

General Specifications

Model ZR22G, ZR402G, and ZR202G
Direct In Situ Zirconia Oxygen Analyzers

EX4xi

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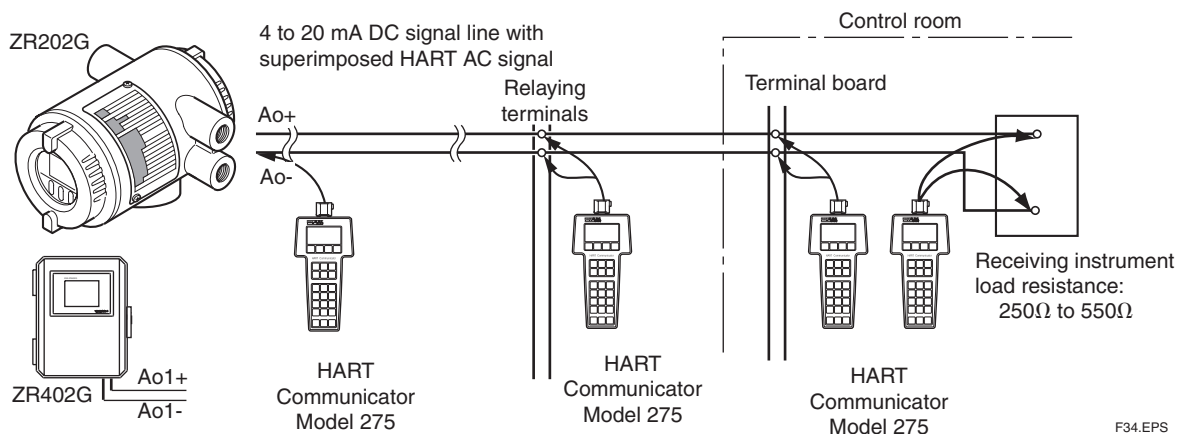
Overview

The ZR22 is a direct insertion (in-situ) type oxygen detector. This detector when inserted through the wall of a flue or furnace allows continuous monitoring of the oxygen concentration of combustion gas via a zirconia cell. Yokogawa offers three (3) types of oxygen detectors: low temperature, high temperature, and pressure compensated. These detectors are subject to harsh environments because they are directly mounted in combustion applications. We recommend utilizing one of the many accessories Yokogawa has available to increase the life of the detector.



Features

- The built-in heater assembly of the probe can be replaced on site, reducing maintenance costs.
- The probe uses a long-life, high reliability Zirconia sensor
- The probe uses three-reference air supply methods (natural air convection, instrument air, and pressure compensated) in its applications.
- The separate type converter incorporates an LCD touch-screen for ease of operation.
- This converter is used as an oxygen analyzer.
- 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.

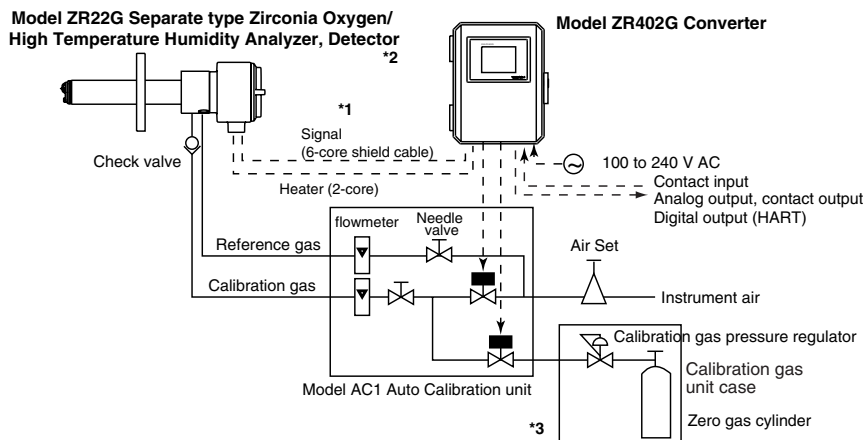


System configuration - Integrated type

Basic System Configuration

System configuration Example 1 of Separate type Analyzer

- 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.
Humidity monitoring and control in drying furnaces and humidifiers.

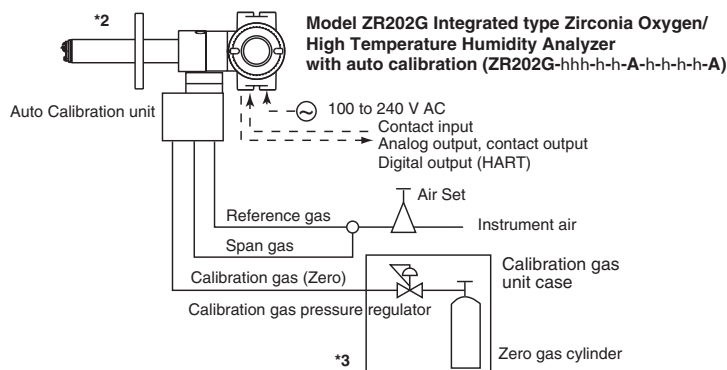


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System configuration - Separate type

System configuration Example 1 of Integrated type Analyzer

- 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.
Humidity monitoring and control in drying furnaces and humidifiers



Note:

The installation temperature limits range for integrated type analyzer is -20 to 55 8C.

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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.


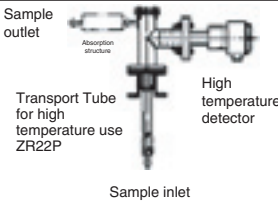

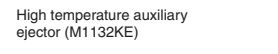
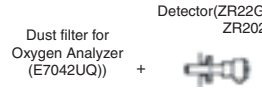
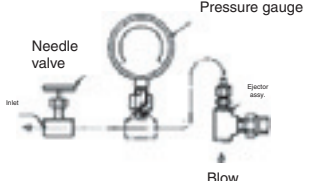
*3 When a zirconia oxygen analyzer is used, 100% N2 gas cannot be used as the zero gas. Use approx. 1 vol% O2 gas (N2-balanced).

| | System Components | Separate type | | | Integrated type | | |
|----|--|----------------|------|------|-----------------|------|------|
| | | System config. | | | System config. | | |
| | | Ex.1 | Ex.2 | Ex.3 | Ex.1 | Ex.2 | Ex.3 |
| 1 | Model ZR22G Separate type Zirconia Oxygen Analyzers/ High Temperature Humidity Analyzers, Detector | ● | ● | ● | | | |
| 2 | Model ZR402G Separate type Zirconia Oxygen / High Temperature Humidity Analyzer, Converter(*1) | ● | ● | ● | | | |
| 3 | Model ZR202G Integrated type Zirconia Oxygen Analyzers/ High Temperature Humidity Analyzers | | | | ● | ● | ● |
| 4 | Model ZR22P Adapter for High Temperature Probe of separate type Zirconia Oxygen Analyzer | ○ | ○ | ○ | | | |
| 5 | M1132KA Auxiliary Ejector for High Temperature Probe of separate type Oxygen Analyzer | ○ | ○ | ○ | | | |
| 6 | Model ZR22R Probe Protector for Zirconia Oxygen Analyzers | ○ | ○ | ● | ○ | ○ | ● |
| 7 | ZA8F-D | | ● | | | ● | |
| 8 | Model AC1-D Automatic Calibration Unit for Separate type Analyzer | ● | | | | | |
| 9 | Automatic Calibration Unit for Integrated type Analyzer (*2) | | | | ● | | |
| 10 | M1132KN Check Valve for Calibration-gas line | ● | (●) | | | (●) | |
| 11 | M1132ZX Pressure Regulator for Gas Cylinder | ● | ● | | ● | ● | |
| 12 | ZR22A, ZR202A Heater Assembly for Spare Parts | ○ | ○ | ○ | ○ | ○ | ○ |

System Components

Detector Components

■ STANDARD SPECIFICATIONS

| Process gas temperature 0 to 700°C | | | | Process gas temperature 0 to 1800°C | |
|------------------------------------|------------------|--|--|--|-----------------|
| Mounting | Insertion length | General-use Probe | Application | High temperature detector | Application |
| Horizontal to vertical | 0.4 to 2 m |  Detector (ZR22G or ZR202G) | Boiler Heating furnace |  | Heating furnace |
| Vertical | 2.5 m or more | | | | |
| Horizontal to vertical | 3 m or less |  Probe Protector (ZR22R) Detector (ZR22G or ZR202G) | For pulverized coal boiler with gas flow velocity 10 m/s or more |  | |
| Horizontal to vertical | 0.4 to 2 m |  Dust filter for Oxygen Analyzer (E7042UQ) + Detector (ZR22G or ZR202G) | Black liquid recovery boiler Cement Kiln |  | |
| Vertical | 2.5 m or more | | | | |

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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 is present-check with YOKOGAWA.

(Oxygen Analyzer)

General Specifications

Oxygen Analyzer

Measurement: Oxygen concentration in combustion exhaust gas and mixed gas (excluding flammable gases).

Measurement System: Zirconia system

Oxygen Concentration: 0.01 to 100 vol% O₂

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% O₂

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

Display Range: 0 to 100 vol% O₂

Warm-up Time: Approx. 20 min.

Repeatability: ±0.5% Maximum value of set range.

Linearity: (Excluding standard gas tolerance) ±1% Maximum value of set range.

Drift: Both zero and span ±2% Maximum value of set range/month

Response Time: Response of 90% within 5 seconds. (Measured after gas is introduced from calibration-gas inlet and analog output starts changing.)

Accuracy: $[(\text{Repeatability})^2] + (\text{Linearity})^2 + (\text{Calibration Gas Accuracy})^2]^{1/2}$

1. ZR22G Separate type Zirconia Oxygen Analyzer, Detector

Oxygen Analyzer

Sample Gas Temperature: -0.725 to 700°C (Probe only) 700 to 1400°C (with High Temperature Probe Adapter)

Sample Gas Pressure: -0.725 to +0.73 psi (-0.725 to +36.3 requires pressure compensation.)

Probe Length: 0.15, 0.4, 0.7, 1.0, 1.5, 2.0, 2.5, 3.0, 3.6, 4.2, 4.8, 5.4m

Probe Material: SUS 316 (JIS)

Ambient Temperature: -20 to +150°C (-4 to 302°F)

Reference Air System: Natural Convection, Instrument Air, or pressure compensated

Instrument Air System: Pressure; 29psi + the pressure inside the furnace (It is recommended to use clean, dry plant air.)

Consumption; Approx. 1NI/min

Wetted Material: SUS 316 (JIS), Zirconia, SUS 304 (JIS) (flange), Hastelloy B, (Inconel 600, 601),

Construction: Heater and thermocouple replaceable construction. Non explosion-proof. Equivalent to NEMA4X/IP 66 (recirculation to furnace with pressure compensated only)

Terminal Box Case: Material; Aluminum alloy

Terminal Box Paint Color: Case; Off-white (Munsell 0.6GY3.1/2.0)
Cover; Moss green (Munsell 2.5Y8.4/1.2)

Finish: Polyurethane corrosion-resistance coating

Gas Connection: 1/4 FNPT
Wiring Connection: 1/2 NPT
Installation: Flange mounting

Weight:

Insertion length of 0.4 m: approx. 6 kg (JIS 5K-65) / approx. 11 kg (ANSI 150-4)

Insertion length of 1.0 m: approx. 8 kg (JIS 5K-65) / approx. 13 kg (ANSI 150-4)

Insertion length of 1.5 m: approx. 10 kg (JIS 5K-65) / approx. 15 kg (ANSI 150-4)

Insertion length of 2.0 m: approx. 12 kg (JIS 5K-65) / approx. 17 kg (ANSI 150-4)

Insertion length of 3.0 m: approx. 15 kg (JIS 5K-65) / approx. 20 kg (ANSI 150-4)

Insertion length of 3.6 m: approx. 17 kg (JIS 5K-65) / approx. 22 kg (ANSI 150-4)

Insertion length of 4.2 m: approx. 19 kg (JIS 5K-65) / approx. 24 kg (ANSI 150-4)

Insertion length of 4.8 m: approx. 21 kg (JIS 5K-65) / approx. 26 kg (ANSI 150-4)

Insertion length of 5.4 m: approx. 23 kg (JIS 5K-65) / approx. 28 kg (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 550 V)

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 +558C

Storage Temperature: -30 to +708C

Ambient Humidity : 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: 1993
CSA C22.2 No.1010-1 certified
UL 3111-1 certified

EMC: Conforms to EN 61326: 1998

Maximum Distance between Probe and Converter:

Conductor two-way resistance must be 10V or less (when a 1.25 mm² cable or equivalent is used, 300 m or less.)

Construction: Outdoor installation, NEMA4 or equivalent (with conduit holes completely sealed with a plastic cable gland optional)

Wiring Connection: G1/2, Pg13.5, M20 by 1.5mm, 1/2 NPT, eight holes

Installation: Panel, wall or pipe mounting

Case: Aluminum alloy

Paint Color: Door; Moss green (Munsell 0.6GY3.1/2.0) Case; Off-white (Munsell 2.5Y8.4/1.2)

Finish: Polyurethane corrosion-resistance coating

Weight: Approx. 6 kg

Functions

Display Functions:

Value Display; Displays values of the measured oxygen concentration

Graph Display; Displays trends of measured oxygen concentration

Data Display; Displays various useful data for maintenance, such as cell temperature, reference junction temperature, maximum/minimum oxygen concentration, or the like.

Status Message; Indicates an alarm or error occurrence with flashing of the corresponding icon. Indicates status such as warming-up, calibrating, or the like by icons.

Alarm, Error Display; Displays alarms such as "Abnormal oxygen concentration" or errors such as "Abnormal cell e.m.f." when any such status occurs.

Calibration Functions:

Auto-Calibration; Requires the Auto-calibration Unit. It calibrates automatically at specified intervals.

Semi-auto Calibration; Requires the Auto-calibration Unit. Input calibration direction on the touchscreen or contact, then it calibrates automatically afterwards.

Manual Calibration; Calibration with opening/closing the valve of calibration gas in operation interactively with an LCD touchscreen.

Blowback Function:

Output through the contact in the set period and time. Auto/semi-auto selectable.

Maintenance Functions:

Can operate updated data settings in daily operation and checking. Display data settings, calibration data settings, blowback data settings, current output loop check, input/output contact check.

Setup Functions:

Equipment settings, current output data settings, alarm data settings, contact data settings, other settings.

Self-diagnosis:

This function diagnoses conditions of the converter or the probe and indicates when any abnormal condition occurs.

Password Functions:

Enter your password to operate the analyzer excepting data display. Individual passwords can be set for maintenance and setup.

Display and Setting Content:

Measuring Related items: Oxygen concentration (vol% O₂), output current value (mA), air ration, moisture quantity (in hot gases) (vol% H₂O)

Display Items: Cell temperature (°C), thermocouple reference junction temperature (°C), maximum/minimum/average oxygen concentration (vol% O₂), cell e.m.f. (mV), cell resistance (Ω), cell condition (in four grades), heater on-time rate (%), calibration record (ten times), time (year/month/day/hour/minute)

Calibration Setting Items: Span gas concentration (vol% O₂), zero gas concentration (vol% O₂), calibration mode (auto, semi-auto, manual), calibration type and method (zero-span calibration, zero calibration only, span calibration only), stabilization time (min.sec), calibration time (min.sec), calibration period (day/hour), starting time (year/month/day/hour/minute)

Equipment Related Items: Measuring gas selection

Output Related Items: Analog output/output mode selection, output conditions when warming-up/maintenance/calibrating (during blowback)/abnormal, 4 mA/20 mA point oxygen concentration (vol% O₂), time constant, preset values when warming-up/maintenance/calibrating (during blowback)/abnormal, output preset values on abnormal

Alarm Related Items: Oxygen concentration high-alarm/high-high alarm limit values (vol% O₂), oxygen concentration low-alarm/low-low alarm limit values (vol% O₂), oxygen concentration alarm hysteresis (vol% O₂), oxygen concentration alarm detection, alarm delay (seconds)

Contact Related Items: Selection of contact input 1 and 2, selection of contact output 1 to 4 (abnormal, high-high alarm, high-alarm, low-alarm, low-low alarm, maintenance, calibrating, range switching, warming-up, calibration-gas pressure decrease, temperature high-alarm, blowback, flameout gas detection)

Converter Output: Two points mA analog output (4 to 20 mA DC) (maximum load resistance of 550 Ω) and one mA digital output point (HART®) (minimum load resistance of 250 Ω)

Range: any setting between 0 to 5 through 0 to 100 vol% O₂ in 1 vol% O₂, or partial range is available (Maximum range value/minimum range value 1.3 or more)

For the log output, the minimum range value is fixed at 0.1 vol% O₂.

4 to 20 mA DC linear or log can be selected.

Input/output isolation

Output damping: 0 to 255 seconds.

Hold/non-hold selection, preset value setting possible with hold.

Contact Output: Four points, contact capacity 30 V DC 3 A, 250 V AC 3 A (resistive load).

Three of the output points can be selected to either normally energized or normally de-energized status.

Delayed functions (0 to 255 seconds) and hysteresis function (0 to 9.9 vol%O₂ can be added to high/low-alarms.

The following functions are programmable for contact outputs.

(1) Abnormal, (2) High-high alarm, (3) High-alarm, (4) Low-low alarm, (5) Low-alarm, (6) Maintenance, (7) Calibration, (8) Range switching answer-back, (9) Warm-up, (10) Calibration-gas pressure decrease (answer back of contact input), (11) Temperature high-alarm, (12) Blowback start, (13) Flameout gas detection (answer back of contact input)

Contact Input: Two points, voltage-free contacts

The following functions are programmable for contact inputs:

(1) Calibration-gas pressure decrease alarm, (2) Range switching - fixed range if use range switching (3) External calibration start, (4) Process alarm (if this signal is received, the heater power turns off), (5) Blowback start

Contact capacity: Off-state leakage current: 3 mA or less

Self-diagnosis: Abnormal cell, abnormal cell temperature (low/high), abnormal calibration, defective A/D converter, defective digital circuit

Calibration: Method; zero/span calibration

Calibration mode; automatic, semi-automatic and manual (All are operated interactively with an LCD touchscreen). Either zero or span can be skipped.

Zero calibration-gas concentration setting range: 0.3 to 100 vol% O₂ (0.01 vol% O₂ in smallest units).

Span calibration-gas concentration setting range: 4.5 to 100 vol% O₂ (0.01 vol%vol% O₂ in smallest units).

Use nitrogen-balanced mixed gas containing 10 vol% O₂ scale of oxygen and 80 to 100 vol% O₂ scale of oxygen for standard zero-gas, and standard span-gas respectively.

Calibration period; date/time setting: maximum 255 days

3. ZR202G Integrated type Zirconia Oxygen Analyzer

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).

Contact Output Signal: Two points (one is fail-safe, normally open)

Contact Input Signal: Two points

Sample Gas Temperature: 0 to 700°C
High temperature service— greater than 700°C is not available.

Sample Gas Pressure: -0.725 to 0.73 psi
(-0.725 to +36.3 requires pressure compensation.)

Probe Length: 0.4, 0.7, 1.0, 1.5, 2.0, 2.5, 3.0m

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

Ambient Humidity: 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)

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: 1993

CSA C22.2 No.1010-1 certified

UL 3111-1 certified

EMC: Conforms to EN 61326: 1998

Reference Air System: Instrument air, or pressure compensated

Instrument Air System (excluding Natural Convection):

Pressure; 29 psi + the pressure inside the furnace. (It is recommended to use clean, dry plant air.)

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. Non explosion-proof.
Equivalent to NEMA 4X/IP66 (recirculation to furnace with pressure compensations only)

Gas Connection: 1/4 FNPT

Wiring Connection: 1/2 NPT select one type (4 pieces)

Installation: Flange mounting

Case: Aluminum alloy

Paint Color: Cover; Moss green (Munsell 0.6GY3.1/2.0)

Case: Off-white (Munsell 2.5Y8.4/1.2)

Finish: Polyurethane corrosion-resistance coating

Weight:

Insertion length of 0.4 m: approx. 8 kg (JIS 5K-65) /
approx. 13 kg (ANSI 150-4)
Insertion length of 1.0 m: approx. 10 kg (JIS 5K-65) /
approx. 15 kg (ANSI 150-4)
Insertion length of 1.5 m: approx. 12 kg (JIS 5K-65) /
approx. 17 kg (ANSI 150-4)
Insertion length of 2.0 m: approx. 14 kg (JIS 5K-65) /
approx. 19 kg (ANSI 150-4)
Insertion length of 3.0 m: approx. 17 kg (JIS 5K-65) /
approx. 22 kg (ANSI 150-4)

Functions

Display Function: Displays values of the measured oxygen concentration, etc.

Alarm, Error Display: Displays alarms such as "AL-06" or errors such as "Err-01" when any such status occurs.

Calibration Functions:

Auto-calibration; Requires the auto-calibration Unit. It calibrates automatically at specified intervals.

Semi-auto Calibration; Requires the auto-calibration unit. Input calibration starts signal by optical switch or contact, then it calibrates automatically afterwards.

Manual Calibration; Calibration with opening/closing the valve of calibration gas in operation interactively with the optical switch.

Maintenance Functions:

Can operate updated data settings in daily operation and checking. Display data settings, calibration data settings, test settings (current output loop check, input/output contact check).

Setup Functions:

Initial settings suit for the plant conditions when installing the converter. Current output data settings, alarm data settings, contact data settings, other settings.

Display and setting content:

Display Related Items: Oxygen concentration (vol% O₂), Output current value (mA), air ratio, moisture quantity (in hot gases) (vol% H₂O), Cell temperature (°C), thermocouple reference junction temperature (°C), maximum/minimum/average oxygen concentration (vol% O₂), cell e.m.f. (mV), cell internal resistance (Ω), cell condition (in four grades), heater on-time rate (%), calibration record (ten times), time (year/month/day/hour/minute)

Calibration Setting Items: Span gas concentration (vol% O₂), zero-gas concentration (vol% O₂), calibration mode (auto, semi-auto, manual), calibration type and method (zero-span calibration, zero calibration only, span calibration only), stabilization time (min.sec), calibration time (min.sec), calibration period (day/hour), starting time (year/month/day/hour/minute)

Output Related Items: Analog output/output mode selection, output conditions when warming-up/maintenance/calibrating/abnormal, 4 mA/ 20 mA point oxygen concentration (vol% O₂), time constant, preset values when warming-up/maintenance/calibrating/abnormal, output preset values on abnormal

Alarm Related Items: Oxygen concentration high-alarm/high-high alarm limit values (vol% O₂), Oxygen concentration low-alarm/low-low alarm limit values (vol% O₂), oxygen concentration alarm hysteresis (vol% O₂), oxygen concentration alarm detection, alarm delay (seconds)

Contact Related Items: Selection of contact input 1 and 2, selection of contact output 1 and 2 (abnormal, high-high alarm, high-alarm, low-alarm, low-low alarm, maintenance, calibrating, range switching, warming-up, calibration-gas pressure decrease, flameout gas detection (answer back of contact input))

Converter Output: One mA analog output point (4 to 20 mA DC (maximum load resistance of 550 Ω) with mA digital output point (HART®) (minimum load resistance of 250 Ω). Range: any setting between 0 to 5 through 0 to 100 vol% O₂, and partial range is available (Maximum range value/minimum range value 1.3 or more)

For the log output, the minimum range values are fixed at 0.1 vol% O₂.

4 to 20 mA DC linear or log can be selected. Input/output isolation

Output damping: 0 to 255 seconds.

Hold/non-hold selection, preset value setting possible with hold.

Contact Output: Two points, contact capacity 30 V DC 3 A, 250 V AC 3 A (resistive load)

One of the output points can be selected to either normally energized or normally de-energized status.

Delayed functions (0 to 255 seconds) and hysteresis function (0 to 9.9 vol% O₂) can be added to high/low-alarms.

The following functions are programmable for contact outputs.

(1) Abnormal, (2) High-high alarm, (3) High-alarm, (4) Low-low alarm, (5) Low-alarm, (6) Maintenance, (7) Calibration, (8) Range switching answer-back, (9) Warm-up, (10) Calibration-gas pressure decrease (answer back of contact input), (11) Flameout gas detection (answer back of contact input).

Contact Input: Two points, voltage-free contacts

The following functions are programmable for contact inputs:

(1) Calibration-gas pressure decrease alarm, (2) Range switching - fixed ranges if use range switching, (3) External calibration start, (4) Process alarm (if this signal is received, the heater power turns off)

Self-diagnosis: Abnormal cell, abnormal cell temperature (low/high), abnormal calibration, A/D converter abnormal, digital circuit abnormal

Calibration: Method; zero/span calibration
Calibration mode; automatic, semi-automatic and manual (All are operated using optical switches). Either zero or span can be skipped.

Zero-calibration gas concentration setting range: 0.3 to 100 vol% O₂ (in 0.01 vol% O₂).
Span-calibration gas concentration setting range: 4.5 to 100 vol% O₂ (in 0.01 vol% O₂).
Use nitrogen-balanced mixed gas containing 10 vol% O₂ scale of oxygen for standard zero-gas, and 80 to 100 vol% O₂ scale of oxygen for standard span-gas.
Calibration period; date/time setting: maximum 255 days

Input/output isolation

Output damping: 0 to 255 seconds.
Hold/non-hold selection, preset value setting possible with hold.

Model and Suffix Codes

1. Separate type Zirconia Oxygen Converter

| Model | |
|------------------------|---|
| ZR402G-T-E-E-A | Zirconia Oxygen Humidity Analyzer Converter |
| Options | |
| /HS | Preset for Humidity Measurement |
| /H | Hood |
| /SCT | Stainless Steel Tag Plate |
| Accessories for ZR402G | |
| IM 11M12A-01-01E | Instruction Manual ZR402 |

Note: When the ZR22 is used with existing older model converters, ZA8C, AV8C and HA400, ROM replacement and addition of a cold junction temperature compensation board are required. These ROMs are included when the /ZA, /AV, or /HA options indicated in the ZR22G model code.

| Model | Language | |
|------------|----------|--|
| | English | |
| ZA8C | K9290KF | |
| HA400 (kg) | K9293HU | |
| HA400 (%) | K9293HQ | |
| AV8C | K9296CN | |

1. Separate type Zirconia Oxygen / High Temperature Humidity Analyzer, Detectors

How to Order:

Specify the Model Number, add the Option Code selections to the Model Number.

The ZR22 requires a conversion kit if used with an AV8C, ZA8C or HA400. Select the /ZA for use with ZA8C or /AV for use with AV8C. See note 4.

| Code | Model Description | Note |
|------------|--|------|
| ZR22G | Zirconia Oxygen/Humidity Analyzer Detector | |
| | Length | |
| -015 | 0.15 meters | |
| -040 | 0.4 meters | |
| -070 | 0.7 meters | |
| -100 | 1.0 meters | |
| -150 | 1.5 meters | |
| -200 | 2 meters | |
| -250 | 2.5 meters | |
| -300 | 3 meters | 1 |
| -360 | 3.6 meters | 1 |
| -420 | 4.2 meters | 1 |
| -480 | 4.8 meters | 1 |
| -540 | 5.4 meters | 1 |
| | Wetted Material | |
| -S | Stainless Steel | |
| -C | Stainless Steel with Inconel Cal Gas Tube | |
| | Flange | |
| -A | ANSI CLASS 150-2-RF (Equivalent) | |
| -C | ANSI CLASS 150-4-RF (Equivalent) | |
| -Q | JIS 5K32A (for high temp probe adapter) | |
| -W | Westinghouse | |
| | Reference Air | |
| -E | External Connection | |
| -P | Pressure Compensation | |
| | Gas Thread | |
| -T | 1/4 inch NPT | |
| | Connection Box Thread | |
| -T-E-A | NPT (1/2 NPT) | |
| -Q-E-A | Quick Connect | |
| | Options | |
| /ZA | For detector use with ZA8C | |
| /AV | For detector use with AV8C | |
| /HA | For detector use with HA400 | |
| /D | Derekane Coating | 2 |
| /C | Inconel Bolt, Oring | |
| /CV | Check Valve | 3 |
| /SCT | Stainless Steel Tag Plate | |
| /PT | Printed Tag | |
| | Spare Parts-ZR22 | |
| E7042UD | Cell Assembly Kit | |
| E7042AY | Filter Screen Kit | |
| M1132KN | Check Valve | |
| M1200DB-06 | High Temperature Fly Ash Filter for ZR22 (ZR22 & Z021D Clamp Included) | 5,6 |
| M1234FF-A | AV8C Single Channel Conversion Kit (for one probe) | 4 |
| M1234FH-A | ZA8C Single Channel Conversion Kit | 4 |
| M1234FM-A | HA400-A Conversion Kit (kg) | 4 |
| M1234FK-A | HA400-V Conversion Kit (Vol%) | 4 |

Note 1: The 4" ANSI Flange (-A*U) is suggested for probe lengths of 3m or greater.

Note 2: Derekane coating is recommended for any application up to 250°F (120°C) when elements corrosive to the detector may be present, such as those found in chemical incinerators.

Note 3: The Check Valve is recommended for use on the Calibration Gas Port for positive pressure applications to prevent contamination of the calibration line during operation.

Note 4: ZR22 Probe requires a conversion kit if used with AV8C/HA400/ZA8C analyzers. The ZR22 detector

uses a PT1000 temperature sensor instead of a transistor type cold junction.

Note 5: M1200DB-06 is not compatible to Z021D probe. M1100DA-01/M1100DA-02 cannot be used with ZR22 or ZR202 probes.

Note 6: The Fly Ash Filter Assembly is a 10 Micron Sintered Stainless Steel Filter with a Fly Ash Detector. It is used when the flue gas stream is laden with particulates. It should be installed upstream from the precipitators. Maximum temperature up to 1290°F (700°C)

2. Integrated type Zirconia Oxygen / High Temperature Humidity Analyzer, Converter

How to Order:

Specify the Model Number, add the Option Code selections to the Model Number.

| Code | Model Description | Note |
|------------|--|------|
| ZR202G | Integral Type Zirconia Oxygen Humidity Analyzer | |
| | Length | |
| -040 | 0.4 meters | |
| -070 | 0.7 meters | |
| -100 | 1.0 meters | |
| -150 | 1.5 meters | |
| -200 | 2 meters | |
| -250 | 2.5 meters | |
| -300 | 3 meters | 1 |
| | Wetted Material | |
| -S | Stainless Steel | |
| -C | Stainless Steel with Inconel Cal Gas Tube | |
| | Flange | |
| -A | ANSI CLASS 150-2-RF (Equivalent) | |
| -B | ANSI CLASS 150-3-RF (Equivalent) | |
| -C | ANSI CLASS 150-4-RF (Equivalent) | |
| -W | Westinghouse | |
| | Auto Calibration | |
| -N | No Auto-Calibration Unit Mounted | |
| -A | Auto-Calibration Unit Mounted Horizontal | 3 |
| -B | Auto-Calibration Unit Mounted Vertical | 3 |
| | Reference Air | |
| -E | External Connection | |
| -P | Pressure Compensation | |
| | Gas Thread | |
| -T | 1/4 inch NPT | |
| | Converter Thread | |
| -T | NPT (1/2 NPT) | |
| | Instruction Manual | |
| -E | English | |
| | Style Code | |
| -A | Always-A | |
| | Options | |
| /D | Derekane Coating | 2 |
| /C | Inconel Bolt, Oring | |
| /CV | Check Valve | 3 |
| /SCT | Stainless Steel Tag Plate | |
| /PT | Printed Tag | |
| | Spare Parts-ZR202 | |
| E7042UD | Cell Assembly Kit | |
| E7042AY | Filter Screen Kit | |
| M1132KN | Check Valve | |
| M1200DB-06 | High Temperature Fly Ash Filter for ZR22 (ZR22 & Z021D Clamp Included) | 4 |

Note 1: The 4" ANSI Flange (-A*U) is suggested for probe lengths of 3m or greater.

Note 2: Derekane coating is recommended for any application up to 250°F (120°C) when elements corrosive to the detector may be present, such as those found in chemical incinerators.

Note 3: The Check Valve is recommended for use on the Calibration Gas Port for positive pressure

applications to prevent contamination of the calibration line during operation. The /CV option is not needed when the auto-calibration unit is mounted.

Note 4: M1200DB-06 is backward compatible to Z021D probe. M1100DA-01/M1100DA-02 cannot be used with ZR22 or ZR202 probes.

3. Probe Protector for Zirconia Oxygen Analyzers

| Model | Suffix code | Option code | Description |
|------------------|-------------|-------------|-------------------------------|
| ZR22R | -L | | Probe Protector(0 to 700°C) |
| Insertion length | -100 | | 1.05 m (3.5 ft) |
| | -150 | | 1.55 m (5.1 ft) |
| | -200 | | 2.05 m (6.8 ft) |
| Flange (*1) | -J | | JIS 5K-65A-FF equivalent |
| | -C | | ANSI CLASS150-4-FF equivalent |
| Style code | *B | | Style B |

*1 Thickness of flange depends on dimensions of flange. T04.EPS

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

| 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) | |
| -F | Oversized Design (For Flame Arrester, Includes Studs) | |
| | 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 | 0.3m (11'8") | |
| -050 | 0.5m (1'8") | |
| -100 | 1.00m (3'3") | |
| -150 | 1.5m (4'11") | |
| -300 | 3.0m (9'10") (Requires Probe Support or Protection) | |
| -NNN | No Transport Tube | |
| | Flange Connection | |
| -C*U | ANSI 4.0", 150# FF Flange | |
| | Options Heater System | |
| /HT | Aux Heater System (to 600°F) (Includes Controller and Heaters) | |
| | Options Blowback Valve | |
| /AV | Automatic Valve (Only with ZR22P-S) | |
| | Options Eductor | |
| /BE | CO:1 ed Air Eductor Pre-Attached with Regulator and Gauge (Cannot be used with /HT or /AV) | |
| /ER | Air Ejector with Return Exhaust Pre-Attached with Regulator and Gauge | |
| /SE | Separate Air Ejector, Regulator and Gauge (Not Pre-Attached) | |
| /WE | Self-Cleaning Water Ejector (Regulator and Gauge Not Included) | |
| /FE | Filtered Eductor | |
| | Options Tag | |
| /SCT | Stainless Steel Tag (Attached with Wire) | |
| | Accessories for ZR22P | |
| E7042VP | Flame Arrester | |
| IM11M12A01-02E | Instruction Manual for ZR402 | |
| IM1133HQ | Instruction Manual for ZR22P-S | |

Note: For this high-temperature probe adapter, be sure to specify the ZR22G probe with insertion length of 0.15

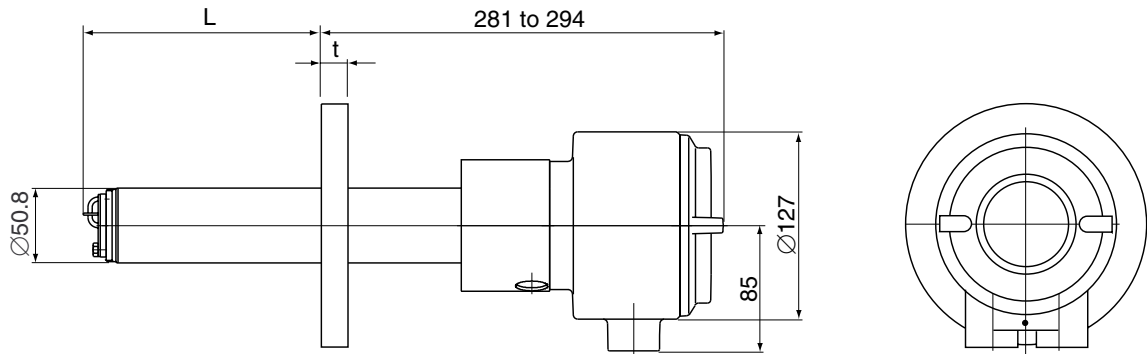
5. Automatic Calibration Unit for Separate type Analyzer

How To Order:
Specify the Model Number, add the Enclosure, Tubings/Fittings, and Reference Air Flowmeter selection codes to the Model Number.

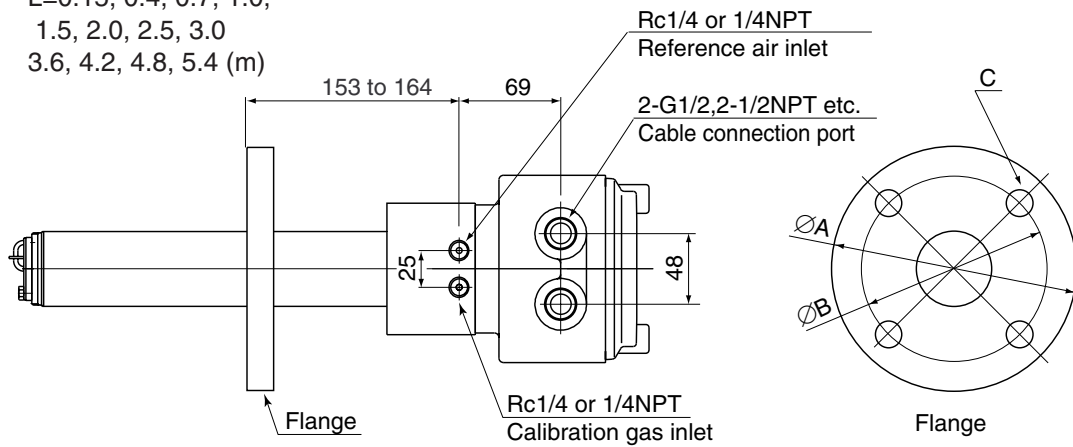
| Code | Model Description | Note |
|--------------|---|------|
| AC1 | Single Channel Auto Calibration | |
| | Enclosure | |
| -4 | NEMA 4, Metal Enclosure | |
| -5 | NEMA 4X, Fiberglass Enclosure | |
| | Tubing/Fittings | |
| -C | 1/4" Copper Tubing & Brass Fittings | |
| -S | 1/4" Stainless Steel Tubing & Fittings | |
| | Power Supply | |
| -A | For use with ZA8C | |
| -D | For use with ZR402 (requires separate 110VAC supply) | |
| | Reference Air | |
| -R*U | Reference Air Flowmeter | |
| | Options | |
| /SCT | Stainless Steel Tag (attached with wire) | |
| | Accessories For Calibration | |
| M1233SR | Remote Calibration Kit with 103 Liter Air Cylinder, 103 Liter 1.0% Cylinder, Two Regulators, Hose and Carrying Case | |
| IM11M6A2-YIA | Instruction Manual | |

EXTERNAL DIMENSIONS

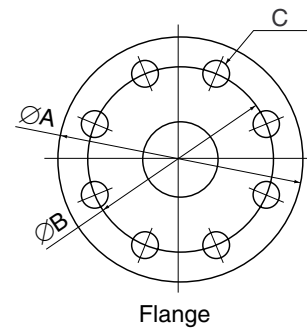
1. Model ZR22G Separate type Zirconia Oxygen Detector



L=0.15, 0.4, 0.7, 1.0,
1.5, 2.0, 2.5, 3.0
3.6, 4.2, 4.8, 5.4 (m)

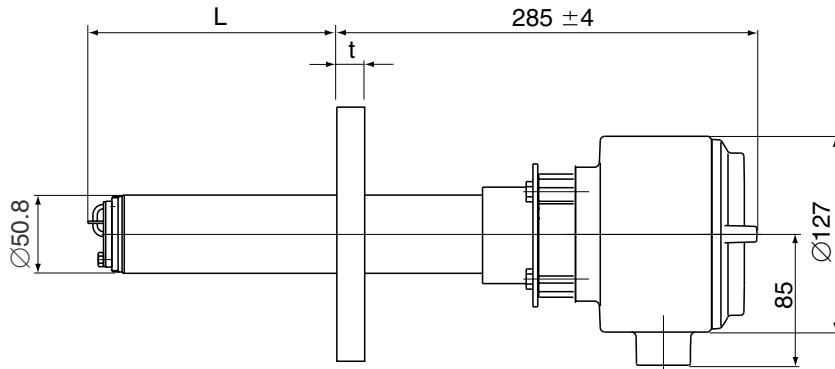


| Flange | A | B | C | t |
|-------------------------------|-------|-------|------------------------|----|
| ANSI CLASS150-2-RF equivalent | 152.4 | 120.6 | 4 - \varnothing 19 | 19 |
| ANSI CLASS150-3-RF equivalent | 190.5 | 152.4 | 4 - \varnothing 19 | 24 |
| ANSI CLASS150-4-RF equivalent | 228.6 | 190.5 | 8 - \varnothing 19 | 24 |
| JIS 5K-32-FF equivalent | 115 | 90 | 4 - \varnothing 15 | 5 |
| Westinghouse | 155 | 127 | 4 - \varnothing 11.5 | 14 |

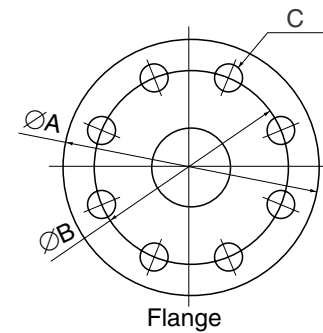
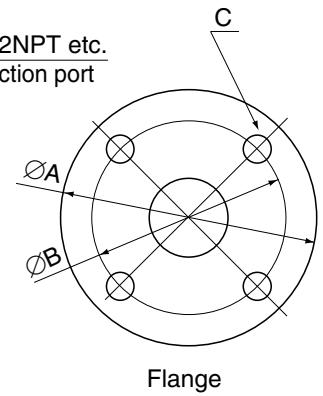
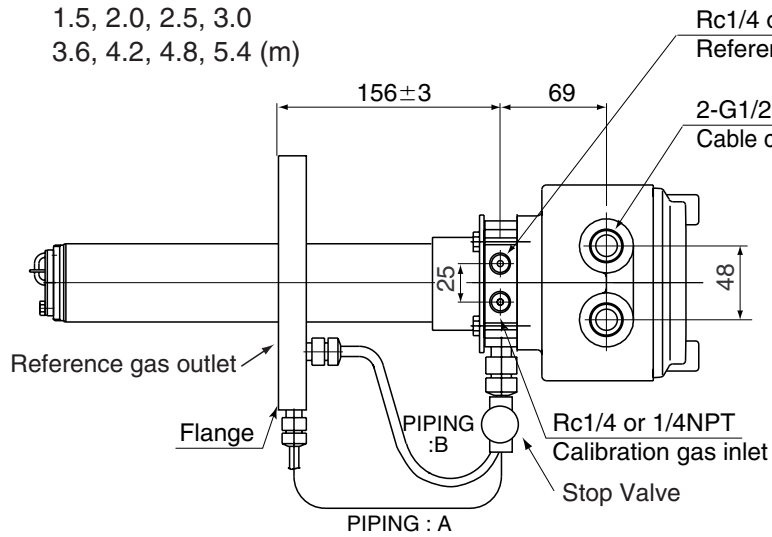


F07_01.EPS

2. Model ZR22...-P (with pressure compensated) Separate type Zirconia Oxygen Detector



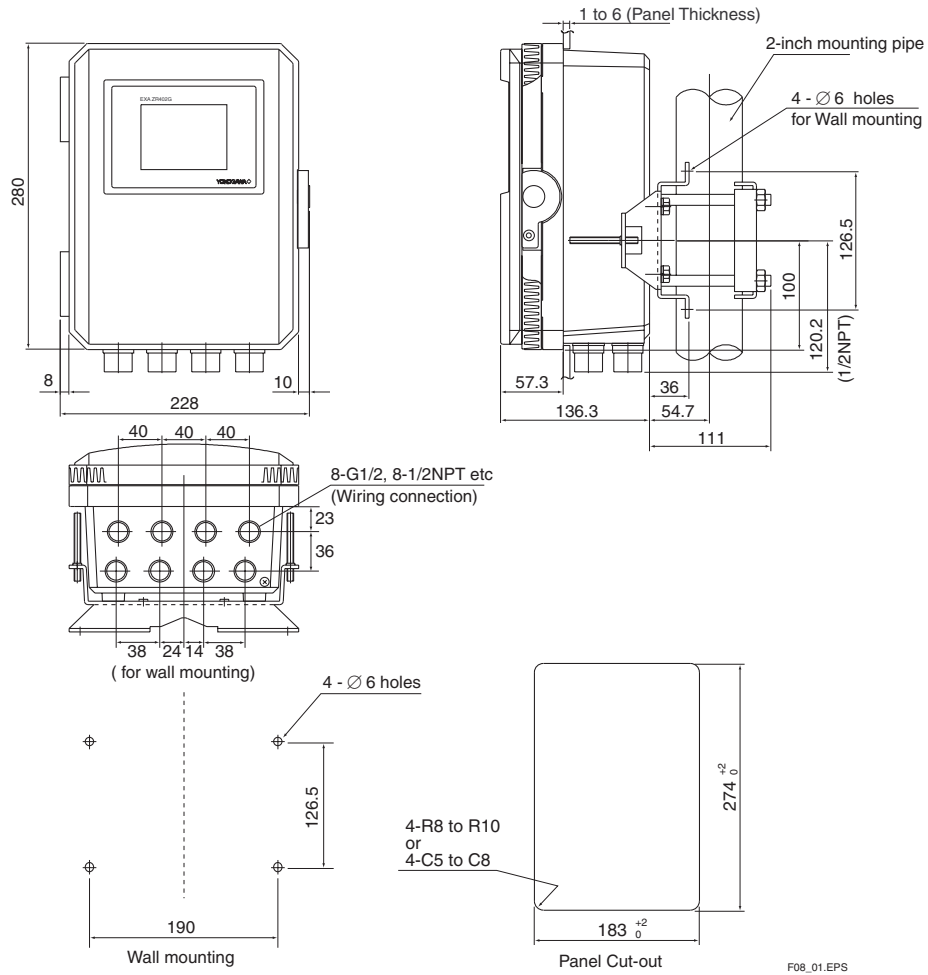
L=0.15, 0.4, 0.7, 1.0,
1.5, 2.0, 2.5, 3.0
3.6, 4.2, 4.8, 5.4 (m)



| Flange | A | B | C | t | PIPING |
|-------------------------------|-------|-------|--------------------|----|--------|
| ANSI CLASS150-2-RF equivalent | 152.4 | 120.6 | 4 - $\text{Ø}19$ | 19 | A |
| ANSI CLASS150-3-RF equivalent | 190.5 | 152.4 | 4 - $\text{Ø}19$ | 24 | B |
| ANSI CLASS150-4-RF equivalent | 228.6 | 190.5 | 8 - $\text{Ø}19$ | 24 | B |
| Westinghouse | 155 | 127 | 4 - $\text{Ø}11.5$ | 14 | A |

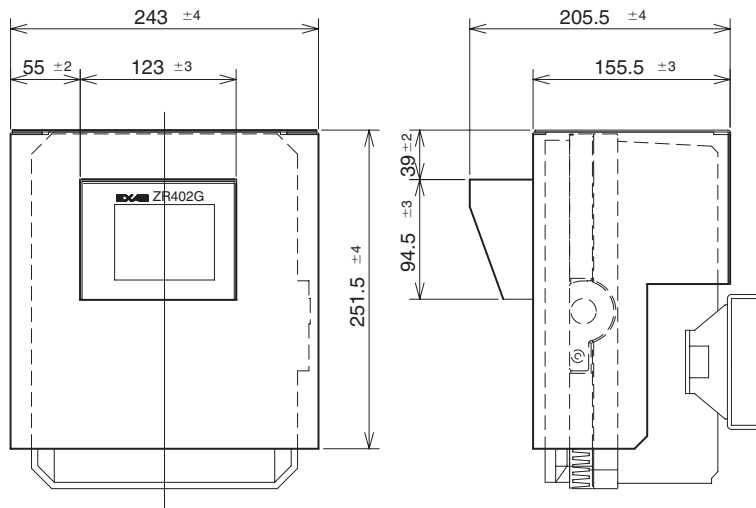
F07_02.EPS

3. Model ZR402G Separate type Zirconia Oxygen Converter



F08_01.EPS

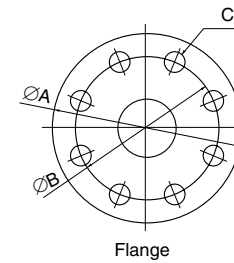
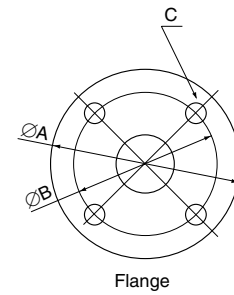
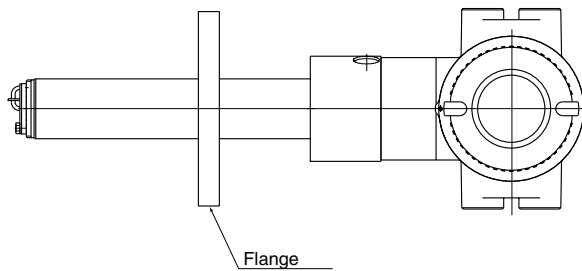
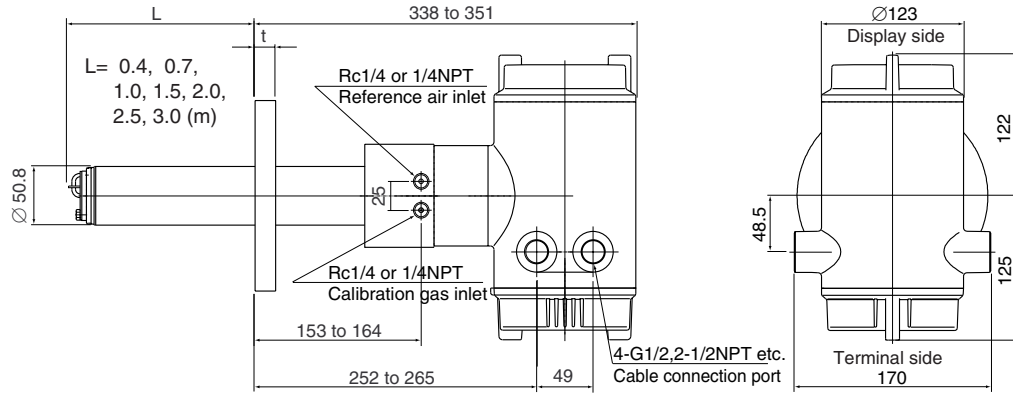
- With sun shield hood (option code /H)



F10.EPS

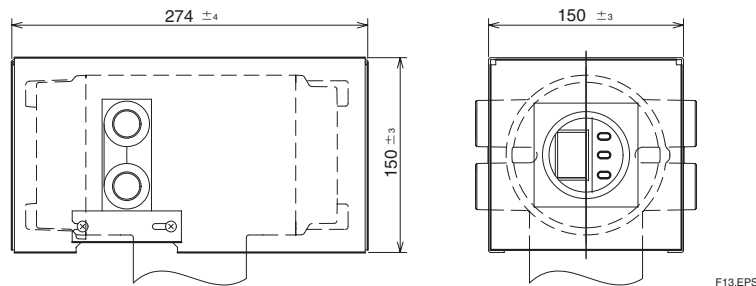
Material of HOOD : Aluminum

4. Model ZR202G Separate type Zirconia Oxygen Analyzer

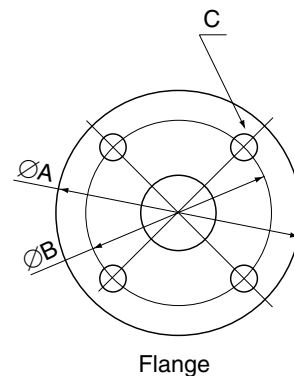
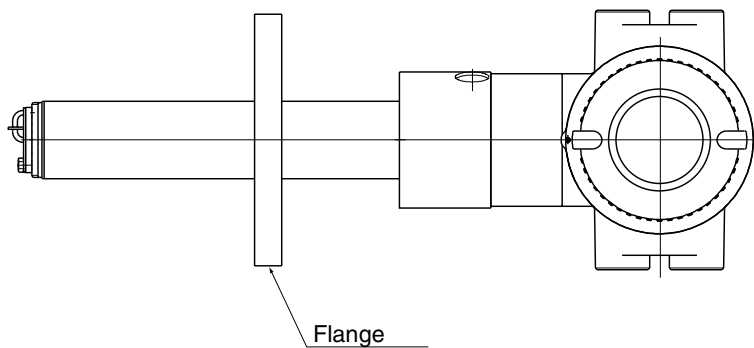
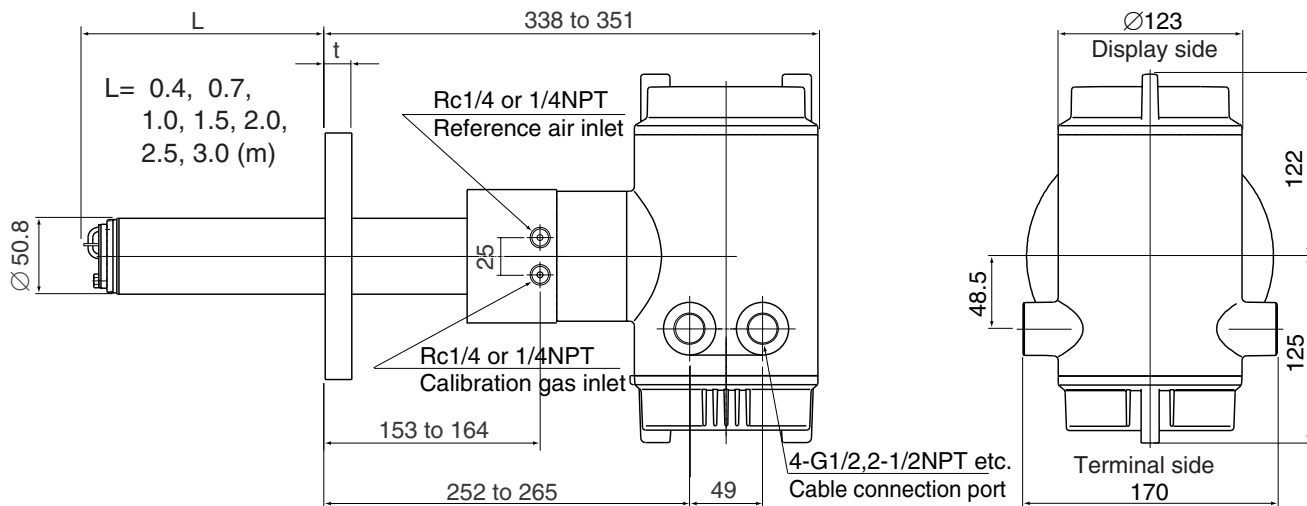


| Flange | A | B | C | t |
|-------------------------------|-------|-------|------------------------|----|
| ANSI CLASS150-2-RF equivalent | 152.4 | 120.6 | 4 - $\varnothing 19$ | 19 |
| ANSI CLASS150-3-RF equivalent | 190.5 | 152.4 | 4 - $\varnothing 19$ | 24 |
| ANSI CLASS150-4-RF equivalent | 228.6 | 190.5 | 8 - $\varnothing 19$ | 24 |
| Westinghouse | 155 | 127 | 4 - $\varnothing 11.5$ | 14 |

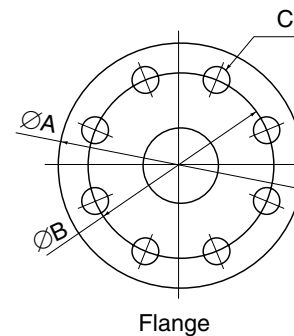
- With sun shield hood (option code /H)



5. Model ZR202G...-P (with pressure compensated) Integrated type Zirconia Oxygen Analyzer

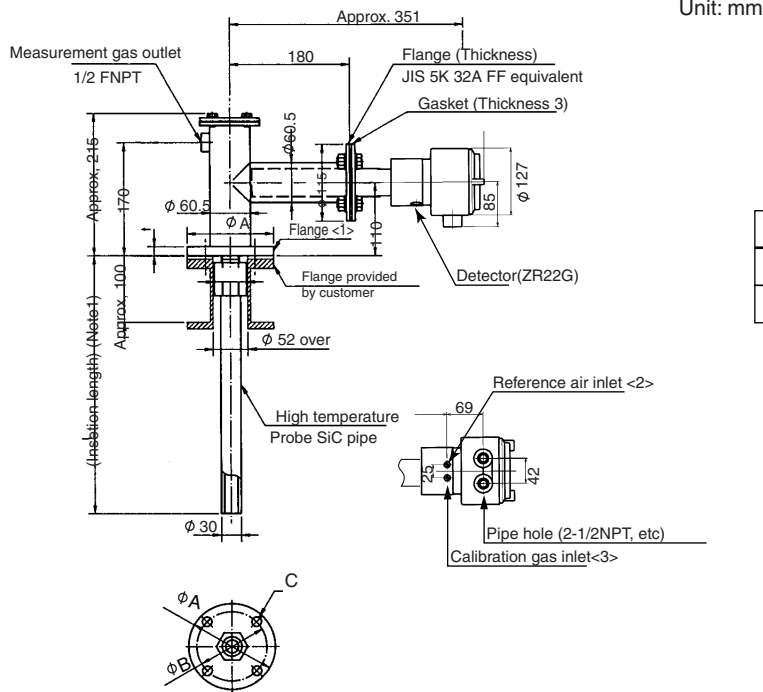


| Flange | A | B | C | t |
|-------------------------------|-------|-------|-----------|----|
| ANSI CLASS150-2-RF equivalent | 152.4 | 120.6 | 4 - Ø19 | 19 |
| ANSI CLASS150-3-RF equivalent | 190.5 | 152.4 | 4 - Ø19 | 24 |
| ANSI CLASS150-4-RF equivalent | 228.6 | 190.5 | 8 - Ø19 | 24 |
| Westinghouse | 155 | 127 | 4 - Ø11.5 | 14 |



F11_01.EPS

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



| <1> Flange | <2>, <3> joint | A | B | C |
|-------------------------------|----------------|-------|-------|---------------|
| JIS 5K-50-FF equivalent | Rc 1/4 | 130 | 105 | 4 - $\phi 15$ |
| ANSI CLASS150-4-RF equivalent | 1/4 FNPT | 228.6 | 190.5 | 8 - $\phi 19$ |

F12A.EPS

- (Note 1) 1=1000 or 1500 (mm)
 (Note 2) Sample gas outlet
 (if the sample gas pressure is negative,
 connect the auxiliary ejector.)

■ OPTIONS

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

Measuring O_2 in the high temperature gases (exceeds $700^\circ C$) requires a general-use probe ZR22G of 0.15 m length and a high-temperature probe adapter.

Sample gas temperature: 0 to $1800^\circ C$

Sample gas pressure: -0.725 to 0.73 psi
 (-0.725 to +36.3 requires pressure compensation.)

Insertion length: 1 m, 1.5 m

Material in Contact with Gas: SUS 316 (JIS), Zirconia, SiC or SUS 310S, SUS 304 (JIS) (flange)

Probe Material: SiC, SUS 310S (JIS)

Installation: Flange mounting (FF type or RF type)

Construction: Non explosion-proof. Rainproof construction.

Weight: Insertion length of 1.0 m: approx. 6.5 kg (JIS) / approx. 8.5 kg (ANSI)

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

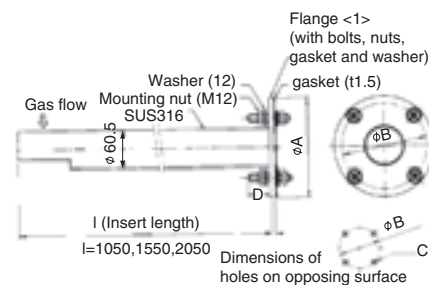
2. ZR22R Probe Protector for Zirconia Oxygen Analyzer

Used when sample gas flow velocity is approx. 10m/sec or more and dust particles wears the detector in cases such as pulverized coal boiler or fluidized bed furnace (or burner). When probe insertion length is 2.5 m or more and horizontal installation, specify the ZR22V to reinforce the probe.

Insertion Length: 1.5 m, 1.55 m, 2.05 m.

Flange: JIS 5K 65A FF equivalent. ANSI CLASS 150-4-FF (without serration) equivalent or DIN PN10-DN50-A equivalent. However, flange thickness is different.

Material: SUS316 (JIS), SUS304 (JIS) (Flange)
 Weight: 1.05 m; Approx. 6/10/8.5 kg (JIS/ANSI/DIN),
 1.55 m; Approx. 9/13/11.5 kg (JIS/ANSI/DIN),
 2.05 m; Approx. 12/16/14.5 kg (JIS/ANSI/DIN)



| Flange<1> | A | B | C | t | D |
|--------------------------------|-------|-------|---------------|----|----|
| JIS 5K-65-FF equivalent | 155 | 130 | 4 - $\phi 15$ | 5 | 40 |
| ANSI CLASS 150-4-FF equivalent | 228.6 | 190.5 | 8 - $\phi 19$ | 12 | 50 |

F17.EPS

3. Filter for 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

4. M1200DB-06 Hastelloy X Sintered Filter Assembly (for use with ZR22G)

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

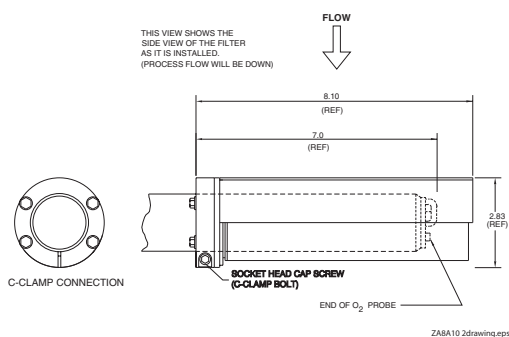
Mesh: 10 microns (filter)

Material: Hastelloy X

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

Connection: Stainless Steel c-clamp with bolts

Weight: Approximately 18 lb (.8kg)



5. K9292DS Check Valve

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 time between calibrations.

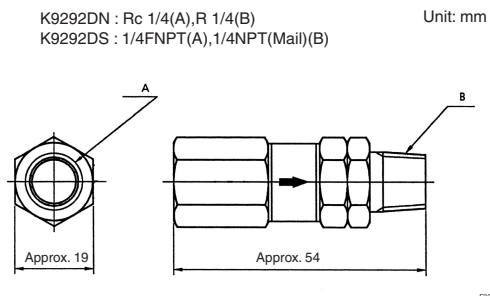
Connection: 1/4 FNPT inlet; 1/4" MNPT outlet

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.

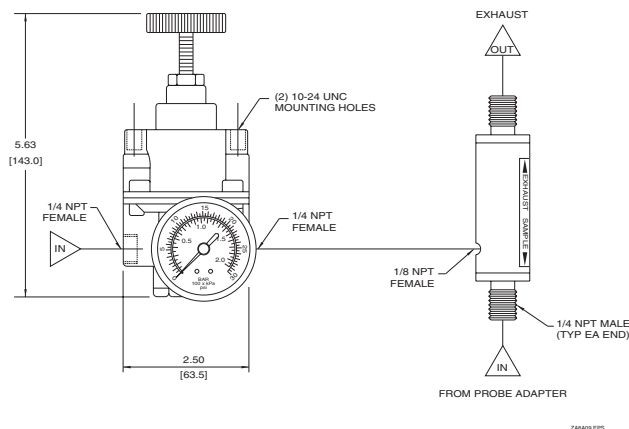


6. Auxiliary Ejector Assembly, Model No. M1132KE

High temperature installations require the use of the auxiliary ejector assembly in all installations. using instrument air, the auxiliary ejector draws a sample through

the adapter tee for quick measurement without mechanical assistance. The assembly includes an ejector, regulator and pressure gauge and is included in the heated eductor (/BE or /ER 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.



7. Ejector, Model No. M1132KA

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

Pressure Regulator, Model no. M1132KD

This general purpose regulator is used to adjust the flow of instrument air entering the ejector. 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

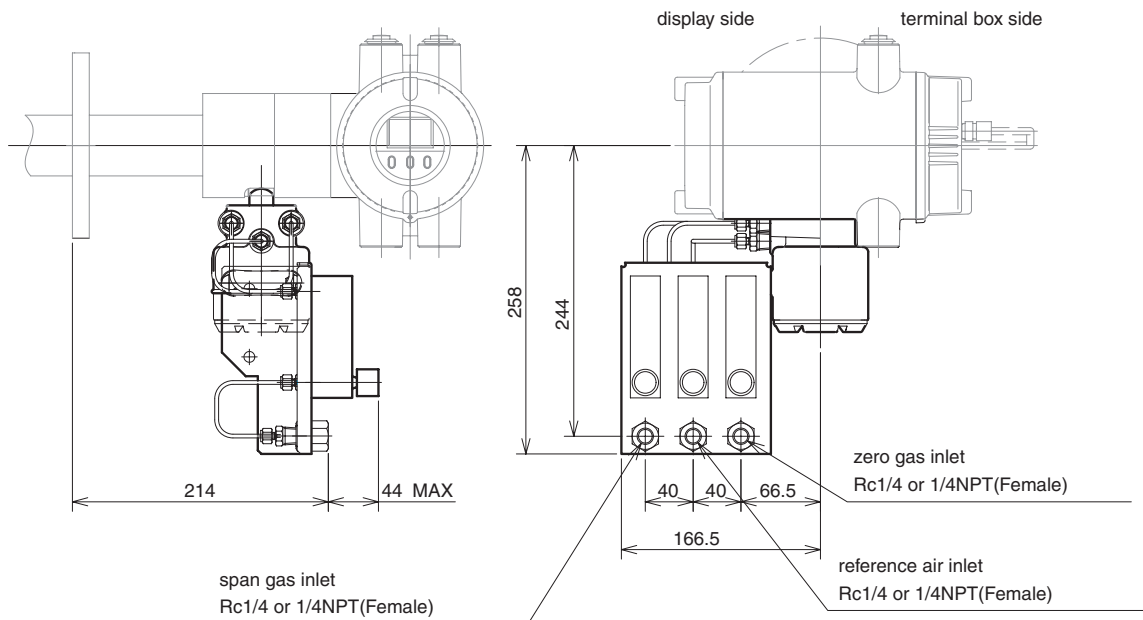
Materials: Body - Die cast aluminum alloy; Diaphragm - Nitrile elastomer and nylon fabric; Trim - Brass, zinc plated steel, acetal.

Weight: 4.0lb (1.8kg)

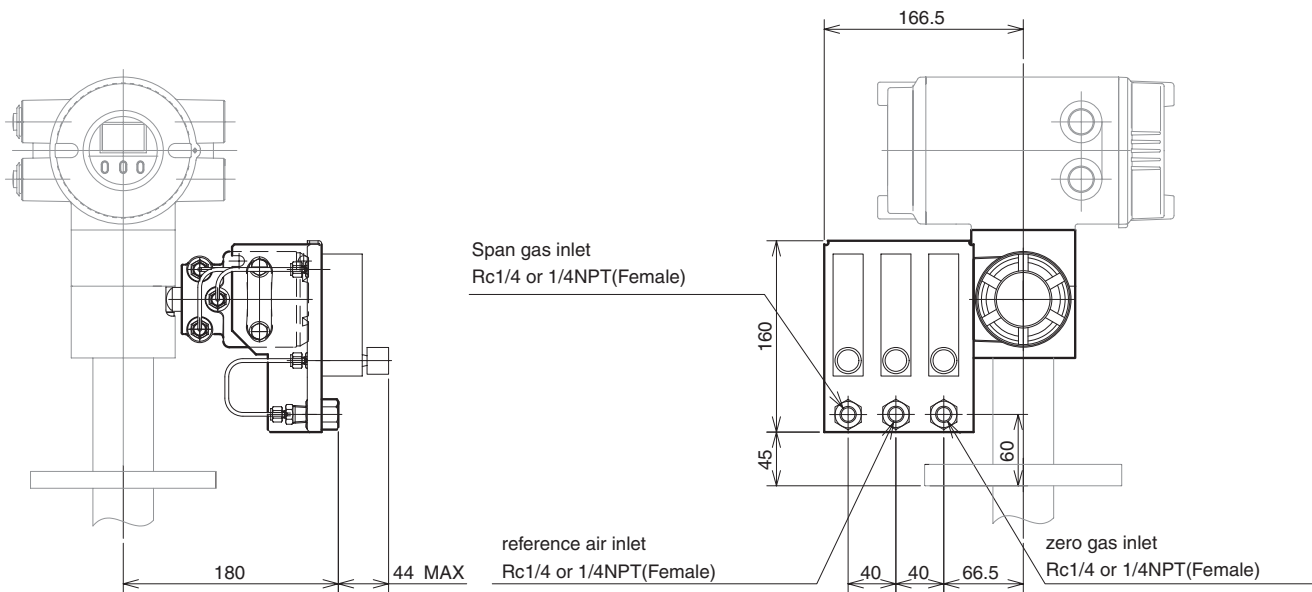
9. Model AR20H Automatic Calibration Unit for Integrated type Analyzer

Horizontal mounting on the ZR202G (-A)

Unit: mm



Vertical mounting on the ZR202G (-B)

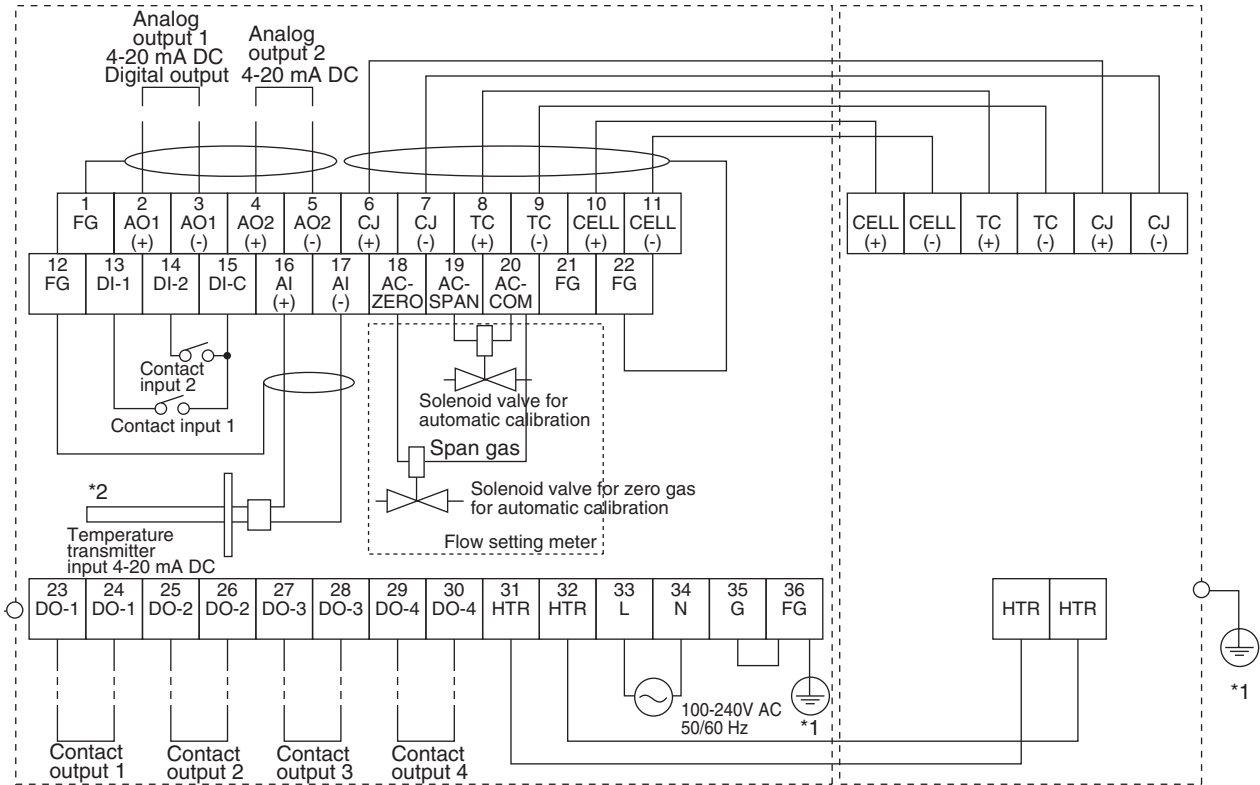


F36.EPS

■ WIRING CONNECTIONS

Model ZR402G Separate type Zirconia Oxygen Analyzer/
High Temperature Humidity Analyzer, Converter

Model ZR22G Separate type Zirconia Oxygen /
High Temperature Humidity Analyzer, Detector

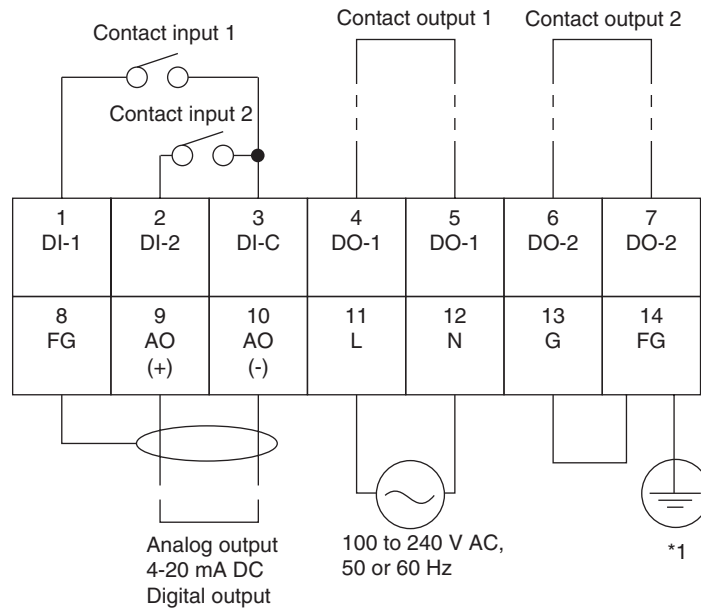


*1 Grand resistance is 100 ohm or less.

*2 Option (Temperature transmitter provide by user) for humidity measurement.

F27.EPS

Model ZR202G Integrated type Zirconia Oxygen / High Temperature Humidity Analyzer



*1 Ground resistance is 100 ohm or less.

F28.EPS