General Specifications

GS 11M7A3-E

Model ZS8
Direct In-Situ Flameproof
Zirconia Oxygen Analyzers

EXA OXY

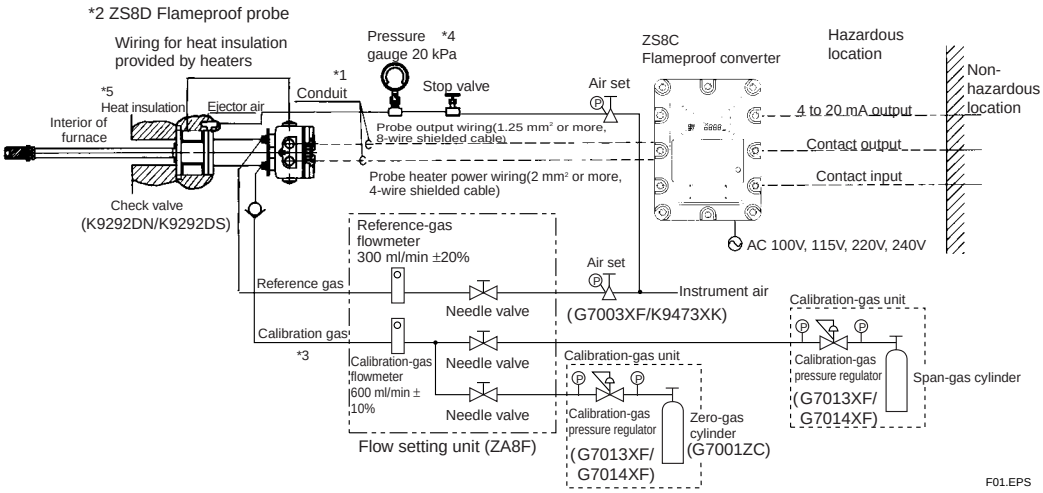
■ GENERAL

The ZS8 Flameproof Zirconia Oxygen Analyzer consists of a flameproof probe and a flameproof converter.

Additionally, a flow setting unit and a calibration gas unit can be selected as cofiguration units, according to specifications.

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.

■ EXAMPLE OF BASIC SYSTEM CONFIGURATION: LAYER OF HEAT INSULATION PROVIDED BY ELECTRIC HEATERS (In case of Gas Fuel)



*1: Conduits

1) When installing conduits, use flexible conduits so that the probe can be removed.
2) Use a shielded cable for the signal cable and ground the shield together with the probe ground.
3) Provide separate conduits for the signal and heater lines.
4) For the insulation from the steam heaters, use 1.25 mm² or more of 6-wire shielded cable and 2 mm² or more of 2-wire shielded cable for the probe output wiring and heater power wiring, respectively.
5) The maximum outside diameter of the cable suited for the cable gland used for the instrument is 13.5 mm (in case that the thread at the conduit side is G 3/4)

*2: The probe material SUS310S or SiC should be selected according to the specified measurement gas temperature (SUS310S: 0 to 800°C; SiC: 800 to 1400°C)

Probe heat insulation can be selected from the following two: heat insulation provided by electric heaters and by steam heaters. See the MODEL AND SUFFIX CODE table.

*3: For the zirconia oxygen analyzer, 100 % nitrogen cannot be used as the zero gas. Generally, approximately a 1% oxygen (nitrogen gas balance) mixture is used.

*4: The setting of the ejector supply air pressure depends on the furnace pressure.

*5: The electric or steam heater's specific heat insulation jackets are optionally available with the type of heat insulation.

For details of the heat insulation work, refer to "ZS8 Flameproof Zirconia Oxygen Analyzer Installation Manual" (TI 11M7A3-01E).

YOKOGAWA

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■ FEATURES

■ TIIS Flameproof Structure

Both the probe (Exd II BT3X) and converter (Exd II BT6) have flameproof structures.

■ Heat Insulation above Sulfuric Acid Dew Point

Using heat insulation provided by electric heaters or steam heaters, the probe is always set at a temperature higher than sulfuric acid dew point (120 to 160°C). Thus, there is no erosion caused by sulfur contained in the sample gas. In the case of heat insulation provided by electric heaters, if the temperature of the heater decreases, the ejector air can be cut off to protect the analyzer.

■ Highly Reliable Oxygen Analysis at High Temperatures (Up to 1400°C)

Its flameproof construction based on our non-flameproof converter and probe with many achievements offers high reliability.

■ Large, Easy-to-Read Digital Display

The large digital display can display the cell emf and temperature as well as oxygen concentration. If any abnormality occurs, it offers an alarm display.

■ One-touch Calibration

Calibration can be executed by simply pressing the calibration button after having air and the standard gas flow.(When the flow setting unit is included)

■ Self-diagnostic Function

■ Easy Replacement of Zirconia Cell

The same cell can be used for both non-flameproof and flameproof models. Also, it is easy to replace.

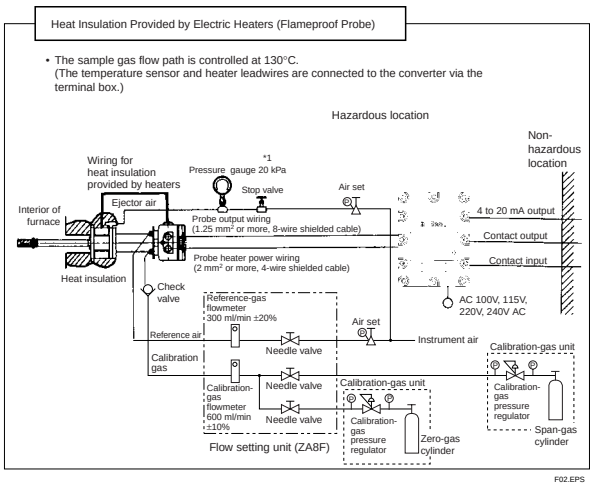
■ Zirconia Cell Enables Quick Response and Long-term Stability

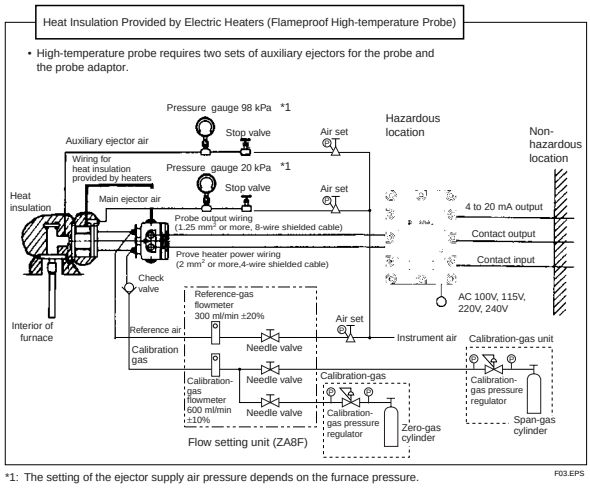
■ Since no compensating wiring is required, wiring costs can be reduced.

■ Can be installed in explosive outdoor atmospheres.

Both the probe and converter can be installed as is in explosive atmospheres at work sites.

■ EXAMPLES OF SYSTEM CONFIGURATION





■ Restriction

Standard stems can not be used for the measurement of oxygen in combustion gases of waste fluid furnaces if the temperature of a sample gas is 100°C or below and the moisture of it exceeds the saturation point.
Contact Yokogawa Electric Corporation.

■ SELECTION CONDITIONS AND EXAMPLES OF CONFIGURATION

Model	Selection Conditions	
Type of heat insulation	1. Heat insulation provided by electric heaters (*1)	2. Heat insulation provided by steam heaters (*1)
Flameproof probe; ZS8D-L (*2)	Select when the sample gas temperature is from 0 to 800°C. Material: SUS310S (0 to 800°C)	
Flameproof high-temperature probe; ZS8D-H (*2)	Select when the sample gas temperature is 800 to 1400°C or when the general probe cannot be used owing to limited installation space.	
Probe with flameproof terminal box; ZO21DW-L (*2)	Select when the gas temperature is 0 to 600°C and the pressure is -20 to +20 kPa. (interior of furnace non-explosion-protected)	
Probe adaptor; ZS8P-H (*3)	Select whenever the high-temperature probe is used.	
Converter ; ZS8C	Should be selected.	
Check valve (K9292DN/K9292DS)	Order when it is required as a spare part.	
Auxiliary ejector assembly K9292VA / K9292VB	For probe. Select depending on the joint type(Rc1/4 or 1/4NPT). (spare parts) (Installed in the probe as standard)	
Auxiliary ejector assembly K9292WA/K9292WB	For probe adaptor. Select depending on the joint type (Rc1/4 or 1/4NPT). (spare parts) (Installed in the probe adaptor as standard)	
Flow setting unit (manual type); ZA8F (*4)	Can be used for one-touch calibration.	
Air set (G7003XF/K9473XK)	Order when it is required.	
Zero-gas cylinder (G7001ZC) (*5)	Order when it is required.	
Pressure regulator for zero-gas cylinder (G7013XF/G7014XF) (*5)	Order when it is required.	
Case assembly (E7044KF) (*5)	Calibration gas unit case (not including cylinder and pressure regulator)	

*1: Select either electric heater or steam heater according to the customer s utility conditions when gas fuel is used. A steam heater must be specified when heavy oil fuel or heavy oil and gas fuel mixture is used.
*2: Select one probe according to the sample-gas temperature and pressure. Both the general and high-temperature probes are equipped with ejectors as standard.
*3: The probe adaptor is equipped with an auxiliary ejector assembly as standard.
*4: The standard flow setting unit is a manual unit. For a flow setting unit for automatic calibration, contact Yokogawa. (Solenoid-valve drive contact output for automatic calibration is incorporated in the ZS8C converter.)
*5: For the calibration-gas unit, a zero-gas cylinder, pressure regulator, and case assembly are needed.

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■ STANDARD SPECIFICATIONS

1. General Specifications

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

Measurement System: Zirconia system

Flameproof Construction:

Probe; Exd II BT3X (Max. surface temperature of 200°C)

Converter; Exd II BT6 (Max. surface temperature of 85°C)

Used condition of Flameproof

Converter: (Exd II BT6)

(a) Before opening the cover, remove power and make sure of non-hazardous atmospheres.

(b) When the ambient temperature of the converter exceeds 50°C, use wire resistant to 70°C or greater for external wiring.

Detector: (Exd II BT3X)

(a) Before opening the cover, remove power and allow the detector to stand at least 40 minutes.

(b) When the ambient temperature of the detector exceeds 30°C, use wire resistant to 70°C or greater for external wiring.

(c) The detector cannot be used except in mixed gases composing air or mixed gas with oxygen concentration lower than air, or combustible gas or vapor.

Measurement Range:

Display; 0 to 100 vol%O_2 (3-digit digital display)

Output; 0 to 5 vol%O_2 to 0 to 25 vol%O_2

Although the measuring range can be set up to 0 to 25 vol%O_2, a sample gas with the oxygen concentration of over 21 vol%O_2cannot be measured in terms of the explosionproof standard.

Warm-up Time: Approx. 30 minutes

Maximum Distance Between Probe and Converter:

Conductor two-way resistance must be 10Ω or less (300 m or less with 1.25 mm^2 conductors)

Power Supply: 100, 115, 220, 240 V AC +10%, -15% 50/60 Hz

Power Consumption:

Analyzer; 80 VA for ordinary use, maximum of 270 VA

Electric heaters providing heat insulation; approximately 200 VA for ordinary use, maximum of approximately 400 VA

■ CHARACTERISTICS

Repeatability: ± 0.5% of span (0 to 5 vol%O_2 or more and up to 0 to 25 vol%O_2 range)

Linearity ±1% of span(0 to 5 vol%O_2 or more and up to 0 to 25 vol%O_2 range)

[Sample gas pressure: within + 4.9 kPa]
The following conditions must be satisfied.
Use oxygen of known concentration (with in the measuring range) as the zero and span calibration gases.
Excluding standard gas tolerance
Excluding the cases where the reference air is by natural convection.

Drift: Both zero and span ± 2.0% of span/month

Response Time: 90% response within 5 seconds (measured when gas is fed through the calibration gas inlet and the analog output signal begins to change)

2. Probe

2.1 Flameproof Probe ZS8D

Sampling Method: Air ejector method

Ejector air; Supply pressure 20 kPa, flow rate at 4 l/min. or less
At atmospheric pressures inside the furnace
(As sample-gas exhaust methods, “recirculate in furnace” and “discharge outside furnace” are available. Specify the method using our model code according to specifications when ordered.
For high-temperature probes, only “discharge outside furnace” is available.)

Sample Gas Temperature:

ZS8D-L-J-□□□ 0 to 800°C (general probe)
(Probe material: SUS310S)

ZS8D-H; 800 to 1400°C (high-temperature probe)
(Probe material: SiC)
For this type, probe adaptor ZS8P-H is required. (The ZS8D-H high-temperature probe can be selected if a general probe cannot be installed owing to limited installation space.)

Sample Gas Pressure:

-5 to 5 kPa for the ZS8D-L general probe

-1.5 to 5 kPa for the ZS8D-H high-temperature probe

(For the range -20 to +20 kPa, the ZO21DW probe with a flameproof terminal box is available.)

Gas Flow Velocity: 30 m/s or less

Dust Amount: 500 mg/Nm^3 or less

Heat Insulation: (Select either heat insulation provided by electric heaters or by steam.)

Heat insulation provided by steam

Pressure: Normal 800 kPa, maximum 1 MPa
At temperatures above the dew point of sulfuric acid (below 160°C) and for gas combustion, there are no sulfuric components, so heat insulation can be attained at a steam pressure of 200 to 300 kPa. Specify when heavy oil or heavy oil and gas fuel is used.

Heat insulation provided by electric heaters

Specify only when gas fuel is used.

Power consumption; 200 VA for ordinary use,
maximum of 400 VA;
Temperature: 130°C (gas fuel)

Reference Gas: Instrument air 300 ml/min ±20%

Calibration Gas: Instrument air and standard gas 600 ml/min ± 10%.

Insertion Length: 0.5, 0.7, 1.0, 1.5 m

Surface Temperature: 200°C or less

Material in Contact with Gas:
Probe SUS310S (or SUS304), Zirconia, SUS304(flange), SUS316 (tube)

Installation: Flange mounting

Probe mounting angle

- ZS8D-L; For SUS310S, between the horizontal and vertically down positions
- ZS8P-H; For SUS310S, between the horizontal and vertically down positions
  For SiC: Vertically down (within ±5°)

Joint; Rc1/4 or 1/4NPT

Flange:
- ZS8D-L; JIS 10K 100 FF SUS304, JPI Class 150 4 RF SUS304, ANSI Class 150 4 RF (no serration) SUS304, DIN PN10 DN100 A SUS304.
- ZS8D-H; JIS 5K 65 FF SUS304

Construction: Flameproof Exd II BT3X

Case Material: Material in contact with gas; SUS316
Terminal box; Aluminum
Others; SUS304

Weight: Approx. 10.3 kg with an insertion length of 0.15 m (JIS high-temperature use).
Approx. 13 to 15 kg with an insertion length of 0.5 m (for JIS/JPI/ANSI/DIN applications).
Approx. 12 to 15 kg with an insertion length of 0.7 m (for JIS/JPI/ANSI/DLN applications).
Approx. 14 to 16 kg with an insertion length of 1 m (for JIS/JPI/ANSI/DIN applications).
Approx. 15 to 17 kg with an insertion length of 1.5 m (for JIS/JPI/ANSI/DIN applications).

2.2 Probe with Flameproof Terminal Box ZO21DW

The probe, as a whole, is not explosion-protected (Calibration gas inlet, reference air outlet) and only its terminal box section is explosion-protected.

Sample Gas Temperature: 0 to 600°C

Sample Gas Pressure: -20 to +20 kPa

Insertion Length: 0.4, 1.0, 1.5, 2.0, 3.0 m

Ambient Temperature: -10 to +70°C (terminal box temperature)

Reference-air Flow Rate: 800 ml/min. (Use instrument air. Reference air is discharged into the furnace.)

Material in Contact with Gas: SUS316,Zirconia,SUS304 (flange)

Installation: Flange mounting (FF)

Probe mounting angle; Between the horizontal and vertically down positions

Note: Probe protector (ZO21R-L-150-□∗B/R, GS11M6A2-E) is required when insertion length is 3 m and horizontal installation.

Joint; Rc1/8

Flange; JIS 10K 100 A FF SUS304 ANSI Class 150 4 RF SUS304, and DIN PN10 DN100 A SUS304.

Construction: The terminal box is explosion-protected (d2G4).

Weight: with insertion length of 0.4 m, approx. 6.5 kg; 1.0 m, approx. 10.0 kg; 1.5 m, approx. 13.0 kg; 2.0 m, approx. 17.0 kg; 3.0 m, approx. 20.0 kg

2.3 Probe Adaptor ZS8P-H

The ZS8P-H probe adaptor is required for the ZS8D-H high-temperature probe.

Sample Gas Temperature: 0 to 800°C (when SUS310S probe is used)
800 to 1400°C (when SiC probe is used)

Sample Gas Pressure: -1.5 to +5 kPa

Insertion Length: 0.5 m, 0.7 m, 1.0 m,1.5m

Material in Contact with Gas: Zirconia, SiC or SUS 310S, SUS304, flange (SUS304)

Installation: Flange mounting (FF or RF type)

Flange; JIS 10K 100 FF SUS304, JPI Class 150 4 RF SUS304, ANSI Class 150 4 RF(no serration) SUS304, and DIN PN10 DN100 A SUS304.

Probe mounting angle;
Vertically down (within ±5°)
SUS310S probe can be mounted horizontally.

Case Material: SUS304

Weight: with insertion length of 0.5 m, approx. 10 to 12 kg(JIS/JPI/ANSI/DIN)

0.7 m, approx. 10.5 to 12.5 kg (JIS/JPI/ANSI/DIN)

1 m, approx. 11 to 13 kg (JIS/ANSI)

1.5 m, approx. 12 to 14 kg (JIS/ANSI)

3. Flameproof Converter ZS8C

Display Section: Measured value display section: 4-digit LED; Talk and response display: 40-character dot matrix LCD with backlight

Display Content:

LED: Oxygen concentration (vol%), error code display

LCD:

Measured value group A (1st level)

Analog bar (output range, alarm setpoints, simultaneous display), max./min. oxygen values, average value (period setting possible), cell emf (mV), clock

(year/month/day/hour/minute)

Measured value group B (2nd level)

Span correction rate/record, zero correction rate/record, cell response time (sec.), cell resistance (Ω), cell condition, estimated cell life-span, heater on-time rate

Setpoint group C (calibration related)

Calibration gas concentration (%O_2), calibration mode (one-touch, semi-automatic, automatic), stabilization time , calibration time, calibration cycle, calibration start time

Setpoint group D (output related)

Output range 1,2 (%O_2), presence or absence of output hold/ preset value, analog output smoothing constant

Setpoint group E (alarm)

HH alarm, H alarm, LL alarm and L alarm setpoints, contact output delay (sec.)/ hysteresis (% span)

Status message group

Self-diagnosis, calibration, warm-up, stabilization, abnormal content

Talk and response message group

Calibration operation indicator, component check indicator, password entry indicator

Help message:

Information supplementary to display content

Analog Output Signal:

Range: any settings between 0 to 5 through 0 to 25 vol%O_2; switching between 2 ranges by external contact input possible (optional); partial range possible (span/zero rate≧ 1.3)

4 to 20 mA DC (max. load resistance 550Ω)

Input/output isolation

Output dumping: 0 to 255 seconds

Dumping released during abrupt output change (releasing range: 0 to 3.0 vol%)

Hold/non-hold selection, preset value setting possible at hold

Contact output signal:

3 points, contact capacity 30 V DC 2A, 250 V AC 2A (resistive load)

Fail-safe condition (normally energized/normally de-energized) selectable, NO/NC selectable using jumper pin

Delay function (0 to 255 sec.) and hysteresis function (0 to 25vol%O_2) can be set for Hi/Lo alarm.

The following functions are programmable for each contact output: (1) Abnormal (self-diagnosis) (2) HiHi alarm (3) Hi alarm (4) LoLo alarm (5) Lo alarm (6) Entry (7) Range switching answerback (8) Warm-up (9) Reduction of calibration-gas pressure (repeat output of contact input) (10) Calibration (11) Blow-back

If any combination is applicable during default, the contact points will operate.

Contact point 1: NC, normally energized (1) Abnormal

Contact point 2: NO, normally de-energized (6) Entry + (10) Calibration + (8) Warm-up

Contact point 3: NO, normally de-energized, (3) Hi alarm + (5) Lo alarm

Contact Output for Solenoid Valve:

Solid State Relay (Triac) output: 2 points

Contact capacity: 250 V AC, 1 A

Leakage current at SSR OFF: 3 mA or less

Contact output for ejector air stop solenoid valve:

Contact capacity: 250 V AC, 1 A (load resistance)

* In the case of a probe with electric heaters, if the heater temperature falls below ±10°C against setting temperature for some reason (or if the power goes off), the ejector stops.

Serial communications: with an RS-422-A interface

Self-diagnosis: Abnormal cell, abnormal cell temperature (low)(high), abnormal analog circuit, abnormal calibration, abnormal ROM/RAM, power failure

Contact Input (optional):
2 points, isolated
Contact input or voltage input

	ON	OFF
Contact input	200 Ω or less	100 kΩ or more
Voltage input	-1 to +1 V DC	-4.5 to +2.5 V DC or more

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The following functions are programmable for each contact input:

(1) Reduction of calibration-gas pressure
(2) Range switching
(3) External calibration start
(4) Process abnormal alarm
(5) Blow-back start

Calibration:

Calibration method: One-touch, automatic/semi-automatic (optional)

All are operated by a talk-and-response procedure with the LCD panel. With automatic/semi-automatic, either zero or span can be skipped.

Calibration-gas concentration setting range:

0.3 to 25 vol%O_2 (minimum setting unit: 0.01 vol%O_2)

Use the standard zero and span gases which are gas mixtures of nitrogen and about 10% oxygen for an 80 to 100% scale.

Ambient Temperature: -20 to +55°C

Power Supply: 100, 115, 220, 240 V AC +10%, -15%, 50/60 Hz

Construction: Exd II BT6, JIS C0920 waterproof, NEMA3 or equivalent (when the openings for conduits are completely sealed)

Power Connection Inlet: Seven G3/4 holes

Air-purge: Rc1/4 or 1/4NPT(F) connection (optional)

Approx. 1 l/min. at 50 kPa

Note that the number of the power connection inlets becomes six when purging.

Installation: Wall or pipe mounting

Case: Aluminum alloy

Paint Colors: 0.6GY3.1/2.0 (for instrument front cover) and 2.5Y8.4/1.2 (instrument case)

Paint: Baked epoxy resin

Weight: Approx. 19 kg (100 to 115 V AC)

Approx. 20.5 kg (220 to 240 V AC)

■ OPTIONS

4. Check Valve K9292DN/K9292DS

This is used to prevent entry of the process gas into the calibration-gas line. It is incorporated in the product as standard. If it is necessary to have one as a spare part, select it according to the specifications.

Connection: Rc1/4 or 1/4NPT (F)
(R1/4 or 1/4NPT (M) connectable)

Material: SUS304

Supply Pressure: Between 70 kPa and 350 kPa

Weight: Approx. 40 g

5. Auxiliary Ejector Assemblies K9292VA/K9292VB (for probe) K9292WA/K9292WB (for probe adaptor)

Assemblies for both the probe and probe adaptor are available. If it is necessary to have one as a spare part, select it according to the specifications.

5.1 Ejector Assembly K9292VE/K9292VF (for probe) K9292WC/K9292WD (for probe adaptor)

Ejector Air Pressure: 20 kPa for probe
98 kPa for probe adaptor

Air Consumption: 4 l/min. for probe
40 l/min. for probe adaptor

Connection: Rc1/4 or 1/4NPT

Material: SUS304

Tube Connection: (ø6/ø4 or 1/4" copper or stainless-steel tubing)

5.2 Pressure Gauge Assembly

Pressure Gauge Type: JIS B7505, A1.5U3/8X75

Material in Contact with Gas: SUS316

Case Material: Aluminum alloy (painted in black)

Scale: 0 to 50 kPa (K9292VA/VB for probes)
0 to 200 kPa (K9292WA/WB for probe adaptors)

Tube Connections: Rc1/4 or 1/4NPT, SUS304

5.3 Needle Valve

Connection: Rc1/4 or 1/4NPT

Material: SUS316

(Note) Pipes and connectors other than the above are not supplied.

6. Flow Setting Unit ZA8F

Used when instrument air is provided.

This unit controls flow rates of calibration gas and reference gas and consists of flowmeter

and flow rate control valve.

Flowmeter: Calibration gas; 0.1 to 1.0 l/min. Reference air; 0.1 to 1.0 l/min.

Construction: Dust-proof and rainproof construction

Case Material: SPCC (Cold rolled steel sheet)
Painting: Baked epoxy resin, Dark-green (Munsell 2.0 GY 3.1/0.5 or equivalent)
Tube Connections: Rc1/4 or 1/4FNPT
Reference Air pressure: Clean air supply of measured gas pressure plus approx. 50 kPa G measured gas pressure plus approx.150 kPa (maximum pressure rating is 300 kPa) when a check valve is used (pressure at inlet of the auto-calibration unit)
Air Consumption: Approx. 1.5 l/min
Weight: Approx. 2.3 kg

7. Air Set G7003XF/K9473XK

Primary Pressure: Max. 1 MPa G
Secondary Pressure: 0 to 200 kPa G
Connection: Rc1/4 or 1/4NPT (F)
Material: Zn alloy

8. Calibration-Gas Unit

This unit consists of a zero-gas cylinder, pressure regulator, and case assembly.

8.1 Zero Gas Cylinder G7001ZC

Capacity: 3.4 **l**
Filled Pressure: 9.8 to 12 MPa G
Gas Composition: 0.95 to 1.0 vol%O_2 + N_2 balance

8.2 Cylinder Pressure Regulator G7013XF/G7014XF

Pressure Gauge:
Primary; 0 to 14.8 MPa G
Secondary: 0 to 0.4 MPa G
Connection:
Inlet: W22 14 threads, right-hand screw
Outlet: Rc1/4 or 1/4NPT (F)
Body Material: Brass

8.3 Case Assembly E7044KF

Case Paint: Baked epoxy resin
Paint Color: Jade green (Munsell 7.5BG 4/1.5)
Mounting: Two-inch pipe mounting
Weight: Approx. 10 kg (including the cylinder)

■ Standard Accessories (for Converters)

Accessory	Quantity	Remarks
Fuses	2 2 2 2	3.15 amperes 0.5 amperes 3 amperes (with steam heater) 12 amperes (with electric heater)
Converter terminal screws	5	M4 screws
Allen wrench	1	

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■ Standard Accessory (for Probes)

Accessory	Quantity	Remarks
Allen wrench	3	

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■ MODEL AND SUFFIX CODES

1. Flameproof Probe (0 to 1400°C)

Model	Suffix code	Option code	Description
ZS8D	-L	.....	General-purpose probe (0 to 800°C)
	-H	.....	High-temperature probe (800 to 1400°C)
Flameproof standard	-J	.....	Exd II BT3X (Maximum surface temperature: 200°C)
Probe material	-A	.....	SUS310S: Specify for general-purpose probe.
	-L	.....	SUS304: Specify for high-temperature probe.
Insertion length	-010	.....	0.1 m: Specify for high-temperature probe.
	-050	.....	0.5 m: SUS310S (0 to 800°C)
	-070	.....	0.7 m: SUS310S (0 to 800°C)
	-100	.....	1.0 m: SUS310S (0 to 800°C)
	-150	.....	1.5 m: SUS310S (0 to 800°C)
Heat insulation model	-1	.....	Steam heater (*1)
	-2	.....	Electric heater (*1)
Power supply (electric heater providing heat insulation)	-N	.....	For heat insulation provided by steam heaters
	-3	.....	220V AC, 50/60Hz
	-4	.....	240V AC, 50/60Hz
	-5	.....	100V AC, 50/60Hz
	-8	.....	115V AC, 50/60Hz
Exhaust method (*2)	-N	.....	Specify for high-temperature probe.
	-0	.....	Discharge outside furnace
	-1	.....	Recirculate in furnace
Flange joint connection	-H	.....	JIS 5K 65 FF, specify for high-temperature probe.
	-J	.....	JIS 10K 100 FF
	-K	.....	JPI Class 150 4 RF
	-A	.....	ANSI Class 150 4 RF
	-E	.....	DIN PN10 DN100 A
Calibration gas, reference gas, and ejector inlet joints (*3)	J	.....	Rc1/4
	A	.....	1/4NPT
Heat insulation jacket (*4)	...	/JS	For steam heaters
	...	/JE	For electric heaters

(*1) A steam heater [-1] must be specified when heavy oil fuel gas and heavy oil fuel mixture is used or clew point temperature of exhaust gas is about 130°C. By selecting either -1 or -2, the steam heater or electric heater is installed. For high-temperature probes, only "discharge outside furnace " is applied.
(*2) Select whether to discharge mixed gases (the sample gas sucked in by the ejector plus the ejector air) outside the furnace or to recirculate them in the furnace. If -1 is selected, a gas-return pipe is provided.
(*3) The flameproof probe is equipped with a check valve and auxiliary ejector assembly as standard.
(*4) Heat insulation jacket must be ordered. It is essential to use owning hood in where installed in surrounding rain.

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(Notes)

(1) Always use the specified external cable lead-in apparatuses given in the table below.
(2) The number of mountable external cable lead-in apparatuses is as follows:
 * Cable gland: 1 or 2
 * Sealing fitting: 1 or 2
(3) As standard, two cable glands (A9601AJ) for the external cable lead-in apparatuses are mounted on the cable inlet ports for the power supply and output signal. On the remaining port, the blind plug (for heat insulation provided by steam heaters) or flexible tube (for heat insulation provided by electric heaters) is mounted.

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External Cable Lead-in Apparatuses

Name	Part No.	Description	Remarks
CABLE GLAND	G9601AJ	Cable O.D. ø10 to ø13.5	Cable gland

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2. Probe with Flameproof Terminal Box (0 to 600°C)

Model	Suffix code	Option code	Description
ZO21DW	-L		Probe with flameproof terminal box
Insertion length	-040		0.4m
	-100		1.0m
	-150		1.5m
	-200		2.0m
	-300		3.0m
Flange joint connection	-J		JIS 10K 100A FF SUS304
	-A		ANSI Class 150 4 RF SUS304
	-E		DIN PN DN100 A SUS304
Style code	*A		Style A
Check valve		/CV	With check valve
Stop valve		/SV	With stop valve
Cable gland		/G	Cable glands (2 pieces)

T08.EPS

(*A) Cable gland [/G] must be specified when installed in hazardous area.

Name	Part No.	Description
CABLE GLAND	G7272YE	Metal Fittings with resisting pressure. O. D.ø11 to ø13

T09.EPS

3. High Temperature Probe Adaptor (0 to 1400°C)

Model	Suffix code	Option code	Description
ZS8P	-H.		High Temperature probe adaptor
Probe material	-A		SUS310S (0 to 800°C)
	-B		SiC (800 to 1400°C) (*1)
Insertion length	-050		0.5m
	-070		0.7m
	-100		1.0m
	-150		1.5m
Sample gas (exhaust method)	-0		Discharge outside furnace (*2)
Flange joint connection	-J		JIS 10K 100 FF SUS304
	-K		JPI Class 150 4 RF SUS304
	-A		ANSI Class 150 4 RF SUS304
	-E		DIN PN10 DN100 A SUS304
Ejector inlet joint (*3)	J		Rc1/4 (specified for JIS and JPI flanges)
	A		1/4NPT (specified for ANSI and DIN flanges)
Heat insulation jacket		/JP	For probe adaptors

T10.EPS

(*1) If the temperature inside the furnace is 800°C or more, select -B.
(*2) Select whether to discharge mixed gases (the sample gas sucked in by the ejector plus the ejector air) outside the furnace or to recirculate them in the furnace.
(*3) The probe adaptor is equipped with an auxiliary ejector assembly as standard.

High Temperature Probe (spare parts)

Part No.	Description
K9292TP	SiC, 0.5 m insertion length
K9292TQ	SiC, 0.7 m insertion length
E7046AL	SiC, 1.0 m insertion length
E7046BB	SiC, 1.5 m insertion length
K9292TV	SUS310S, 0.5 m insertion length
K9292TW	SUS310S, 0.7 m insertion length
E7046AP	SUS310S, 1.0 m insertion length
E7046AQ	SUS310S, 1.5 m insertion length

T11.EPS

4. Flameproof Converter

Model	Suffix code	Option code	Description
ZS8C	·····	·····	Converter
Flameproof standard	-J ·····	·····	Exd II BT6 (Max. surface temperature 85°C)
Power supply	-3 ·····	·····	220V AC, 50/60Hz
	-4 ·····	·····	240V AC, 50/60Hz
	-5 ·····	·····	100V AC, 50/60Hz
	-8 ·····	·····	115V AC, 50/60Hz
Auxiliary heater thermostat for probe(*1)	-0 ·····	·····	For probe heat insulation provided by steam heaters
	-1 ·····	·····	For probe heat insulation provided by electric heaters
Panel	-E ·····	·····	English
	-J ·····	·····	Japanese
Wall mounting		/W ·····	With wall mounting bracket
		/P ·····	With pipe mounting bracket
Air-purge connection		/AP2 ·····	1/4NPT
		/AP1 ·····	Rc1/4

(*1) A steam heater [-0] must be specified when heavy oil fuel, gas and heavy oil fuel mixture is used or clew point temperature of exhaust gas is about 130°C.

T12.EPS

(Notes)

(1) Always use the specified external cable lead-in apparatuses given in the table below.
(2) The number of mountable external cable lead-in apparatuses is as follows:
 * Cable gland: up to 7
 * Sealing fitting: up to 7
(3) As standard, three cable glands (G9601AE) for the external cable lead-in apparatuses are mounted on the cable inlet ports for the power supply and output signal. On the remaining four ports, blind plugs are mounted.
(4) If any signal other than the power supply and output signal is required, additionally prepare the following parts as necessary

T13.EPS

External Cable Lead-in Apparatus

Name	Part No.	Description	Remarks
CABLE GLAND	G9601AE	Cable O.D. ø10 to ø13.5	Cable gland
CABLE GLAND ASSY	K9356AG	Cable O.D. ø8.5 to ø11	Cable gland
FITTING ASSY	K9356AH	Cable inlet size: G3/4 (PF3/4)	Sealing fitting

T14.EPS

5. Check Valve (specified as spare parts if necessary)

Part No.	Description
K9292DS	Connection: 1/4NPT; material: SUS304
K9292DN	Connection: Rc1/4; material: SUS304

T16.EPS

6. Auxiliary Ejector Assembly (specified as spare parts if necessary)

Part No.	Description
K9292VB	For probe, 1/4NPT with a pressure gauge and valve
K9292VA	For probe, Rc1/4 with a pressure gauge and valve
K9292VF	Ejector joint (for auxiliary ejectors), 1/4 NPT
K9292VE	Ejector joint (for main ejectors), Rc1/4
K9292WB	Auxiliary ejector (for probe adaptors), 1/4 NPT, with a pressure gauge and valve
K9292WA	Auxiliary ejector (for probe adaptors), Rc1/4, with a pressure gauge and valve
K9292WD	For probe adaptor, 1/4NPT
K9292WC	For probe adaptor, Rc1/4

T15.EPS

7. Flow Setting Unit (for manual calibration)

Model	Suffix code	Option code	Description
ZA8F	·····	·····	Flow setting unit
Joint	-J ·····	·····	Rc1/4
	-A ·····	·····	1/4NPT with adaptor
Style code	*B ···	·····	Style B

T17.EPS

8. Air Set

Description \ Part No.	G7003XF	K9473XK
Primary Pressure	Max. 1 MPa G	Max. 1 MPa G
Secondary Pressure	0 to 200 kPa G	0 to 200 kPa G
Connection	Rc 1/4	1/4NPT with adaptor
Material	Zn alloy	Zn alloy

T21.EPS

9. Calibration Gas Unit

9.1 Zero-gas Cylinder

Part No.	Description
G7001ZC	3.4L container, 0.95 to 1.0 vol% O_2 + N_2 balance

T18.EPS

9.2 Cylinder Pressure Regulator

Part No.	Description
G7014XF	Inlet: W22 14 threads Outlet: 1/4NPT(F)
G7013XF	Inlet: W22 14 threads Outlet: Rc1/4

T19.EPS

9.3 Case Assembly

Part No.	Description
E7044KF	Calibration-gas unit case

T20.EPS

10. Spare Parts

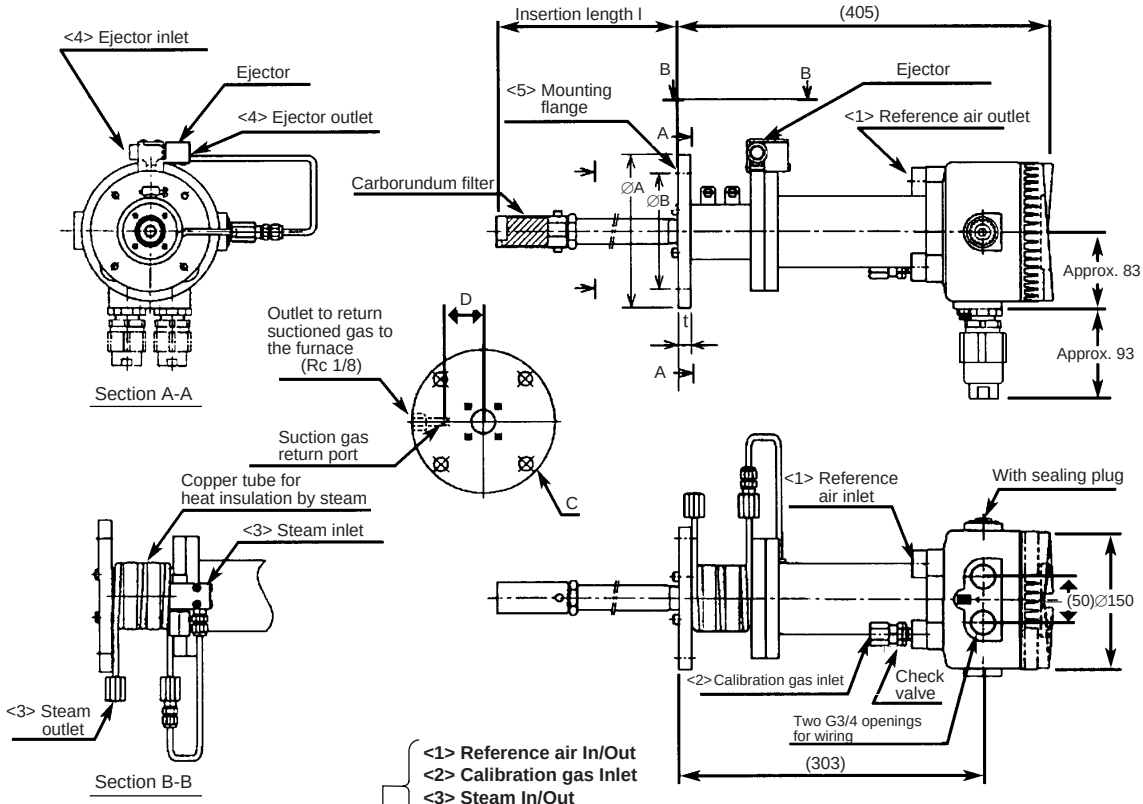
Part No.	Description
E7042UD	Cell assembly
K9292DE	Filter assembly (with bracket)
K9292BB	Flame arrester: Inlet for calibration gas and reference air, 1/4NPT
K9292BA	Flame arrester: Inlet for calibration gas and reference air, Rc1/4
K9292BY	Flame arrester: Reference air outlet, 1/4 NPT
K9292BU	Flame arrester: Reference air outlet, RC1/4
K9292XT	Heat insulation jacket: for steam heaters
K9292XU	Heat insulation jacket: for electric heaters
K9292XV	Heat insulation jacket: for probe adaptors

T22.EPS

■ EXTERNAL DIMENSIONS

1. Flameproof Probe ZS8D

Unit: mm



Note that the steam inlet and outlet positions may be changed.

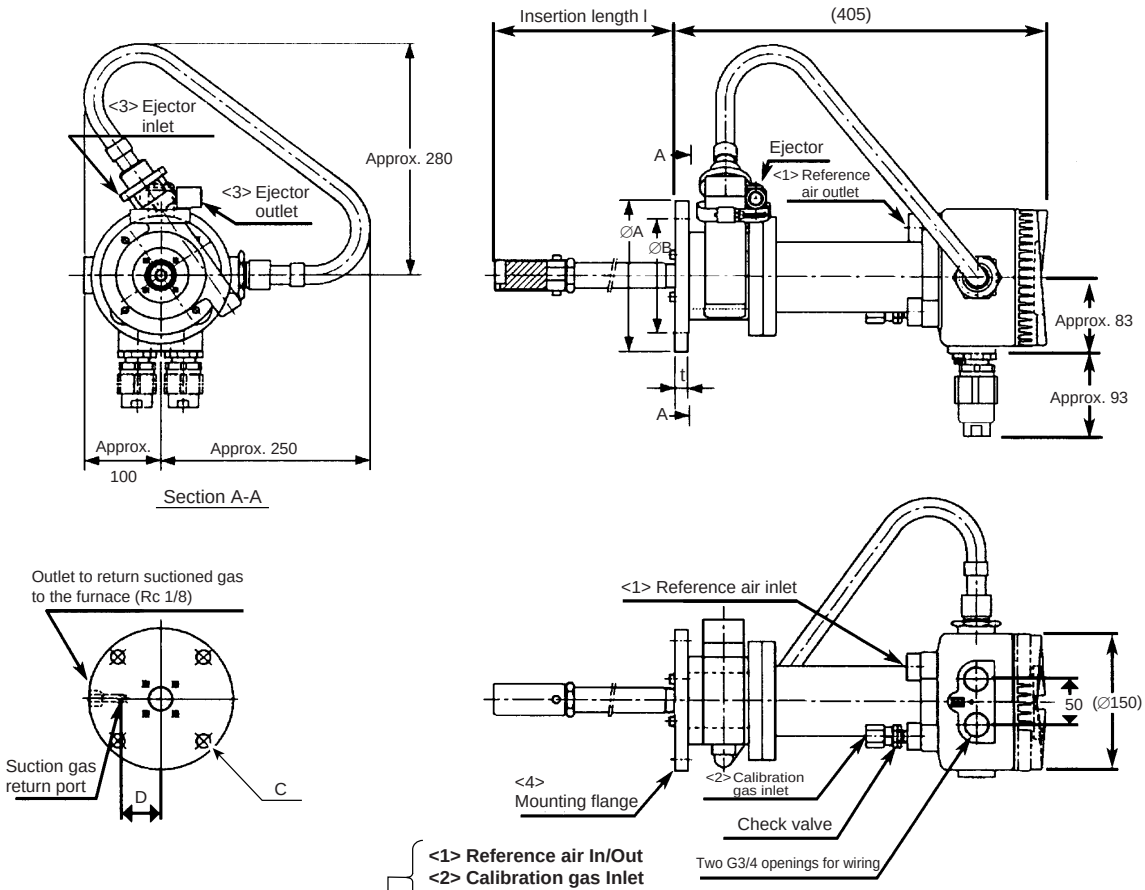
Model and Suffix code	Length l (m)	Joint J: Rc1/4 A: 1/4NPT	<5> Flange							Weight (kg)
			Flange	A	B	C	D	t No return type	t Return type	
ZS8D-L-J-A-050-1-N-□-J□	500	Rc1/4, 1/4NPT	JIS 10K-100-FF SUS304	210	175	8-Ø19	41	18	18	Approx. 13
ZS8D-L-J-A-070-1-N-□-J□	700									Approx. 13.5
ZS8D-L-J-A-100-1-N-□-J□	1000									Approx. 14
ZS8D-L-J-A-150-1-N-□-J□	1500									Approx. 15
ZS8D-L-J-A-050-1-N-□-K□	500	Rc1/4, 1/4NPT	JPI CLASS 150-4-RF SUS304	229	190.5	8-Ø19	41	24	24	Approx. 15
ZS8D-L-J-A-070-1-N-□-K□	700									Approx. 15
ZS8D-L-J-A-100-1-N-□-K□	1000									Approx. 16
ZS8D-L-J-A-150-1-N-□-K□	1500									Approx. 17
ZS8D-L-J-A-050-1-N-□-A□	500	Rc1/4, 1/4NPT	ANSI CLASS 150-4-RF SUS304	228.6	190.5	8-Ø19	41	24	24	Approx. 15
ZS8D-L-J-A-070-1-N-□-A□	700									Approx. 15
ZS8D-L-J-A-100-1-N-□-A□	1000									Approx. 16
ZS8D-L-J-A-150-1-N-□-A□	1500									Approx. 17
ZS8D-L-J-A-050-1-N-□-E□	500	Rc1/4, 1/4NPT	DIN PN10-DN100-A SUS304	220	180	8-Ø18	41	20	20	Approx. 12
ZS8D-L-J-A-070-1-N-□-E□	700									Approx. 13
ZS8D-L-J-A-100-1-N-□-E□	1000									Approx. 13
ZS8D-L-J-A-150-1-N-□-E□	1500									Approx. 14

F04.EPS

Flameproof General-purpose Probe (ZS8D-L-J-A-□-1-N-□-□□)
— Model for steam Heater Providing Heat Insulation —

■ EXTERNAL DIMENSIONS

Unit: mm



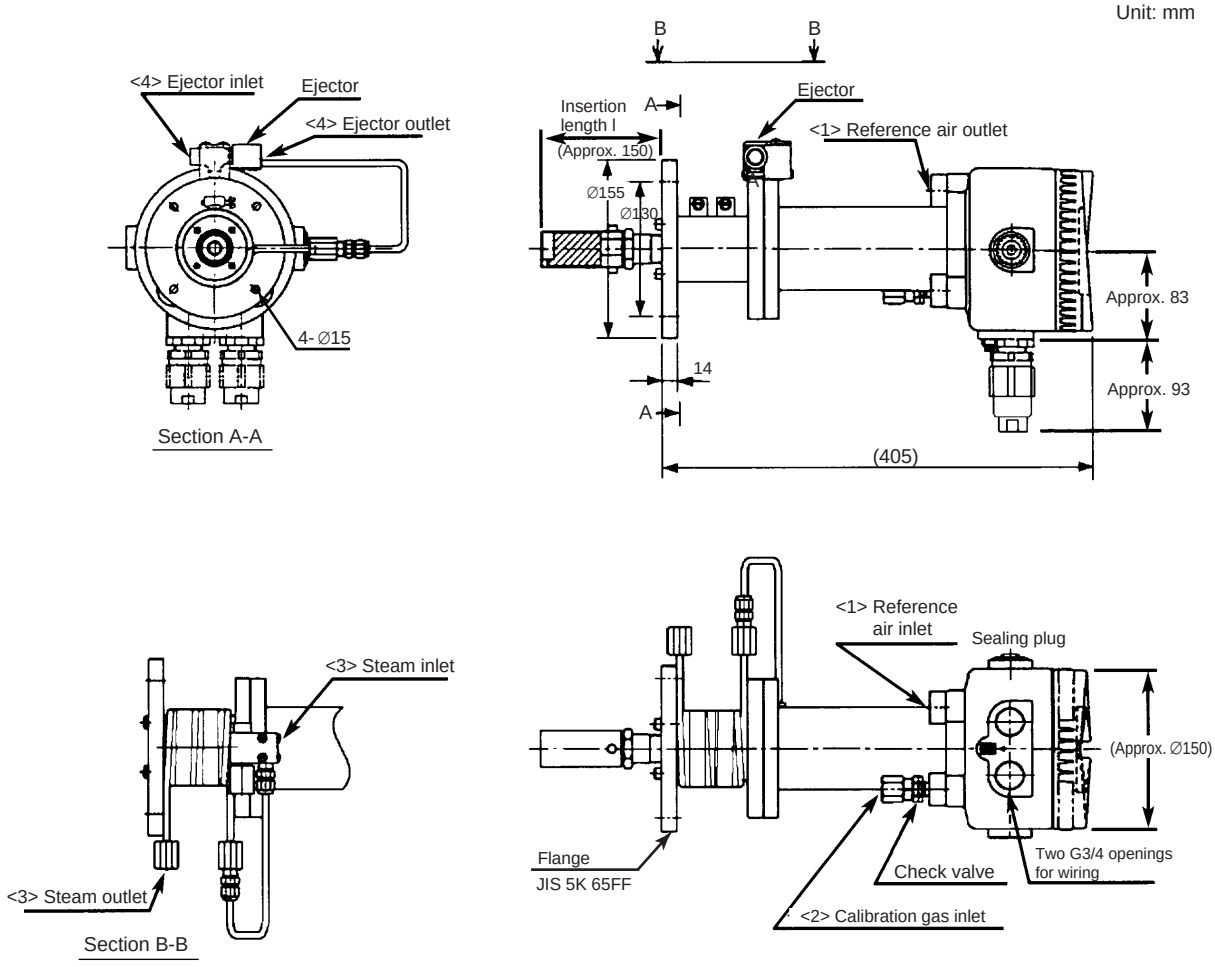
Model and Suffix code	Length l (mm)	Joint J: Rc1/4 A: 1/4NPT	<4> Flange							Weight (kg)
			Flange	A	B	C	D	t No return type	t Return type	
ZS8D-L-J-A-050-2-□-□-J□	500	Rc1/4, 1/4NPT	JIS 10K 100 FF SUS304	210	175	8-Ø19	41	18	18	Approx. 14
ZS8D-L-J-A-070-2-□-□-J□	700									Approx. 14.5
ZS8D-L-J-A-100-2-□-□-J□	1000									Approx. 15
ZS8D-L-J-A-150-2-□-□-J□	1500									Approx. 16
ZS8D-L-J-A-050-2-□-□-K□	500	Rc1/4, 1/4NPT	JPI CLASS 150 4 RF SUS304	229	190.5	8-Ø19	41	24	24	Approx. 16
ZS8D-L-J-A-070-2-□-□-K□	700									Approx. 16
ZS8D-L-J-A-100-2-□-□-K□	1000									Approx. 17
ZS8D-L-J-A-150-2-□-□-K□	1500									Approx. 18
ZS8D-L-J-A-050-2-□-□-A□	500	Rc1/4, 1/4NPT	ANSI CLASS 150 4 RF SUS304	228.2	190.5	8-Ø19	41	24	24	Approx. 16
ZS8D-L-J-A-070-2-□-□-A□	700									Approx. 16
ZS8D-L-J-A-100-2-□-□-A□	1000									Approx. 17
ZS8D-L-J-A-150-2-□-□-A□	1500									Approx. 18
ZS8D-L-J-A-050-2-□-□-E□	500	Rc1/4, 1/4NPT	DIN PN10 DN100 A SUS304	220	180	8-Ø18	41	20	20	Approx. 13
ZS8D-L-J-A-070-2-□-□-E□	700									Approx. 14
ZS8D-L-J-A-100-2-□-□-E□	1000									Approx. 14
ZS8D-L-J-A-150-2-□-□-E□	1500									Approx. 15

F05.EPS

Flameproof General-purpose Probe (ZS8D-L-J-A-□-2-□-□-□□)
— Model for Electric Heater Providing Heat Insulation —

■ EXTERNAL DIMENSIONS

Unit: mm



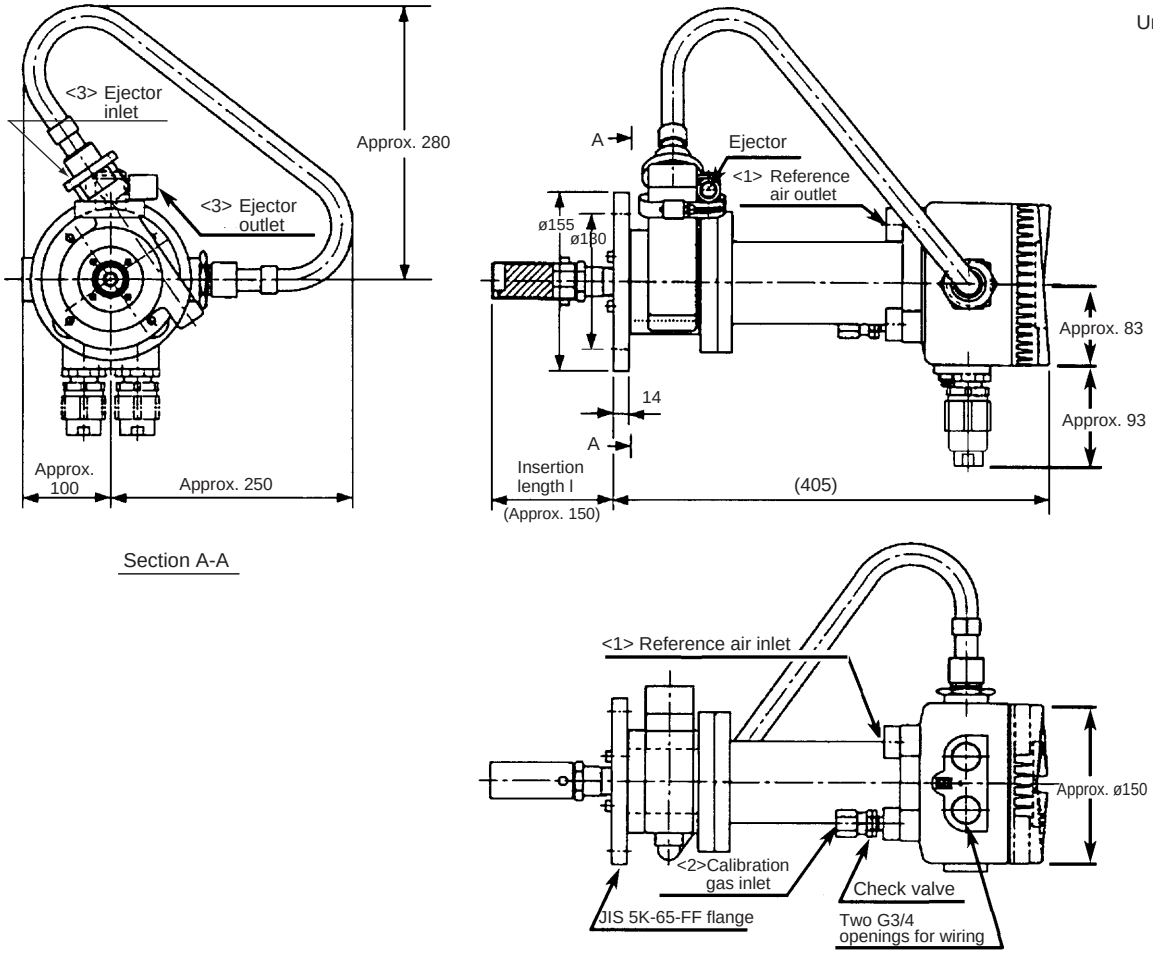
Model and Suffix code	<1> Reference air inlet/outlet	<2> Calibration gas inlet	<3> Steam in/out	<4> Ejector in/out	Weight (kg)
ZS8D-H-J-L-010-1-N-N-HJ	Rc1/4	Rc1/4	Rc1/4	Rc1/4	Approx. 10.3
ZS8D-H-J-L-010-1-N-N-HA	1/4NPT	1/4NPT	1/4NPT	1/4NPT	

F06.EPS

Flameproof High-temperature Probe (ZS8D-H-J-L-010-1-N-N-H□)
— Model for steam Heater Providing Heat Insulation —

■ EXTERNAL DIMENSIONS

Unit: mm



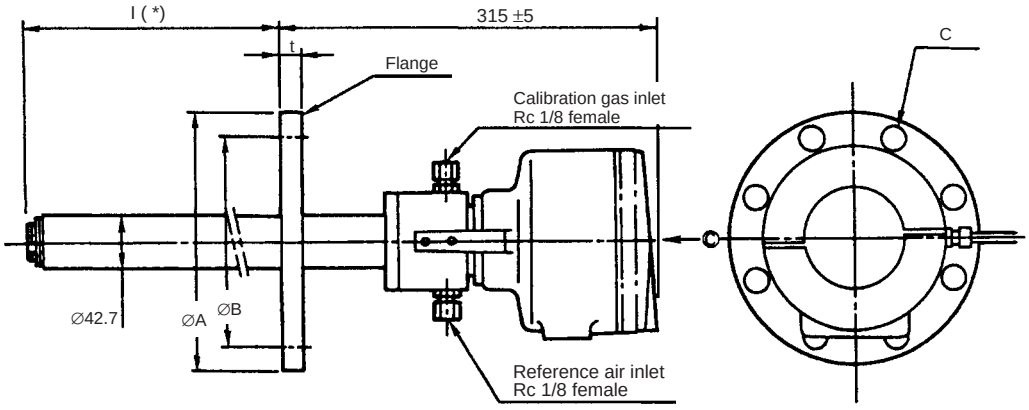
Model and Suffix code	<1> Reference air inlet/outlet	<2> Calibration gas inlet	<3> Ejector in/out	Weight (kg)
ZS8D-H-J-L-010-2-□-N-HJ	Rc1/4	Rc1/4	Rc1/4	Approx. 11.8
ZS8D-H-J-L-010-2-□-N-HA	1/4NPT	1/4NPT	1/4NPT	

F07.EPS

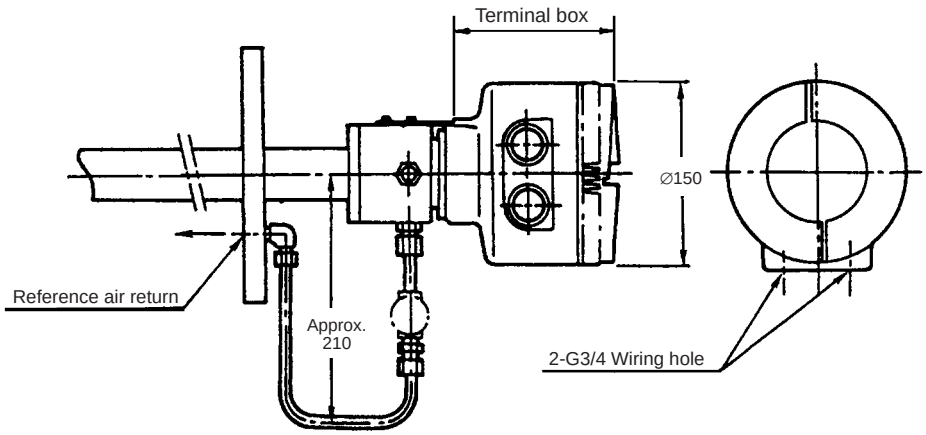
Flameproof High-temperature Probe (ZS8D-H-J-L-010-2-□-N-H□)
— Model for Electric Heater Providing Heat Insulation—

■ EXTERNAL DIMENSIONS

2. Probe with Flameproof Terminal Box ZO21DW



(*) l = 400, 1000, 1500, 2000, 3000 (mm)



Probe with Flameproof Terminal Box ZO21DW

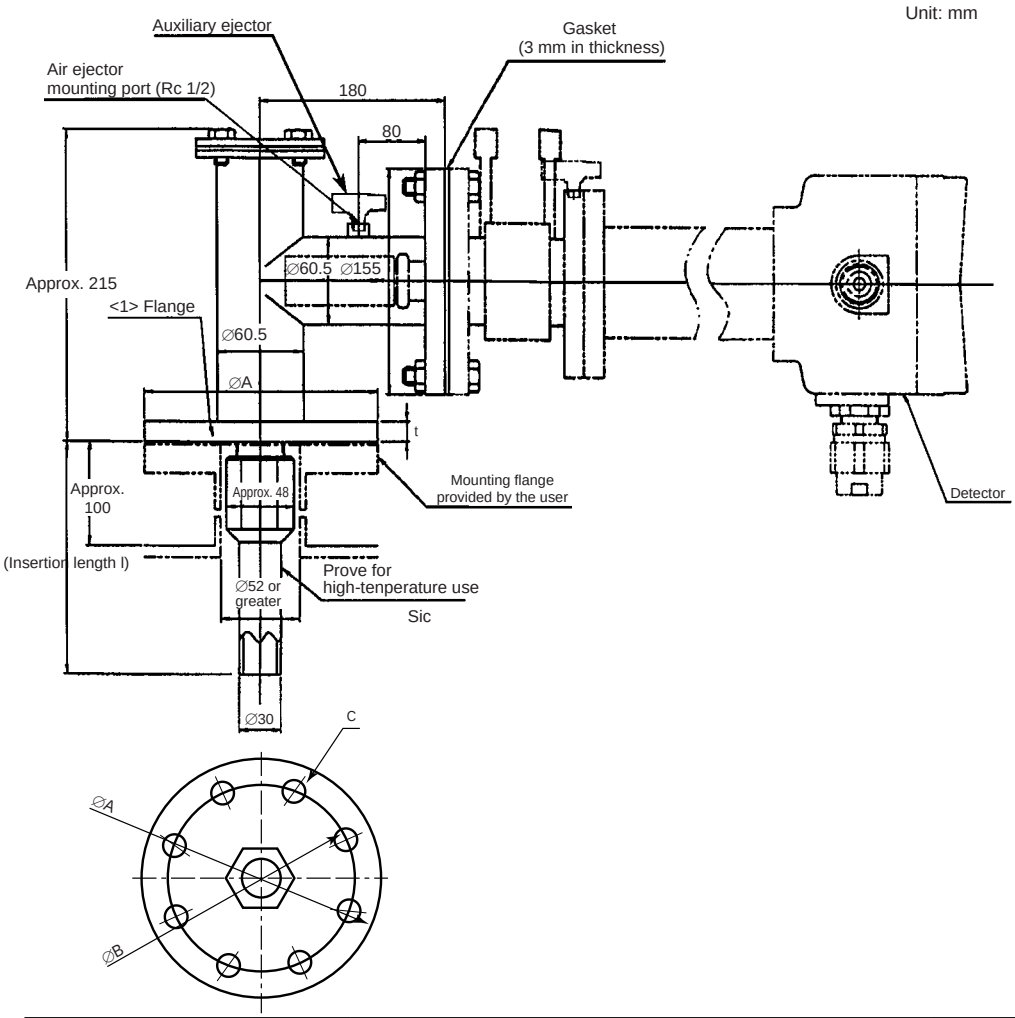
Flange (mm)				
	A	B	C	t
JIS 10K 100 FF SUS304	210	175	8- ∅19	18
ANSI CLASS 150 4 RF SUS304	228.6	190.5	8-∅19	24
DIN PN10 DN100 A SUS304	220	180	8-∅18	20

F09.EPS

■ EXTERNAL DIMENSIONS

3. High Temperature Probe Adaptor ZS8P

Unit: mm

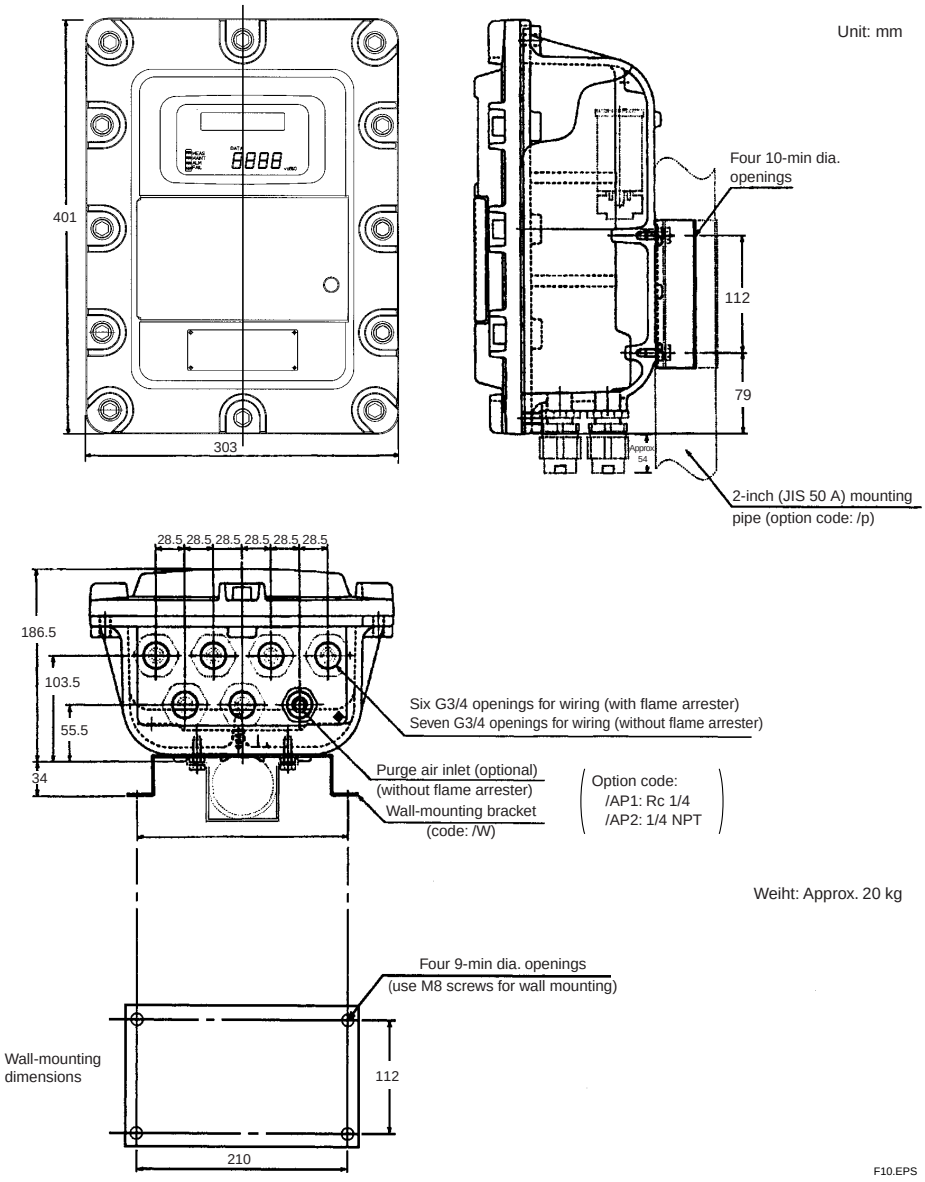


Model and Suffix code	Insertion Length l (mm)	<1>Flange (mm)					Weight (kg)
		Flange	A	B	C	t	
ZS8P-H-□-050-0-JJ	500	JIS 10K 100 FF SUS304	210	175	19 dia. 8 holes	18	Approx. 10 kg
ZS8P-H-□-070-0-JJ	700						Approx. 10.5 kg
ZS8P-H-□-100-0-JJ	1000						Approx. 11.0 kg
ZS8P-H-□-150-0-JJ	1500						Approx. 12.0 kg
ZS8P-H-□-050-0-KJ	500	JPI CLASS 150 4 RF SUS304	229	190.5	19 dia. 8 holes	24	Approx. 12.0 kg
ZS8P-H-□-070-0-KJ	700						Approx. 12.5 kg
ZS8P-H-□-100-0-KJ	1000						Approx. 13.0 kg
ZS8P-H-□-150-0-KJ	1500						Approx. 14.0 kg
ZS8P-H-□-050-0-AA	500	ANSI CLASS 150 4 RF SUS304	228.6	190.5	19 dia. 8 holes	24	Approx. 12.0 kg
ZS8P-H-□-070-0-AA	700						Approx. 12.5 kg
ZS8P-H-□-100-0-AA	1000						Approx. 13.0 kg
ZS8P-H-□-150-0-AA	1500						Approx. 14.0 kg
ZS8P-H-□-050-0-EA	500	DIN PN10 DN100 A SUS304	220	180	18 dia. 8 holes	20	Approx. 10.5 kg
ZS8P-H-□-070-0-EA	700						Approx. 11.0 kg
ZS8P-H-□-100-0-EA	1000						Approx. 11.5 kg
ZS8P-H-□-150-0-EA	1500						Approx. 12.5 kg

F08.EPS

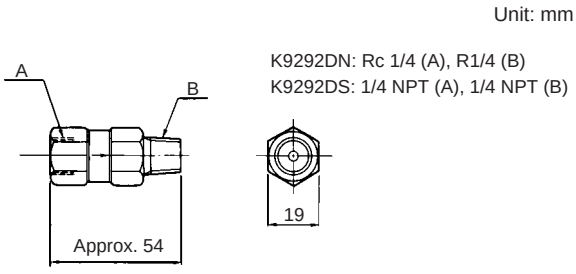
■ EXTERNAL DIMENSIONS

4. Flameproof Converter ZS8C



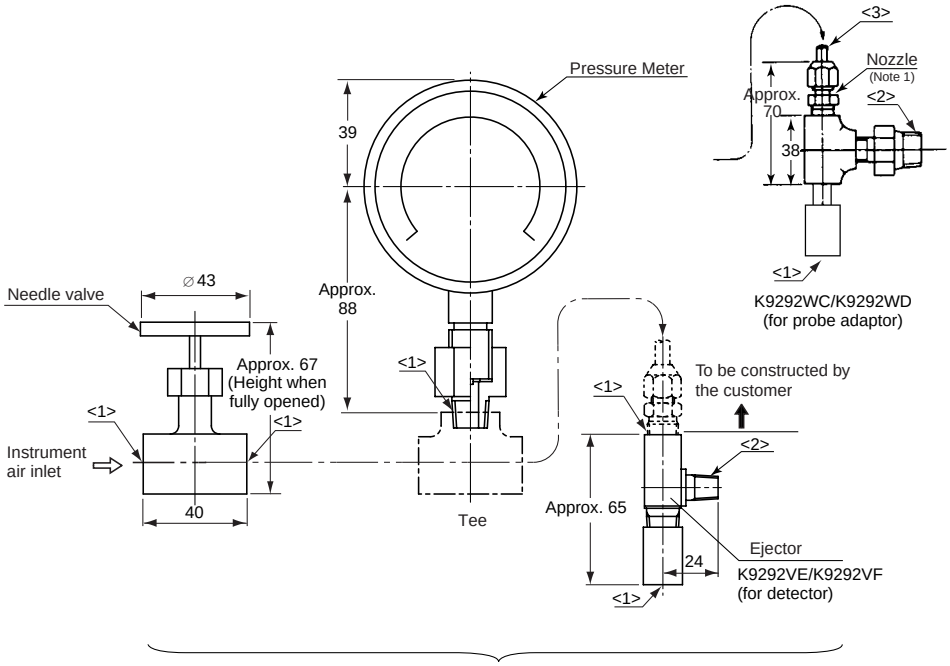
Flameproof Converter ZS8C

5. Check Valve



Check Valve (K9292DN/K9292DS)

6. Ejector Assembly

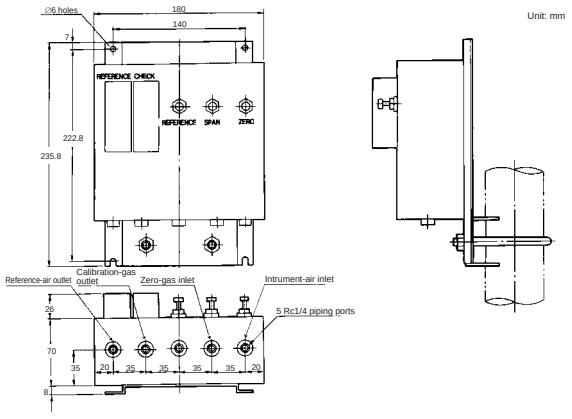


Ejector assembly K9292VA/K9292VB/K9292WA/K9292WB

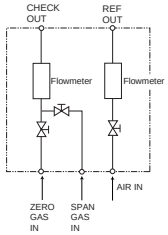
Parts number	Specification	<1>	<2>	<3>
K9292VA	For Detector use	Rc1/4	R1/8	—
K9292VB	For Detector use	1/4NPT	R1/8	—
K9292WA	For Probe adaptor use	Rc1/4	R1/2	Pipe O.D.∅6
K9292WB	For Probe adaptor use	1/4NPT	R1/2	Pipe O.D.∅1/4

(Note 1) The connecter of ejector assembly is a dedicated connecter with nozzle function. F11-3.eps

7. Flow Setting Unit



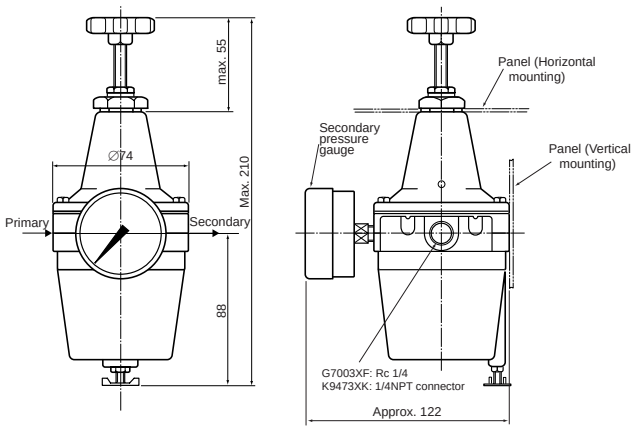
Flow Setting Unit (ZA8F) (for manual calibration)



Flow Setting Unit Internal Piping Diagram (ZA8F)

F12.EPS

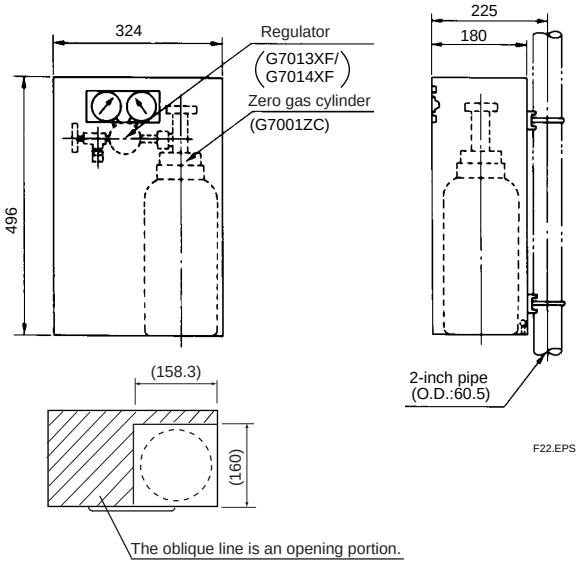
8. Air Set



Air Set (G7003XF/K9473XK)

9. Calibration Gas Unit

Unit: mm

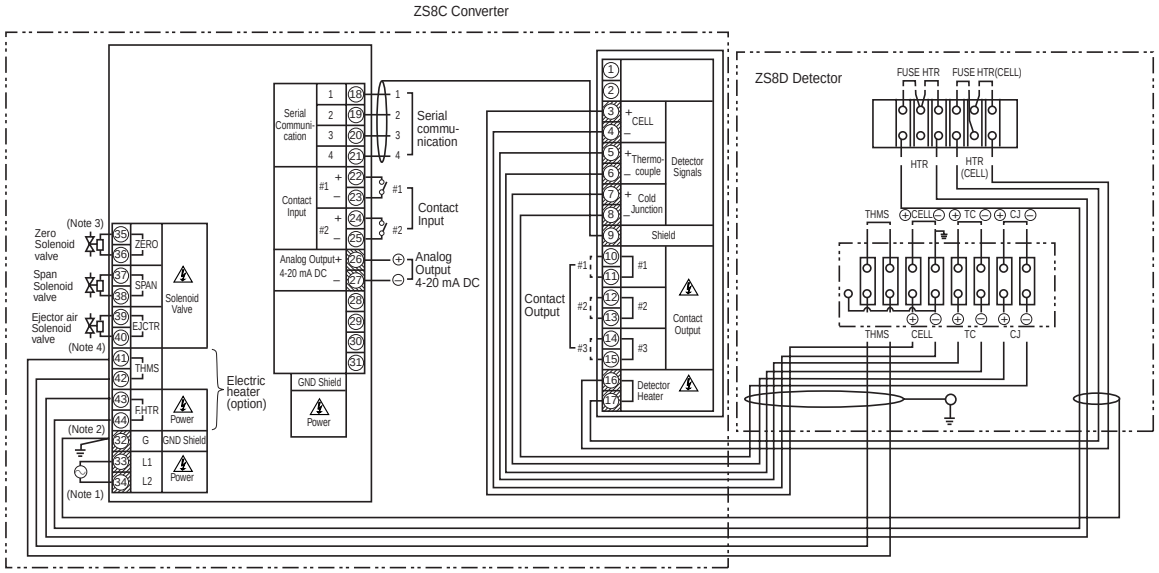


F22.EPS

Note: The zero gas cylinder and the regulator valve are not included in the E7044KF (case assembly)

Calibration Gas Unit

■ WIRING DIAGRAM

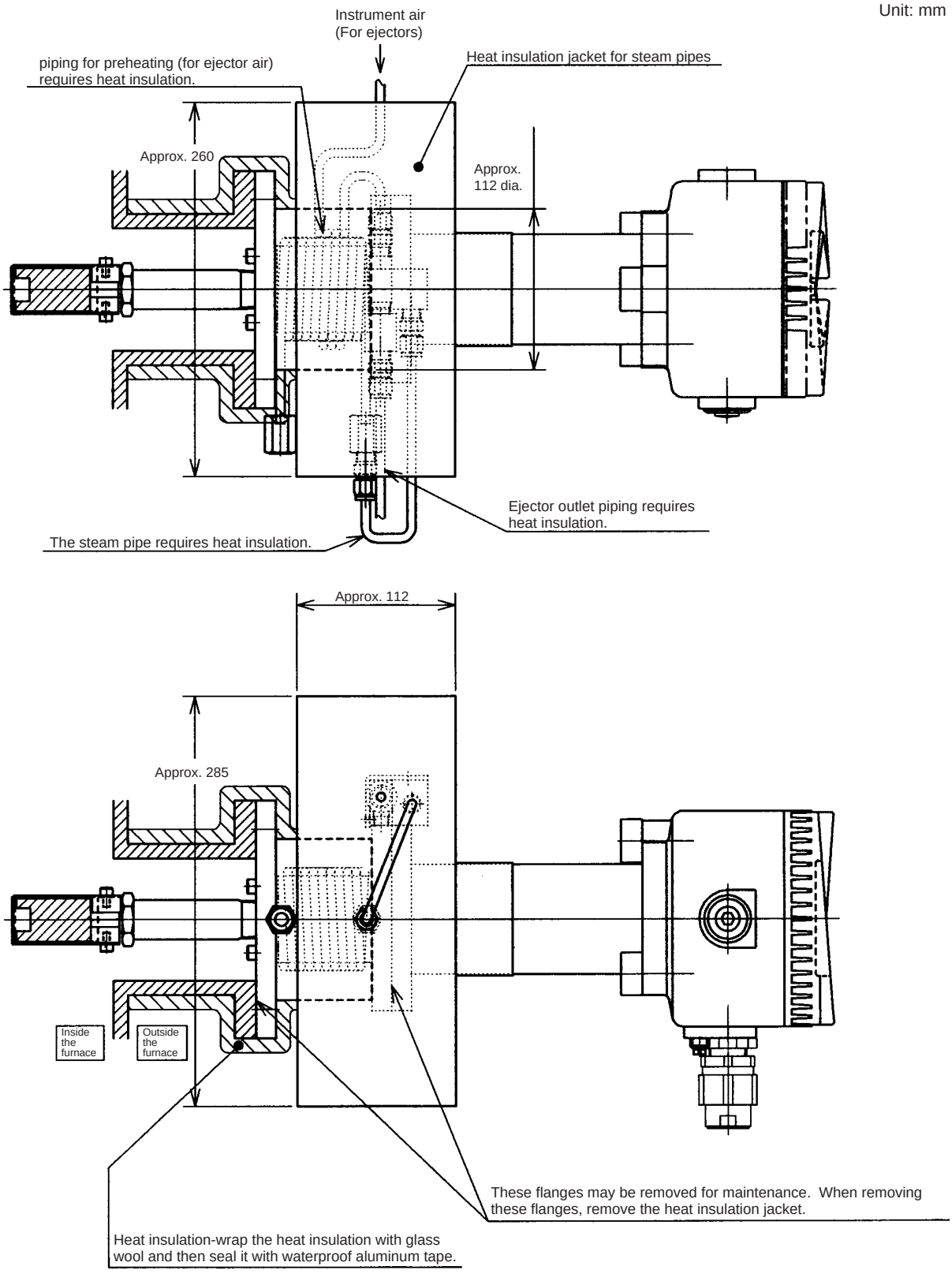


(Note 1) Converter power supply : 100/ 115/ 220/ 240 V AC, 50/60 Hz
(Note 2) Connect HTR cable shield of the detector to terminal of ㉜
(Note 3) To terminals ㉟ and ㊱ for the zero solenoid valve and terminals ㊲ and ㊳ for the span solenoid valve ; power to activate the valves is output.
(Note 4) To terminals ㊴ and ㊵ for the solenoid valve for the ejector air ; power to activate the valve is output. (Note that this applies only to converters with a temperature controller.)

■ EXAMPLE OF INSTALLING HEAT INSULATION FOR FLAMEPROOF PROBES

1. Heat Insulation for Steam Heaters-Installation of “Discharge Outside Furnace” Type of Heat Insulation Jacket

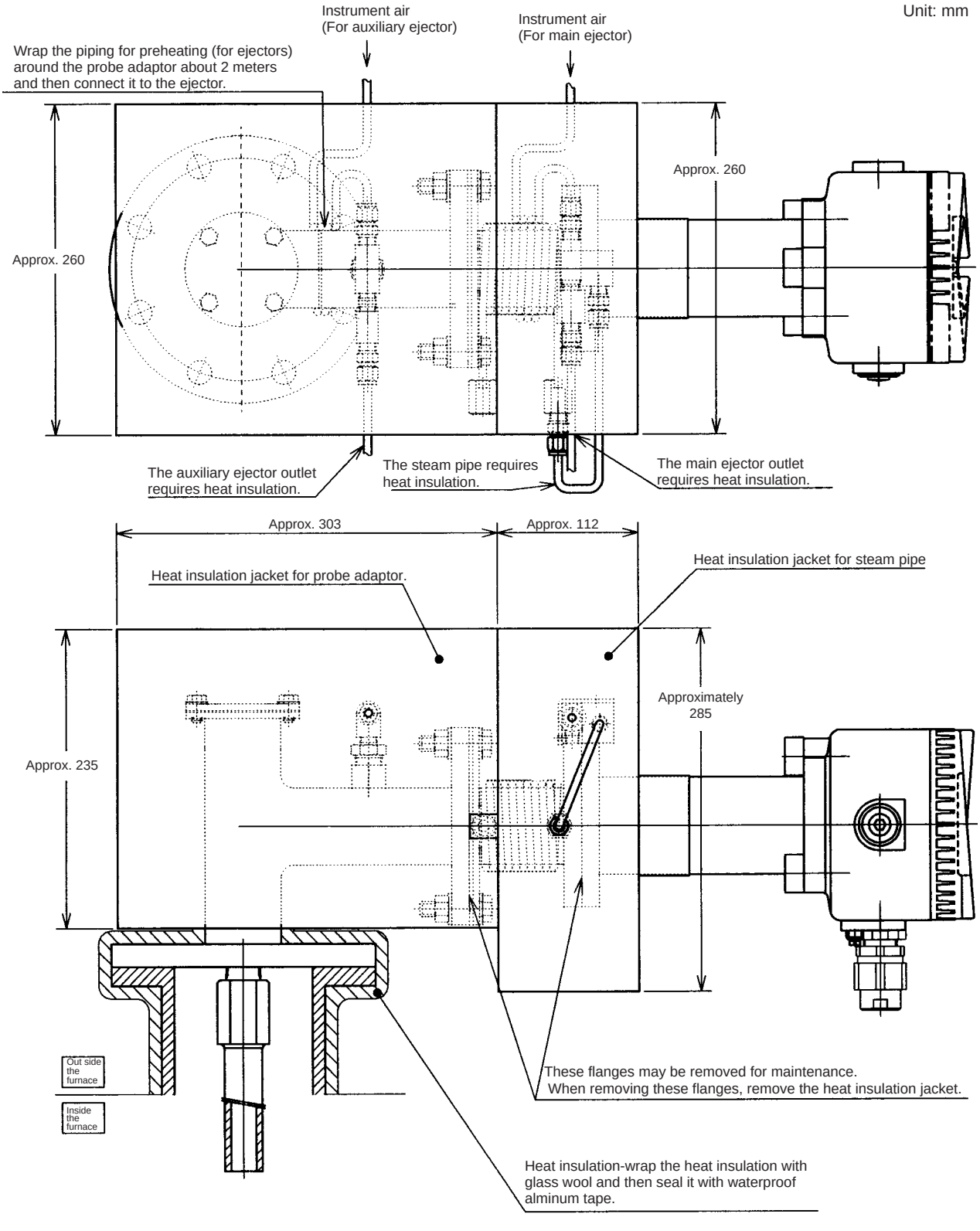
Unit: mm



F14.EPS

2. Flameproof Probes for High-temperature Use (Heat Insulation for Steam Heaters) Example of Installing Heat Insulation Jacket

Unit: mm



F15.EPS

Model ZS8 Direct In-Situ Flameproof Zirconia Oxygen Analyzer

Specify by placing a check mark (✓) in the box (☐) and filling in the blanks.

1. General Information

Customer: _____ Destination of delivery: _____
Plant name: _____ Object: ☐ indication ☐ record ☐ control ☐ alarm
Measurement location: _____ Fuel: ☐ natural gas ☐ oil ☐ coal ☐ others
Output signal: ☐ 4 to 20 mA ☐ other Power supply: _____ V AC _____ Hz
Combustion method: ☐ natural gas only ☐ oil only
☐ oil + gas (→ sulfur content of fuel _____%)
Heat insulation: ☐ electric heater
☐ steam heater (supply pressure _____kPa)

2. Process Conditions

2.1 Measurement gas composition
_____

2.2 Measurement oxygen concentration

	Normal	Min.	Max.	☐ vol%O_2	☐
2.3 Temperature	Normal	Min.	Max.	☐ °C	☐
2.4 Pressure	Normal	Min.	Max.	☐ kPa	☐ mmH_2O
2.5 Gas flow velocity	Normal	Min.	Max.	☐ m/sec	☐
2.6 Dust content	Material _____	Particle _____ size mm μm Q'ty			☐ g/Nm^3
	☐ _____				
2.7 Corrosive gases	☐ present ☐ absent	Kind _____	Q'ty _____	☐ ppm	☐ _____
		_____	Q'ty _____	☐ ppm	☐ _____
2.8 Inflammable gases	☐ present ☐ absent	Kind _____	Q'ty _____	☐ ppm	☐ _____
		_____	Q'ty _____	☐ ppm	☐ _____

2.9 Other information _____

3. Installation Data

3.1 Ambient temperature
◯ probe to °C ◯ converter to °C
3.2 Vibration ☐ present ☐ absent _____
3.3 1 Position of probe ☐ furnace ☐ stack ☐ other
2 Mounting conditions of probe
☐ horizontal ☐ vertical ☐ _____
☐ indoors ☐ outdoors ☐ under eaves
3 Material of probe ☐ SUS310S ☐ SiC
4 Probe insertion length ☐ 0.5 m ☐ 0.7 m ☐ 1.0 m ☐ 1.5 m
5 Flange ☐ JIS _____ ☐ JPI _____ ☐ ANSI _____ ☐ DIN _____
3.4 Instrument air supply ☐ allowed ☐ not allowed _____kPa (☐ kgf/cm^{2}G)
3.5 Position of converter ☐ indoors ☐ outdoors ☐ under eaves
3.6 Distance between probe and converter (cable length)
_____ m
3.7 Calibration method ☐ manual ☐ automatic (flow setting unit provided by customer)

4. Quotation Data

Item		Quantity	Remarks
ZS8D probe			
ZS8C converter			
ZS8P-H probe adaptor	Material: SUS310S (gas temperature 0 to 800°C)		
	Material: SiC (gas temperature 800 to 1400°C)		
K9292VA/K9292VB main ejector assembly (for probe)			Specify if necessary as a spare part.
K9292WA/K9292WB auxiliary ejector assembly (for probe adaptor)			Specify if necessary as a spare part.
ZA8F flow setting unit (for manual calibration)			
K9292DN/K9292DS check valve			Specify if necessary as a spare part.
G7003XF/K9473XK air set			
G7001ZC zero-gas cylinder			
G7013XF/G7014XF zero-gas cylinder pressure regulator			
E7044KF case assembly			

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