

# General Specifications

Model ZR22S and ZR202S  
Explosionproof Direct In Situ Zirconia  
Oxygen Analyzers

EXAxi

CE

GS 11M13A01-01E-A

## Overview

This analyzer consists basically of a probe and a converter that are used as a Zirconia Oxygen Analyzer. The probe is of direct insertion type, and the converter uses a digital display.

Two types of analyzers are available: separate type and integrated type. As its name implies, the integrated type combines probe and converter.

Separate and integrated type Zirconia oxygen analyzers need not use a sampling device, and allow direct installation of the probe in the wall of a flue or furnace to measure the concentration of oxygen in the stack gas.

The converter displays the cell temperature and cell emf in addition to the oxygen concentration.

This analyzer is most suitable for monitoring combustion and controlling the low-oxygen combustion of various industrial furnaces in such explosive atmospheres as at petroleum refineries, petrochemical plants, and natural gas plants.

## Features:

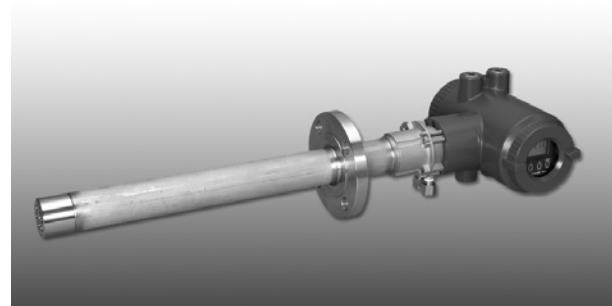
- The built-in heater and strut assemblies are field repairable for probes up to 3 meters in length.
- The probe uses a long-life, high-reliability Zirconia sensor.
- The separate type converter incorporates a LCD touch-screen for ease of operation.
- The integrated type integrates both probe and converter, to reduce wiring, piping, and installation costs. This type of unit uses an optical switch for ease of operation at the site.
- Remote maintenance using digital communications (HART) reduces maintenance costs. \*1

\*1: HART is a registered trademark of HART Communication Foundation.



ZR22S

ZR402G



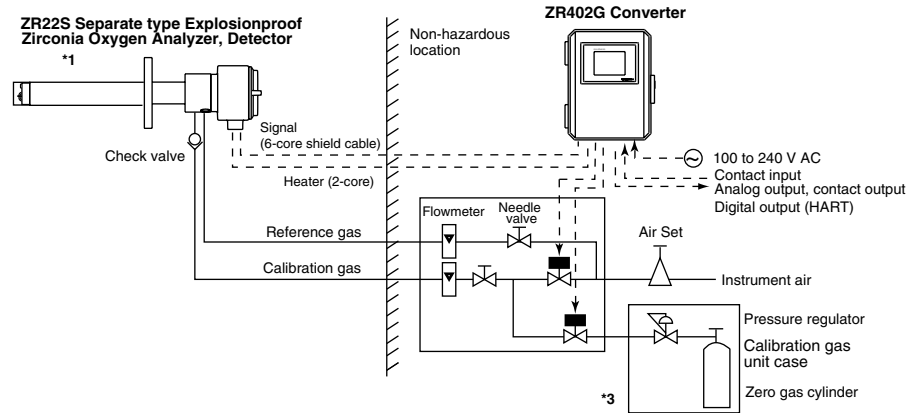
ZR202S

## Basic System Configuration

### System configuration - Separate type Explosionproof

Example 1

- Automatic calibration system uses instrument air for reference gas.  
For the calibration gas, a standard gas cylinder may be used for more accurate calibration.
- Applications: Oxygen concentration monitoring and control in large boilers (for private power generation and for business use) and in heating furnaces, and the like.

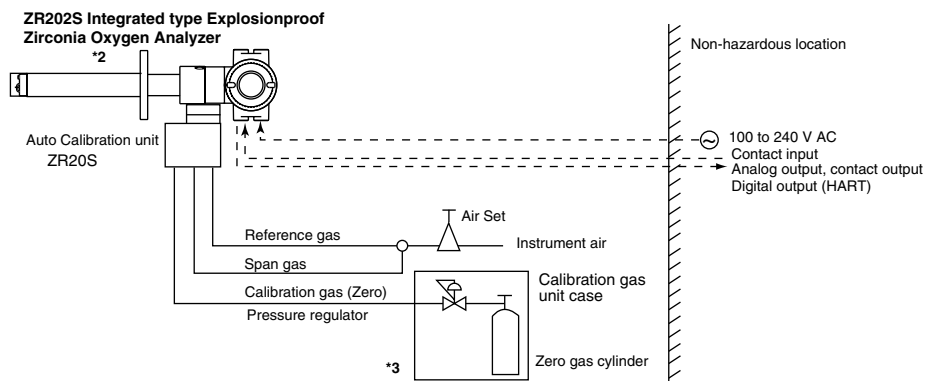


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### System configuration - Integrated type Explosionproof

Example 1

- For an integrated type as shown in the figure above.
- Applications: Oxygen concentration monitoring and control in large boilers (for private power generation and for business use) and in heating furnaces, and the like.



Note:  
The installation temperature limits range for integrated type analyzer is -20 to 55 °C.

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\*1 Shield cable:

Use shielded signal cables, and connect the shields to the FG terminal of the converter.

\*2 Select the desired probe from the Probe Configuration table on page 4.

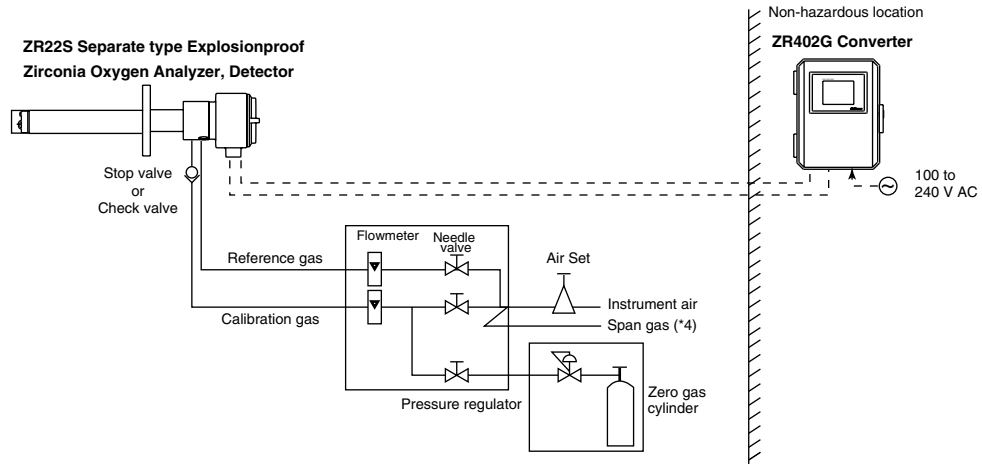
\*3 When a zirconia oxygen analyzer is used, 100% N<sub>2</sub> gas cannot be used as the zero gas. Use approx. 1 vol% O<sub>2</sub> gas (N<sub>2</sub>-balanced).

## Basic System Configuration

### System configuration – Separate type Explosionproof

**Example 2**

- Instrument air is used as the reference gas.  
A standard gas cylinder can be used for the calibration gas for more accurate calibration.
- Application example: Oxygen concentration monitoring and control in large boilers (for private power generation and for business use) and in heating furnaces.



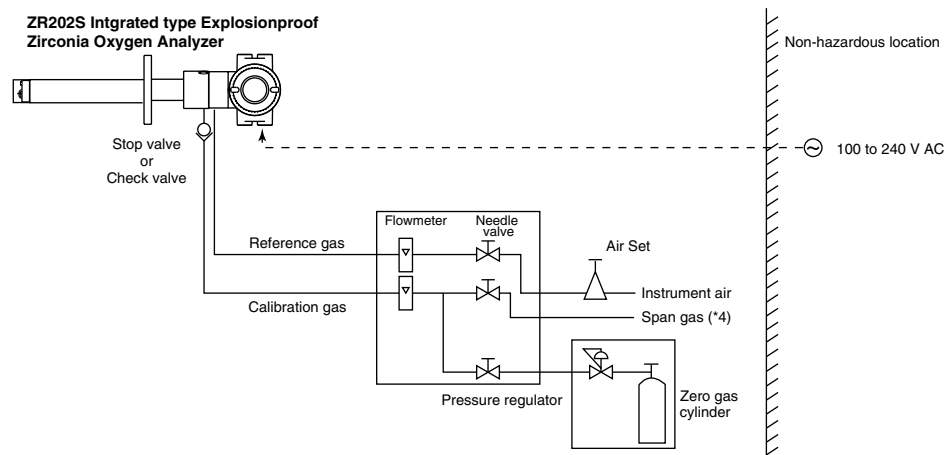
\*4 Calibration gas unit same as for zero gas.

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### System configuration – Integrated type Explosionproof

**Example 2**

- Instrument air is used as the reference gas.  
A standard gas cylinder can be used for the calibration gas for more accurate calibration.
- Application example: Oxygen concentration monitoring and control in large boilers (for private power generation and for business use) and in heating furnaces.



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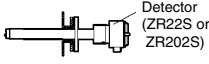
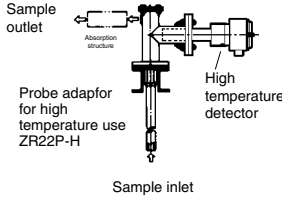
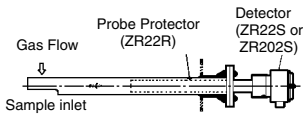
**System Components**

System Components		Separate type		Integrated type	
		System config.		System config.	
		Ex. 1	Ex. 2	Ex. 1	Ex. 2
1	ZR22S Separate type Explosionproof Zirconia Oxygen Analyzers Detector	●	●		
2	ZR402G Separate type Zirconia Oxygen Analyzer, Converter(*1)	●	●		
3	ZR202S Integrated type Explosionproof Zirconia Oxygen Analyzers			●	●
4	ZR22P Adapter for High Temperature Probe of separate type Zirconia Oxygen Analyzer	○	○		
5	ZR22R Probe Protector for Zirconia Oxygen Analyzers	○	○	○	○
6	K9292DS Check Valve for Calibration-gas line	●	(●)		(●)
7	G7011XF/E7040EL, G7004XF/K9473XG Air Set	●	●	●	●
8	M1132ZX Pressure Regulator for Gas Cylinder	●	●	●	●
9	ZR22A, ZR202A Heater for Spare Parts	○	○	○	○

- : Items required for the above system example
- : To be selected depending on each application. For details, refer to Chapter of Options.
- (●) : Select either
- (\*1) : When used as a high temperature humidity analyzer, specify /HS options.

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**Detector Components**

Process gas temperature 0 to 700°C				Process gas temperature 0 to 1400°C	
Mounting	Insertion length	General-use Probe	Application	High temperature detector	Application
Horizontal to vertical	0.4 to 2 m		Boiler Heating furnace		Heating furnace
Horizontal to vertical	2 m or less		For pulverized coal boiler with gas flow velocity 10 m/s or more	Temperature: Probe material SUS310S 800°C Probe material SiC 1400°C Mounting: Vertical downwards Insertion length: 1.0m, 1.5m When duct pressure is atmospheric or negative, attach air ejector. High temperature auxiliary ejector (M1132KE)	

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**Application Example:**

Separate and integrated type Zirconia Oxygen Analyzers

- Large, medium and small boilers (boilers for power generation: heavy oil, gas or coal)
  - Various industrial furnaces (refinery process/iron manufacture heating furnace, coal kiln, and black liquid recovery boilers)
- For other applications, contact Yokogawa Electric Corporation.
- May not be applicable corrosive gas such as ammonia, chlorine is present-check with YOKOGAWA.

## STANDARD SPECIFICATIONS

### General Specifications

Measurement Object: Oxygen concentration in combustion exhaust gas and mixed gas (excluding inflammable gases). May not be applicable corrosive gas such as ammonia, chlorine is present-check with YOKOGAWA.

Measurement System: Zirconia system

Explosionproof Approval:

ZR22S-A (ATEX);

ApplicableStandard;EN50014:1997  
+A1, +A2, EN50018:2000+A1  
EN 50281-1:1998+A1

Certificate: KEMA 04ATEX2156  
Type of Protection and Marking  
Code: EEx d HB+HB+H<sub>2</sub>

Group: II  
Category:2GD  
Temperature Class: T2  
The maximum surface temperature  
for dust-proof: T300°C  
Enclosure: IP66

ZR22S-B (FM);

Applicable Standard: FM3600 1998,  
FM3615 1989, FM3810  
2005, ANSI/NEMA 250 1991

Explosionproof for Class I, Division  
1, Groups B, C and D  
Dust-ignition proof for Class II/III,  
Division 1, Groups E, F and G  
Enclosure Rating: NEMA 4X  
Temperature Class: T2

ZR22S-C (CSA);

Applicable Standard: C22.2 No.  
0-M1991, C22,2 No. 0.4-04,  
C22.2 No.0.5-1982, C22.2  
No.25-1966, C22.2 No. 30-M1986,  
C22.2 No.94-M91, C22.2-No.61010-1-04  
Certificate: 1649642

Explosionproof for Class I, Division  
1, Groups B, C and D  
Dust-ignitionproof for Class II/III,  
Division 1, Groups E, F and G  
Enclosure: Type 4X  
Temperature Class: T2

ZR22S-D (IECEx);

IECx flameproof type  
Applicable Standard: IEC 60079-0:2004,  
0:2004, IEC 60079-1:2003,  
IEC 61241-0:2004, IEC  
61241-1:2004

Certificate: IECEx KEM 06.0006  
Ex d IIB+H<sub>2</sub> T2  
Enclosure: IP66  
IECEx type of protection "Dust"  
Ex tD A21 IP66 T300KC  
Enclosure: IP66

ZR202S-A (ATEX);

ApplicableStandard: EN50014:1997  
+A1, +A2, EN50018:2000,  
EN 50281-1:1998

Certificate: KEMA 04ATEX2156  
Type of Protection and Marking  
Code: EEx d HB+H<sub>2</sub>

Group: II  
Category: 2GD  
Temperature Class: T2  
The maximum surface temperature  
for dust-proof: T300°C  
Enclosure: IP66

ZR202S-B (FM);

Applicable Standard: FM3600 1998  
FM3615 1989, FM3810  
2005, ANSI/ASME 250 1991

Explosionproof for Class I, Division  
1, Groups B, C and D  
Dust-ignitionproof for Class II/III,  
Division 1, Groups E, F and G  
Enclosure Rating: NEMA 4X  
Temperature Class: T2

ZR202S-C (CSA);

Applicable Standard: C22.2 No.0-M1991,  
C22.2 No. 0.4-04, C22.2 No.0.5-1982,  
C22.2 No.25-1966, C22.2 No.30-M1986,  
C22.2 No.94-M91, C22.2-No.61010-1-04

Certificate: 1649642  
Explosionproof for Class I, Division  
1, Groups B, C and D  
Dust-ignitionproof for Class II/III.  
Division 1, Groups E, F and G  
Enclosure: Type 4X  
Temperature Class: T2

ZR202S-D (IECEx);

IECEx flameproof type  
Applicable Standard: IEC 60079-0:2004,  
IEC 60079-1:2003, IEC 61241-0:2004,  
IEC 61241-1:2004

Certificate: IECEx KEM 06.0006  
Ex d IIB+H<sub>2</sub> T2  
Enclosure: IP66  
IECEx type of protection "Dust"  
Ex tD A21 IP66 T300°C  
Enclosure:IP66

Oxygen Concentration: 0.01 to 100 vol% O<sub>2</sub>

Output Signal: 4 to 20 mA DC (maximum load resistance  
550Ω)

Measurement Range: Any setting in the range of 0 to 5  
through 0 to 100 vol% O<sub>2</sub> (in 1 vol% O<sub>2</sub>), or  
partial range

Digital Communication (HART): 250 to 550Ω, depending  
on number of field devices connected to the  
loop (multi-drop mode).

Note: HART is a registered trademark of the HART Communication  
Foundation.

Display Range: 0 to 100 vol% O<sub>2</sub>

Warm-up Time: Approx. 20 min.

Repeatability:  
 $\pm 0.5\%$  Maximum value of set range. (less than 0 to 25 vol% O<sub>2</sub> range)  
 $\pm 1\%$  Maximum value of set range.  
 (0 to 25 vol% O<sub>2</sub> or more and up to 0 to 100 vol% O<sub>2</sub> range)

Linearity: (Excluding standard gas tolerance)  
 $\pm 1\%$  Maximum value of set range; less than 0 to 25 vol% O<sub>2</sub> range

Drift: (Excluding the first two weeks in use)  
 Both zero and span  $\pm 2\%$  Maximum value of set range/month

Response Time:  
 Response of 90% within 60 seconds.  
 (Measured after gas is introduced from calibration gas inlet and analog output starts changing.)

### 1. ZR22S Separate type Explosionproof Zirconia Oxygen Analyzer, Detector

Sample Gas Temperature: 0 to 700°C (Probe only)  
 It is necessary to mount the cell using Inconel cell-bolts when the temperature is greater than 600°C.  
 700 to 1400°C (with High Temperature Probe Adapter)  
 For high-temperature sample gas, apply 0.2 m length probe and High Temperature Probe Adapter ZR22P-H.  
 Sample Gas Pressure: -0.725 to +0.725 psi  
 For 0.15m probe, -0.0725 to +0.725 psi. No pressure fluctuation in the furnace should be allowed.

Probe Length: 0.15, 0.4, 0.7, 1.0, 1.5, 2.0 m  
 \*The built-in heater and strut assemblies are field repairable for probes up to 3 meters in length.

Probe Material: SUS 316 (JIS)  
 Ambient Temperature: -20 to +60°C (-20 to +150°C on the case surface)

Reference Air System: Instrument Air  
 Instrument Air System: Pressure; 7.25 psi + the pressure inside the furnace (It is recommended to use air which has been dehumidified by cooling to dew point -20°C or less, and dust or oil mist removed.)  
 Consumption; Approx. 1NI/min

Material in Contact with Gas: SUS 316 (JIS), Zirconia, SUS 304 (JIS) (flange), Hastelloy B, (Inconel 600, 601)

Construction: Heater and thermocouple replaceable construction.  
 Equivalent to NEMA 3/IP55.

Terminal Box Case: Material; Aluminium alloy  
 Terminal Box Paint Color: Case: Silver gray (Munsell 3.2PB7.4/1.2)  
 Cover: Mint green (Munsell 5.6BG3.3/2.9)

Finish: Polyurethane corrosion-resistance coating  
 Gas Connection: 1/4 NPT  
 Wiring Connection: 1/2 NPT  
 Installation: Flange mounting  
 Probe Mounting Angle:  
 Installing at angles from horizontal to vertical downward is possible.

Weight:  
 Insertion length of 0.4 m: approx. 28.7 lbs (ANSI 150 4)  
 Insertion length of 1.0 m: approx. 33.1 lbs (ANSI 150 4)  
 Insertion length of 1.5 m: approx. 37.5 lbs (ANSI 150 4)  
 Insertion length of 2.0 m: approx. 41.9 lbs (ANSI 150 4)

### 2. ZR402G Separate type Zirconia Oxygen Analyzer, Converter

Operated using an LCD touchscreen on the converter.  
 Display: LCD display of size 320 by 240 dot with touchscreen.  
 Output Signal: 4 to 20 mA DC, two points (maximum load resistance 550Ω)  
 Contact Output Signal: four points (one is fail-safe, normally open)  
 Contact Input: two points  
 Auto-calibration Output: Two points (for dedicated auto-calibration unit)

Ambient Temperature: -20 to +55°C  
 Storage Temperature: -30 to +70°C  
 Humidity Range: 0 to 95% RH (non-condensing)  
 Installation Altitude: 2000 m or less  
 Category based on IEC 1010: II (Note)  
 Pollution degree based on IEC 1010: 2 (Note)  
 Note: Installation category, called over-voltage category, specifies impulse withstand voltage. Category II is for electrical equipment.  
 Pollution degree indicates the degree of existence of solid, liquid, gas or other inclusions which may reduce dielectric strength. Degree 2 is the normal indoor environment.

Power Supply Voltage: Ratings; 100 to 240 V AC  
 Acceptable range; 85 to 264 V AC  
 Power Supply Frequency: Ratings; 50/60 Hz  
 Acceptable range; 45 to 66 Hz  
 Power Consumption: Max. 300 W, approx. 100 W for ordinary use.

Safety and EMC conforming standards  
 Safety: Conforms to EN 61010-1: 2001  
 CSA C22.2 No.1010-1 certified  
 UL 3111-1 certified  
 EMC: Conforms to EN 61326: 1998 + A2: 2001 class A  
 EN61000-3-2: 2000  
 EN61000-3-3: 1995 + A1: 2001

Maximum Distance between Probe and Converter:  
 Conductor two-way resistance must be 10Ω or less (when a 1.25 mm<sup>2</sup> cable or equivalent is used, 300 m or less.

Construction: Outdoor installation, equivalent to NEMA 4 (with conduit holes completely sealed with a cable gland)

Wiring Connection: 1/2 NPT, eight holes  
 Installation: Panel, wall or 2-inch pipe mounting  
 Case: Aluminum alloy  
 Paint Color: Door: Mint green (Munsell 5.6BG3.3/2.9)  
 Case: Silver gray (Munsell 3.2PB7.4/1.2)  
 Finish: Polyurethane corrosion-resistance coating  
 Weight: Approx. 13.2 lbs

**Functions**

Display Functions:  
 Value Display  
 Graph Display  
 Data Display  
 Status Message  
 Alarm, Error Display  
 Calibration Functions:  
 Auto-Calibration  
 Semi-auto Calibration  
 Manual Calibration  
 Blowback Function  
 Maintenance Functions  
 Setup Functions  
 Self-diagnosis  
 Password Functions  
 Display and setting content  
 Display Items  
 Calibration Setting Items  
 Equipment Related Items  
 Output Related Items  
 Alarm Related Items  
 Contact Related Items  
 Converter Output  
 Contact Output  
 Contact Input  
 Contact capacity  
 Self-diagnosis  
 Calibration

### 3. ZR202S Integrated type Explosionproof Zirconia Oxygen Analyzer

Display: 6-digit LCD  
 Switch: Three optical switches  
 Output Signal: 4 to 20 mA DC, one point (maximum load resistance 550Ω)  
 Digital Communication (HART): 250 to 550Ω, depending on quantity of field devices connected to the loop (multi-drop mode).  
 Note: HART is a registered trademark of the HART Communication Foundation.  
 Contact Output Signal: Two points (one is fail-safe, normally open)  
 Contact Input Signal: Two points  
 Sample Gas Temperature: 0 to 700°C  
 It is necessary to mount the cell using Inconel cell-bolts when the temperature measures more than 600°C.  
 High-temperature service — greater than 700°C — is not available.  
 Sample Gas Pressure: -0.725 to + 0.725 psi  
 No pressure fluctuation in the furnace should be allowed.  
 Probe Length: 0.4, 0.7, 1.0, 1.5, 2.0  
 \*The built-in heater and strut assemblies are field repairable for probes up to 3 meters in length.  
 Probe Material: SUS 316 (JIS)  
 Ambient Temperature: -20 to +55°C (- 5 to +70°C on the case surface)  
 Storage Temperature: -30 to +70°C  
 Humidity Range: 0 to 95 %RH (non-condensing)  
 Installation Altitude: 2000 m or less  
 Category based on IEC 1010: II (Note)

Pollution degree based on IEC 1010: 2 (Note)  
 Note: Installation category, called over-voltage category, specifies impulse withstand voltage. Category II is for electrical equipment.  
 Pollution degree indicates the degree of existence of solid, liquid, gas or other inclusions which may reduce dielectric strength. Degree 2 is the normal indoor environment.  
 Power Supply Voltage: Ratings; 100 to 240 V AC  
 Acceptable range; 85 to 264 V AC  
 Power Supply Frequency: Ratings; 50/60 Hz  
 Acceptable range; 45 to 66 Hz  
 Power Consumption: Max. 300 W, approx. 100 W for ordinary use.  
 Safety and EMC conforming standards  
 Safety: Conforms to EN 61010-1: 2001  
 CSA C22.2 No.1010-1 certified  
 UL 3111-1 certified  
 EMC: Conforms to EN 61326: 1998 + A2: 2001 classA  
 EN 61000-3-2: 2000  
 EN 61000-3-3: 1995 + A1: 2001  
 Reference Air System: Instrument Air  
 Instrument Air System: Pressure; 7.25 psi + the pressure inside the furnace (It is recommended to use air which is dehumidified to dew point -20°C or less, and dust or oil mist are removed.)  
 Consumption; Approx. 1NI/min  
 Material in Contact with Gas: SUS 316 (JIS), Zirconia, SUS 304 (JIS) (flange), Hastelloy B, (Inconel 600, 601)  
 Construction: Heater and thermocouple replaceable construction.  
 Equivalent to NEMA 3/IP55.  
 Gas Connection: Rc 1/4 NPT  
 Wiring Connection: 1/2 NPT  
 Installation: Flange mounting  
 Probe Mounting Angle:  
 Horizontal to vertically downward.  
 Installing at angles from horizontal to vertical downward is available.  
 Case: Aluminum alloy  
 Paint Color: Cover; Mint green (Munsell 5.6BG3.3/2.9)  
 Case: Silver gray (Munsell 3.2PB7.4/1.2)  
 Finish: Polyurethane corrosion-resistance coating  
 Weight:  
 Insertion length of 0.4 m: approx. 33.1 lbs (ANSI 150 4)  
 Insertion length of 1.0 m: approx. 37.5 lbs (ANSI 150 4)  
 Insertion length of 1.5 m: approx. 41.9 lbs (ANSI 150 4)  
 Insertion length of 2.0 m: approx. 46.3 lbs (ANSI 150 4)

**Functions**

- Display Function
- Alarm, Error Display
- Calibration Functions:
  - Auto-calibration
  - Semi-auto Calibration
  - Manual Calibration
- Maintenance Functions
- Setup Functions
- Display and setting content::
  - Display Related Items
  - Calibration Setting Items
  - Output Related Items
  - Alarm Related Items
  - Contact Related Items
- Converter Output:
  - Contact Output
  - Contact Input
- Self-diagnosis
- Calibration

**Model and Suffix Codes**

**1. Separate type Zirconia Oxygen Analyzer, Converter**

Model	Suffix code	Option code	Description
ZR402G	-----	-----	Separate type Zirconia Oxygen Analyzer, Converter
Converter thread	-T	-----	1/2NPT
Display	-E	-----	English
Instruction manual	-E	-----	English
—	-A	-----	Always -A
Options		/H /SCT /PT	Hood (*2) Stainless steel tag plate (*1) Printed tag plate (*1)
Tag plates			

\*1 Specify either /SCT or /PT option code.

\*2 Sun shield hood is still effective even if scratched.

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**2. Separate type Explosionproof Zirconia Oxygen Analyzer, Detectors**

Model	Suffix code	Option code	Description
ZR22S	-----	-----	Separate type Explosionproof Zirconia Oxygen Analyzer, Detector
Explosion proof Approval	-A -B -C -D	----- ----- ----- -----	ATEX certified explosionproof FM certified explosionproof CSA certified explosionproof IECEX certified flameproof
Length	-015 -040 -070 -100 -150 -200	----- ----- ----- ----- ----- -----	0.15 m (for high temperature use) (*1) 0.4 m 0.7 m 1.0 m 1.5 m 2.0 m
Wetted material	-S -C	----- -----	SUS316 Stainless steel with Inconel calibration gas tube (*7)
Flange (*2)	-A -B -C -Q -W	----- ----- ----- ----- -----	ANSI Class 150 2 RF SUS304 ANSI Class 150 3 RF SUS304 ANSI Class 150 4 RF SUS304 JIS 5K 32 FF SUS304 (for high temperature use) (*3) Westinghouse
Reference air	-E	-----	External connection (Instrument air) (*8)
Gas Thread	-T	-----	1/4NPT
Connection box thread	-T	-----	1/2NPT
—	-A	-----	Always -A
—	-A	-----	Always -A
Options	Valves  Tag plates	/C /CV /SV /SCT /PT	Inconel bolt (*4) Check valve (*5) Stop valve (*5) Stainless steel tag plate (*6) Printed tag plate (*6)

- \*1 Used with the ZR22P High Temperature Probe Adapter. Select flange (-Q).
- \*2 The thickness of the flange depends on its dimensions.
- \*3 The flange thickness does not conform to JIS specification.
- \*4 Inconel probe bolts and U shape pipe are used. Use this option for high temperature use (ranging from 600 to 700 °C).
- \*5 Specify either /CV or /SV option code.
- \*6 Specify either /SCT or /PT option code.
- \*7 Recommended if measured gas contains corrosive gas like chlorine.
- \*8 Piping for reference air must be installed to supply reference air constantly at a specified flow rate.

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### 3. Integrated type Explosionproof Zirconia Oxygen Analyzer

Model	Suffix code	Option code	Description
ZR202S	-----	-----	Integrated type Explosionproof Zirconia Oxygen Analyzer
Explosion proof Approval	-A -B -C -D	-----	ATEX certified explosionproof FM certified explosionproof CSA certified explosionproof IECEx certified flameproof
Length	-040 -070 -100 -150 -200	-----	0.4 m 0.7 m 1.0 m 1.5 m 2.0 m
Wetted material	-S -C	-----	SUS316 Stainless steel with Inconel calibration gas tube (*7)
Flange (*1)	-A -B -C -W	-----	ANSI Class 150 2 RF SUS304 ANSI Class 150 3 RF SUS304 ANSI Class 150 4 RF SUS304 Westinghouse
Auto Calibration	-N -A -B	-----	Not required Horizontal mounting (*5) Vertical mounting (*5)
Reference air	-E	-----	External connection (Instrument air) (*8)
Gas Thread	-T	-----	1/4NPT
Connection box thread	-T	-----	1/2NPT
Instruction manual	-E	-----	English
—	-A	-----	Always -A
Options		/C /CV /SV /H /SCT /PT	Inconel bolt (*2) Check valve (*3) Stop valve (*3) Hood (*6) Stainless steel tag plate (*4) Printed tag plate (*4)

- \*1 The thickness of the flange depends on its dimensions.
- \*2 Inconel probe bolts and U shape pipe are used. Use this option for high temperature use (ranging from 600 to 700°C).
- \*3 Specify either /CV or /SV option code.
- \*4 Specify either /SCT or /PT option code.
- \*5 No need to specify the option codes, /CV and /SV, since the check valves are provided with the autocalibration unit. Auto calibration cannot be used when natural convection is selected as reference air.
- \*6 Sun shield hood is still effective even if scratched. Hood is necessary for outdoor installation out of sun shield roof.
- \*7 Recommended if measured gas contains corrosive gas like chlorine.
- \*8 Piping for reference air must be installed to supply reference air constantly at a specified flow rate.

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### 4. Probe Protector for Zirconia Detectors

#### Model ZR22R LOW TEMPERATURE PROBE DETECTOR

**HOW TO ORDER:**

Specify the model number, add the insertion length, and the flange connections code selection(s) to the model number and total the prices to arrive at list price.

**PRODUCT NOTES**

**PROBE PROTECTOR** - This accessory is used when the sample gas flow velocity is approximately 10 m/sec (33 ft./sec) or more and dust particles may attack the probe, such as in the case of coal fired boilers. The probe protector **MUST** be the same length and flange type as the probe.

Code	Model Description	Note
ZR22R	Low temperature probe protector	
	Insertion Length	
-040	0.40 m (1'4 inch)	
-046	0.46 m (1'6 inch)	
-100	1.00 m (3'3 inch)	
-150	1.50 m (4'11 inch)	
-200	2.00 m (6'7 inch)	
-250	2.50 m (8'2 inch)	
-300	3.00 m (9'10 inch)	
	Flange Connection	
-C*U	ANSI 4.0 inch, 150#FF flange	
	Accessories	
M1132LL	Support clamp for ZR22G for retrofit	

The model ZR22R Probe Protectors are required for coal-fired applications, or other applications with particulate laden flue gas, where the gas flow is 10 meters/second or more.

- Insertion Length: 1.5 m, 1.55 m, 2.05 m.
- Flange: ANSI CLASS 150-4-FF (without serration) equivalent
- Material: SUS316 (JIS), SUS304 (JIS) (Flange)
- Weight: 1.05 m; Approx. 10 kg
- 1.55 m; Approx. 13 kg
- 2.05 m; Approx. 16 kg

## 5. Probe Support for Zirconia Detectors

### Model ZR22V LOW TEMPERATURE PROBE SUPPORT

**HOW TO ORDER:**

Specify the model number, add the insertion length, and the flange connections code selection(s) to the model number and total the prices to arrive at list price.

Code	Model Description	Note
ZR22V	Low temperature probe support	
	Insertion Length	
-150	1.50 m (for use with 3.0m probe or longer)	
	Flange Connection	
-C*U	ANSI 4.0 inch, 150#FF flange	
	Accessories	
M1132LL	Support clamp for ZR22 for retrofit	

ZR22V Probe Supports are needed if the detector is 2.5 meter or greater, horizontal installation is required, and no probe protector (ZR22R) is used.

## 6. Adapter for High Temperature Probe of Separate Type Oxygen Analyzer (for applications above 700°C)

### Model ZR22P HIGH TEMPERATURE PROBE ADAPTER

**HOW TO ORDER:**

Specify the model number, add the Tee configuration, transport tube material, insertion length, flange connection and options code selection(s) to the model number and total the prices to arrive at list price.

Code	Model Description	Note
ZR22P	High temperature probe adapter	
	Tee Configuration	
-H	Basic design (side eductor port)	
-T	Basic design (bottom port)	
-S	Split design (for blowback)	
	Transport Tube Material	
-A	Silicon carbide (SiC) (Up to 2600°F/1427°C)	
-B	310 S stainless steel (up to 1980°F/1082°C)	
-C	Alumina ceramic (up to 3400°F/1871°C)	
-N	No transport tube	
	Insertion Length	
-033	0.3 m (1'8 inch)	
-050	0.5 m (1'8 inch)	
-100	1.00 m (3'3 inch)	
-150	1.5 m (4'11 inch)	
-300	3.0 m (9'10) (requires probe support or protector)	
-NNN	No transport tube	
	Flange Connection	
-C*U	ANSI 4.0 inch, 150# RF flange	
	Options Eductor	
/BE	Air eductor pre-attached with regulator & gauge (cannot be used with /HT or /AV)	
/ER	Air eductor with return exhaust pre-attached with regular & gauge	
/SE	Separate air eductor, regulator & gauge (not pre-attached)	
	Options Tag	
/SCT	Stainless steel tag (attached with wire)	

**ZR22P-H High Temperature Probe Adapter for Separate type Oxygen Analyzer**

Measuring O2 in the high temperature gases (exceeds 700°C) requires a general-use probe ZR22G of 0.15 m length and a high-temperature probe adapter (model ZR22P).

aprox. 8.5 kg (ANSI)  
 Insertion length of 1.5m: approx. 7.5 kg (JIS) /  
 approx. 9.5 kg (ANSI)

Sample gas temperature: 0 to 1800°C  
 Sample gas pressure: -0.725 to 36.3 psi  
 (+0.725 to +36.3 requires pressure compensation.)  
 Insertion length: 1 m, 1.5 m  
 Material in Contact with Gas: SUS 316, Zirconia, SUS 304 (flange)

Probe Material: varies 4 inch ANSI  
 Installation: Flange mounting  
 Construction: Non explosion-proof. Rainproof construction.  
 Weight: Insertion length of 1.0 m: approx. 6.5 kg (JIS) /

**7. Heater Assembly**

Model	Suffix code	Option code	Description
ZR22A	.....	.....	Heater Assembly for ZR22S
Length (*1)	-015 .....	.....	0.12 m
	-040 .....	.....	0.4 m
	-070 .....	.....	0.7 m
	-100 .....	.....	1 m
	-150 .....	.....	1.5 m
	-200 .....	.....	2 m
Jig for change	-A .....	.....	with Jig (*2)
	-N .....	.....	None
—		-A .....	Always -A

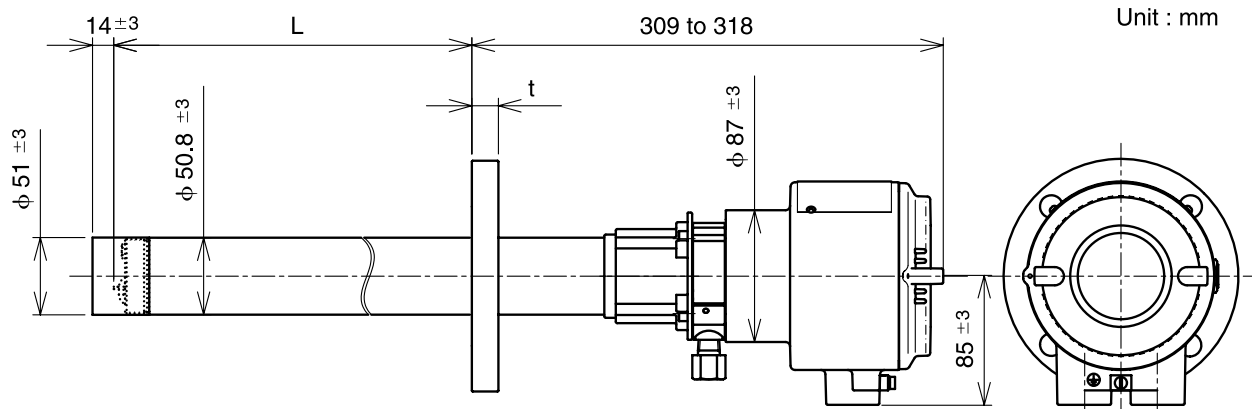
\*1 Suffix code of length should be selected as same as ZR22S installed.  
 \*2 Jig part no. is K9470BX to order as a parts after purchase.  
 (Note) The heater is made of ceramic, do not drop or subject it to pressure stress.  
 Yokogawa shall not guarantee the heater assembly after its replacement.  
 T20.EPS

Model	Suffix code	Option code	Description
ZR202A	.....	.....	Heater Assembly for ZR202S
Length (*1)	-040 .....	.....	0.4 m
	-070 .....	.....	0.7 m
	-100 .....	.....	1 m
	-150 .....	.....	1.5 m
	-200 .....	.....	2 m
Jig for change	-A .....	.....	with Jig (*2)
	-N .....	.....	None
—		-A .....	Always -A

\*1 Suffix code of length should be selected as same as ZR202S installed.  
 \*2 Jig part no. is K9470BX to order as a parts after purchase.  
 (Note) The heater is made of ceramic, do not drop or subject it to pressure stress.  
 Yokogawa shall not guarantee the heater assembly after its replacement.  
 T21.EPS

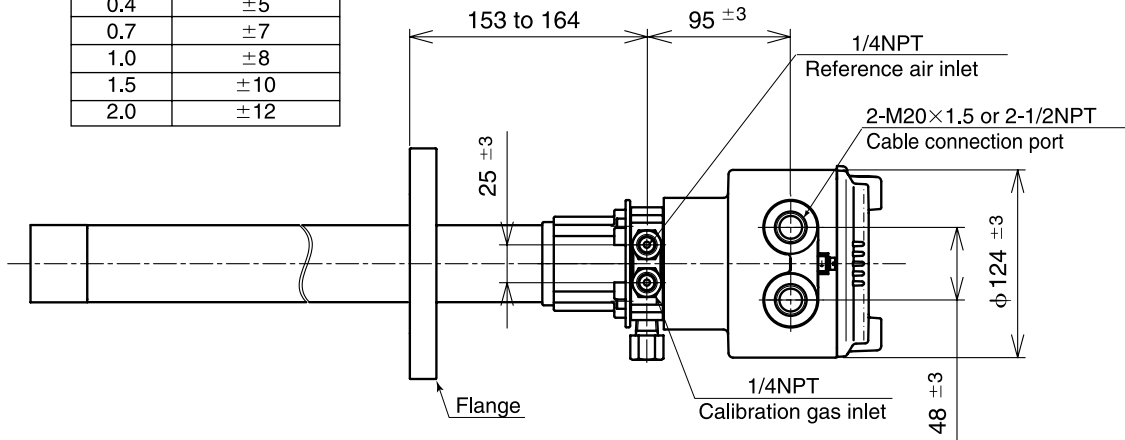
**EXTERNAL DIMENSIONS**

**1. ZR22S Separate type Explosionproof Zirconia Oxygen Analyzer, Detectors**

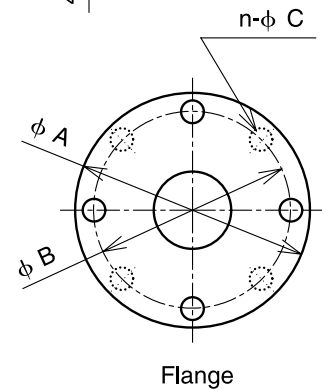


Unit : mm

L (m)	tolerance (mm)
0.12	±4
0.4	±5
0.7	±7
1.0	±8
1.5	±10
2.0	±12

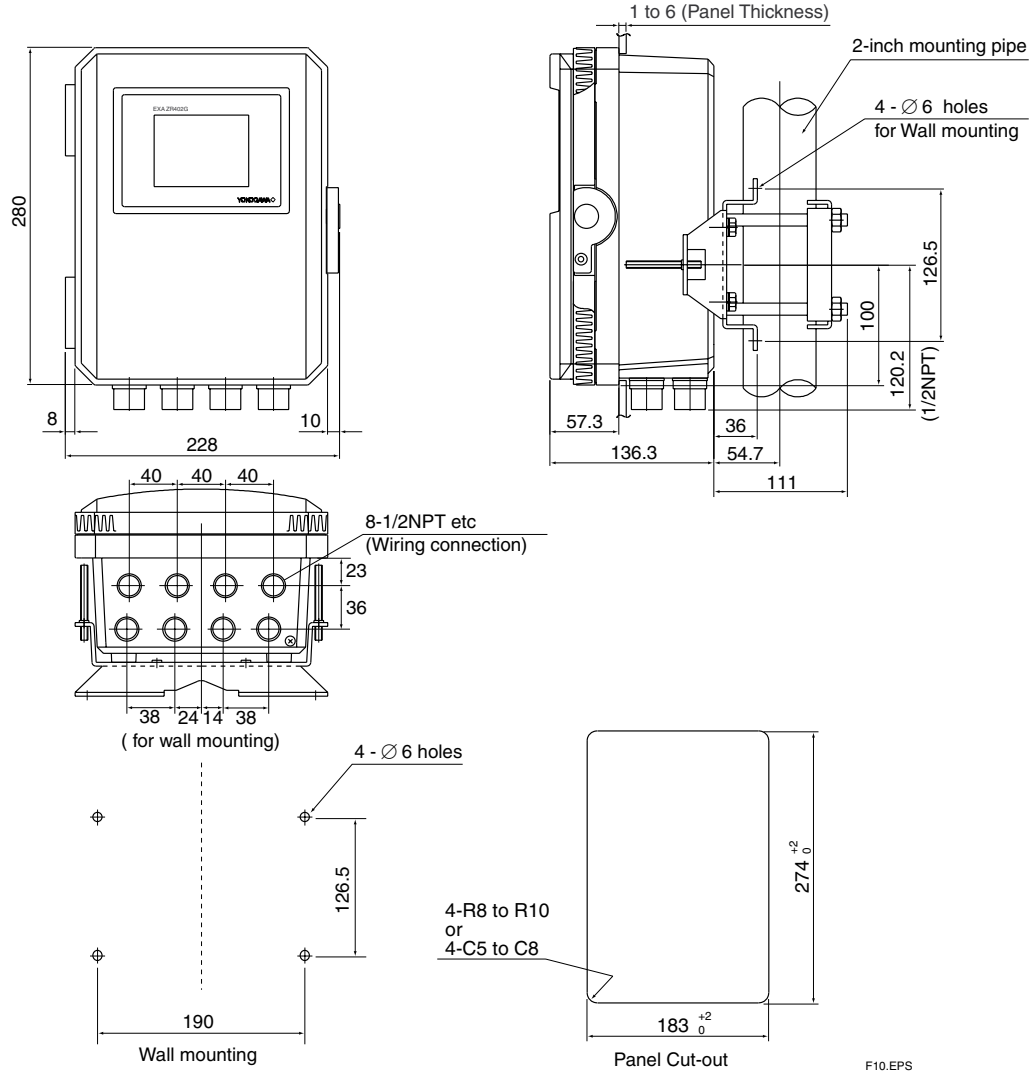


Flange	A	B	n	C	t
ANSI Class 150 2 RF SUS304	152.4	120.6	4	19	19
ANSI Class 150 3 RF SUS304	190.5	152.4	4	19	24
ANSI Class 150 4 RF SUS304	228.6	190.5	8	19	24
JIS 5K 32 FF SUS304	115	90	4	15	5
Westinghouse	155	127	4	11.5	14



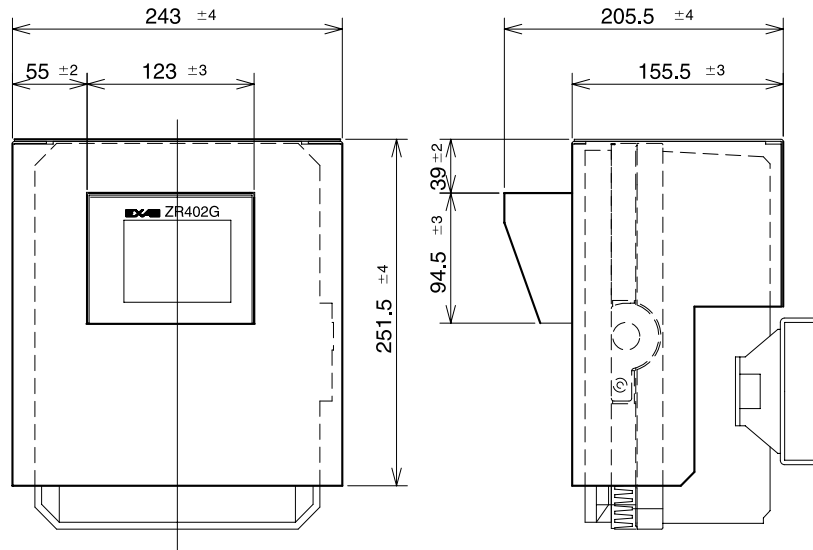
F09.EPS

2. ZR402G Separate type Zirconia Oxygen Analyzer, Converter



F10.EPS

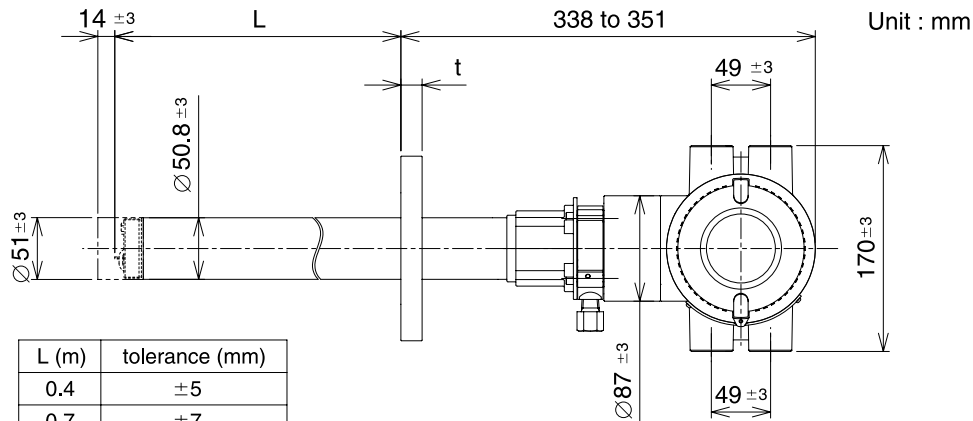
● With sun shield hood (option code /H)



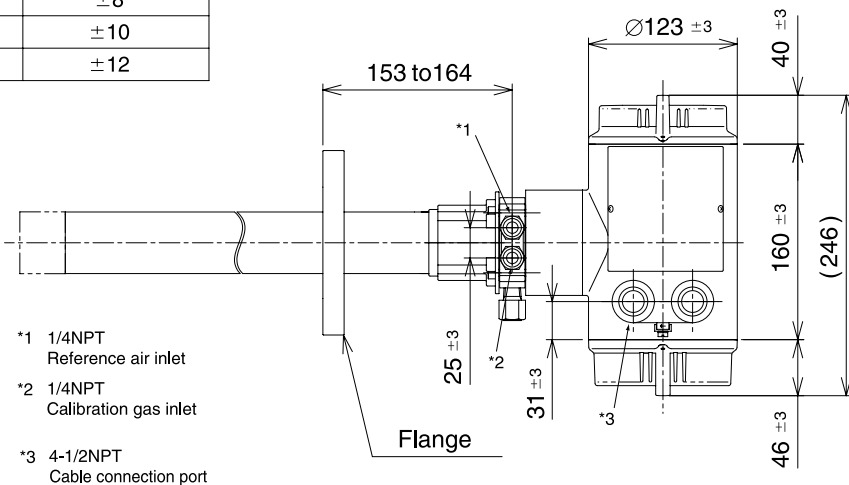
Material of HOOD : Aluminum

F11.EPS

### 3. ZR202S Integrated type Explosionproof Zirconia Oxygen Analyzers



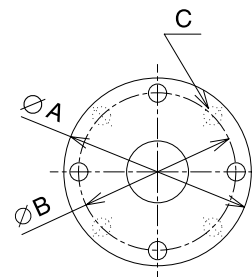
L (m)	tolerance (mm)
0.4	±5
0.7	±7
1.0	±8
1.5	±10
2.0	±12



- \*1 1/4NPT  
Reference air inlet
- \*2 1/4NPT  
Calibration gas inlet
- \*3 4-1/2NPT  
Cable connection port

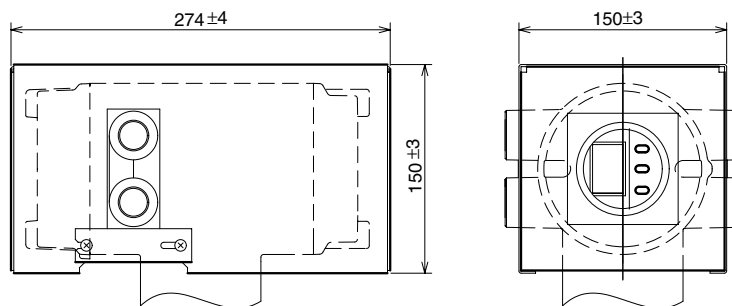
Flange	A	B	C	t
ANSI Class 150 2 RF SUS304	152.4	120.6	4 - Ø19	19
ANSI Class 150 3 RF SUS304	190.5	152.4	4 - Ø19	24
ANSI Class 150 4 RF SUS304	228.6	190.5	8 - Ø19	24
Westinghouse	155	127	4 - Ø11.5	14

F12.EPS



Flange

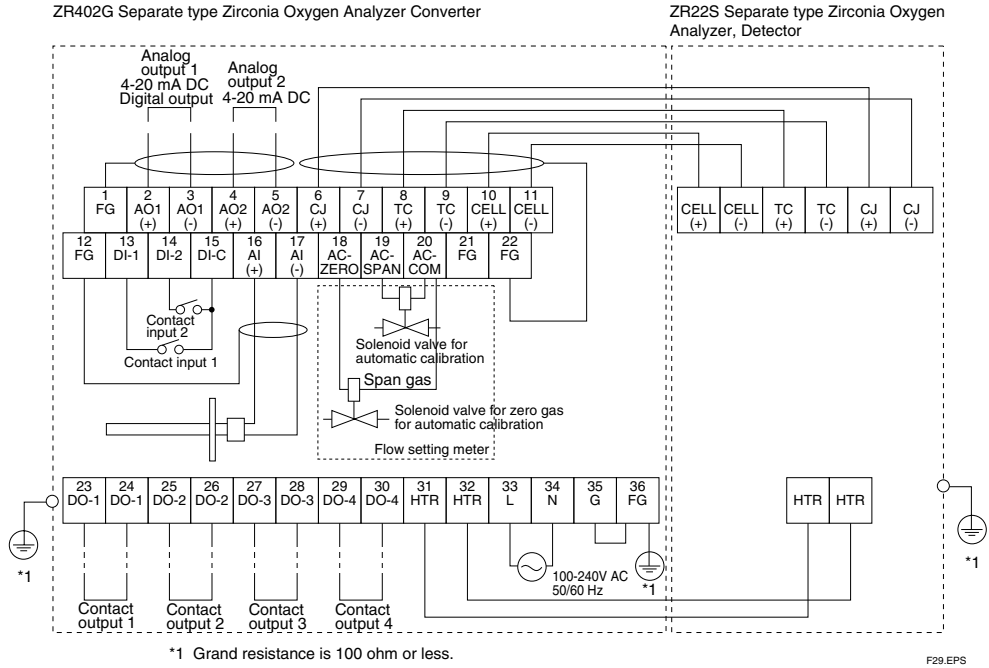
● With sun shield hood (option code /H)



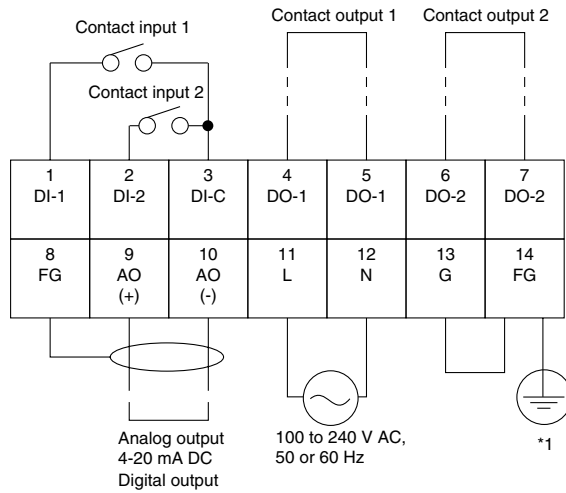
Material of HOOD : Aluminum

F13.EPS

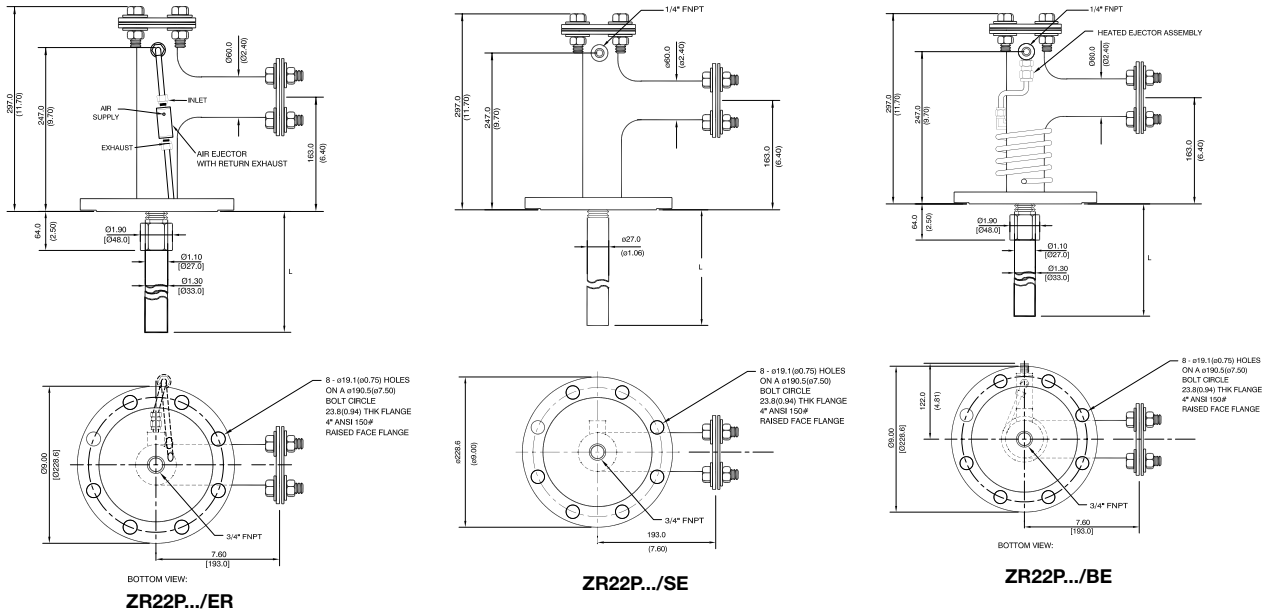
## ■ WIRING CONNECTIONS



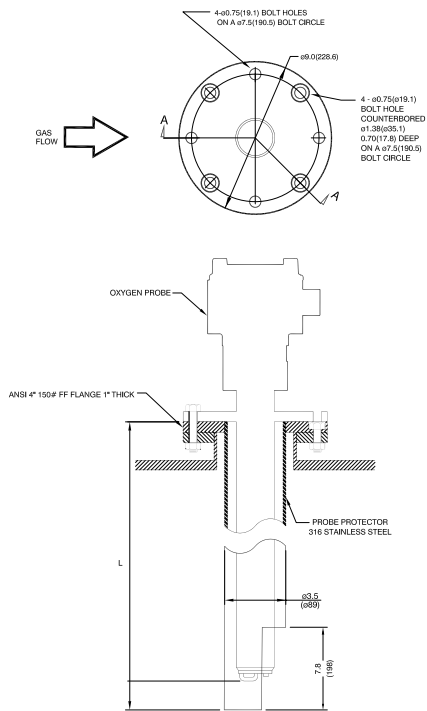
### ZR202S Integrated type Zirconia Oxygen Analyzer



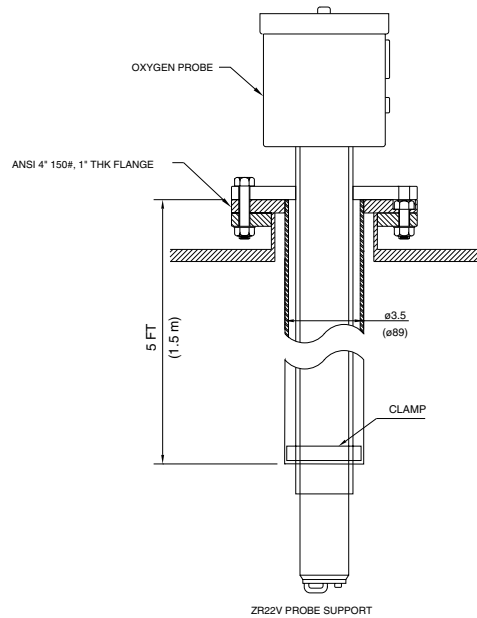
### 4. Model ZR22P Adapter for High Temperature Probe of Separate type Oxygen Analyzer



### 5. ZR22R Probe Protector for Zirconia Oxygen Analyzer



### 6. ZR22V Probe Support



**OPTIONS**

**1. Filter to Oxygen Analyzer E7042UQ**

This filter is used to protect the cell from corrosive dust components in natural gas or oil applications. Measured gas flow rate is needed to be 1m/sec or more to replace gas inside zirconia sensor.

Mesh: 30 microns

Material: Carborundum (Filter), SUS316 (JIS)

Weight: Approx. 0.2kg

**2. M1234SE-A Self Cleaning Fly-Ash Filter**

This uniquely designed filter protects the Zirconia sensor in harsh coal-fired applications. The design prevents accumulation of fly-ash that would clog other fly-ash filters.

Filter material: Hastaloy X

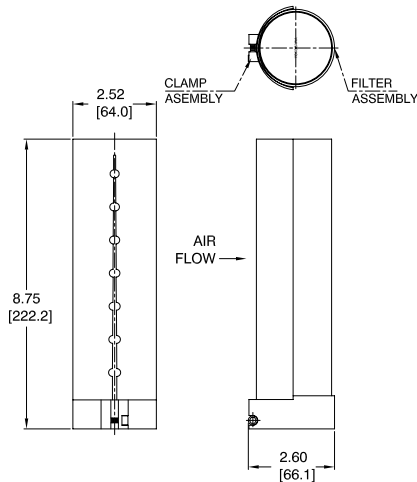
Base Material: SSSL 316

Max OD: 6.35cm (2.5 in)

Filter surface area: 296 sq-cm (46 sq-in)

Max opera. temp.: 700°C (1292°F)

Pore size: 10 micron



**3. M1200DB-06 Hastelloy X Sintered Filter Assembly**

This filter addresses blockage and coating problems experienced by tough applications.

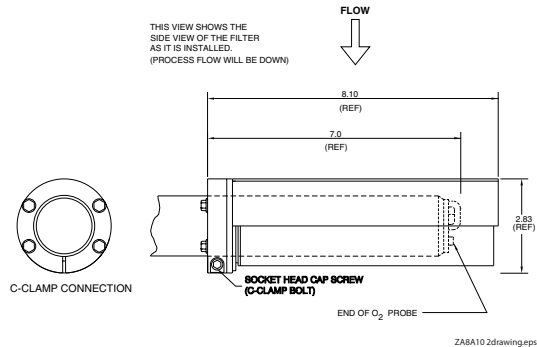
Mesh: 10 microns (filter)

Material: Hastelloy X

Maximum Temperature Rating: 1292°F (700°C)

Connection: Stainless Steel c-clamp with bolts

Weight: Approximately 18 lb (.8kg)



**4. M1234VV-A Check Valve (/ CV option)**

The check valve prevents the water vapor in the process from diffusing down the calibration line where it may condense and cause the cell to crack. A check valve should be used on all natural gas and positive pressure applications and any time a cal line is installed with long periods (>3 months) of time between calibrations.

Connection: 1/4 FNPT inlet; 1/4" MNPT outlet

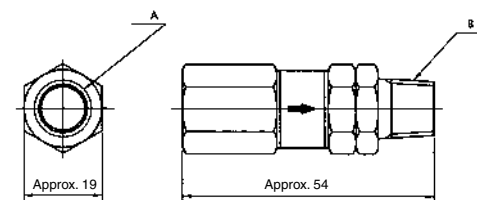
Material: 304SS

Cracking Pressure: 1 psi

Weight: Approximately 0.1lb (50g)

Note: The check valve is not a substitution for an inline filter for removing moisture from instrument air source.

Unit: mm



**5. Auxiliary Eductor Assembly, Model No. M1132KE**

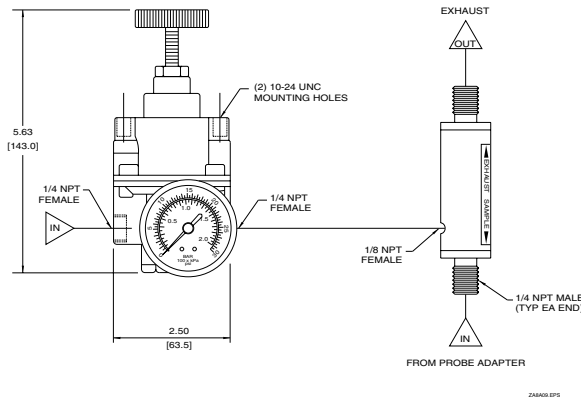
High temperature installations require the use of the auxiliary eductor assembly in all negative pressure

installations. using instrument air, the auxiliary eductor

draws a sample through the adapter tee for quick measurement without mechanical assistance. The assembly includes an eductor, regulator and pressure

gauge and is included in the eductor option for the ZR22P high temperature adapter tee.

Note: Positive pressure requires the use of a needle valve to restrict the flow of sample gas.



**6. Eductor, Model No. M1132KA (spare)**

The ejector induces flow of the sample from the process through the transport tube. The draft causes the sample flow from the process to be pulled through a high temperature adapter tee (i.e. transport tube).

Material: 316SS

Air Supply: 1/8" NPT female

Exhaust: 1/8" NPT male straight

Vacuum Force: 7.6" Hg

Vacuum Flow: 2.4 SCFM

Air Consumption: 1.7 SCFM

Weight: 6oz (170g)

Vacuum: 1/8" NPT male

**7. Pressure Regulator, Model no. M1132KD (spare)**

This general purpose regulator is used to adjust the flow of instrument air entering the eductor. Made of durable materials and corrosion resistant construction, it provides reliable operation in harsh industrial environments.

Flow Capacity: 20SCFM (33.6 m3/hr) at 100psig (700 kPa) supply - 20 psig (140 kPa) outlet.

Exhaust Capacity: 0.1 SCFM (0.17 m3/hr) - downstream pressure 5 psig (35 kPa) above setpoint.

Sensitivity: 1" (2.5 cm) of water

Effect of Supply Pressure Variation: Less than 0.2 psig (1.4 kPa) for 25 psi (170 kPa) change.

Maximum Supply Pressure: 250 psig (1700 kPa)

Air Consumption: Less than 6 SCFH (0.17 m3/hr)

Output Range: 0 to 60 psi ( 0 to 400 kPa)

Port Size: 1/4" NPT

Materials: Body - Die cast aluminum alloy; Diaphragm - Nitrile elastomer and nylon fabric; Trim - Brass, zinc plated steel, acetal.

Weight: 4.0lb (1.8kg)

**8. Pressure Gauge, Model no. M1132ME**

Indicates the pressure of instrument air flowing into the eductor.

Gauge size: 2"

Measure range: 0 to 60 psi (0 to 400 kPa)

Connection: 1/4" FNPT

Weight: 0.5 lb (0.2 kg)

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