Item	Specification
Ambient operating temperature	-10°C to +55°C (+14°F to +131°F)
Storage temperature	-20°C to +55°C (-4°F to +131°F)
Ingress protection	IP65
AC power supply. Two user-selectable voltage ranges: a) 100-120Vac 50/60Hz b) 220-240Vac 50/60Hz	a) 100-120Vac -15% +10% (Min. 85V – Max. 132V) b) 220-240Vac -15% +10% (Min. 187V – Max. 264V)
Altitude	Up to 2000m
Overvoltage category	Category II.
Pollution degree	Pollution Degree 2. *See Note 1*
Relative humidity	0 to 80% RH

Note 1: Where the installation is such that the enclosure ingress protection IP65 is maintained and the covers remain securely fitted, the apparatus is suitable for use in locations where there may be significant deposits of nonflammable dusts or fibres (Pollution Degree 4) and/or where there may be drips, splashes of water, prolonged exposure to rain or subjected to hose down.

The covers may be removed during installation or servicing only if there is negligible risk of pollution or contamination of the electronic circuits contained within the enclosures and if the covers are securely replaced immediately after the operation is completed. Refer to Section 7.

Table 11. Control unit operating environment

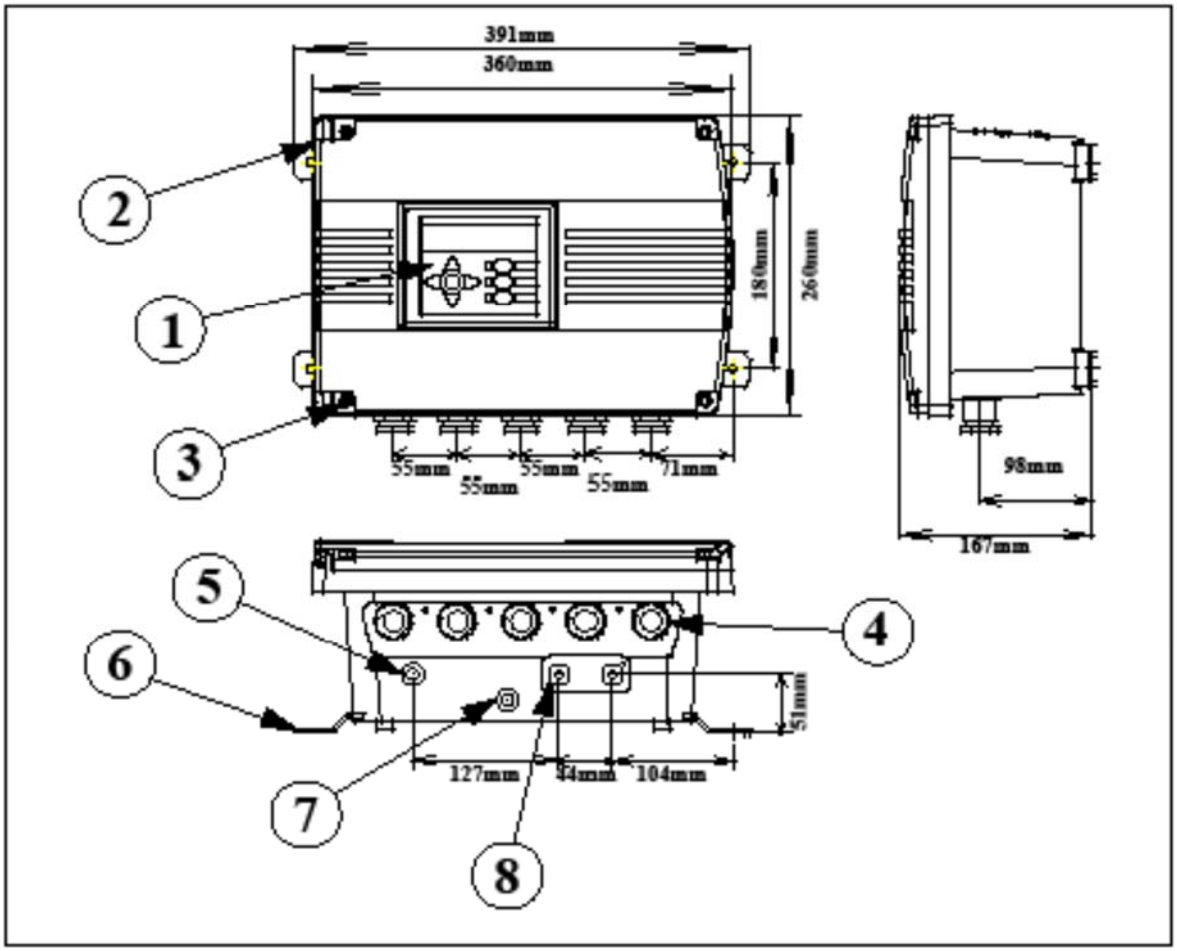


Figure 16. Control unit installation

1	Keypad and LCD display	5	Enclosure breather fitting (optional) or blanking port
2	Door hinge	6	Wall mounting brackets
3	M6 bolts (4 off)	7	EMC earth termnial
4	3/4” NPT (INT) threaded cable conduit entries or optional adaptors as required	8	¼” NPT (INT) threaded enclosure purge inlet and outlet fittings (optional) or blanking plugs

5.2 Electrical installation

WARNINGS

Refer to the warnings and conditions outlined in the "General Safety Information" in Section 1.3 of this manual.

The sensor head and control unit have independent electrical supplies. This means that if the sensor head is un-powered, the COe sensor may still be heated to 300°C by the control unit. If the control unit is un-powered, the sensor head will still be heated to 250°C by its own power supply.

This appliance must be connected to a protective earth.

Ensure that the electrical installation of the control unit conforms to all applicable local and national electrical safety requirements.

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.

The volt-free relay output terminals are isolated from the control unit mains circuits and from each other so that either the mains voltage circuits or signal circuits can be connected to the contacts.

The mains supply to the control unit and any AC voltages connected to the relay outputs shall all be derived from the same supply phase.

The analogue output terminals and the user remote dry contact input terminals are separated from the control unit mains circuits by reinforced insulation. These terminals must only be connected to circuits that are themselves separated from mains voltages by at least reinforced insulation.

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

Opening the control unit door will expose parts that represent a risk of electric shock.

The control unit door shall only be opened if there is negligible risk of pollution of the electronic circuits from moisture, liquids, dust, or other form of contamination.

For operation above 50°C, all cables connected to the control unit must be rated for temperatures of at least 80°C (176°F)

CAUTION

Ensure that the rated voltage is suitable for the installation.

The control unit is intended to be powered from a supply which has the 'Neutral' conductor referenced to ground. Where this is unavailable, it is recommended that a suitable isolating transformer is installed and the secondary winding is referenced to ground.

To comply with the European Community EMC Directive the cables connected to the mains supply, relay contact outputs, analogue outputs, and dry contact inputs shall be screened. In addition, the EMC earth terminal on the control unit (Figure 16, item 7) must always be connected to a local EMC earth (ground). The conductor used must not exceed 2m in length.

NOTES

To comply with EMC requirements, all cable screens must be connected to the control unit enclosure at the point of entry.

- The control unit inputs and outputs shall not be subject to voltages with respect to earth (ground) which exceed the values given in section 8 Technical Specification. The maximum mains voltage with respect to earth shall be 264Vac / 264Vdc.
- The control unit does not incorporate an integral on/off switch. You must provide a means of externally isolating the electrical supply from the control unit. Use a suitable switch or circuit breaker located close to the control unit, clearly marked as its disconnection device. This must also incorporate a suitable fuse or over-current protection device, set to or rated at no more than 15A. To comply with the relevant safety requirements this power disconnection device shall be approved to:
    - UL 489 for equipment used in the USA.
    - CSA C22.2 No. 5.1 for equipment used in Canada.
    - IEC 60497 for equipment used in the EU and the rest of the world.
- Ensure that the electrical supply to the control unit can provide the necessary maximum power.
- Electrical terminations in the control unit are suitable for 0.5mm^2 (20 AWG) to 2.5mm^2 (14 AWG) solid conductors or 1.5mm^2 (16 AWG) stranded conductors.
- The mains power cable connected to the control unit shall have a minimum conductor size of 1.0mm^2 (16 AWG).

- To comply with the relevant safety requirements the cables carrying mains power and connected to the control unit shall be approved to:
    - IEC 60227 or IEC 60245, and be designated H05VV-F for equipment used in the EU
    - UL 817 or CSA C22.2 No. 21, and be designated STO for equipment used in North America.
- Gland entry sizes and positions are shown in Figure 16. Unused entries should be fitted with appropriate blanking plugs.
- All control unit cable glands and blanking plugs shall either be made of metal or have a flammability rating of V-1 or better.
- All control unit cable glands and blanking plugs shall maintain the level of ingress protection specified for the control unit (see section 8.5).
- For installations in the USA or Canada, cable glands shall be UL or CSA approved.
- All glands shall be selected to provide cable strain relief and the effectiveness of that strain relief to withstand pulling and twisting of the cable confirmed in accordance with the relevant safety standard applicable to the installation.
- The mains power cable shall have an external diameter within the range specified for the selected cable gland.
- The mains power cable must be wired so that the protective earth conductor is the last conductor to take the strain in the event of the cable slipping in its anchorage.
- Do not exceed the maximum load impedance of 1000 ohms for the analogue (0/4-20mA) current outputs.
- Electrical power should be supplied at 100-120V or 220-240V (+10% -15%) 50/60 Hz. To gain access refer to Figure 16. Unscrew the four M6 bolts [3] using a 5mm Allen key and open the control unit door. Ensure that the transformer primary connection (PL6 or PL7 in Figure 16) and the main power fuse rating (F1) are appropriate for the electrical supply voltage (see Table 12).

Nominal voltage	Transformer primary connection	Mains power fuse (F1) rating
100-120Vac	PL7	T3.15A HRC (5 x 20mm)
220-240Vac	PL6	T1.6A HRC (5 x 20mm)

Table 12. Control unit electrical power voltage selection

- All electrical connections and access to the mains power fuse, F1, are made to the control PCB inside of the control unit enclosure. After electrical connections are complete ensure that the safety cover is re-fitted and the access door is fully bolted down.

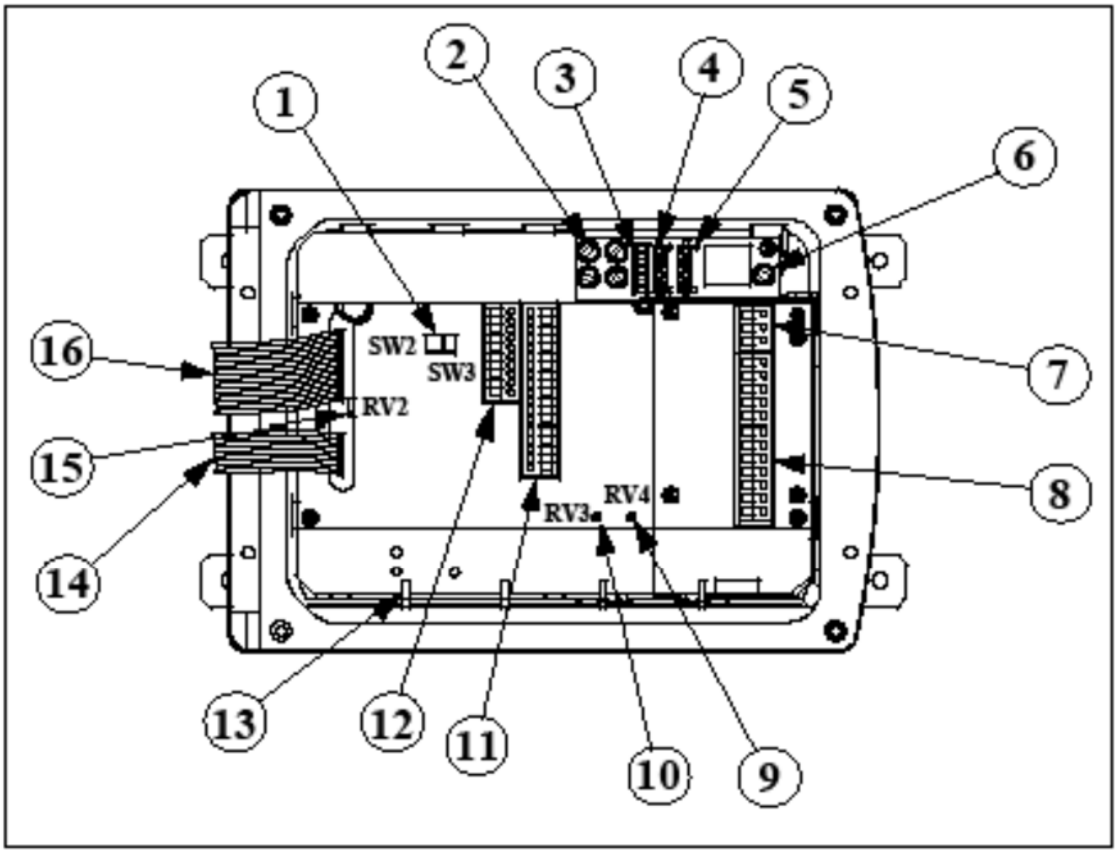


Figure 17. Control unit enclosure detail

1	TFx sensor coarse zero adjustments SW2 (left) and SW3 (right)	9	(0/4-20mA) Analogue output span adjustment of oxygen sensor RV4
2	Sensor heater fuses F2 to F5 (F2.5A HRC 5 x 20mm)	10	(0/4-20mA) Analogue output span adjustment of combustibles sensor RV3
3	Transformer secondary connection PL5	11	Terminal block TB2 interconnection wiring and external signal connections
4	Transformer primary connection PL6 (220-240V nominal)	12	Terminal block TB1 interconnection wiring
5	Transformer primary connection PL7 (100-120V nominal)	13	M4 cable screen termination studs (4 studs)
6	Mains power fuse F1	14	Keypad ribbon cable connection PL2
7	Mains power connections TB3	15	LCD viewing angle adjustment RV2
8	Relay output connections TB4	16	LCD ribbon cable connection PL1

Electrical power and user external connections to the analyser outputs are detailed in Figure 23, Figure 24, and Figure 25, and in Table 13, Table 14, Table 15 and Table 16.

Interconnecting wiring between the control unit and the sensor head is detailed in Appendix A – Interconnecting Wiring Schedules.

CAUTION

Connections to terminal block TB2-15, 16, 17 and 18 (analogue output signal terminals) should not exceed 30V RMS (42.4V peak) or 60V dc to earth when connected to associated equipment.

Terminals TB1-1 to TB1-10 and TB2-1 to TB2-10 shall only be used to connect to a sensor head.

5.3 Enclosure purge connection

WARNING

Pipes connected to the enclosure purge connections shall be routed so that they do not represent a trip hazard.

A purge may be applied to the control unit to help prevent corrosion within the enclosure.

The enclosure purge inlet and outlet connection sizes and location are shown in Figure 16.

The purge gas must be air from a non-hazardous area source or an inert gas. The control unit internal volume is approximately $8.5x10^{-3}m^3$ ($520in^3$). Vent the outlet freely to atmosphere and ensure that the vent cannot become blocked or restricted.

For hazardous Areas, the purge must satisfy the area safety requirements.

For corrosive purge, a flow rate of 50 to 100ml/min at 490 to 980 Pa (50 to 100mm H_2O) is required.

		Terminal
Electrical power		
100 to 120Vac -15% +10%	Live	TB3-L
220 to 240Vac -15% +10%	Neutral	TB3-N
50/60Hz, 250VA maximum	Protective earth	TB3-Protective ground
Note that pin TB3-protective ground is at the top		

Table 13. Control unit electrical power connections

		Terminal
Relay 1	Closes on relay 1 set and opens on power fail	TB4-1
	Opens on relay 1 set and closes on power fail	TB4-2
	Common	TB4-3
Relay 2	Closes on relay 2 set and opens on power fail	TB4-4
	Opens on relay 2 set and closes on power fail	TB4-5
	Common	TB4-6
Relay 3	Closes on relay 3 set and opens on power fail	TB4-7
	Opens on relay 3 set and closes on power fail	TB4-8
	Common	TB4-9
Relay 4	Closes on relay 4 set and opens on power fail	TB4-10
	Opens on relay 4 set and closes on power fail	TB4-11
	Common	TB4-12

Note that TB4-12 is at the top

The relay outputs may be configured by the user to be either concentration alarms, fault indications, autocalibration or blowback valve drives via the analyser software interface.

Relay contact ratings:- Minimum 10mA 5V ac or dc.

Maximum 3A 250Vac or 1A 28Vdc.

Table 14. Relay output connections

		Terminal
0/4 to 20mA oxygen output signal (isolated)	+ ve	TB2-15
maximum load impedance 1000 ohms	- ve	TB2-16
0/4 to 20mA combustibles output signal (isolated)	+ ve	TB2-17
maximum load impedance 1000 ohms	- ve	TB2-18

The full scale of the above outputs represents the range selected by the user via the analyser software interface.

Table 15. Analogue output connections

		Terminal
Close contacts to initiate an automatic calibration of the analyser	+ ve ground	TB2-11 TB2-12
Close contacts to initiate an automatic blowback of the analyser	+ ve ground	TB2-13 TB2-14
The remote dry contacts must be suitable for use with the low voltage signal generated by the control unit, i.e. 5V 5mA maximum.		
Calibration and blowback parameters to be set by the user via the software interface prior to remote function initiation.		

Table 16. User remote dry contact inputs

WARNING

When used in a classified location, user provided switches must be suitable for that location (eg. Non-incendive).

6 Initial Startup Procedure

6.1 Gases required

The gas samples required to commission and calibrate the analyser depend on the configuration of the analyser. Refer to Table 17.

Service	Gas	Pressure	Flow l/min	O_2	COe	Dual
Aspirator supply	Regulated clean dry air	0.2 to 0.3 barg (3 to 5 psig)	typically 1.5	yes	yes	yes
Calibration gas for O2 'HIGH CAL' and COe 'LOW CAL'	Regulated clean dry air	0 to 1 barg (0 to 15 psig)	typically 0.6	yes	yes	yes
Calibration gas for O2 'LOW CAL'	0.3% O2 balance N2 *	0 to 1 barg (0 to 15 psig)	typically 0.6	yes	no	yes
Calibration gas for COe 'HIGH CAL'	1000ppm(v) CO balance air **	0 to 1 barg (0 to 15 psig)	typically 0.6	no	yes	yes

Table 17. Gas requirements

*calibration gas composition can be between 0.25% and 2.5% O_2 in N_2

** calibration gas composition can be between 500ppm(v) to 1,000ppm(v)

6.2 Visual inspection

Check the rating label on the sensor head terminal box lid to ensure that the voltage and frequency stated are suitable for the installation.

In the sensor head terminal box (refer to Figure 10):

- Check voltage selection link is set to the appropriate supply voltage (see Section 3.5).
- Check fuse F1 fitted is F6.3A HRC (voltage independent).

In the control unit (refer to Figure 17):

- Check that the transformer primary lead is connected to the correct socket. PL7 for 100V-120V (nominal) or PL6 for 220V-240V (nominal).

- Check that the fuse F1 fitted is T3.15A HRC for 100-120V (nominal) or T1.6A HRC for 220-240V (nominal).

Interconnecting wiring:

- Check that all interconnections are correctly wired and terminated in accordance with local electrical safety requirements and the interconnection wiring schedules in Appendix A – Interconnecting Wiring Schedules.

6.3 Initial power up

Connect the sensor head and control unit to the nominal required power supply.

Refer to Figure 17. Adjust RV2 on the control unit PCB (viewing angle adjustment for the LCD display) to give the best display contrast when viewed under normal conditions.

NOTE

The LCD display may appear completely blank if this control is incorrectly adjusted.

From a cold start, the sensor head will pre-heat the air space, depending on configuration and ambient temperature before applying power to the individual sensor heaters. The aspirator air supply is controlled by a solenoid valve. The solenoid valve will remain closed until the sensor head is at operating temperature. This will prevent inadvertent damage to the sensor head by exposing it to sample gases before the internal temperature is above the sample gas dew point. The solenoid valve will operate after a time interval of between 15 and 60 minutes depending on configuration and ambient temperature.

Wait until both the sensor head and control unit have both been switched on for a minimum of 90 minutes. Refer to Figure 16 and perform the following tests.

Using the control unit keypad select the VIEW menu entry then scroll using the up and down arrow keys until the oxygen sensor temperature is displayed. Check that the oxygen sensor temperature is stable at 700° ±10°C.

Scroll the display using the up and down arrow keys until the combustibles sensor temperature is displayed. Check that the combustibles sensor temperature is stable at 300° ±10°C.

6.4 Analogue output span setup

Refer to the QuickStart manual.

- If a zirconia sensor is fitted then select the **SET OUTPUTS** option in the **SERVICE** menu and select **20mA** for the oxygen analogue output. Check the

current at TB2/15 & 16 in the control unit is 20.00 ±0.01mA; if necessary, adjust RV4 on the control unit PCB until the analogue output reads 20.00 ±0.01mA.

- If a combustibles sensor is fitted then select the **SET OUTPUTS** option in the **SERVICE** menu and select **20mA** for the combustibles output. Check the current at TB2/17 & 18 in the control unit is 20.00 ±0.01mA; if necessary, adjust RV3 on the control unit PCB until the analogue output reads 20.00 ±0.01mA.

6.5 Sensor head sample flow adjustment

With the analyser powered and the sensor head at a stable temperature, adjust the aspirator air supply pressure so that the value indicated on the label in the sensor head terminal enclosure is achieved at the sensor head. This produces a sample flow of 200 to 300 ml/min. Allowance should be made for pressure loss between the indicator and the sensor head where necessary.

6.6 Combustibles sensor zero adjustment

If a combustibles sensor is fitted then refer to Figure 17 and perform the following check and adjustments, if necessary:

- Apply an air sample to the calibration gas inlet at 600 to 800ml/min flow rate for at least 5 minutes.
- Using the keypad select the VIEW menu entry and scroll using up and down arrow keys to select the combustibles sensor output voltage.
- Check that the sensor output voltage is less than 60mV (positive or negative). If not, check the installation wiring.
- If the installation appears correct, set SW2 on the control PCB to the zero position. If the voltage measured is positive, set SW3 to the lower position (towards the bottom of the unit). If the voltage measured is negative, set SW3 to the upper position (towards the top of the unit).
- Adjust SW2 clockwise one step at a time, until the sensor voltage is less than 60mV (positive or negative). Note there will be a lag of up to 30 seconds between a switch change and the voltage response.

6.7 Sensor calibration

The sensor head must be powered and at a stable temperature for a minimum of 24 hours.

Refer to the analyser QuickStart manual.

- Apply an air sample to the calibration gas inlet at a flow rate of 600 to 800ml/min. Perform a HIGH point calibration of the zirconia sensor (if fitted) and a LOW point calibration of the combustibles sensor (if fitted).
- Apply a nominal 0.3% O_2 in N_2 gas mixture to the calibration gas inlet at a flow rate of 600 to 800ml/min. Perform a LOW point calibration of the zirconia sensor

(if fitted). Verify that the analyser display reads the correct gas concentration, as set in the calibration procedure.

- Apply a nominal 1000ppm(v) CO in air gas mixture to the calibration gas inlet at a flow rate of 600 to 800ml/min. Perform a HIGH point calibration of the combustibles sensor (if fitted). Verify that the analyser display reads the correct gas concentration, as set in the calibration procedure.

NOTE

After initial startup and calibration it is recommended that the calibration, catchpots and air filter are checked within 5 to 10 days.

6.8 Flow alarm calibration

Figure 18. Flow alarm relay box components

1	Fault/Alarm relay enable/disable	4	SPAN/NORMAL flow potentiometer
2	Fault/Alarm relay direct/invert	5	(Rotary switch (low flow alarm threshold)
3	ZERO flow potentiometer		

WARNINGS

To avoid the risk of electric shock disconnect mains power to the relay contacts TB2 before removing the cover of the flow alarm relay box.

The cover shall only be removed if there is negligible risk of pollution from moisture, liquids, dust, or other form of contamination.

NOTES

The flow alarm operates independently from the control unit.

The flow sensor is a thermal device and therefore its operating performance is reduced until the sensor head has reached its stable operating temperature. Typically this may take up to 24 hours from power being applied to the sensor head, depending on ambient conditions.

6.8.1 Initial checks

This procedure establishes the span/normal flow value of the Flow Alarm.

With process sample flowing through the analyser, make a note of the current value of oxygen and/or combustibles on the display.

Select a calibration gas which is significantly different from the value given by the process sample (instrument air is normally suitable). Pass 600ml/min of this calibration gas through a flowmeter and needle valve into the calibration port, the analyser display should now display the calibration gas value.

Gradually reduce the flow of the calibration gas in steps, allowing time for the change in measurement on the display. Now increase the calibration gas flow gradually until the reading approaches the original calibration gas value. At this point, the calibration gas flow is approximately equal to the normal sample gas flow.

The process sample flow through the sensor head should be approximately 200 - 300ml/min for an oxygen only analyser. The combustibles only and dual sensor analysers should have a sample flow of approximately 200 -250ml/min. Flows significantly below this indicate a partially blocked sample path (sample probe, internal filter, etc) or an incorrectly set aspirator air supply.

If the analyser reading goes directly to the check gas value then the analyser is not drawing a sample and the cause must be investigated.

6.8.2 Flow alarm relay enable / disable switch

During the calibration procedure it is possible to disable the operation of the "low flow" alarm and "flow fault" relays to avoid false alarms within the customers' control system. The Fault/Alarm relay enable/disable switch (Figure 18, item 1) is located in the Flow Alarm Relay Box. Set BOTH switches to the OFF position to avoid false alarms during this setup procedure. Once the calibration or testing is complete both switches should be set back to the ON position.

6.8.3 Set Zero Threshold

This will establish the flow alarm signal level at which no sample gas is flowing through the analyser.

NOTE

The ZERO flow threshold is to be set with process gas present in the sensor head.

1. Remove relay box cover.
2. One LED from each of the 3 red/green pairs should be on to indicate the board is functioning. If not, check wiring.
3. Ensure a representative process sample within the sensor head before you shut off the aspirator air supply.
4. Shut off the aspirator air supply.
5. Wait for the system to stabilise, (typically 10 minutes).
6. Locate the ZERO flow potentiometer (Figure 18, item 3) and, using a suitable tool, slowly turn until the RED LED comes ON. Then turn in the opposite direction until the GREEN LED just comes on.

The Zero is now set and, with no sample flow, the ZERO GREEN LED will be ON.

The ZERO GREEN LED will remain ON unless there is a fault, in which case check the system, (a recalibration of the Flow Alarm may be required).

6.8.4 Set Span / Normal Threshold

This will establish the Flow Alarm signal level at which sample gas is flowing through the analyser at 100% (Normal) flow rate.

1. Turn on the aspirator air supply to establish 100% (Normal) sample flow.
2. Ensure there is full flow of representative process sample gas through the analyser. Wait for the system to stabilise if any adjustment to gas or flow is necessary to achieve this.
3. Locate the SPAN/NORMAL flow potentiometer (Figure 18, item 4) and, using a suitable tool, slowly turn until the RED LED comes ON. Then turn in the opposite direction until the GREEN LED just comes on.

The Span is now set and, with 100% sample flow, the SPAN GREEN LED will be ON.

NOTE

Should any adjustment be made to the aspirator air pressure control regulator, the Flow Alarm will require recalibrating.

6.8.5 Flow Alarm Trigger Point

Set the Rotary Switch (Figure 18, item 5) to the value at which the Flow Alarm is to indicate low flow. e.g. 50% is at the 12 o'clock position.

NOTE

It is recommended that the Flow Alarm trigger point should be set between 50-70% in normal operation.

The Flow Alarm system is now set-up.

6.8.6 Activate Flow Alarm

Set both Fault/Alarm relay Enable/Disable switch (Figure 18, item 1) to the ON position. The Flow Alarm is now operational.

6.8.7 Operational Check

To check the Flow Alarm is operating correctly, the sample gas flow can be reduced by restricting the aspirator air flow temporarily using the aspirator air isolation valve.

1. With the aspirator air valve open, check that all three green LED's are ON (indicating a healthy flow alarm status).
2. Locate the Fault/Alarm relay Enable/Disable switch (Figure 18, item 1) and set BOTH switches to the OFF position to avoid false alarms during this test procedure.
3. Slowly close the aspirator isolation valve. The Flow Alarm LED, (above Figure 18 Item 5) will show RED when the flow falls below the threshold value set by the Rotary Switch.
4. Restore the aspirator air supply by opening fully the isolation valve to resume full sample gas flow.
5. The Flow Alarm LED will now switch back to GREEN when the sample gas flow exceeds the alarm value that has been set.
6. All three GREEN LED's will now be ON. If not, investigate and rectify the fault.
7. Set the Fault/Alarm relay Enable/Disable switch back to ON. Low Flow or a Fault condition will now be indicated via the customer interface relays.
8. Replace the Flow Alarm Relay Box Cover.

7 Maintenance and Spares

WARNINGS

The sensor head is heated and may be attached to a hot flue. The external surfaces will be uncomfortably hot even after power down for several hours. Exercise care when handling the sensor head even when unpowered on a hot flue.

The analyser must be maintained by a suitable skilled and competent person.

7.1 Maintenance

WARNINGS

The covers may only be opened during maintenance if there is negligible risk of pollution of the electronic circuits due to moisture, liquids, dirt, dust or other form of contamination.
Before refitting the covers, ensure the sealing gasket is clean, dry and undamaged. All covers should be replaced and secured as soon as possible after completing the operation.

In order to avoid dirt or water entering the enclosures when the covers are opened, the external surfaces of the analyser should be clean and dry before any cover is opened. Remove dust and loose particles with a soft brush. Wipe the surfaces thoroughly with a clean cloth, moistened with water.

The sensor head flange mounting shall be regularly inspected for leaks to prevent the leakage of hazardous gases.

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

It is recommended that the analyser should have its calibration checked once a month, and catch pots and air filters should be checked every three months. These times can then be adjusted depending on site experience.

Analyser flow rates, air supplies, probes and filters (internal an external), should be checked once per year, as well as the whole analyser and cabling for signs of wear. In more rugged applications, these times may need to be shorter, depending on experience.

If the optional flow alarm is fitted, its settings should be checked as part of the analyser flow rate checks and recalibration should be carried out as required.

7.2 Replacing fuses

WARNINGS

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.

For the location of fuses in the sensor head refer to Figure 10 (fuse F1 power) and Figure 14 (fuse FS11 low alarm).

For the location of fuses in the control unit refer to Figure 17 (fuse F1 power) (fuses F2 to F5 sensor heaters).

7.3 Preventative maintenance

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

The preventative maintenance program consists of a yearly inspection of the analyser and the 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 full SERVOSURE report.

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.

7.4 Spare parts

WARNING

SERVOTOUGH FluegasExact spares must be supplied by Servomex.

Table 18 to Table 22 list the parts that may be relevant to the installation. Service Manual 02700002D is available and must be used when replacing any of these parts.

Item		Spare part number
1	Control Unit Spare	Consult Servomex
2	Complete Mains Protection Cover Kit	S2700996
3	Enclosure Gasket Kit	S2700999
4	Fuse Kit (Control Unit & Sensor Head)	S2700998 *

* includes: F1.6A HRC (5 x 20mm), F2.5A HRC (5 x 20mm), F3.15A HRC (5 x 20mm) & F6.3A HRC (5 x 20mm)

Table 18. Control Unit – description

Item		Spare part number
1	Sensor Head Spare	Consult Servomex
30	4" Mounting Gasket Kit	S2720985
31	4" Weld-On Flange Mounting Kit	S2720984
32	Mains Protection Cover	S2720983
33	Enclosure Gasket Kit (Control Unit & Sensor Head)	S2700999
34	Fuse Kit (Control Unit & Sensor Head)	S2700998 *
* includes: F1.6A HRC (5 x 20mm), F2.5A HRC (5 x 20mm), F3.15A HRC (5 x 20mm) & F6.3A HRC (5 x 20mm)		

Table 19. Sensor Head – description

Item		Spare part number
1	Silicon Carbide Filter Kit	S2740998
2	Probe Tube Coupling	2344-2294
3	Probe Shroud (single filter)	S2740996A
4	Probe Shroud (double filter)	S2740996B
5	Probe Support Disc*	S2740995
6	Thermal Spacer Flange Kit	S2750997
7	High Temperature Standoff	S2750995
8	Probe Retention Flange Kit	S2750998
9	Probe <700°C, SS, Open-ended, 0.5m	S2740701A
10	Probe <700°C, SS, Open-ended, 1.0m	S2740701B
11	Probe <700°C, SS, Open-ended, 1.5m	S2740701C
12	Probe <700°C, SS, Open-ended, 2.0m	S2740701D
13	Probe <700°C, SS, Filtered, 0.5m *	S2740702A
14	Probe <700°C, SS, Filtered, 1.0m *	S2740702B
15	Probe <700°C, SS, Filtered, 1.5m *	S2740702C
16	Probe <700°C, SS, Filtered, 2.0m * & **	S2740702D
17	Probe <700°C, SS, Filtered, 2.5m * & **	S2740702E
18	Probe <700°C, SS, Filtered, 3.0m * & **	S2740702F
19	Probe <700°C, SS, Double-Filtered, 0.5m *	S2740712A
20	Probe <700°C, SS, Double-Filtered, 1.0m *	S2740712B
21	Probe <700°C, SS, Double-Filtered, 1.5m *	S2740712C
22	Probe <700°C, Hastelloy, Open-ended, 0.5m	S2740713A
23	Probe <700°C, Hastelloy, Open-ended, 1.0m	S2740713B
24	Probe <700°C, Hastelloy, Open-ended, 1.5m	S2740713C
25	Probe <1000°C, High Temp Alloy, Open-ended, 0.5m	S2740704A

26	Probe <1000°C, High Temp Alloy, Open-ended, 1.0m	S2740704B
27	Probe <800°C, High Temp Alloy, Open-ended, 1.5m	S2740704C
28	Probe <700°C, High Temp Alloy, Open-ended, 2.0m	S2740704D
29	Probe <1000°C, High Temp Alloy, Filtered, 0.5m	S2740705A
30	Probe <1000°C, High Temp Alloy, Filtered, 1.0m	S2740705B
31	Probe <800°C, High Temp Alloy, Filtered, 1.5m	S2740705C
32	Probe <700°C, High Temp Alloy, Filtered, 2.0m	S2740705D
33	Probe <1750°C, Ceramic, Open-ended, 0.5m	S2740707A
34	Probe <1750°C, Ceramic, Open-ended, 1.0m	S2740707B
35	Probe <1750°C, Ceramic, Open-ended, 1.2m	S2740707D
36	Probe <1750°C, Ceramic, Open-ended, 1.5m	S2740707C
37	Probe <1750°C, Ceramic, Filtered, 0.6m	S2740708A
38	Probe <1750°C, Ceramic, Filtered, 1.1m	S2740708B
39	Probe <1750°C, Ceramic, Filtered, 1.5m	S2740708C
40	Probe Support <700°C, SS, 0.5m	S2740997A
41	Probe Support <700°C, SS, 1.0m	S2740997B
42	Probe Support <700°C, SS, 1.5m	S2740997C
43	Probe Support <700°C, SS, 2.0m	S2740997D
44	Probe Support <700°C, SS, 2.5m	S2740997E
45	Probe Support <700°C, SS, 3.0m	S2740997F
46	Filter Retaining Kit	S2740415

* Item 5 (Probe Support Disc) is required for Items 13 to 21 when replacing the <700°C SS filtered/double-filtered probe in a supported probe installation.

** Items 16,17 and 18 (filter probes exceeding 1.5m in length) are only available as part of a supported probe installation and should not be used alone.

Table 20. Sample probes – description

Item		Spare part number
1	Quickstart Manual - English	02700003D
2	Quickstart Manual - French	02700013D
3	Quickstart Manual - German	02700023D
4	Installation Manuals - English	02700005D
5	Installation Manuals - French	02700015D
6	Installation Manuals - German	02700025D
7	Service Manual - English	02700002D

Table 21. Manuals – description

Item		Spare part number
2	Complete Mains Protection Cover Kit	S2700996

Table 22. Flow alarm relay box spares

8 Technical Specification

8.1 Oxygen measurement performance

Description	Specification
Analogue output ranges	0-1% (min) to 0-25% max O_2 in 1% steps
Display resolution	0.01% O_2
Accuracy	± 1% of reading or 0.1% O_2 *
Response time (T_{90}) unfiltered software	< 10 seconds (sensor head only at 300ml/min)

* Whichever is greater

Table 23. Oxygen measurement performance

8.2 Combustibles measurement performance

Description	Specification
Analogue output ranges	0-500ppm (min) to 0-30,000ppm max COe in 1ppm steps
Working range	0-6,000ppm COe
Display resolution	1ppm(v) COe
Accuracy	± 5% of full scale output range
Response time (T_{90}) unfiltered software	< 20 seconds (sensor head only at 300ml/min)

Table 24. Combustibles measurement performance

CAUTION

The combustibles measurement is not promoted or recommended as a primary safety measurement, e.g. for use in electrostatic precipitator (ESP) protection or coal mill applications.

8.3 Flow alarm performance

Description	Specification
Repeatability	± 20ml/min at 200ml/min (nominal flow)
Response time (T_{90})	< 20 seconds

Table 25. Flow alarm performance

8.4 Analyser inputs and outputs

Input/Output	Specification
Digital display	2 line by 16 character back lit LCD
User interface	Menu driven with 8 button tactile keypad
Analogue outputs	One user-configurable 0-20mA or 4-20mA isolated current output dedicated to each measurement. Maximum load 1 kΩ. Clamped at 21mA Maximum isolation voltage 50V
Relay outputs	Four SPCO relays. Contact rating 3A/250V AC or 1A/28V DC (non inductive) maximum and 10mA/5V AC or DC minimum. User assigned as concentration (2), fault alarms, calibration in progress, blowback in progress, autocalibration solenoid valves (2/3) and blowback solenoid valve control. Maximum contact voltage with respect to earth 264Vac / 264Vdc.
Digital inputs	Two external digital inputs for autocalibration and auto-blowback initiation. Non-isolated, requiring voltage-free contact closure (or equivalent) to analyser ground to initiate. Maximum output voltage 5.25V Maximum output current 0.6mA
Flow alarm relay box	Two SPCO relays (250Vac / 3A or 12Vdc / 1A max) Flow Status Alarm and Flow Alarm Fault. Maximum contact voltage with respect to earth 264Vac / 264Vdc

Table 26. Analyser inputs and outputs summary

8.5 Physical

Property	Specification
Size	Sensor head: 301mm x 330mm x 256mm Control unit: 391mm x 167mm x 260mm Flow alarm relay box: 120mm x 120mm x 80mm Purge Controller: 300mm x 225mm x 170mm
Weight	Sensor head: <17kg (37.5lbs) Control unit: <10kg (24.3lbs) Flow alarm relay box: <2.5kg (5.5lbs) Purge Controller: < 7.5kg (16.5lbs)
Power supply	Two voltage ranges are provided: 100-120Vac, 50/60Hz 220-240Vac, 50/60Hz Control unit: 250VA Sensor head: 600VA Sensor head and control unit are powered separately. Control unit voltage is user set. Sensor head voltage is factory set.
Ambient temperature – control unit	Operating: -10°C to +55°C (+14°F to +131°F) Storage: -20°C to +55°C (-4°F to +131°F)
Ambient temperature – sensor head	Operating: -20°C to +70°C (-4°F to +160°F) Storage: -30°C to +80°C (-2°F to +176°F)
Ambient temperature – flow alarm relay box	Operating: -10°C to +50°C (+14°F to +122°F) Storage: -20°C to +70°C (-4°F to +160°F)
Ambient temperature – purge controller	Operating: -20°C to +55°C (-4°F to +131°F) Storage: -20°C to +55°C (-4°F to +131°F)
Maximum altitude	2000m (6500 feet)
Ingress protection – control unit	IP65
Ingress protection – sensor head	IP66
Ingress protection – flow alarm relay box	IP66
Aspirator air requirements	Pressure: 0.2 to 0.3 barg (3 to 5 psig). Flow: 1.5 litres/min typical. Instrument grade compressed air, free from oil, water.

Table 27. Physical specification

8.6 Materials in contact with sample

Component	Materials
Oxygen sensor	316 and 310 stainless steel, zirconia, platinum, alumina, Ni/Fe/Cr alloy, high temperature sealing glasses
Combustibles sensor	316 stainless steel, platinum, platinum/iridium, zirconia, alumina, corrosion resistant glass, graphite gasket
Flow alarm sensor	316 stainless steel, zirconia, platinum, nickel, high temperature sealing glass
Sensor head	316 and 303 stainless steel, gasket sealing material
Sample probes	316 and 310 stainless steel, Incoloy 803, silicon carbide, high temperature ceramic

Table 28. Materials in contact with sample

8.7 Hazardous area classification

Please see next page.

Sensor Head - European	
ATEX	Ⓔx II 3 G
Coding	Ex pz IIC T3/T2 Gc
Temperature Range	-20°C to +70°C
Certificate number (ATEX)	Baseefa12ATEX0073X
Certificate number (IECEx)	IECEx BAS 12.0045X
Sensor Head - North American	
Canadian Standards Association (CSA)	
Type Z Pressurization	Class I, Div 2, Groups ABCD, T3/T2
	Class I, Zone 2, Group IIC, T3/T2
Enclosure	IP66
Temperature Range	-20°C to +70°C
Certificate number (CSA)	2578918
Purge Controller – North American	
Canadian Standards Association (CSA)	
Type Z Pressurization	Class I, Div 2, Groups ABCD, T6
	Class I, Zone 2, Group IIC, T6
Temperature Range	-20°C to +55°C
Certificate number (CSA)	2578918
Flow alarm relay box - European	
ATEX	Ⓔx II 3 GD
Coding (Gases)	Ex nA nC IIC T4 Gc
Coding (Dusts)	Ex tc IIIC T75°C Dc IP66
Temperature Range	-20°C to +65°C
Certificate number (ATEX)	Baseefa11ATEX0263X

Certificate number (IECEx)	IECEx BAS 11.0128X
Flow alarm relay box - North American	
Canadian Standards Association (CSA)	
Non-incendive (USA and Canada)	Class I, Div 2, Groups A,B,C & D T4
	Class II, Div 2, Groups F & G T4
	Class III, Div 1 T4
Canada	Ex nA nC IIC T4 Gc
USA	Class I, Zone 2, AEx nA nC IIC T4 Gc
	Zone 22, AEx tc IIIB T75°C Dc
Enclsoure	IP66
Ambient Temperature	-20°C to +65°C max
Certificate number (CSA)	2578918
Control Unit - European	
ATEX	Ⓔx II 3 GD
Coding (Gases)	Ex ic nA nC IIC T5 Gc
Coding (Dusts)	Ex tc IIIB T75°C Dc IP65
Ambient Temperature Range	-10°C to +55°C
Certificate number (ATEX)	ITS 10ATEX47005X
Control Unit - North American	
Canadian Standards Association (CSA)	
Non-incendive (USA and Canada)	Class I, Div 2, Groups A,B,C & D T5
	Class II, Div 2, Groups F & G T5
	Class III, Div 1 T5
Canada	Ex nA nC IIC T5 Gc

USA	Class I, Zone 2, AEx nA nC IIC T5 Gc
	Zone 22 AEx tc IIIB T75°C Dc
Enclsoure	IP65
Ambient Temperature	-10°C to +55°C max
Certificate number (CSA)	2578918

Table 29. Hazardous Area classification

WARNINGS

To minimise the risk of propagating brushed discharges, do not install in a high velocity dust laden environment.

8.8 ATEX / IECEx certification labels

8.8.1 Sensor head

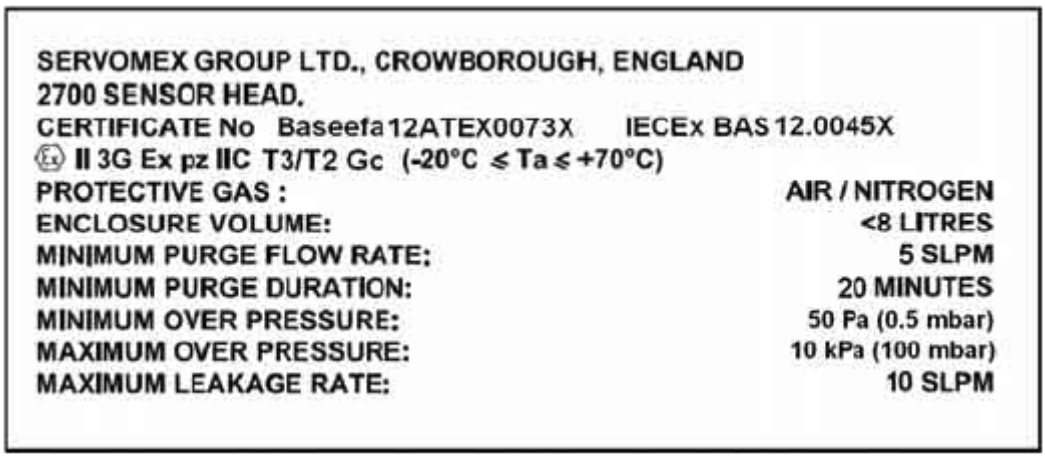


Figure 19. Leakage compensation label

Figure 20. Continuous flow label

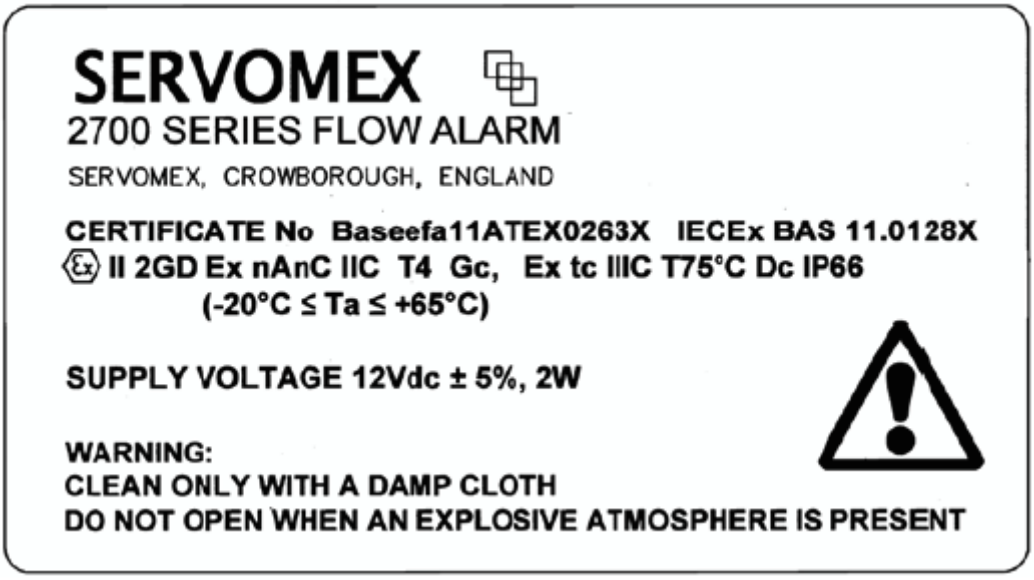


Figure 21. Flow alarm label

8.8.2 Control unit

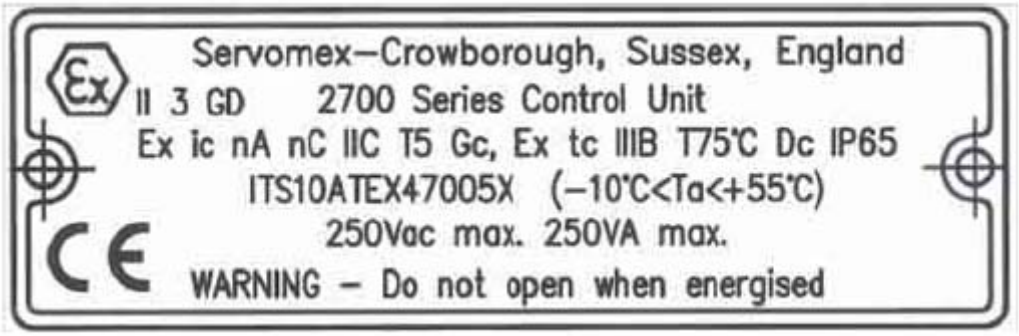


Figure 22. Control unit label

9 Appendix A – Interconnecting Wiring Schedules

The interconnecting wiring specification is given in Table 30. Wiring schedules for the oxygen only, the combustibles only and the dual sensor versions are given in Table 32, Table 33 and Table 34 accordingly. The wiring schedule for the optional flow alarm is given in Table 35.

The electrical terminations in the analyser are suitable for 0.5mm^2 (20 AWG) to 2.5mm^2 (14 AWG) solid and 1.5mm^2 (16 AWG) stranded conductors. Both the control unit and sensor head have independent AC power supplies.

The maximum loop resistance limit of 4 ohms is required only for the sensor heater lines (2 lines per sensor). The sensor outputs, temperature signals and bridge supply wires need not be limited by this restriction on resistance. Depending on installation environment it may prove more cost effective to use interconnecting cables with more twisted pairs but with a smaller cross section per core and where necessary to run heater wires in parallel to produce the required minimum loop resistance of 4 ohms.

Oxygen only	3 twisted pairs with overall screen. Minimum 0.5mm^2 cross section. Maximum heater loop resistance 4 ohms.	1.0mm^2 1.5mm^2 2.5mm^2	100m 150m 300m
Combustibles only	6 twisted pairs individually screened and overall screened. Minimum 0.5mm^2 cross section. Maximum heater loop resistance 4 ohms.		100m max.
Oxygen and combustibles See Note 2	Minimum 9 twisted pairs individually screened and overall screened. 0.5mm^2 cross section. Maximum heater loop resistance 4 ohms.		100m max.

Note 1: For optional sensor head temperature display and the sensor head temperature high and sensor head temperature low faults at control unit, add 1 extra twisted pair to cable specification.

Note 2: Recommend 12 twisted pairs, individually screened and overall screened 0.5mm^2 cross section conductors. Use 2 pairs for the Ziconia sensor heater. Cable and gland sizes may vary depending on the manufacturer. Always check that the outside diameter of the cable is suitable for the gland being specified.

Table 30. Interconnecting cable requirements

Recommended Cables and Suppliers (Always check manufactures specification for full compatibility before use).		
Analyser	Cable Supplier	Part Number
Oxygen Only	Alpha…… Belden……..	M9700040 1056A
Combustibles Only	Alpha…… Belden……..	M9740080 1077A
Oxygen and Combustibles	Alpha…… Belden……..	M9740120 1078A

Table 31. Recommended cables and suppliers

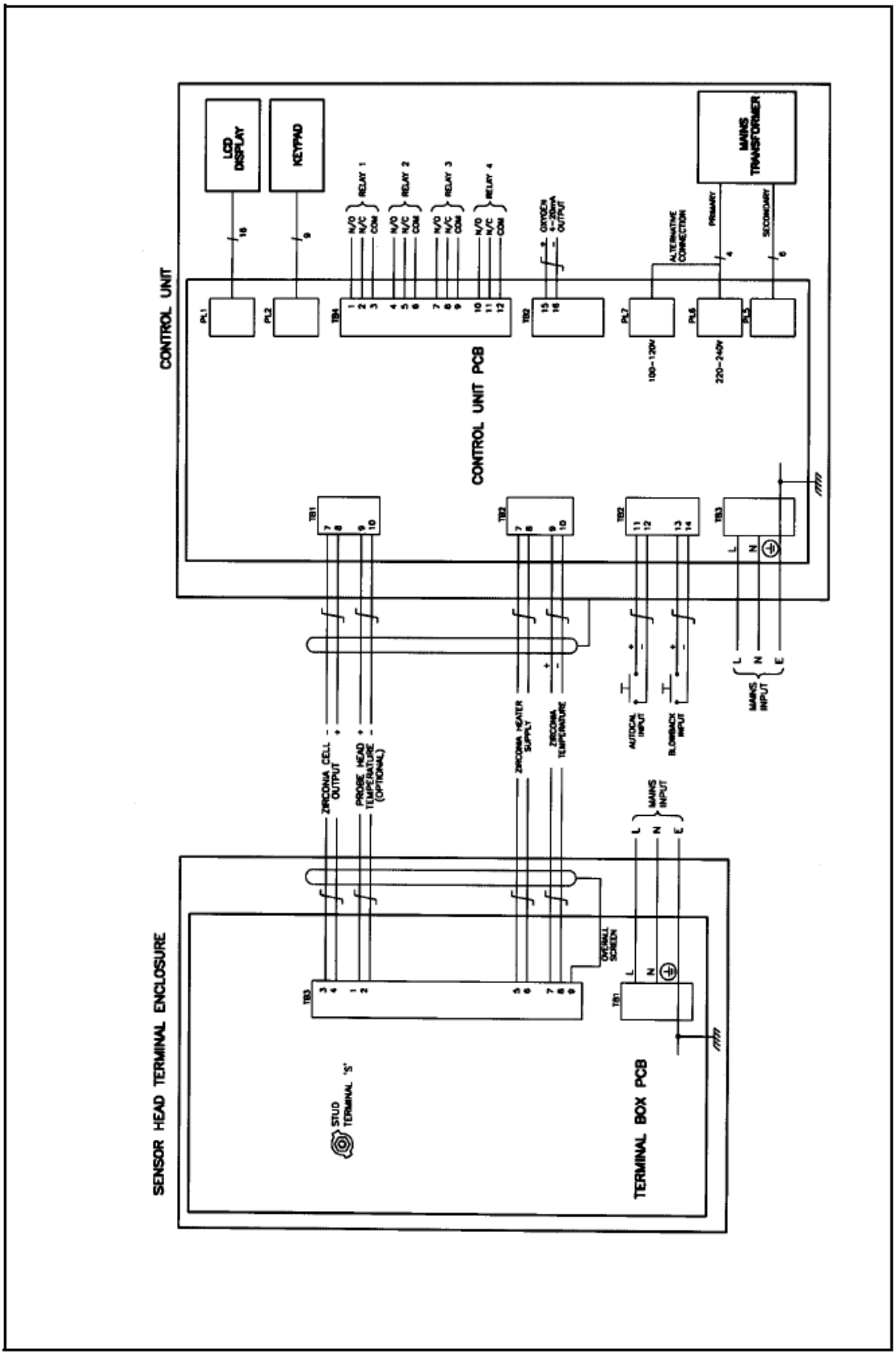


Figure 23. Oxygen sensor only interconnection wiring schematic

Sensor head terminal	Function		Control unit terminal
TB3-1	Optional sensor head temperature measurement	+ve	TB1-9
TB3-2		-ve	TB1-10
TB3-3	Zirconia cell output	-ve	TB1-7
TB3-4		+ve	TB1-8
TB3-5	Zirconia sensor heater supply (polarity not important)		TB2-7
TB3-6			TB2-8
TB3-7	Zirconia sensor temperature output	+ve	TB2-9
TB3-8		-ve	TB2-10
TB3-9	Overall cable screen connection *		Enclosure
* for correct earthing details see Section 0			

Table 32. Oxygen sensor only interconnection wiring

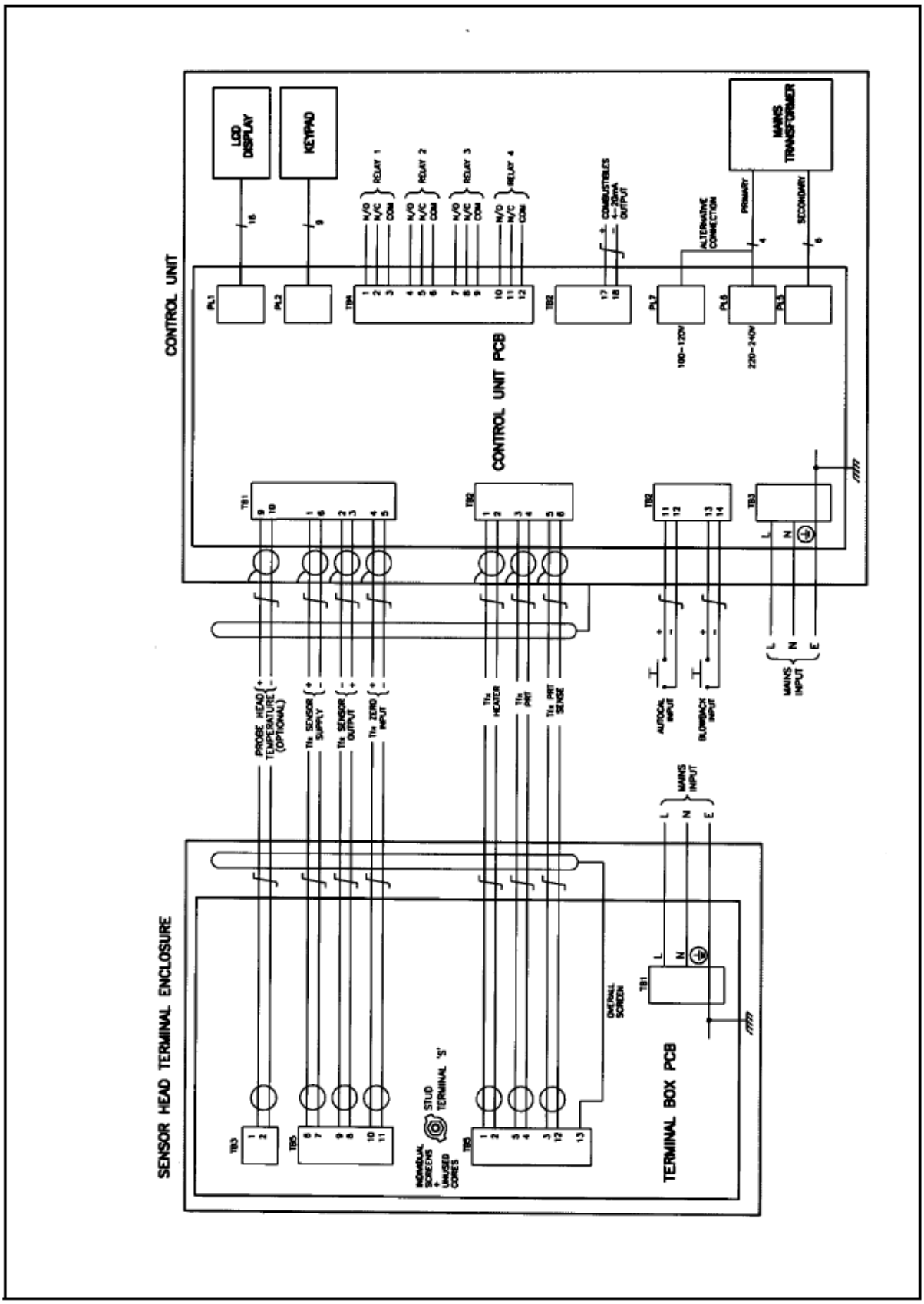


Figure 24. Combustibles only interconnection wiring schematic

Sensor head terminal	Function		Control unit terminal
TB5-1	Combustibles sensor heater supply (polarity not important)		TB2-1
TB5-2			TB2-2
TB5-3	Combustibles sensor temperature output	sense	TB2-5
TB5-4		-ve	TB2-4
TB5-5		+ve	TB2-3
TB5-6	Combustibles sensor bridge supply	+ve	TB1-1
TB5-7		-ve	TB1-6
TB5-8	Combustibles sensor bridge output	+ve	TB1-3
TB5-9		-ve	TB1-2
TB5-10	Combustibles sensor bridge offset correction	+ve	TB1-4
TB5-11		-ve	TB1-5
TB5-12	Combustibles sensor temperature output	ground	TB2-6
Stud terminal 'S'	Individual screens and unused cores		Enclosure
TB5-13	Overall cable screen connection *		Enclosure
* for correct earthing details see Section 0			

Table 33. Combustibles only interconnecting wiring

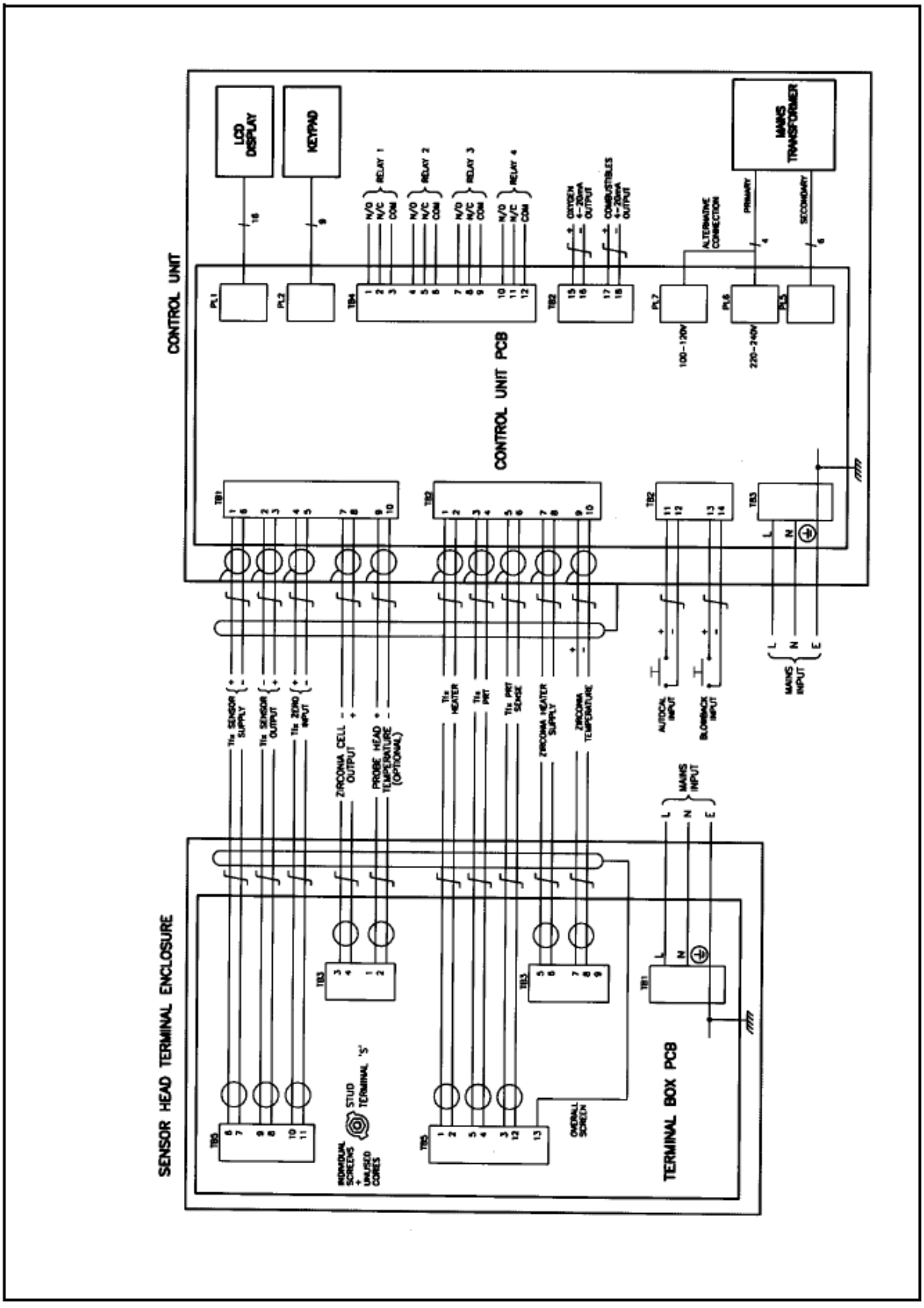


Figure 25. Dual sensor interconnection wiring schematic

Sensor head terminal	Function		Control unit terminal
TB5-1	Combustibles sensor heater supply (polarity not important)		TB2-1
TB5-2			TB2-2
TB5-3	Combustibles sensor temperature output	sense	TB2-5
TB5-4		-ve	TB2-4
TB5-5		+ve	TB2-3
TB5-6	Combustibles sensor bridge supply	+ve	TB1-1
TB5-7		-ve	TB1-6
TB5-8	Combustibles sensor bridge output	+ve	TB1-3
TB5-9		-ve	TB1-2
TB5-10	Combustibles sensor bridge offset correction	+ve	TB1-4
TB5-11		-ve	TB1-5
TB5-12	Combustibles sensor temperature output	ground	TB2-6
TB5-13	Overall cable screen connection *		Enclosure
TB3-1	Optional sensor head temperature measurement	+ve	TB1-9
TB3-2		-ve	TB1-10
TB3-3	Zirconia cell output	-ve	TB1-7
TB3-4		+ve	TB1-8
TB3-5	Zirconia sensor heater supply (polarity not important)		TB2-7
TB3-6			TB2-8
TB3-7	Zirconia sensor temperature output	+ve	TB2-9
TB3-8		-ve	TB2-10

Stud terminal 'S'	Individual screens and unused cores	Enclosure
* for correct earthing details see Section 0		

Table 34. Dual sensor interconnecting wiring

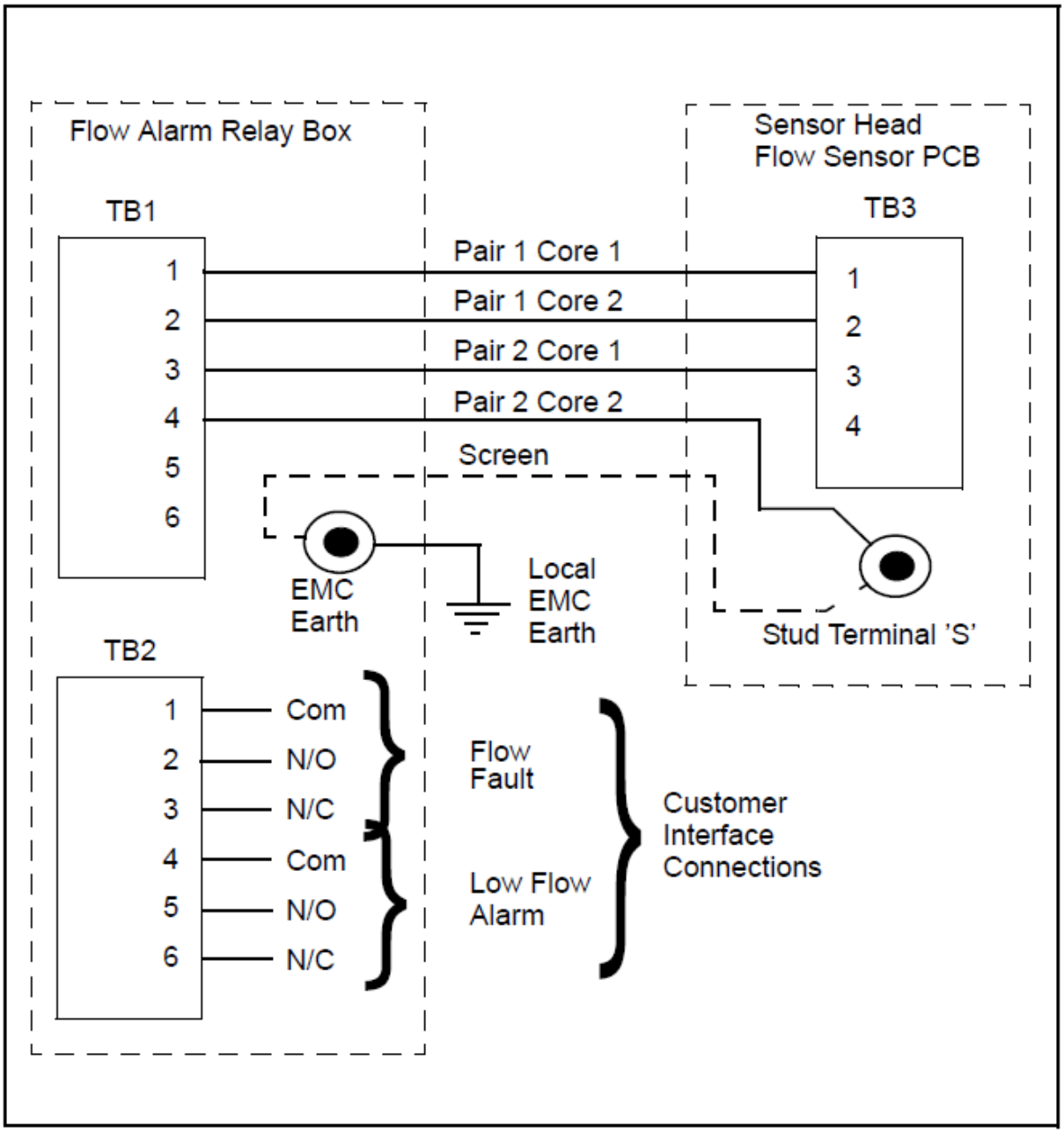


Figure 26. Flow alarm interconnection wiring schematic

Flow alarm relay box	Function	Flow sensor PCB	Wire size
TB1-1	+12V	TB3-1	
TB1-2	Signal	TB3-2	
TB1-3	0V	TB3-3	
TB1-4	Not used	Stud terminal 'S' sensor head main PCB	0.13 to 1.5mm^2 (26 to 16 AWG) with overall screen
TB1-5	Not used	-	
TB1-6	Not used	-	
EMC earth stud	Screen	Stud terminal 'S'	

Table 35. Flow alarm interconnection wiring schematic

CAUTION

Cables between the sensor head and flow alarm relay box should be temperature rated appropriately for the ambient environment in which they are used.

To comply with the requirements of the European EMC Directive, the EMC Earth on the flow alarm relay box shall be connected to a local EMC earth. The connection shall be not more than 3m long.

10 Appendix B – Compliance and Standards Information

This analyser complies with the European Community "Electromagnetic Compatibility Directive":

- Emissions 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: Industrial.

The analyser complies with the Class A digital apparatus requirements of ICES-003 of Canada through the application of EN55022:1994.

L’analyseur est conforme aux conditions A numériques d’appareillages de classe de NMB-003 du Canada par l’application du EN55022:1994.

This analyser complies with Part 15 of the FCC Rules for Class A equipment. It is not suitable for operation when connected to a public utility power supply that also supplies residential environments.

The analyser has been assessed to IEC 61010-1 for electrical safety including any additional requirements for US and Canadian national differences.

Servomex Group Limited is a BS EN ISO 9001 and BS EN ISO 14001 certified organisation.

11 Appendix C – Product Disposal / Applicability of the Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC

- This product is not considered to be within the scope of the Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC.
- This product 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.
- Additional advice and information on the disposal of this product in accordance with the requirements of the WEEE Directive can be obtained from:

Servomex Group Limited

Jarvis Brook

Crowborough

East Sussex

TN6 3FB

England

+44 (0)1892 652181

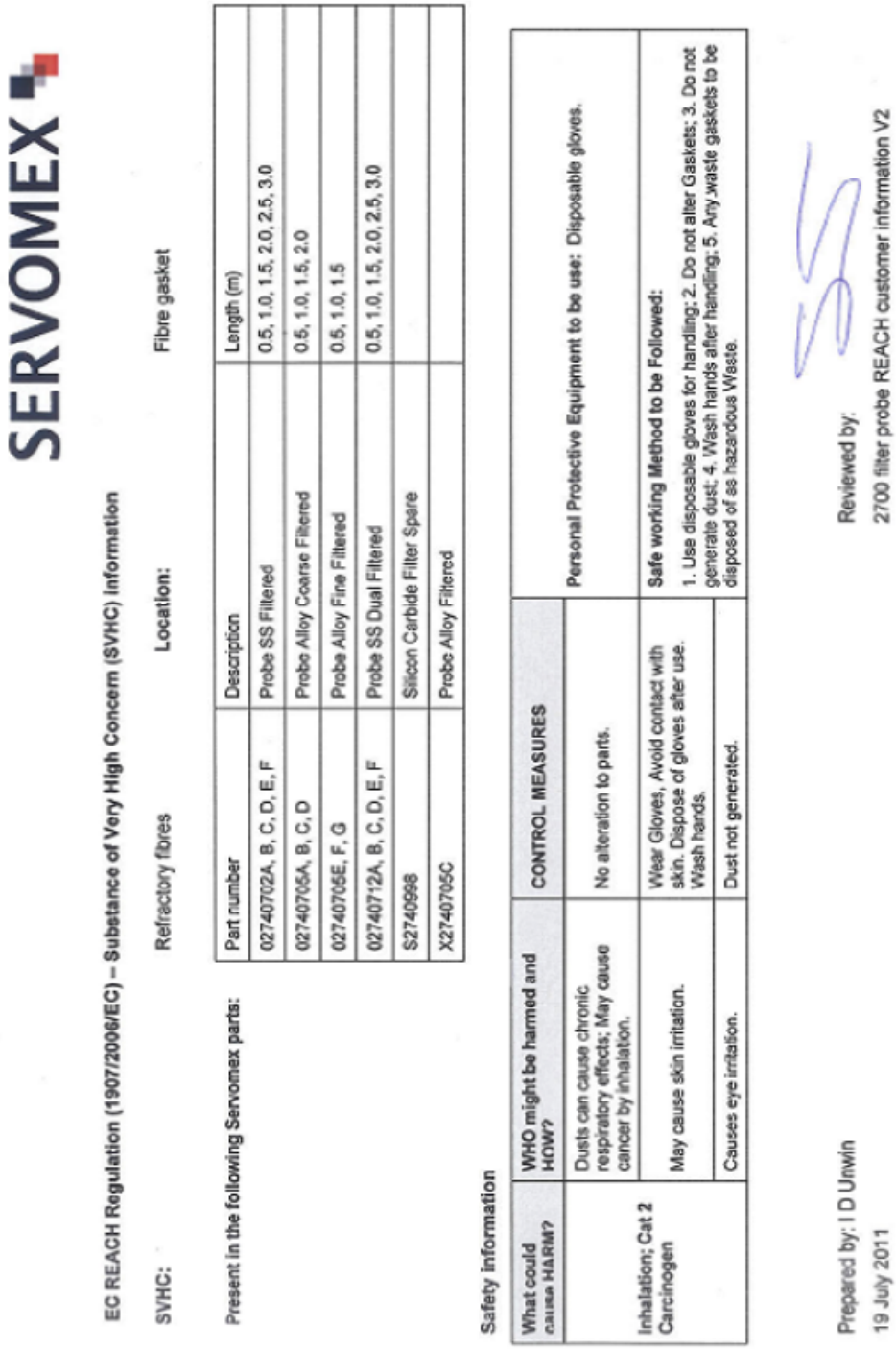
Fax: +44 (0)1892 662253

Global email: info@servomex.com

- All analysers returned to Servomex or one of its appointed agents for servicing, disposal, or any other purpose must be accompanied by a completed decontamination certificate.

12 Appendix D – REACH Regulation

In pursuance of the requirements included in Article 33 of the European REACH Regulation on the Registration, Evaluation, Authorisation and Restriction of Chemicals, information on Substances of Very High Concern (SVHC) contained in Servomex products is provided on www.servomex.com.



SERVOMEX

EC REACH Regulation (1907/2006/EC) – Substance of Very High Concern (SVHC) information

SVHC: Refractory fibres Location: Fibre gasket

Present in the following Servomex parts:

Part number	Description	Length (m)
027407028, B, C, D, E, F	Probe SS Filtered	0.5, 1.0, 1.5, 2.0, 2.5, 3.0
027407058, B, C, D	Probe Alloy Coarse Filtered	0.5, 1.0, 1.5, 2.0
027407058, F, G	Probe Alloy Fine Filtered	0.5, 1.0, 1.5
027407128, B, C, D, E, F	Probe SS Dual Filtered	0.5, 1.0, 1.5, 2.0, 2.5, 3.0
S2740998	Silicon Carbide Filter Spare	
X2740705C	Probe Alloy Filtered	

Safety information

What could cause HARM?	WHO might be harmed and HOW?	CONTROL MEASURES	Personal Protective Equipment to be use: Disposable gloves.
Inhalation; Cat 2 Carcinogen	Dusts can cause chronic respiratory effects; May cause cancer by inhalation.	No alteration to parts.	Safe working Method to be Followed: 1. Use disposable gloves for handling; 2. Do not alter Gaskets; 3. Do not generate dust; 4. Wash hands after handling; 5. Any waste gaskets to be disposed of as hazardous Waste.
	May cause skin irritation.	Wear Gloves, Avoid contact with skin. Dispose of gloves after use. Wash hands.	
	Causes eye irritation.	Dust not generated.	

Prepared by: I D Unwin
19 July 2011

Reviewed by:

2700 filter probe REACH customer information V2

13 Appendix E – North American – Hazardous Area Installation Drawing

ALL DIMENSIONS IN MM
DO NOT SCALE

MACHINED SURFACE FINISH 3.2μm UNLESS SPECIFIED
REMOVE ALL BURRS AND SHARP EDGES.

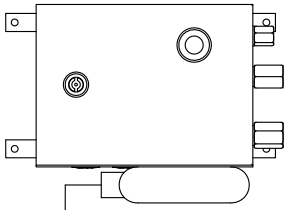
CTQ DENOTES ELEMENTS CRITICAL TO QUALITY

IF IN DOUBT ASK

REV	CHANGE NOTE No	REVISIONS	DRN	APVD	DATE
0	–	ORIGINAL	LRF	CKP	14.11.13
1	–	SHEETS 2 & 3 ADDED	LRF	CKP	4.12.14

02760 PZ PURGE CONTROL SYSTEM

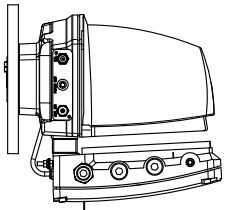
UNCLASSIFIED LOCATION OR
CLASS I DIV 2 OR
CLASS I ZONE 2
HAZARDOUS LOCATION



ALARM OUTPUT
120Vac 0.5A
30Vdc 1A

02720 SENSOR HEAD

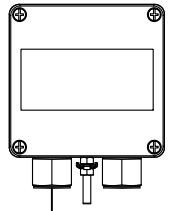
UNCLASSIFIED LOCATION OR
CLASS I, DIV 2 OR
CLASS I ZONE 2
HAZARDOUS LOCATION
TYPE OF PROTECTION: PZ PURGE



MAINS SUPPLY
100 – 240Vac
600 VA

02720 FLOW ALARM RELAY BOX

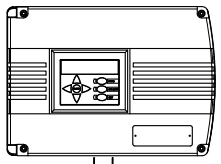
UNCLASSIFIED LOCATION OR
CLASS I,II DIV 2 OR CLASS III DIV 1 OR
CLASS I ZONE 2 OR ZONE 22
HAZARDOUS LOCATION
TYPE OF PROTECTION: NONINCENDIVE



RELAY CONTACTS
250Vac 3A
30Vdc 1A

02710 CONTROL UNIT

UNCLASSIFIED LOCATION OR
CLASS I,II DIV 2 OR CLASS III DIV 1 OR
CLASS I ZONE 2 OR ZONE 22
HAZARDOUS LOCATION
TYPE OF PROTECTION: NONINCENDIVE



MAINS SUPPLY
100 – 240Vac
250 VA

RELAY CONTACTS
250Vac 3A
30Vdc 1A

NOTES:

1. UNITS SITED IN A CLASSIFIED LOCATION APPROVED TO CERTIFICATE 2578918.
2. INSTALLATION MUST BE IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE (NFPA 70, ARTICLE 504) AND ANSI/ISA RP12.06.01:2003 OR CANADIAN ELECTRICAL CODE (CEC) PART 1 CSA C22.1.
3. THE MAXIMUM UNCLASSIFIED LOCATION VOLTAGE IS 250V AC/DC
4. DIVISION 2 WIRING PRACTICES SHALL BE USED TO CONNECT TO ALL ENCLOSURES SITED IN A CLASSIFIED LOCATION.
5. WHEN SITED IN A CLASSIFIED LOCATION THE SENSOR HEAD MUST BE USED IN CONJUNCTION WITH THE SERVOMEX 02760 PZ PURGE CONTROL SYSTEM.
6. SENSOR HEAD MUST NOT BE OPENED UNLESS THE AREA ATMOSPHERE IS KNOWN TO BE BELOW THE IGNITABLE CONCENTRATION OF COMBUSTIBLE MATERIALS OR UNLESS ALL EQUIPMENT WITHIN HAS BEEN DE-ENERGISED 50 MINUTES, WHILE THE PURGE SYSTEM REMAINS ON.
7. RESISTANCE BETWEEN EACH ENCLOSURE AND GROUNDING ELECTRODE MUST BE LESS THAN ONE OHM.

WARNING! ATTENTION!

Do not open when an explosive atmosphere is present.
Ne pas ouvrir en atmosphère explosive.

CERTIFIED DRAWING – DO NOT CHANGE WITHOUT AUTHORISATION

TITLE: CSA INSTALLATION DRAWING	DRAWN: LRF
	DATE: 07/02/13
MATERIAL: – –	CHECKED: NP
FINISH: – –	APPROVED: CKP
TOLERANCES UNLESS OTHERWISE SPECIFIED LINEAR: X. ± 0.8mm, X.X ± 0.4mm, X.XX ± 0.1mm ANGULAR: ± 1° HOLE DIAMETER: ± 0.1mm	SCALE: NTS

SERVOMEX — CROWBOROUGH, SUSSEX, ENGLAND

DRAWING NUMBER: 02700/879/1

SHEET 1 OF 3 — A3 — AutoCAD

FILENAME: 02700\879_1

ALL DIMENSIONS IN MM
DO NOT SCALE

MACHINED SURFACE FINISH 3.2μm UNLESS SPECIFIED
REMOVE ALL BURRS AND SHARP EDGES.

CTQ DENOTES ELEMENTS CRITICAL TO QUALITY

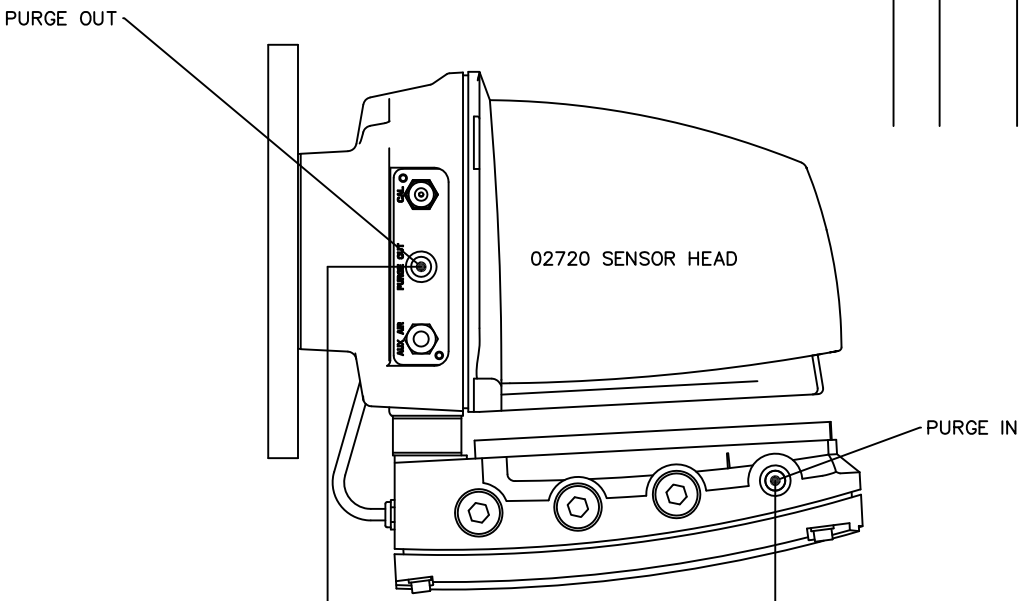
IF IN DOUBT ASK

REV	CHANGE NOTE No	REVISIONS	DRN	APVD	DATE
0	–	ORIGINAL	LRF	CKP	14.11.13
1	–	SHEETS 2 & 3 ADDED	LRF	CKP	4.12.14

SENSOR HEAD INSTALLATION IN A CLASSIFIED LOCATION

NOTES:

1. THIS SHEET IS ONLY APPLICABLE WHERE THE SENSOR HEAD IS SITED IN A CLASSIFIED LOCATION.
2. EACH INSTRUMENT TO BE PRESSURE TESTED TO 100mbar (10kPa). LEAKAGE RATE NOT TO EXCEED 10 L/MIN.
3. MAXIMUM LENGTH OF PURGE TUBING TO AND FROM ANALYSER: 100m (200m TOTAL).
4. TUBING BORE: 8mm NOM.



CERTIFIED DRAWING – DO NOT CHANGE WITHOUT AUTHORISATION

TITLE: CSA INSTALLATION DRAWING	DRAWN: LRF
	DATE: 29/09/14
MATERIAL: – –	CHECKED: NP
FINISH: – –	APPROVED: CKP
TOLERANCES UNLESS OTHERWISE SPECIFIED LINEAR: X. ± 0.8mm, X.X ± 0.4mm, X.XX ± 0.1mm ANGULAR: ± 1° HOLE DIAMETER: ± 0.1mm	SCALE: NTS

SERVOMEX CROWBOROUGH, SUSSEX, ENGLAND

DRAWING NUMBER: 02700/879/1

SHEET 2 OF 3

AutoCAD A3

FILENAME: 02700\879_1

ALL DIMENSIONS IN MM
DO NOT SCALE

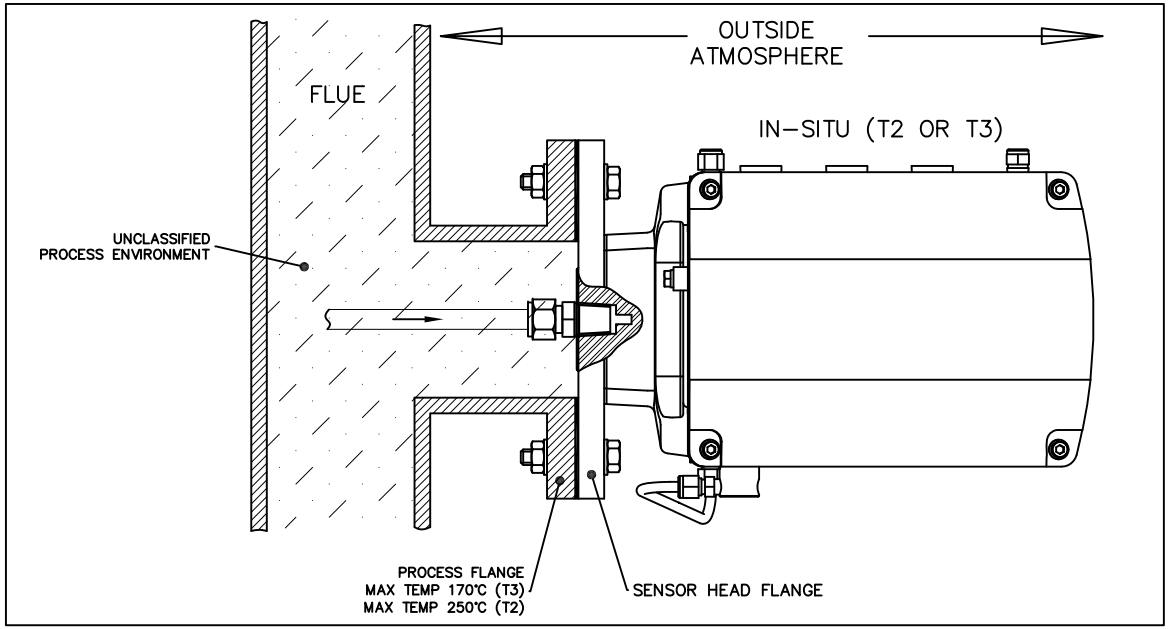
MACHINED SURFACE FINISH 3.2μm UNLESS SPECIFIED
REMOVE ALL BURRS AND SHARP EDGES.

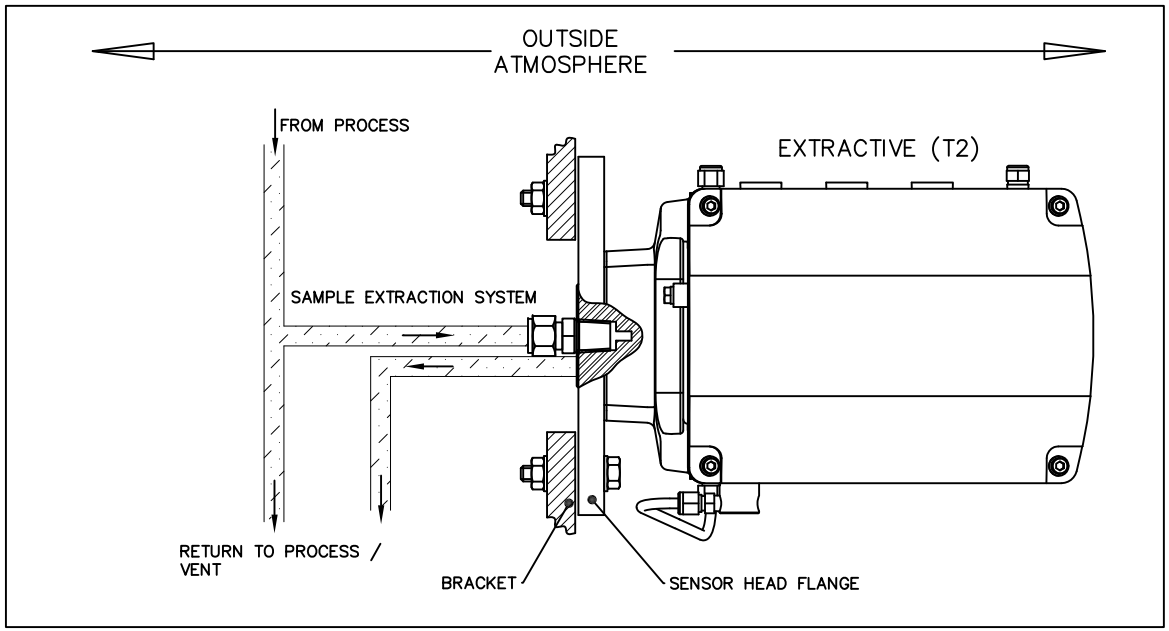
CTQ DENOTES ELEMENTS CRITICAL TO QUALITY

IF IN DOUBT ASK

REV	CHANGE NOTE No	REVISIONS	DRN	APVD	DATE
0	–	ORIGINAL	LRF	CKP	14.11.13
1	–	SHEETS 2 & 3 ADDED	LRF	CKP	4.12.14

TYPICAL MOUNTING ARRANGEMENTS





NOTES:

1. THIS SHEET IS ONLY APPLICABLE WHERE THE SENSOR HEAD IS SITED IN A CLASSIFIED LOCATION.

CERTIFIED DRAWING – DO NOT CHANGE WITHOUT AUTHORISATION

TITLE: CSA INSTALLATION DRAWING	DRAWN: LRF
	DATE: 20/11/14
MATERIAL: – –	CHECKED: NP
FINISH: – –	APPROVED: CKP
TOLERANCES UNLESS OTHERWISE SPECIFIED LINEAR: X. ± 0.8mm, X.X ± 0.4mm, X.XX ± 0.1mm ANGULAR: ± 1° HOLE DIAMETER: ± 0.1mm	SCALE: NTS

SERVOMEX — CROWBOROUGH, SUSSEX, ENGLAND

DRAWING NUMBER: 02700/879/1

SHEET 3 OF 3 A3 AutoCAD

FILENAME: 02700\879_1