

For maximum efficiency and fuel cost savings, the SERVOTOUGH Fluegas (2700) is a high performance gas analyser ideal for monitoring the oxygen and combustibles in a wide variety of combustion processes. The Fluegas 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**

- Close coupled, low flow extracted volume design compared to in-situ analysers, the Fluegas is not subject
  to the harsh process conditions, ensuring a lower cost of
  ownership while simultaneously delivering fast, stable
  and highly reliable O<sub>2</sub> and COe measurements
- Servomex zirconium oxide cell an accurate, long life, low drift, and highly robust O<sub>2</sub> measurement, able to withstand reducing process conditions
- Thick Film Catalytic Sensors a sensitive, fast response, and reliable COe measurement that responds to COe even in low process O<sub>2</sub> conditions
- Safety First protective, BASEEFA tested flametraps as standard prevent possible ignition of flue gases in fuel rich conditions
- **Highly Flexible** wide variety of probes, mounting flanges, calibration and air panels available
- Configurations for safe or hazardous area use

### **APPLICATIONS**

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



### **KEY FEATURES**

### Close coupled, low flow extractive design

The close coupled and low flow extractive design of the SERVOTOUGH Fluegas delivers market leading sensor life, reliability and stability. By extracting the sample at low flow rates, as oppose to measuring the sample in the process stream, the Fluegas 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 one of 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  $O_2$ , the measurement of COe is a major advantage in improving combustion efficiency. Our Thick Film Catalytic Sensors offer fast response and high sensitivity to combustible gas breakthrough, the first sign of incomplete combustion. By reducing  $O_2$  levels close to those of incomplete combustion, significant fuel savings and a reduction in NOx emmisions 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 COe measurements even if the flue gas O<sub>2</sub> 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 being a source of ignition to these flue rich gases, the Fluegas has in built flame traps that prevents gas ignition within the hot Zirconium Oxide cell passing back to the process flue.

### **HAZARDOUS AREA APPROVALS**

### Control Unit:

Approved as EEx nC IIC T5 ( $-20^{\circ}$ C < Ta <  $+55^{\circ}$ C) for ATEX Group II, Category 3 Gas and Dust. Hazardous Atmospheres T75°C (BASEEFA No. BAS02ATEX3205)

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

### **EC DIRECTIVE COMPLIANCE**

The SERVOTOUGH Fluegas 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 BlmSchV
13 (large combustion plant)
and 17 (waste incineration and similar processes).

GOST Pattern Approval for Russia.

UK MCERTS Approval.

### **ELECTRICAL SAFETY**

Electrical safety to IEC 61010-1

The product is rated for "Overvoltage Category II"

The product is rated for "Pollution Degree 2"

### **Electrical Safety USA/Canada**

Complies with FM approval class number 3810. CAN/CSA - C22.2 No. 1010.1-92.

SPECIFICATIONS  Gas measured:	Overgon (O.)	Combustibles (CO = C	arbon Monovida Faui rala at
Gas measured:	Oxygen (O <sub>2</sub> )	Combustibles (COe-C	arbon Monoxide Equivalent)
TECHNOLOGY	Zirconium oxide (zirconia)	Determined thirds Class and this course	
TECHNOLOGY	Zirconium oxide (zirconia)	Patented thick film catalytic sensor	
		High Sensitivity	Sulphur Resistant
Typical applications:	All combustion	Natural Gas, Light Oil <sup>1</sup>	Sour Gas, Heavy Oils, Coal Incinerators <sup>2</sup>
PERFORMANCE			
Intrinsic error (accuracy):	$\pm 1\%$ of reading or $\pm 0.1\%$ O <sub>2</sub> *	±25ppm or ±5%	±75ppm or ±5%
		of reading *	of reading *
Resolution options:	0.01% O <sub>2</sub>	1ppm recommended	10ppm recommended
Drift (zero):	Per 3 months; <0.5% of range	<25ppm/week	<35ppm/week
	or 0.05% O <sub>2</sub> *		
Display range:	0.01% to 25%	0ppm to 10,000ppm	
Min. recommended range:	0-1% O <sub>2</sub> *	0-500ppm	
Max. COe in stream:	Not applicable	6000ppm	
Linearity:	<0.1% O <sub>2</sub>	<3% FSR	
Repeatability:	<0.1% O <sub>2</sub>	<1	1% FSR
Recommended Calibration	12 months	1 :	month
frequency:			
Cross sensitivity: (under normal plant	No significant effect	Effect of common combustible flue gases per 1000 ppm	
operating conditions)		SO <sub>2</sub> <30ppm	<100ppm
operaning contactions,		CH <sub>4</sub> <10ppm	<50ppm
		H <sub>2</sub> <2500ppm	<2500ppm
SIGNAL INPUTS/OUTPUTS		_	
Analogue output:	One configurable isolated 0/4-2	.0mA per measurement (reco	ommended impedance 600Ω
	or less, 1kΩ max)	•	
	$\rm O_2$ output configurable from 0-1% min. to 0-25% max. $\rm O_2$ in 1% steps		
	COe output configurable from	0-500ppm to 0-15,000ppm (	measurement range remains

- <sup>1</sup> Fuels with sulphur contents <1%
- <sup>2</sup> Fuels with sulphur contents >1% (consult Servomex for fuels with sulphur content >2.5%)
- below 1% display shows low oxygen level warning

as above)

\* whichever is greater

Digital inputs:

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

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

Two non-isolated digital inputs provided to remotely initiate autocalibration and perform

### **SPECIFICATIONS**

PHYSICAL Ingress protection: Weight:

Dimensions, WxDxH:

Mounting:

Max altitude: Ambient temperature: Control unit: Sensor head: IP66 / NEMA 4X

Control unit: <11kg (<24.3lbs) Sensor head: <17kg (<37.5lbs) - Dual transducer

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") Control unit: Wall, 19" rack and panel mounting Sensor head: Choice of mounting flanges and adaptors

2000m (6500 feet)

Operation Storage

-10°C to +55°C (+14°F to +131°F) -20°C to +55°C (-4°F to +131°F) -30°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.
Oxygen only		
3 twisted pairs with overall screen*	1.0mm <sup>2</sup>	100m
	1.5mm <sup>2</sup>	150m
	2.5mm <sup>2</sup>	300m
Combustibles only		

<u>Compustibles only</u>

6 twisted pairs with individual and overall screens\* 100m

Oxygen and Combustibles

9 twisted pairs with individual and overall screens\* 100m

\*Maximum loop resistance of  $4\Omega$  is required for the heater connections and use cables with a minimum of 0.5mm² 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 M9700080
Oxygen and combustibles M9700120

### **POWER REQUIREMENTS**

Voltage: 100-120V ac, 50/60 Hz <u>or</u> 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

Pump unit:

### **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. The unit can be supplied as an oxygen only measurement, combustibles (COe) only measurement, or an oxygen Measurement and and combustibles measurement analyser. The analyser can also be supplied with specially coated pcbs for use in supply voltage: very humid environments. 110 and 220V ac available. For natural gas and light oil applications with fuels with sulphur contents <1% our high sensitivity combustibles Combustible sensors 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. A range of sample probes are available for use in different sampling environments. Fo samples with a relatively Sample probes: low dust loading (<0.2 g/m³) 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/m³) 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. Choose from ¾" NPT, M20, M25, PG13.5 or PG21 entries. Select entry size to suit cables and glands used. Sensor head 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 enclosure: 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 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 mounting option: 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 The sensor head is supplied with an equivalent PCD 4" ANSI 150lbs flange as standard. Adaptors are available to suit other flange sizes. option: The analyser is not designed to withstand 150lbs pressure. The flue pressure should be a maximum of 5psig. The control unit is available for either wall or rack/panel mounting. Control unit The rack/panel mounting controller is supplied with an additional panel. Control unit 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. 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.

Recommended with N2 aspiration unless other suitable device made available separately. Consult Servomex.

DESCRIPTION				
Analyser controller:	Safe Area Hazardous Area European C Hazardous Area FM Div. 2 Hazardous Area CSA Div. 2	Cat 3, Zone 2		
UK MCERTS:	Approval required Not required			
Measurement and supply voltage:		Uncoated pcbs ☐110-120V ☐220-240V	Coated pcbs □110-120V □220-24	40V
	O <sub>2</sub> Combustibles only Oxygen & combustibles			
Combustible Sensor:	High sensitivity		Sulphur resistant	
Aspirator supply:	Air		Nitrogen	
Sample probes:	SS sample probe, unsupported SS sample probe, supported, f SS sample probe, supported, of High temperature alloy, unsup High temperature alloy, unsup Ceramic, sample probe, open	filtered with shroud <700°C/1292°F dual filtered, with shroud <700°C/1292°F ported, open ended, <1000°C/1832°F ported, filtered, <1000°C/1832°F ended, <1750°C/3182°F oported, filtered, <1500°C/2732°F *	Length (m)  0.5   1.0   1.5    /	2.0   2.5   3.0
Internal filter:	Internal flame arrestors and	internal sample filter		<b>1</b>
Electrical threaded entries:	%" NPT (O <sub>2</sub> and COe) M20 (O <sub>2</sub> or COe) M25 (O <sub>2</sub> and COe) PG 13.5 (O <sub>2</sub> or COe) PG21 (O <sub>2</sub> and COe)			0000
Sensor head enclosure:	Breather port Purge fittings			
Sensor head mounting option:	High temperature stand off	upported probes) upported probes) acer (excluding supported probes) (excluding supported probes) & probe retention (excluding supported	probes)	0
Adaptor flange option:	Model 700B/N to 2700 adap	th studs (4" ANSI 150lbs equivalent) otor flange (excluding high temperature s ange (excluding supported probes)	stand off)	
Control unit monitoring:	Wall mounted Rack or panel mounted			
Control unit enclosure option:	Blanking plugs only Breather port Purge fittings			

## **DESCRIPTION**

Utilities:	None Air set, single/dual Autocal air set Autocal and blowback Manual cal, single/dual	single single		dual dual	
Pump unit:	110V ac pump 240V ac pump			Consult Servomex Consult Servomex	
Quickstart & Installation manual	The 2700 Analyser is supplie	ed with a Quic English French German	kstart	™ and installation m Spanish Chinese Russian	nanual.
Service manual					nformation, parts removal, refitting and test available. It is intended for use by Servomex
Default software interface language	The analyser is supplied with selectable. The default softw				installed. The active language is user /hen the analyser is shipped.

## **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 <sub>2</sub> in nitrogen) Air must be free from combustible gases (eg CO, H <sub>2</sub> , hydrocarbons, etc)	Span (high)	Zero
0.3% $\rm O_2$ in nitrogen Gas composition can be between 0.25% and 2.5% $\rm O_2$ in Nitrogen	Zero (low)	N/A
500ppm carbon monoxide in air Gas composition can be between 500ppm and 1000ppm in air	N/A	Span

## **SAMPLE WETTED MATERIALS**

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

## SYSTEM RESPONSE TIMES T<sub>90</sub> (typical)

Measurement	O <sub>2</sub> 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.

### **ACCESSORIES AND STANDARD PROBE OPTIONS**

### **Utilities unit specification**

**Temperature** 

Operating:  $-10^{\circ}\text{C to } +50^{\circ}\text{C } (+14^{\circ}\text{F to } +122^{\circ}\text{F})$ Storage:  $-20^{\circ}\text{C to } +55^{\circ}\text{C } (-4^{\circ}\text{F to } +131^{\circ}\text{F})$ 

Compressed air & blowback air requirements:

Pressure: 1 to 5barg (15 to 72.5psig) Flow: 4.5 to 10 litres/min

Instrument grade compressed air\*, free of oil, water & dirt

#### **Utilities units**

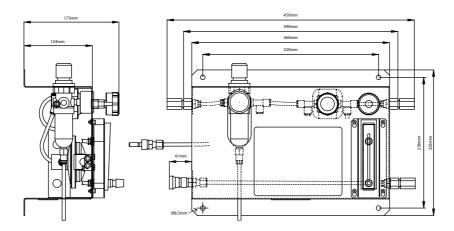
02730701 Aspirator air set, single or dual sensor

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)

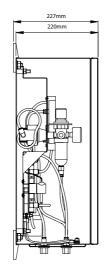


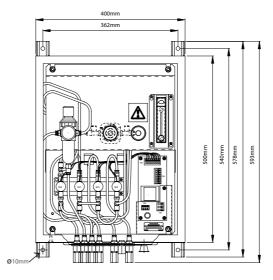
Aspirator air set and automatic calibration units \*\*
02730711 (single sensor), 02730721
(single sensor, with blowback), 02730713C (dual sensor),
02730723C (dual sensor, with blowback)

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)



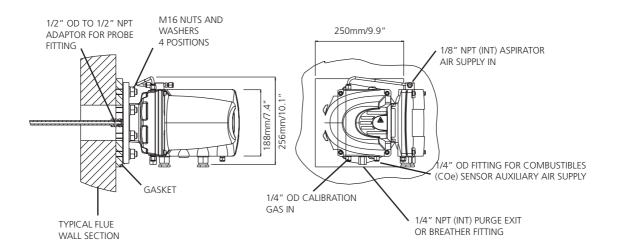


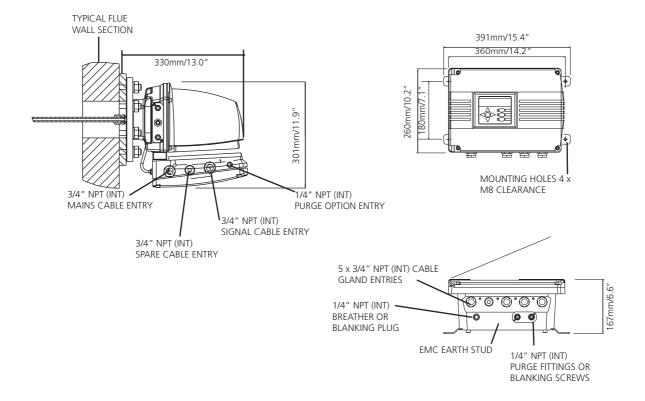
The Nickel plated brass bulkhead connections are suitable for 1/4" NPT and BSP male fittings & tubing. Internal components are brass, plastic fittings and tubing.

- \* 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

### **DIMENSIONS**

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





Dimensions shown in millimetres

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



	SERVOMEX EMISSIONS ANALYSERS	SERVOMEX COMBUSTION ANALYSERS	SERVOMEX PROCESS ANALYSERS
SERVOTOUGH (Hazardous Area)	SERVOTOUGH  2500 - SERVOTOUGH SpectraExact 2900 - SERVOTOUGH Laser	SERVOTOUGH  2700 - SERVOTOUGH Fluegas 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)	SERVO <b>PRO</b>		SERVOPRO 5400 - SERVOPRO MultiExact 4100
SERVOFLEX (Portables)		SERVOFLEX 5100 i.s - SERVOFLEX Micro i.s	SERVOFLEX  5100 i.s - SERVOFLEX Micro i.s 5100 Marine - SERVOFLEX MicroMar

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