ZFG2 Zirconia Oxygen Probe

- **True wet measurement of excess oxygen in combustion flue gases.**
- **Minimal installation, cost effective in situ measurement.**
- **Fully site serviceable probes, minimal downtime.**
- **Interchangeable probes eliminating the need for recalibration.**
- **Probes available with 0.4m (16in), 1.0m (39in), 1.5m (58in) and 2.0m (78in) insertion lengths.**
- **Flametrap recommended for gas-fired boiler applications.**
- **27 month cell warranty.**

ABB Instrumentation

Introduction

The ZFG2 Flue Gas Oxygen Probe is one of the most advanced in the world. A simplified design makes all the component parts easily accessible and field serviceable. The new universal probe construction gives the ultimate system flexibility while retaining all the features, benefits and reliability of the previous generation.

Fully interchangeable with previous ABB Kent-Taylor, and the ability to upgrade from other manufacturer's products, the probe, in common with earlier models is of the in situ type, inserted directly into the boiler smoke box, or flue duct, eliminating the need for costly sampling installations.

Operating in the process temperature range of 20°C to 600°C (68° to 1112°F) the system gives true wet analysis of net excess oxygen in combustion gases. The probes can be fitted with a flame trap, thereby extending their use to measurement on gas fired boilers.

Installation and commissioning are particularly easy and the level of in-service maintenance is extremely low.

Principle of Operation

The detector cell is constructed from stabilized zirconia employing integral platinum electrodes and is specific to oxygen. Air is supplied to the internal (reference) electrode to provide a constant partial pressure of oxygen while the measured gases are in contact with the outer electrode producing a potential proportional to O_2 concentration.

The Probe

The zirconia probes, constructed from 316 stainless steel, house a ceramic dust filter and flame trap, the detector cell, cell heater and thermocouple. Wiring between the electronics unit and the probe can be carried in a single 6m (20ft) flexible conduit, which is PVC coated for IP65 (NEMA4) rated probes. The conduit also contains the tubing for the reference air supply. The standard probe insertion lengths available are 0.4, 1.0, 1.5 and 2.0m (16, 39, 58 and 78 inches) and fixing to the duct or smoke box is by means of a drilled flange. Stand-off fixings can be used to reduce the insertion length for smaller ducts. A screwed bush is available for fixing the 0.4m probe to the duct or smoke box. Longer length probes are available.

All components of the probe are easily removable and can be replaced on site without the use of special tools or bonding agents. Replacement of the zirconia oxygen sensor can be made without the need for recalibration of the electronics unit.

A calibration gas inlet port is fitted to the probes to enable accuracy checks to be made without removal of the probes from their mountings.

The site-replaceable cell carries a 27 month warranty.

SPECIFICATION

Calibration (in situ):
One point using clean air
Two point using certified test gas.

Flue Temperature:
20° to 600°C (68° to 1112°F)

Pressure:
Suitable for all normal positive or negative flue pressures.

Dimensions:
See dimension details diagram.

Probe Fixing:
Flange (or $2^1/_2$ in NPT screwed fitting ZFG2 0.4m).

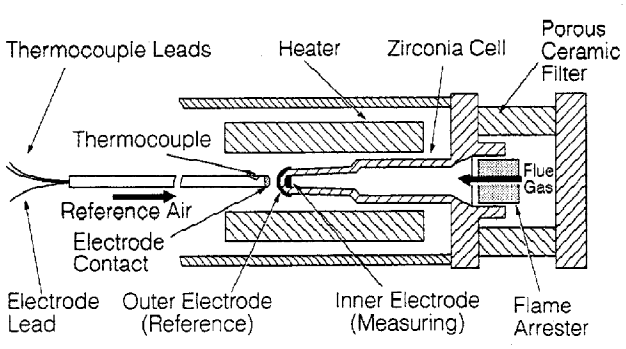
Probe Insertion:
0.4, 1.0, 1.5 or 2.0m (standard). Specials up to 4.0m (156 in) max.

Flange Options:
0.4m ZFG2 Standard
6.0 ±0.4 thick x 101.0 ±1 dia.
6 holes 7.3 dia. equispaced on 80.0 ±0.2 P.C.D.
1.0, 1.5 and 2.0m ZFG2 Standard
12.0 ±1 thick x 165.0 ±dia.
6 holes 12.5 ±0.5 dia. equispaced on 140 P.C.D.
Westinghouse Model 132 equivalent
6.0 ±0.4 thick x 127.0 ±1 dia.
4 holes 9.5 (0.375") dia. equispaced on 99.0 ±0.2 P.C.D.
Westinghouse DIN equivalent
12.0 ±1 thick x 185.0 ±0.5 dia.
4 holes 18 dia. equispaced on 145.0 ±0.2 P.C.D.
Westinghouse ANSI equivalent
12.0 ±1 thick x 153 ±0.5 dia.
4 holes 20.0 ±0.2 equispaced on 121.0 ±0.2 P.C.D.
Westinghouse JIS equivalent
12.0 ±1 thick x 155.0 ±0.5 dia.
4 holes 15 equispaced on 130.0 ±0.2 P.C.D.

Cable Length:
10m or 6m (32 or 20ft) as fitted. Max. distance probe to electronics unit 69m (224ft) using terminal box (Part no. 003000060) and additional cable.

Probe Weight:
0.4m (16in) – 6kg (13.2lb) [including 6m (20ft) cable]
1.0m (39in) – 10.8kg (23.7lb) [including 6m (20ft) cable]
1.5m (58in) – 11.6kg (25.5lb) [including 6m (20ft) cable]
2.0m (78in) – 12.5kg (27.5lb) [including 6m (20ft) cable]

ERA Citation of suitability for gas fired installations where Group IIB equipment is applicable.



Measuring Range

Response Rate:
< 40s to 63% of final value < 1 minute to 90% of final value (typical).

Reference Gas:
Clean, oil-free air. Any stable flow in the range 100 to 1000 cc/minute.

Construction:
316 stainless steel and ceramic

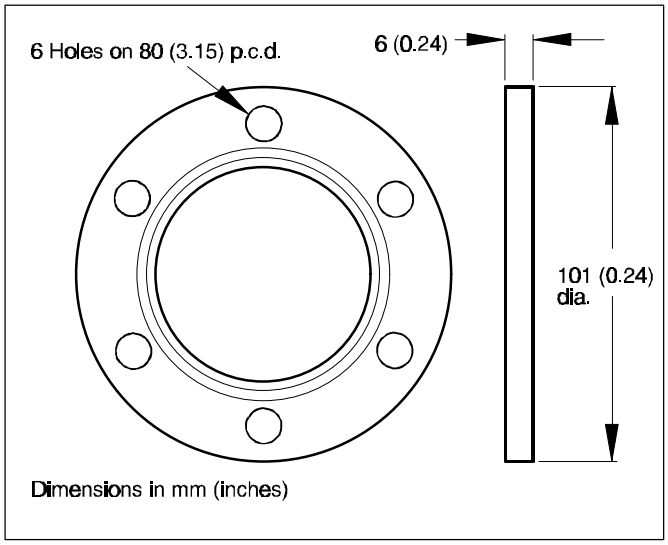
Thermocouple:
NiCr/NiAl Pt. 4 BS4937 Type K.

Insertion Length:
0.4m, 1.0m, 1.5m or 2.0m.

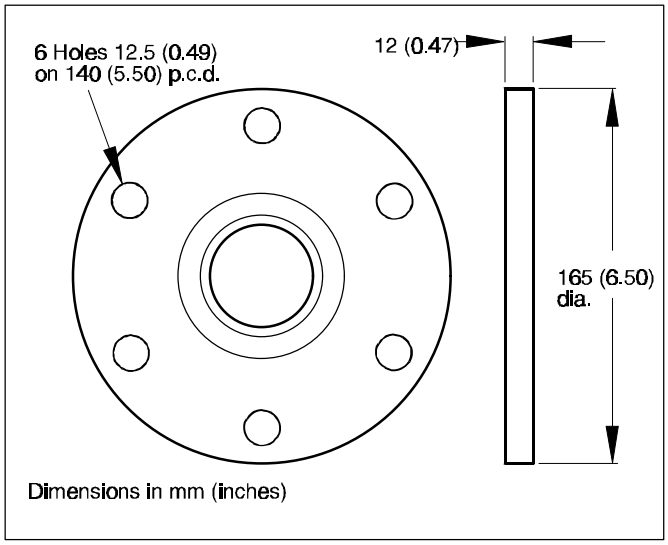
Protection Class:
Meets requirements of NEMA 4x
NEC Class 1 Div. 2 Gases B, C, D – IP65

Applications

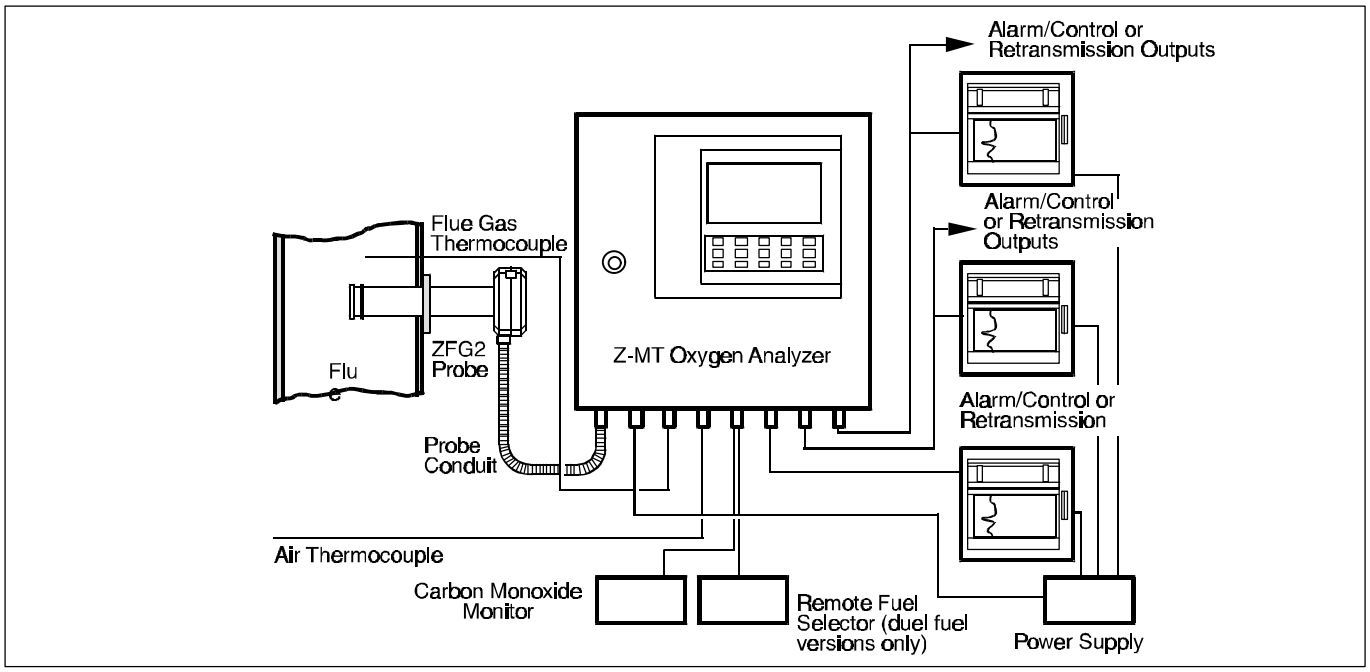
- Industrial boilers – gas, oil or pulverized fuel fired.
- Utility power boilers – oil, gas or pulverized fuel fired.
- Recovery boilers.
- Hospital boilers.
- Incinerators (low temperature).
- Water vapour measurement on paper machines, laminated and chipboard manufacture.
- Tuv Approval 936/803006
- Llyods Approval 93/00139



Standard Mounting Flange [1.0m (39in), 1.5m (58in), or 2.0m (78in)]



Standard Mounting Flange [0.4m (16in)]



System Schematic Diagram, ZFG2 Probe

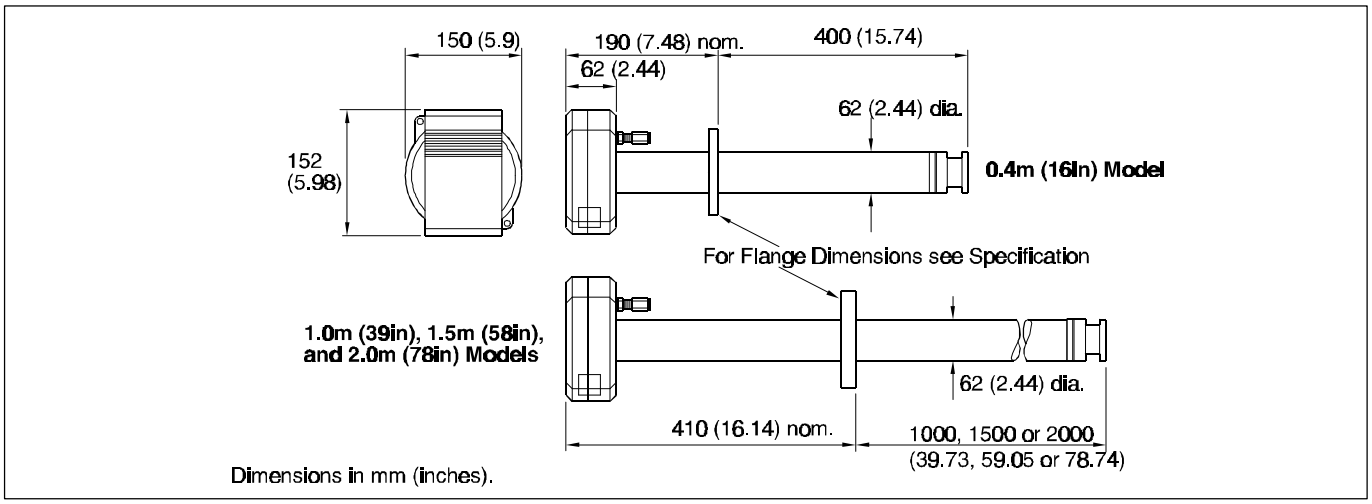
Identification Table

Code Digits 1,2,3,4	5	6	7	8	9	10	11	12	13
Basic Type Number	**Insertion Length**	**Flange Type**	**Conduit**			**Cell**	**Flame Arrester**	**Reference Air**	**Mounting Plate Assembly**
			Entry Type	**No. Off**	**Length**				
ZFG2 Zirconia Oxygen Probe	1 0.4m (16in) 2 1.0m (39in) 3 1.5m (58in) 4 2.0m (78in)	1 STD 2 DIN 3 ANSI 4 JIS 5 Model 132 9 Special	1 20mm 2 1/2in NPT	0 None 1 One Std. 2 Two Std. 3 One IP65 4 Two IP65	0 None 1 6m (20ft) 2 10m (32ft)	1 Standard Cell 2 Flow Through Cell	0 None 1 Flame Arrester	1 Internal 2 External	0 None 1 Standard [0.4m (16in) probes] 2 Standard (long probes)

Code Number Example

ZFG2 2 1 1 2 1 1 1 1 2

ZFG2 Zirconia oxygen probe
Insertion length – 1.0m (16in)
Flange type – standard
Conduit entry type – 20mm (0.78in)
Number of conduits – two
Conduit length – 6m (20ft)
Cell type – standard
Flame arrester fitted
Internal reference air tubing (within conduit)
Standard mounting plate



ORDERING INFORMATION

ZIRCONIA OXYGEN - ZFG2 SERIES OXYGEN PROBES

Code No.	Description
	BASE NUMBER - 1st thru 5th characters
ZFG2-1	Basic Probe, 0.4 M
ZFG2-2	Basic Probe, 1.0 M
ZFG2-3	Basic Probe, 1.5 M
ZFG2-4	Basic Probe, 2.0 M
	FLANGE - 6th character
1	ABB Standard
2	Westinghouse/DIN Equivalent
3	Westinghouse/ANSI Equivalent
4	Westinghouse/YEW JIS Equivalent
5	Westinghouse Model 132 Equivalent
6	Special
	CONDUIT ENTRY - 7th character
1	20 mm (required when using pre-wired flexible conduit)
2	1/2" NPT (specify Code 00 for 8th and 9th characters)
	PRE-WIRED FLEXIBLE CONDUIT (See Note 1) - 8th and 9th characters
00	None (specify Code 2 for 7th character)
11	1 Standard 20 ft
12	1 Standard 32 ft
19	1 Standard special length
21	2 Standard 20 ft
22	2 Standard 32 ft
29	2 Standard special length
31	1 NEMA, 4X 20 ft
32	1 NEMA, 4X 32 ft
39	1 NEMA, 4X special length
41	2 NEMA, 4X 20 ft
42	2 NEMA, 4X 32 ft
49	2 NEMA, 4X special length
	CELL TYPE - 10th character
1	Standard
2	Flow through
	FLAME ARRESTOR - 11th character
0	None
1	Flame Arrestor
	REFERENCE AIR SUPPLY (See Note 2) - 12th character
1	Internal
2	External
	MOUNTING PLATE ASSEMBLY - 13th character
0	None
1	Mounting Plate Assembly (0.4 M unit)
2	Mounting Plate Assembly (1-2 M unit)

ZFG2-112001021 SAMPLE CATALOG NUMBER

Note 1 - This option provides pre-wired flexible conduit for the probe heater control, reference air supply tube, T/C extension wire and sensor signal. This can be provided in a single conduit or two conduits, where a separate conduit is desired to carry the 55 VAC heater current. Select option 1 for character 7 for probe mating connection (20 mm).

Note 2 - The reference air supply can be supplied via a pump in the ZMT electronics unit, from an instrument air supply directly to the probe or by instrument air which is fed to a regulator/flow control panel in the ZMT. If using air tubing supplied with conduit, internal reference air connection should be specified.

ORDERING INFORMATION (Cont'd)

Code No.	Description
	ZFG2 CABLES AND ACCESORRIES
003000105	Cell
003000087	Flame Arrestor
00300081	Mounting Plate, 0.4m Probe
NBT/0938	Mounting Plate, 1.0-2.0m Probe
003000345	Filter, Ceramic
003000355	Filter Kit
003000060	Termination Box
	CABLE / CONDUIT
003000166	One Standard, 20 ft
ZFG20060	One Standard, 30 ft
ZFG20061	Two Standard, 20 ft. (Heater Cable)
ZFG20062	Two Standard, 20 ft.
ZFG20063	Two Standard, 30 ft (Heater Cable)
ZFG20064	Two Standard, 30 ft.
ZFG20065	One NEMA4X, 20 ft.
ZFG20066	One NEMA4X, 30 ft.
ZFG20067	Two NEMA4X, 20 ft (Heater Cable).
ZFG20068	Two NEMA4X, 20 ft.
ZFG20069	Two NEMA4X, 30 ft. (Heater Cable)
ZFG20070	Two NEMA4X, 30 ft
	SPARES - 0.4 METER PROBE (The following spares are recommended for a single ZFG2 - 0.4m unit)
ZFG2-0035	Complete Heater Assembly comprising: Heater, Heater ceramic insulator, Head end heater ceramic insulator, 6BA x 1/4" cheesehead screw, Clear sleeving, Black rubber sleeving and Clear heatshrink sleeving.
ZFG2-0036	Complete thermocouple/electrode lead assembly
B10734	Blanking Plug
	SPARES LIST FOR 1.0m, 1.5m, and 2.0m PROBES
ZFG2-0037	Thermocouple/electrode lead assembly
ZFG2-0038	Heater Assembly
B10734	Blanking Plug
002310036	Stainless Steel 'O' ring

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