

SERVOMEX

COMBUSTION ANALYSERS



INTRODUCING FLOWCUBE
SENSOR TECHNOLOGY
RELIABILITY, SAFETY, CONFIDENCE

SERVOTOUGH Fluegas Exact (2700)

For maximum efficiency and fuel cost savings, the SERVOTOUGH Fluegas Exact (2700) is a high performance, combustion gas analyser ideal for monitoring the oxygen and combustibles in a wide variety of combustion processes. The Fluegas Exact is designed to meet the needs of power generation, process heaters, thermal crackers and incinerators, where it is your perfect partner for harsh environments, high temperatures and dusty conditions.

FEATURES

- **Flowcube technology** - integrated, in-line, solid state flow sensor - ground breaking technology now allows a continuous monitoring of flow through the analyser; enhancing diagnostics and measurement certainty. A must where operational safety is vital
- **Close coupled, low flow extracted volume design** - compared to in-situ analysers, the Fluegas Exact is not subject to the harsh process conditions, ensuring a lower cost of ownership while simultaneously delivering fast, stable and highly reliable O₂ and CO_e measurements
- **Servomex zirconium oxide cell** - an accurate, long life, low drift, and highly robust O₂ measurement, able to withstand reducing process conditions
- **Thick film catalytic sensors** - a sensitive, fast response, and reliable CO_e measurement that responds to CO_e even in low process O₂ conditions
- **Safety first** - protective, tested flametraps as standard prevent possible ignition of flue gases in fuel rich conditions

APPLICATIONS

- Process heaters
- Thermal crackers
- Incinerators
- Power generation boilers
- High temperatures
- High dust loadings

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KEY FEATURES

Servomex Flowcube Technology

Servomex's determination to deliver users the most safe, accurate and reliable levels of measurement remains at the forefront of our design philosophy – therefore our unique flow sensor technology has been placed before the measurement transducers, enabling positive flow conditions to be validated.

Close Coupled, Low Flow Extractive Design

The close coupled and low flow extractive design of the Fluegas Exact delivers market leading sensor life, reliability and stability. By extracting the sample at low flow rates, as opposed to measuring the sample in the process stream, the Fluegas Exact is not vulnerable to the effects of the harsh process environment. In addition, the unique low flow rate design ensures the probe and filters are not compromised by dust and particulates that regularly affect high flow rate extractive analysers. All these benefits are achieved without compromising the response time of the measurement.

Servomex Zirconium Oxide Cell

Our Zirconium Oxide cell, designed specifically for the combustion analysis market, is highly robust with excellent resistance to thermal and mechanical shock, and unlike many others available, it is resistant even in reducing process conditions, offering instant recovery and operation when process conditions return to normal. Acknowledged as the most reliable on the market, it offers world class accuracy and stability together with extended calibration intervals.

Thick Film Catalytic Sensors

Combined with the measurement of O₂, the measurement of CO_e is a major advantage in improving combustion efficiency and safety. Our Thick Film Catalytic Sensors offer fast response and high sensitivity to combustible gas breakthrough, the first sign of incomplete combustion. By reducing O₂ levels close to those of incomplete combustion, significant fuel savings and a reduction in NO_x emissions can be readily achieved. For added piece of mind and continuous operational performance, all our catalytic sensors are supplied with excess auxiliary air. Unlike traditional pellistor type measurements, this allows CO_e measurements even if the flue gas O₂ levels drop significantly below that required for complete combustion.

Two sensor versions are available depending on application usage; a high sensitivity version for natural and clean gas applications, and a sulphur resistant version for sour gas and sulphur resistant fuels.

Safety First

During process upset, start up and shut down conditions, there is always a chance that a flue rich mixture is temporarily in the process. To help protect against the Fluegas Exact being a source of ignition to these flue rich gases, the Fluegas Exact has in-built flame traps that prevent gas ignition within the hot Zirconium Oxide cell passing back to the process flue.

HAZARDOUS AREA APPROVALS

Control Unit:

Ex ic nA nC IIC T5 Gc (Ta = -10°C to +55°C)
Ex tc IIIC T75°C Dc (Ta = -10°C to +55°C)
ATEX Group II, Category 3, Gas and Dust hazardous atmospheres
Intertek Certification No. ITS10ATEX47005X

Factory Mutual - FMRC approved as non-incendive for:

Class I, Div. 2, Groups A, B, C & D
Class II, Div. 2, Groups F & G
Class III, Div. 1 & 2
Enclosure Type 4X
T5. Ambient Temperature 55°C max.

Canadian Standards Association - CSA suitable for use in:

Class I, Div. 2, Groups A, B, C & D
Class II, Div. 1, Groups E, F & G
Class III, Div. 1
T5. Ambient Temperature 55°C max. Enclosure Type 4X

Sensor Head:

Use purge for installation in hazardous locations
EUROPE - ATEX Group II, Category 3 Gases (Zone 2) when fitted with a suitable purge*
USA - Class I and II, Div. 2 and Class III, Div. 1 and 2 when fitted with a suitable purge*

* For certified sensor heads which include the flow sensor option, please contact Servomex for the latest certification status.

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EC DIRECTIVE COMPLIANCE

The SERVOTOUGH Fluegas Exact is in compliance with:

Low Voltage Directive

EMC Directive

And all other applicable Directives

REGIONAL APPROVALS

China Pattern Approval

TÜV tested and notification by BMU to the requirements of BImSchV

13 (large combustion plants)

and 17 (waste incineration and similar processes)

GOST Pattern Approval for Russia

UK MCERTS Approval

ELECTRICAL SAFETY

Electrical safety to IEC 61010-1, ANSI/ISA 61010-1, CAN/CSA 61010-1

The product is rated for "Overvoltage Category II"

The product is rated for "Pollution Degree 2"

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SPECIFICATIONS

Gas measured:	Oxygen (O ₂)	Combustibles (COe-Carbon Monoxide Equivalent)	
TECHNOLOGY	Zirconium oxide (zirconia)	Patented thick film catalytic sensor	
Typical applications:	All combustion	High Sensitivity Natural Gas, Light Oil ¹	Sulphur Resistant Sour Gas, Heavy Oils, Coal Incinerators ²
PERFORMANCE			
Intrinsic error (accuracy):	±1% of reading or ±0.1% O ₂ *	±25ppm or ±5% of reading *	±75ppm or ±5% of reading *
Resolution options:	0.01% O ₂	1ppm recommended	10ppm recommended
Drift (zero):	Per 3 months; <0.5% of range or 0.05% O ₂ *	<25ppm/week	<35ppm/week
Display range:	0.01% to 25%	0ppm to 10,000ppm	
Min. recommended range:	0-1% O ₂ ♦	0-500ppm	
Max. COe in stream:	Not applicable	6000ppm	
Linearity:	<0.1% O ₂	<3% FSR	
Repeatability:	<0.1% O ₂	<1% FSR	
Recommended Calibration frequency:	12 months	1 month	
Cross sensitivity: (under normal plant operating conditions)	No significant effect	Effect of common combustible flue gases per 1000 ppm	
		SO ₂ <30ppm	<100ppm
		CH ₄ <10ppm	<50ppm
		H ₂ <2500ppm	<2500ppm
FLOWCUBE, FLOW SENSOR			
Repeatability:	± 20ml/min at 200ml/min (nominal flow)		
Response Time (T ₉₀):	<20 seconds		
Alarms & relays:	Two SPCO relays (250V ac/3A or 28V dc/1A max), Flow Status Alarm, and Flow Alarm Faults		
Analogue output:	One configurable isolated 0/4-20mA per measurement (recommended impedance 600Ω or less, 1kΩ max) O ₂ output configurable from 0-1% min. to 0-25% max. O ₂ in 1% steps COe output configurable from 0-500ppm to 0-15,000ppm (measurement range remains as above)		
Alarms & relays:	Four SPCO relays (250V ac/3A or 28V dc/1A max), configurable for Concentration Alarms, Faults, In Calibration, In Blowback, and solenoid valves for blowback and autocalibration		
Digital inputs:	Two non-isolated digital inputs provided to remotely initiate autocalibration and perform blowback		

¹ Fuels with sulphur contents <1%

² Fuels with sulphur contents >1% (consult Servomex for fuels with sulphur content >2.5%)

♦ below 1% display shows low oxygen level warning

* whichever is greater

The performance specification has been written, and verified, in accordance with the international standard IEC 1207-1:1994 "Expression of performance of gas analysers".

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SPECIFICATIONS

PHYSICAL

Ingress protection:	IP66 / NEMA 4X	
Weight:	Control unit: <11kg (<24.3lbs) Sensor head: <17kg (<37.5lbs) Flow Alarm: <2.5kg (<5.5lbs)	
Dimensions, WxDxH:	Control unit: 391 x 167 x 260mm (15.4" x 6.6" x 10.3") Sensor head: 301 x 330 x 256mm (11.9" x 13.0" x 10.1") Flow Alarm: 120 x 120 x 80mm (4.7" x 4.7" x 3.1")	
Mounting:	Control unit: Wall, 19" rack and panel mounting Sensor head: Choice of mounting flanges and adaptors Flow Alarm: Wall	
Max altitude:	2000m (6500 feet)	
Ambient temperature:	Operation	Storage
Control unit:	-10°C to +55°C (+14°F to +131°F)	-20°C to +55°C (-4°F to +131°F)
Sensor head:	-20°C to +70°C (-4°F to +158°F)	-30°C to +80°C (-22°F to +176°F)

INTERCONNECTING CABLE REQUIREMENTS

	Cross Section	Max.
<u>Oxygen only</u>		
3 twisted pairs with overall screen*	1.0mm ²	100m
	1.5mm ²	150m
	2.5mm ²	300m
<u>Combustibles only</u>		
6 twisted pairs with individual and overall screens*		100m
<u>Oxygen and Combustibles</u>		
9 twisted pairs with individual and overall screens*		100m
*Maximum loop resistance of 4Ω is required for the heater connections and use cables with a minimum of 0.5mm ² cross section		
Note: Add 1 extra twisted pair if the optional sensor head temperature readout is required to be displayed by the Control Unit.		
Part numbers for supplier Alpha Wire Company (www.alphawire.com):		
Oxygen only	M9700040	
Combustibles only	M9740080	
Oxygen and combustibles	M9740120	
<u>Flow Sensor</u>		
3 cores with overall screen	1.0mm ²	100m

POWER REQUIREMENTS

Voltage: 100-120V ac, 50/60 Hz or 220-240V ac, 50/60 Hz
 Rated Power: Control Unit 250VA, Sensor Head 600VA
 Note: Control Unit and Sensor Head are powered separately.
 Control Unit power supply is fixed at time of order, but is field configurable. Sensor Head supply voltage is factory set.

SENSOR HEAD COMPRESSED AIR REQUIREMENTS

Aspirator Air:
 Pressure: 3.5psig typical (3 to 5psig - 0.2 to 0.3barg)
 Flow: <1.5 litres/min typical

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DESCRIPTION

Analyser controller	The analyser consists of a sensor head and a control unit which includes a backlit liquid crystal display (2 line x 16 characters) and an eight button keypad. The sensor head is suitable for installation in non-hazardous areas, (hazardous area available when used with suitable purge). There are four versions of the control unit available: GEN for installation in non-hazardous areas. EU2 for installation in European Zone 2 hazardous areas. FM2 for installation in US Class I & II, Division 2 and Class III, Division 1 & 2 hazardous areas. CSA for installation in Canadian Class I & II, Division 2 and Class III, Division 1 & 2 hazardous areas.
Measurement and supply voltage:	The unit can be supplied as an oxygen only measurement, combustibles (COe) only measurement, or an oxygen and combustibles measurement analyser. The analyser can also be supplied with specially coated pcbs for use in very humid environments. 110 and 220V ac available.
Combustible sensors	For natural gas and light oil applications with fuels with sulphur contents <1% our high sensitivity combustibles sensor is recommended. For sour gas, heavy oils, coal and incinerators with fuels with sulphur content >1% our sulphur resistant combustible sensor is recommended. For applications with fuels >2.5% sulphur refer to Servomex.
Flowcube internal flow sensor:	Our Flowcube technology offers an internal solid state flow sensor fitted directly to the inlet of the measurement transducers, ensuring that the measurement gas is flowing through the transducer at all times for maximum reliability and safety. The remote relay box offers one flow status relay contact and one flow sensor system fault relay contact, for maximum diagnostic coverage.
Sample probes:	A range of sample probes are available for use in different sampling environments. For samples with a relatively low dust loading (<0.2 g/m ³) open ended probes are available in stainless steel, high temperature alloy, and ceramic materials suitable for a range of temperatures up to 1750°C. Filtered probes are also available for samples with higher dust loading (up to 20 g/m ³) and temperatures below 1500°C. The stainless steel filtered probe can also be supplied with additional mechanical support and shroud. (Note: for higher dust loadings and temperatures refer to Servomex).
Internal filter:	The analyser is supplied fitted with flame arrestors and an internal filter as standard.
Electrical threaded entries:	Choose from ¼" NPT, M20, M25, PG13.5 or PG21 entries. Select entry size to suit cables and glands used.
Sensor head enclosure:	The analyser sensor head is fitted as standard with a breather port to prevent pressurisation of the enclosure. These can be replaced with fittings for the addition of a corrosive or PZ purge for the sensor head and terminal box, if required. The oxygen only analyser can also be supplied equipped to use nitrogen instead of compressed air to power the internal aspirator.
Sensor head mounting option:	There are six sensor head mounting options: A standard mounting option, a probe retention option which allows the sensor head to be removed whilst the sample probe is retained within the flue, a thermal spacer which separates the sensor head from the flue wall with a high surface temperature (350°C to 500°C), a stand off flange which increases the separation between the sensor head and the heat radiation from the flue wall (350°C to 500°C), a combined thermal spacer and probe retention and a combined probe retention and stand-off flange.
Adaptor flange option:	The sensor head is supplied with an equivalent PCD 4" ANSI 150lbs flange as standard. Adaptors are available to suit other flange sizes. The analyser is not designed to withstand 150lbs pressure. The flue pressure should be a maximum of 5psig.
Control unit monitoring:	The control unit is available for either wall or rack/panel mounting. The rack/panel mounting controller is supplied with an additional panel.
Control unit enclosure option:	The analyser can be fitted with blanking plugs, a breather port or fittings to allow the use of a corrosive or PZ type purge system.
Utilities:	A utilities unit can be configured with one or more of the following:- Aspirator air set - provides filtration and pressure regulation of the compressed air for the aspirator in the analyser. Autocalibration - provides the necessary components to allow automatic calibration of the analyser with calibration gases (not supplied) Manual calibration - provides the necessary components to allow manual calibration of the analyser with calibration gases (not supplied) Blowback - provides the necessary components to allow the blowback of the sample probe and internal filter When nitrogen aspiration is used the calibration versions of the utilities units cannot be used.

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SERVOTOUGH

Fluegas Exact (2700)

DESCRIPTION

Utilities:	None <input type="checkbox"/> Air set, single/dual <input type="checkbox"/> Autocal air set <input type="checkbox"/> single <input type="checkbox"/> Autocal and blowback <input type="checkbox"/> single <input type="checkbox"/> dual <input type="checkbox"/> Manual cal, single/dual <input type="checkbox"/> dual <input type="checkbox"/>
Quickstart & Installation manual:	The Fluegas Exact Analyser is supplied with a Quickstart™ and installation manual. English <input type="checkbox"/> French <input type="checkbox"/> German <input type="checkbox"/>
Service manual:	A service manual containing technical descriptions, fault diagnosis information, parts removal, refitting and test instructions, tool and test equipment lists, and electrical drawings is available. It is intended for use by Servomex trained service personnel. None <input type="checkbox"/> English <input type="checkbox"/>
Default software interface language:	The analyser is supplied with English, French and German software installed. The active language is user selectable. The default software interface language will be active when the analyser is shipped. English <input type="checkbox"/> French <input type="checkbox"/> German <input type="checkbox"/>

CALIBRATION GAS REQUIREMENTS

Calibration gas requirements:

Pressure: 1barg (15psig) Flow: 600ml/min typical

Calibration gas composition	Oxygen sensor (Zr)	Combustibles sensor (Tfx)
Air (20.95% O ₂ in nitrogen) Air must be free from combustible gases (eg CO, H ₂ , hydrocarbons, etc)	Span (high)	Zero
0.3% O ₂ in nitrogen (recommended) Gas composition can be between 0.25% and 2.5% O ₂ in Nitrogen	Zero (low)	N/A
1000ppm carbon monoxide in air (recommended) Gas composition can be between 500ppm and 2500ppm in air	N/A	Span

SAMPLE WETTED MATERIALS

Item	Materials	Item	Materials
Sensor head	Stainless steel (303 and 316), gasket sealing material (Klinger grade SLS 150)	Unfiltered sample probe (<700°C)	Stainless steel (316)
Oxygen sensor	Stainless steel (310 and 316), zirconia, platinum, alumina, Ni/Fe/Cr alloy, high temperature sealing glasses	Filtered sample probe (<700°C)	Stainless steel (316), stainless steel (310), silicon carbide
Combustibles sensor	Stainless steel (316), platinum, platinum/iridium, zirconia, alumina, corrosion resistant glass	Unfiltered sample probe (700°C-1000°C)	Haynes alloy 556, stainless steel (316)
Flow Cube	Stainless steel (316), Zirconia, platinum/iridium, corrosion resistant glass	Filtered sample probe (700°C-1000°C)	Stainless steel (310), Haynes alloy 556, Stainless steel (316), silicon carbide
		High temperature sample probe (<1750°C)	High temperature ceramic, stainless steel (316)

SERVOTOUGH

Fluegas Exact (2700)

SYSTEM RESPONSE TIMES T_{90} (typical)

Measurement	O ₂ only	Combustibles COe only
<700°C, 1m long, stainless steel sample probe with sample filter:	<17s	<27s
<1000°C, 1m long, H556 alloy sample probe with sample filter:	<17s	<27s
<1750°C, 1m long, ceramic sample probe with sample filter:	<20s	<30s

SERVICE & SUPPORT

For new installations and replacement of older Servomex and competitor products, we will work with you to develop a bespoke service and support package, ensuring full measurement availability and plant operation within your timescales and budget.

SERVOSPARES

To ensure the integrity and optimum performance of your Servomex product, we recommend fitting only factory authorised spare parts. This is particularly important for all hazardous area certified products.

SERVOSURE

Ensure your Servomex analyser is properly commissioned and delivers optimum performance with a maintenance contract, service programme and extended warranty.

SERVOTECH

Make the most of your Servomex gas analyser by attending a training course at one of our training centres in Europe, USA or Asia or on your own site.

SERVOHELP

Whether you have a simple question or complex process challenge, our local offices and global support network are here to help you.

SERVOTOUGH Fluegas Exact (2700)

ACCESSORIES AND STANDARD PROBE OPTIONS

Utilities unit specification

Temperature

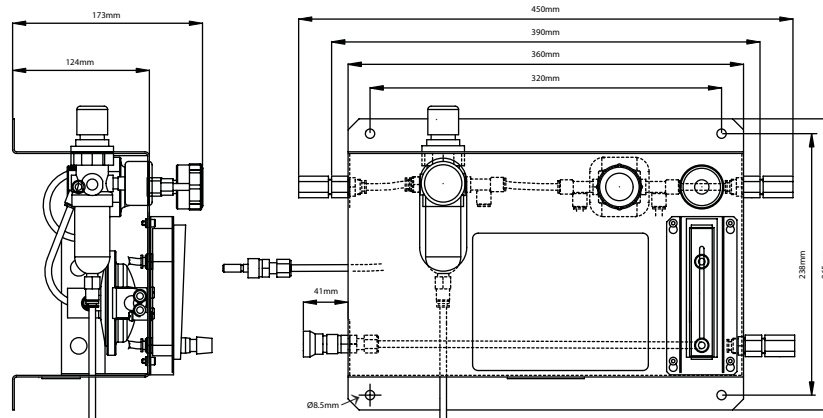
Operating: -10°C to +50°C (+14°F to +122°F)
Storage: -20°C to +55°C (-4°F to +131°F)

Compressed air & blowback air requirements

Pressure: 1 to 5 barg (15 to 72.5 psig)
Flow: 4.5 to 10 litres/min
Instrument grade compressed air*, free of oil, water & dirt

Utilities units

02730701 Aspirator air set, single or dual sensor
W 93mm x D 99mm x H 165mm
(W 3.7" x D 3.9" x H 6.5"), <400gms (<1.0lbs)
02730731 Aspirator air set and manual calibration, single or dual sensors
W 390mm x D 174mm x H 265mm
(W 15.5" x D 6.8" x H 10.4"), <4.5Kgs (<10lbs)

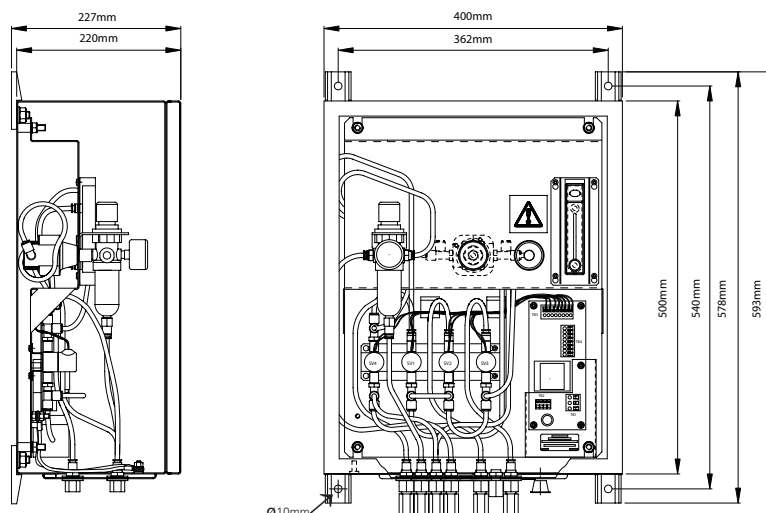


Aspirator air set and automatic calibration units **

02730711 (single sensor), 02730721
(single sensor, with blowback), 02730713C (dual sensor),
02730723C (dual sensor, with blowback)
W 400mm x D 220mm x H 500mm
(W 16" x D 9" x H 20"), <16Kgs (<35lbs)

Ingress protection: IP65/NEMA 12 (Auto cal. units only)

Power supply: 100V ac, 50/60Hz <20VA; 110-120V ac,
50/60Hz <20VA or 220-240V ac,
50/60Hz <20VA (field configurable)



The Nickel plated brass bulkhead connections are suitable for 1/4" NPT and BSP male fittings & tubing. Internal components are brass, plastic fittings and tubing.

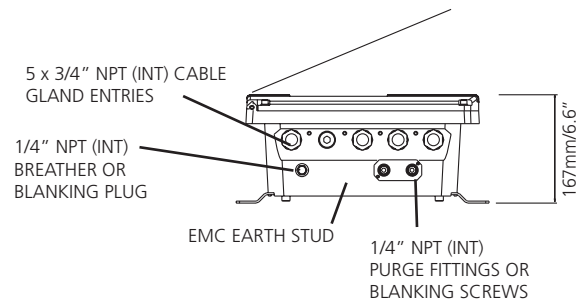
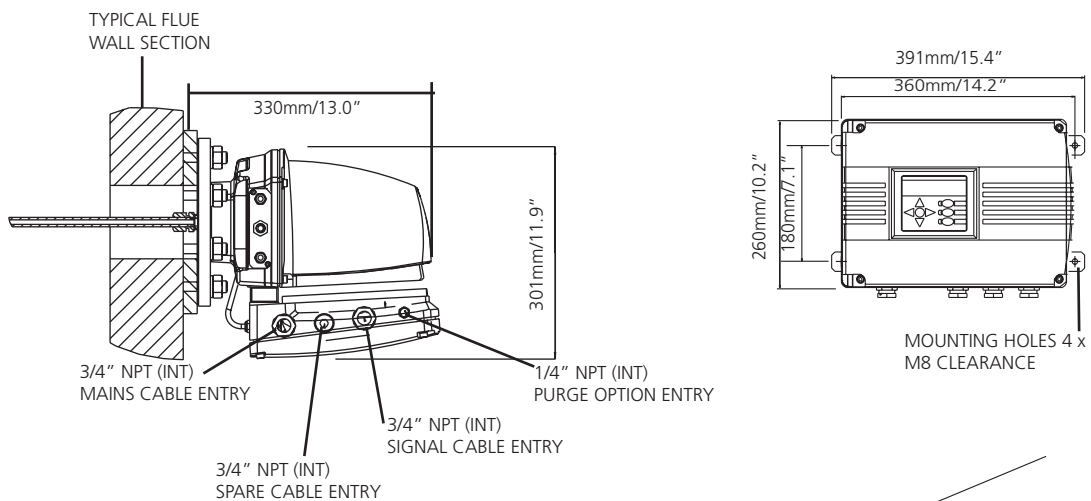
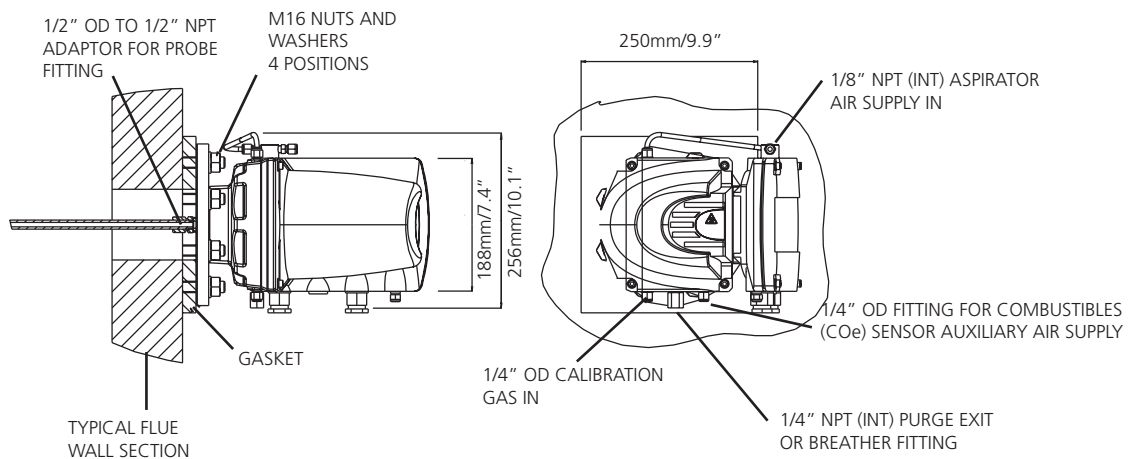
* Or nitrogen, if analyser equipped for nitrogen aspiration (single measurement oxygen units only)

** The autocalibration versions of the utility units comply with the "CE Marking Directive" 93/68/EEC

SERVOTOUGH Fluegas Exact (2700)

DIMENSIONS

TYPICAL ANALYSER MOUNTING ORIENTATION WITH 4" ANSI FLANGE. OTHER FLANGES ARE AVAILABLE













SERVICE ACCESS REQUIRED FOR DOOR TO BE OPENED:
365mm/14.4" IN FRONT
250mm/9.9" TO LEFT HAND SIDE

Dimensions shown in millimetres

SERVOTOUGH

Fluegas Exact (2700)

Servomex range of products for the Hydrocarbon Processing Industry

	 SERVOMEX EMISSIONS ANALYSERS	 SERVOMEX COMBUSTION ANALYSERS	 SERVOMEX PROCESS ANALYSERS
SERVOTOUGH (Hazardous Area)	 SERVOTOUGH 2500 - SERVOTOUGH SpectraExact 2900 - SERVOTOUGH Laser	 SERVOTOUGH 2700 - SERVOTOUGH Fluegas Exact 2900 - SERVOTOUGH Laser	 SERVOTOUGH 1900 Digital - SERVOTOUGH Oxy 1900 IR - SERVOTOUGH Spectra 2200 - SERVOTOUGH OxyExact 2500 - SERVOTOUGH SpectraExact 2900 - SERVOTOUGH Laser 1800
SERVOPRO (Safe Area)	 SERVOPRO 4900		 SERVOPRO 5400 - SERVOPRO MultiExact 4100
SERVOFLEX (Portables)		 SERVOFLEX 5100 i.s - SERVOFLEX Micro i.s	 SERVOFLEX 5100 i.s - SERVOFLEX Micro i.s

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