YAMATAKE Specification

ST3000 Ace Smart Transmitter JTR Series of Remote-Sealed Type Differential Pressure Transmitters

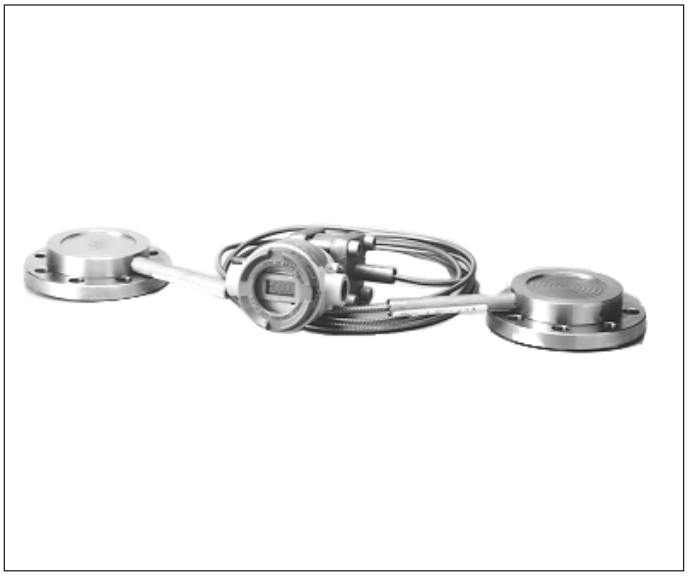
JTR929A/JTR930A

General

The ST3000 Ace* Smart Transmitter is a microprocessor-based smart transmitter that features high performance and excellent stability. Capable of measuring gas, liquid, and vapor flow rates, and liquid levels, it transmits 4 to 20 mA dc analog and digital signals according to the measured differential pressure.

It can also execute two-way communications between the SFC (Smart Field Communicator), and, via DE protocol, with the TDCS3000 or 3000^{X} and a database, thus facilitating self-diagnosis, range resetting, and automatic zero adjustment.

Remote-sealed differential pressure transmitters are suitable for the measurement of differential pressures (flow rates, liquid levels, etc.) of process fluids that are highly corrosive, tend to condense, precipitate metal, etc.



Features

(1) Excellent stability and high performance
- Long-term stability is proven in 500,000 installations worldwide.
- Unique characterization and composite semiconductor sensors realize excellent temperature and static pressure characteristics.

(2) A diverse lineup
- A wide range of models is available to meet user requirements. They include general purpose, high-temperature service, high-temperature vacuum service, and high-temperature high-vacuum service. In addition, the working temperature range of general purpose models has been expanded to 180°C maximum to allow you greater freedom in instrumentation.
- A wide variety of corrosion-resistant materials for wetted parts is also available.
- These differential pressure transmitters can be mounted in various ways, including direct mounting on tanks without using 2B stanchion pipes.

(3) Function to correct the temperature of the capillary section fill fluid:
- Changes in the density of the fill fluid caused by temperature fluctuations are calculated, and the output is corrected accordingly. This function substantially reduces (to 1/5—1/10) the effect of seasonal fluctuations in temperature.

(4) Multiprotocol communication
- Either analog output (4 to 20 mA dc), analog FSK output (4 to 20 mA dc) or digital output (DE protocol) is possible.
- Two-way communication using digital output facilitates self-diagnosis, range resetting, automatic zero adjustment, and other operations.

(5) Full after-sales service program
- From product delivery to replacement, we service all your needs. Our nationwide service network provides all the backup you require, including trial operation support and regular maintenance.

Applications

Petroleum/Petrochemical/Chemical
- For the measurement of liquid levels including corrosive fluids at high temperatures, and high temperatures under vacuum
- For the control of flow rates as used with tapless venturi tubes

Electric Power/City Gas/Other Utilities
- For measurement applications that require high degrees of stability and accuracy

Pulp and Paper
- For lines that need transmitters resistant to chemical liquids, corrosive fluids and the like

Iron and Steel/Nonferrous Metal/Ceramics
- For lines that require stable measurement under strictly controlled (temperature, humidity, etc.) conditions

Machinery/Shipbuilding
- For lines that require stable measurement under strictly controlled (temperature, humidity, vibration, etc.) conditions

Specifications

Measuring span/setting range/working pressure range:

See Table 1.

Output/communication:

Analog output (4 to 20 mA dc)

Analog FSK output (4 to 20 mA dc)

(Frequency shift keying signal transmission system)

Digital output (DE protocol)

Supply voltage and load resistance:

10.8 to 45 V dc. A load resistance of 250 Ω or more is necessary between loops. (See Figure 1)

Sealing liquid: Silicone oil for general purpose, high-temperature, high-temperature vacuum, and high-temperature high-vacuum models

Fluorine oil for oxygen and chlorine models

For specific gravity, see Table 2.

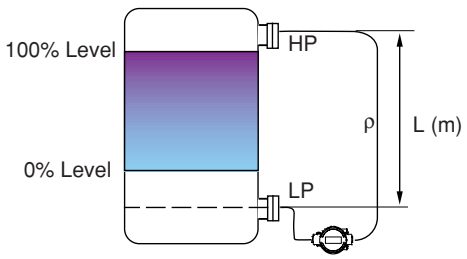
Function to correct the temperature of the capillary section fill fluid: (Patent No.1978534)

Changes in the density of the fill fluid (ρ) caused by temperature fluctuations are calculated, and the output is corrected accordingly. This function substantially reduces the effect of seasonal fluctuations in temperature.

<How to set this function>

Set the inter-flange height L (m) according to the SFC. If the height L (m) is already known, let us know, so, this function can be set before shipment.

If the high pressure side (HP) of your transmitter is located under the tank, place a minus (-) sign before the height L setting.



Temperature ranges of wetted parts:

See Table 2.

Ambient temperature ranges:

See Table 2, except for explosion-proof models with digital indicators, which have to be used within the following ranges:

Models with digital indicators:

Normal operating conditions: -20 to 70°C

Operative limits: -30 to 80°C

JIS pressure-resistant special explosion-proof models: -20 to 60°C

JIS intrinsically safe explosion-proof models: -10 to 60°C

Ambient humidity range:

5 to 100% RH

Stability against supply voltage change:

±0.005% FS/V

Lightning protection:

Peak value of voltage surge: 100 kV

Peak value of current surge: 1000 A

Dead time: Approx. 0.4 sec

Damping time constant:

Selectable from 0 to 32 sec in ten stages

Waterproof/dustproof structure:

JIS C0920 watertight: NEMA3 and 4X

JIS F8001 class 2 watertight: IEC IP67

Explosion-proof structure:

JIS special explosion-proof models: (Exds II CT4)

JIS intrinsically safe models: (i3aG4)

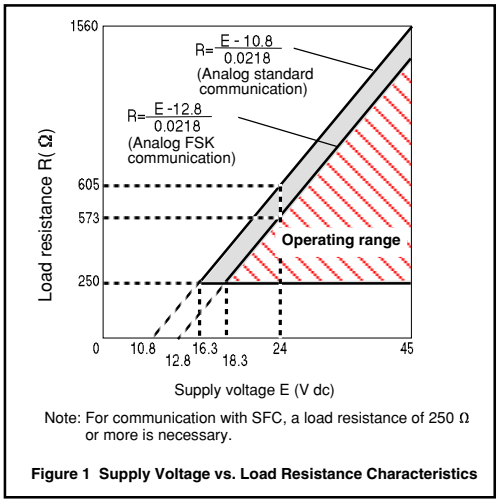
	Measuring Span	Setting Range	Working Pressure Range
JTR929A	2.5～100kPa {250～10160mmH_2O}	-100～100kPa {-10160～10160mmH_2O}	Up to the smaller value of either setting range or flange rating (For negative pressures, see Figures 2 and 3.) (For flange rating, see "Max Working Pressure")
JTR930A	35～700kPa {0.35～7kgf/cm²}	-100～700kPa {-1～7kgf/cm²}	Up to the smaller value of either setting range or flange rating (For negative pressures, see Figures 2 and 3.) (For flange rating, see "Max Working Pressure")

Table 1 Measuring Span, Setting Range, and Working Pressure Range

		Temperature Range (℃) Note 1), Note 4)			
		General-purpose models	High-temp./high-temp. vacuum models	High-temp. high-vacuum models	Oxygen and chlorine models
Wetted parts section	Normal operating range	-40～180	-5～280 Note 5)	10～280 Note 5)	-10～120
	Operative limit range	-50～185	-10～310 Note 6)	-10～310 Note 6)	-40～125
Ambient temperature Note 2)	Normal operating range	-30～75	-5～55	10～55	-10～75
	Operative limit range	-50～80	-10～60	-10～60	-40～80
Specific gravity of fill liquid Note 3)		0.935	1.07	1.09	1.87

Table 2 Temperature Range of Wetted Parts Section and Ambient Temperature Range

Note 1) See the working pressures and temperatures of the wetted parts section in Figure 2, Figure 3, and Figure 4.
Note 2) Ambient temperatures of the transmitter itself
Note 3) Approximate values at the temperature of 25°C
Note 4) Note that if the operating temperature falls below the lower limit of the normal operating range, the response of the transmitter becomes slower.
Note 5) When the wetted parts material is tantalum, the upper limit is 180°C.
Note 6) When the wetted parts material is tantalum, the upper limit is 200°C.



Note: For communication with SFC, a load resistance of 250 Ω or more is necessary.

Figure 1 Supply Voltage vs. Load Resistance Characteristics

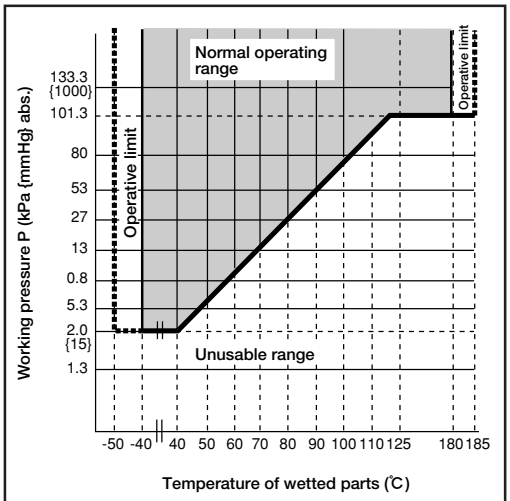


Figure 2-1 Working Pressure and Temperature of Wetted Parts Section

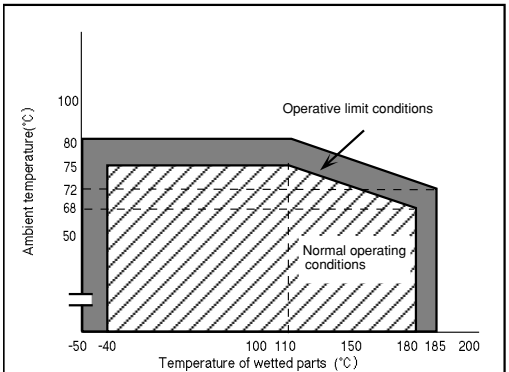


Figure 2-2 Ambient Temperature and Temperature of Wetted Parts Section (for general purpose models)

Note) When the fill liquid is for general purposes, makesure before using your transmitter that the conditions in both Figure 2-1 and Figure 2-2 are met.

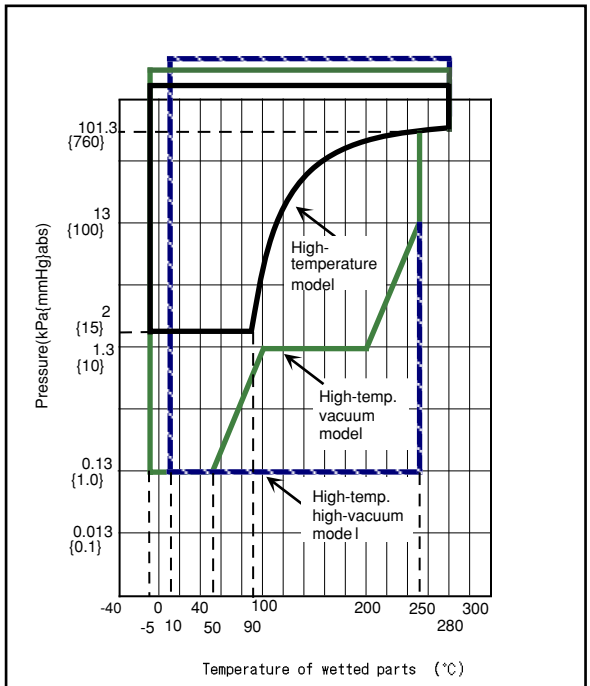


Figure 3 Working Pressure and Temperature of Wetted Parts Section (for high-temperature, high-temperature vacuum, and high-temperature high-vacuum models)

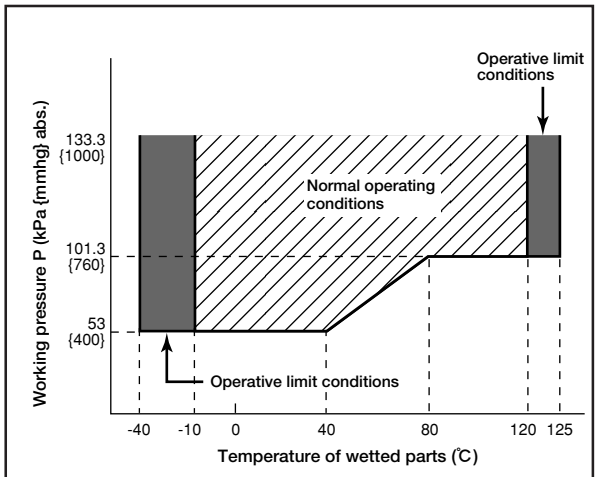
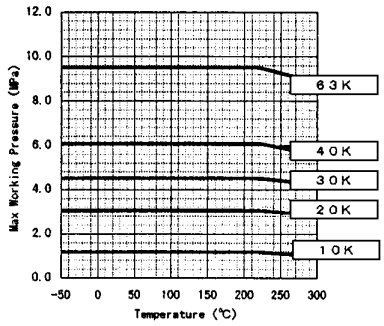
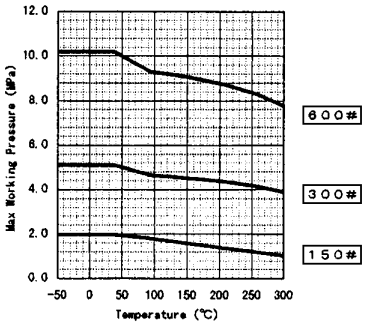
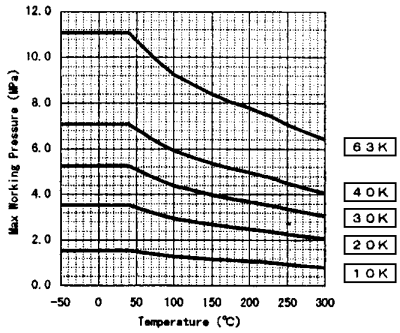
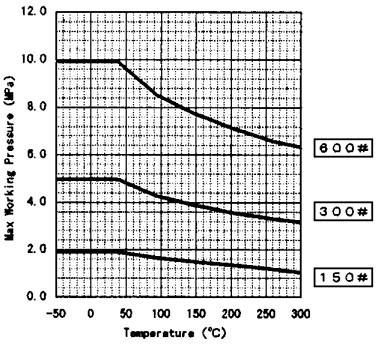
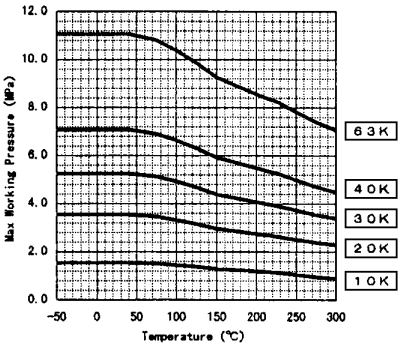
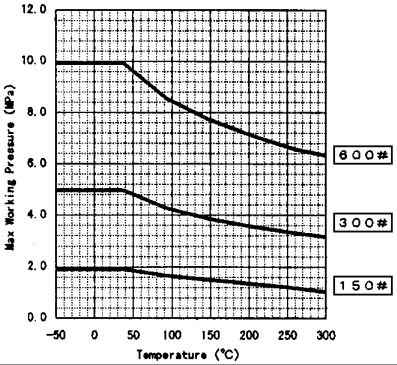
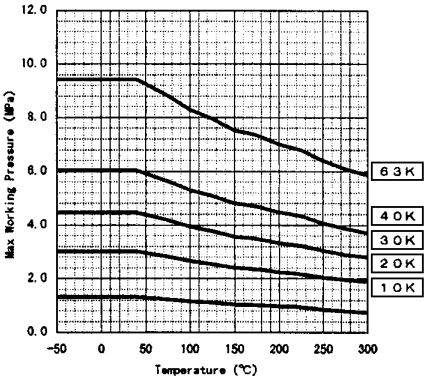
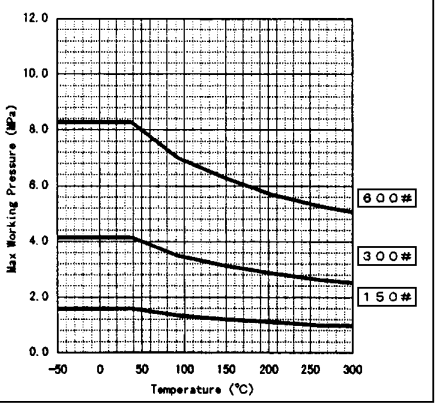


Figure 4 Working Pressure and Temperature of Wetted Parts Section (for oxygen and chlorine models)

Max Working Pressure

<*ForNewAce*>

Note1. Max Working Pressure depends on flange rating , flange materials and operating temperature. Please refer to the following data.
Operating range of temperature depends on specification of transmitters
Note2. In cace of flange type (JTF940□、JTC940□)and remote sealed type (JTU940□、JTH940□),
Max Working Pressure depends on the smaller value of either 1.5MPa or following data .
Note3. In cace of absolute remote sealed type (JTS940□),
Max Working Pressure depends on the smaller value of either 3.5MPa abs or following data .
As for the following data , the vertical axis represent gage pressure.
Please exchange of units from gage pressure to absolute pressure, when you use.
Note4. In cace of remote sealed type (JTH960□), Max Working Pressure depends on the smaller value of either 10MPa or following data .
Note5. In cace of 1/2B remote sealed type (JTE929□,JTE930□,JTH960□),
Max Working Pressure depends on the smaller value of either 5.1MPa or the following data as for adoptor flange (HF) .

	JIS	JPI/ANSI
Carbon steal		
SUS304		
SUS316		
SUS316L		

Process pipe connection:

Flanges (both higher and lower pressure sides)

Flush diaphragm:

JIS10K, 20K, 30K, 63K, and 80A (RF) equivalents

ANSI150, 300, and 600-3B (RF) equivalents

JPI150, 300, and 600-3B (RF) equivalents

Extended diaphragm:

JIS10K, 20K, 30K, and 100A (RF) equivalents

ANSI150 and 300-4B (RF) equivalents

JPI150 and 300-4B (RF) equivalents

Electrical conduit connection:

G1/2 internal thread

1/2NPT internal thread (Not usable with JIS explosion-proof models)

Materials:

Center body: SUS316

Transmitter case: Aluminum alloy

Meter body cover: SUSF304

Wetted parts materials:

SUS316 (SUS316L for diaphragm only)

Hastelloy C, tantalum, etc.

Flange materials:

Carbon steel (SF440A), SUS304, SUS316, SUS316L

Bolts and nuts materials (for fastening meter body cover):

Carbon steel (SNB7), SUS630

Capillary section:

Capillary tube length: 2, 3, 4, 5, 6, 7, 8, 9, and 10 m

Capillary tube material: SUS316

Armored tube material: SUS304

Coating (optional): Olefin coating to improve corrosion resistance (Not usable with high-temperature vacuum or high-temperature high-vacuum models)

Finish: Housing: light beige (Munsell 4Y7.2/1.3)

Cap: dark beige (Munsell 10YR4.7/0.5)

Corrosion-resistant finish:

Standard: Corrosion-resistant paint (Baked acrylic paint)

Corrosion-resistant finish:

Corrosion-resistant paint (Baked acrylic paint), fungus-proof finish

Corrosion-proof finish:

Corrosion-proof paint (Baked epoxy paint), fungus-proof finish

Corrosion-resistant finish (silver paint):

Transmitter case is silver-painted in addition to the above corrosion-resistant finish.

Built-in indicating meter:

The digital LCD indicator (optional) indicates actual flow rates (in SI units) and can be set freely between -19999 and 19999 (4.5 digits). For actual calibration, specify the following items when placing your order:

- Actual calibration range
- Actual calibration unit
- Proportional representation and instructions about square-root extraction

Various kinds of data can be set using the SFC smart communicator (Ver. 7.1 or later).

Burnout feature:

Choice of three states at abnormal condition:

Burnout of output values: none

upper limit

lower limit

Grounding: Class 3 grounding (grounding resistance 100 Ω max.)

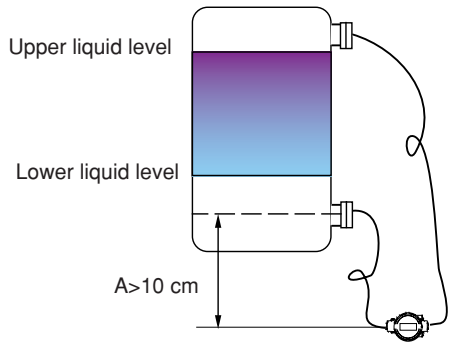
Mounting: Direct mounting on the process side

For mounting the transmitter body, choose between the following two methods:

(1) Using 2-inch pipe mounting brackets: Mount the transmitter on a horizontal or vertical 2-inch pipe, then use the brackets.

Materials: Brackets: carbon steel
U bolts and nuts: SUS304

Mounting Notes



1) If the fluid to be measured contains hydrogen, please consult us.

2) When mounting the transmitter, leave a space of at least 10 cm under the lower nozzle of the tank. If no space is available, please consult us.

Mounting (continued):

(2) Direct mounting (for general purpose model only)

Mount the transmitter directly on the tank using the direct mounting kit supplied.

<Features>

- Direct mounting saves space.
- Capillary tubes can be neatly arranged using tube clamps. This also improves temperature characteristics.

Direct mounting kit (weight: about 600 g)

Component	Material
Adaptor	SUS13 (SUS304 equivalent)
Adaptor fastening bolt	SUS304 (M8)
Tube clamp	Brass + nickel plating

Weight: Approx. 19.8 kg
(including JIS10K-80A flange and capillary 5 m long)

Tank Level Setting by Direct Mounting Method

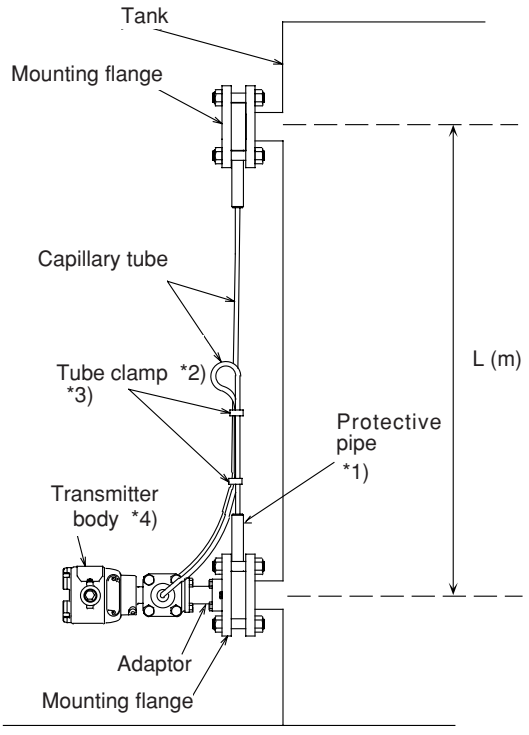
Notes)

*1) When fitting a protective pipe upward as shown in the figure, be sure to specify a capillary tube with olefin coating. If a capillary tube without olefin coating is to be used, set the capillary withdrawal direction downward a little.

*2) When bending a capillary tube, as shown in the figure, do not twist it. Also note that the minimum bending diameter is about 5 cm. Do not apply excessive force.

*3) Three tube clamps are supplied as an option. Referring to the figure, fix the tube at appropriate places. Do not tighten the clamps to the extent of deforming the tube.

*4) Before zero adjusting using the SFC, be sure to set the inter-flange height L (m) and use the capillary fill fluid temperature correction function.



Optional Specifications

External zero adjustment function:

The transmitter can be easily zero-adjusted in the field with a flat-blade screwdriver.

Additional lightning protection:

It is possible to achieve a lightning protection performance of 200 kV, 2000 A, twice the standard performance (100 kV, 1000 A). This is advisable when the transmitter is to be used in lightning-prone areas such as mountains, hills and wherever high-performance lightning protection is required.

Elbow: This is an adaptor for changing the electrical conduit connection port from the horizontal to the vertical direction, if required by wiring conditions in the field. One or two elbows may be used as needed.

Water inhibiting treatment (including oil inhibiting treatment):

The transmitter is shipped with dry and oil-free wetted parts.

Oil inhibiting treatment:

The transmitter is shipped with oil-free wetted parts. (The vent drain plug is coated with a small amount of fluorine oil to prevent galling.)

FEP protective film:

Use FEP protective films when corrosive fluids are used or to inhibit ion migration from metal diaphragms.

Working temperature range:

0 to 110°C

Working pressure range:

atmospheric pressure to flange rating

(up to JIS10K, ANSI/JPI150)

(Not usable under negative pressure)

Electric power specification:

This specification applies where stringent quality control is required, such as in the electric power and city gas industries.

Special burnout (3.2 mA):

The burnout output value (in the lower-limit direction) under abnormal conditions shall be 3.2 mA (-5%) or less.

Test report: The test report indicates the results of appearance, I/O characteristics, insulation resistance, and breakdown voltage tests.

Mill sheet: The mill sheet shows the chemical composition, heat-treatment conditions, and mechanical properties of the materials used for the wetted parts.

Documents of conformance to the High Pressure Gas Control Law (for general purposes):

This specification applies when documents verifying conformance to the High Pressure Gas Control Law are required. The documents consist of a strength calculation sheet, the mill sheet, and a pressure resistance and gas-tightness test result sheet.

Strength calculation sheet:

The strength calculation sheet indicates the strength of the meter body cover, flanges, bolts, etc.

Pressure resistance and gas-tightness tests (for general purposes):

The pressure resistance and gas-tightness test result sheet shows the results of a pressure resistance test (under water pressure for 10 minutes) performed on the wetted parts.

Traceability certificate:

This certificate consists of three parts: the transmitter's measurement control system configuration diagram, a calibration certificate, and a test report.

Conformance to non-SI units:

We deliver transmitters set to any non-SI unit you specify.

Transmitter Handling Notes

To make the most of the performance this transmitter can offer, please use it properly noting the points mentioned below. Before using it, please read the Instruction Manual.

Transmitter Installation Notes

⚠ Warning

- **When installing the transmitter, ensure that gaskets do not protrude from connecting points into the process (such as adapter flange connection points and connecting pipes and flanges). Gasket protrusion may cause leaks and output errors.**
- **Do not use the transmitter outside its defined pressure, temperature, and connection specifications. A serious accident may otherwise occur due to damage and leaks.**
- **When performing wiring work in explosion-proof areas, follow the work method specified in the explosion-proof guidelines. In addition, when the wiring for an explosion-proof product is a pull-in pressure-resistant packing-cable, be sure to use a pressure-resistant packing-cable adapter certified by Yamatake Corporation.**
- **When conduits are used for connection, be sure to use conduit fittings certified by Yamatake Corporation.**

⚠ Caution

- **After installing the transmitter, do not step on it. Using it as a foothold or the like could make it collapse and cause injury.**
- **Be careful not to hit the glass indicator with tools etc. This could break the glass and cause injury.**
- **This transmitter is heavy. Wear safety shoes and take care when installing it.**

Wiring Notes

⚠ Warning

- **To avoid shocks, do not perform electrical wiring work with wet hands or with live wires.**

⚠ Caution

- **Do wiring work properly in conformance with the specifications. Wiring mistakes may result in breakdown.**
- **Use a power supply that conforms to the specifications. Use of an improper power supply may result in breakdown.**

Performance

Shown for each item are the upper limit (URV) (*1) and the lower limit (LRV) (*2) of the calibration range or the percentage ratio of the maximum value of the span to χ (kPa).

JTR929A (for general purpose and high-temperature models) Material for Wetted Parts: SUS316

Accuracy	Linear output:	$\pm$ 0.3%	($\chi \geqq$ 12.5kPa {1250mmH$_2$O})
		$\pm$ $(0.3 \times \frac{12.5}{\chi})$ %	($\chi <$ 12.5kPa {1250mmH$_2$O})
	Square-root output:	When output is 50 to 100%: same as linear output When output is 7.1 to 50%: linear output $\times \frac{50}{\text{square-root output \%}}$ When output is less than 7.1%: dropout	
Temperature characteristics (Shift from the set range) **Change of 55°C**	Zero shift:	$\pm$0.75%	($\chi \geqq$ 25kPa {2500mmH$_2$O})
		$\pm 0.75 \times \frac{25}{\chi}$ %	($\chi <$ 25kPa {2500mmH$_2$O})
	Combined shift: (including zero and span shifts)	$\pm$1.6%	($\chi \geqq$ 25kPa {2500mmH$_2$O})
		$\pm 1.6 \times \frac{25}{\chi}$ %	($\chi <$ 25kPa {2500mmH$_2$O})
Static pressure effect (Shift with respect to setting range) **Change of 7MPa {70kgf/cm^2}**	Zero shift:	$\pm$0.75%	($\chi \geqq$ 25kPa {2500mmH$_2$O})
		$\pm (0.75 \times \frac{25}{\chi})$%	($\chi <$ 25kPa {2500mmH$_2$O})
	Combined shift: (including zero and span shifts)	$\pm$1.00%	($\chi \geqq$ 25kPa {2500mmH$_2$O})
		$\pm (1.00 \times \frac{25}{\chi})$%	($\chi <$ 25kPa {2500mmH$_2$O})

JTR930A (for general purpose and high-temperature models) Material for Wetted Parts: SUS316

Accuracy (*3)	Linear output:	$\pm$0.2%	($\chi \geqq$ 210kPa {2.1kgf/cm^2})
		$\pm (0.05+0.15 \times \frac{210}{\chi})$%	($\chi <$ 210kPa {2.1kgf/cm^2})
	Square-root output:	When output is 50 to 100%: same as linear output When output is 7.1 to 50%: linear output $\times \frac{50}{\text{square-root output \%}}$ When output is less than 7.1%: dropout	
Temperature characteristics (Shift from the set range) (*3) **Change of 55°C**	Zero shift:	$\pm (0.25+0.5 \times \frac{210}{\chi})$%	
	Combined shift: (including zero and span shifts)	$\pm$1.6%	($\chi \geqq$ 210kPa {2.1kgf/cm^2})
		$\pm (1.0+0.6 \times \frac{210}{\chi})$%	($\chi <$ 210kPa {2.1kgf/cm^2})
Static pressure effect (Shift with respect to setting range) (*3) **Change of 7MPa {70kgf/cm^2}**	Zero shift:	$\pm (0.75 \times \frac{700}{\chi})$%	
	Combined shift:	$\pm (1.00 \times \frac{700}{\chi})$%	

JTR929A (for general purpose and high-temperature models) Material for Wetted Parts: Hastelloy C, Tantalum

Accuracy	Linear output:	$\pm 0.4\%$ ($\chi \geqq 12.5$kPa {1250mmH$_2$O})
		$\pm(0.4\times\frac{12.5}{\chi})\%$ ($\chi < 12.5$kPa {1250mmH$_2$O})
	Square-root output:	When output is 50 to 100%: same as the linear output When output is 7.1 to 50%: linear output $\times \frac{50}{\text{square-root output \%}}$ When output is less than 7.1%: dropout
Temperature characteristics (Shift from the set range) Change of 30°C (Range from -5 to 55°C)	Zero shift:	$\pm 2.15\%$ ($\chi \geqq 25$kPa {2500mmH$_2$O})
		$\pm 2.15\times\frac{25}{\chi}\%$ ($\chi < 25$kPa {2500mmH$_2$O})
	Combined shift: (including zero and span shifts)	$\pm 3.0\%$ ($\chi \geqq 25$kPa {2500mmH$_2$O})
		$\pm 3.0\times\frac{25}{\chi}\%$ ($\chi < 25$kPa {2500mmH$_2$O})
Static pressure effect (Shift with respect to setting range) Change of 7MPa {70kgf/cm^2}	Zero shift:	$\pm 6.00\%$ ($\chi \geqq 25$kPa {2500mmH$_2$O})
		$\pm(6.00\times\frac{25}{\chi})\%$ ($\chi < 25$kPa {2500mmH$_2$O})
	Combined shift: (including zero and span shifts)	$\pm 7.00\%$ ($\chi \geqq 25$kPa {2500mmH$_2$O})
		$\pm(7.00\times\frac{25}{\chi})\%$ ($\chi < 25$kPa {2500mmH$_2$O})

JTR930A (for general purpose and high-temperature models) Material for Wetted Parts: Hastelloy C, Tantalum

Accuracy (*3)	Linear output:	$\pm 0.2\%$ ($\chi \geqq 210$kPa {2.1kgf/cm^2})
		$\pm(0.05+0.15\times\frac{2.1}{\chi})\%$ ($\chi < 210$kPa {2.1kgf/cm^2})
	Square-root output:	When output is 50 to 100%: same as the linear output When output is 7.1 to 50%: linear output $\times \frac{50}{\text{square-root output \%}}$ When output is less than 7.1%: dropout
Temperature characteristics (Shift from the set range) Change of 30°C (*3) (Range from -5 to 55°C)	Zero shift:	$\pm(0.15+0.7\times\frac{210}{\chi})\%$
	Combined shift: (including zero and span shifts)	$\pm 1.75\%$ ($\chi \geqq 210$kPa {2.1kgf/cm^2})
		$\pm(1.00+0.75\times\frac{210}{\chi})\%$ ($\chi < 210$kPa {2.1kgf/cm^2})
Static pressure effect (Shift with respect to setting range) (*3) Change of 7MPa {70kgf/cm^2}	Zero shift:	$\pm(0.75\times\frac{700}{\chi})\%$
	Combined shift: (including zero and span shifts)	$\pm(1.00\times\frac{700}{\chi})\%$

JTR929A (for high-temperature vacuum and high-temperature high-vacuum models)
Material for Wetted Parts: SUS316

Accuracy	Linear output:	$\pm$ 0.3% ($\chi \geqq 12.5$kPa {1250mmH$_2$O})
		$\pm$ ($0.3 \times \frac{12.5}{\chi}$) % ($\chi < 12.5$kPa {1250mmH$_2$O})
	Square-root output:	When output is 50 to 100%: same as the linear output When output is 7.1 to 50%: linear output $\times \frac{50}{\text{square-root output \%}}$ When output is less than 7.1%: dropout
Temperature characteristics (Shift from the set range) Change of 30°C (Range from -5 to 55°C)	Zero shift:	$\pm$1.5% ($\chi \geqq 25$kPa {2500mmH$_2$O})
		$\pm 1.5 \times \frac{25}{\chi}$ % ($\chi < 25$kPa {2500mmH$_2$O})
	Combined shift: (including zero and span shifts)	$\pm$2.5% ($\chi \geqq 25$kPa {2500mmH$_2$O})
		$\pm 2.5 \times \frac{25}{\chi}$ % ($\chi < 25$kPa {2500mmH$_2$O})
Static pressure effect (Shift with respect to setting range) 7MPa {70kgf/cm^2}	Zero shift:	$\pm$6.00% ($\chi \geqq 25$kPa {2500mmH$_2$O})
		$\pm(6.00 \times \frac{25}{\chi})$% ($\chi < 25$kPa {2500mmH$_2$O})
	Combined shift: (including zero and span shifts)	$\pm$7.00% ($\chi \geqq 25$kPa {2500mmH$_2$O})
		$\pm(7.00 \times \frac{25}{\chi})$% ($\chi < 25$kPa {2500mmH$_2$O})

JTR930A (for high-temperature vacuum and high-temperature high-vacuum models)
Material for Wetted Parts: SUS316

Accuracy (*3)	Linear output:	$\pm$0.2% ($\chi \geqq 210$kPa {2.1kgf/cm^2})
		$\pm(0.05+0.15 \times \frac{210}{\chi})$% ($\chi < 210$kPa {2.1kgf/cm^2})
	Square-root output:	When output is 50 to 100%: same as the linear output When output is 7.1 to 50%: linear output $\times \frac{50}{\text{square-root output \%}}$ When output is less than 7.1%: dropout
Temperature characteristics (Shift from the set range) Change of 30°C (*3) (Range from -5 to 55°C)	Zero shift:	$\pm(0.15+0.70 \times \frac{210}{\chi})$%
	Combined shift: (including zero and span shifts)	$\pm$1.75% ($\chi \geqq 210$kPa {2.1kgf/cm^2})
		$\pm(1.00+0.75 \times \frac{210}{\chi})$% ($\chi < 210$kPa {2.1kgf/cm^2})
Static pressure effect (Shift with respect to setting range) (*3) Change of 7MPa {70kgf/cm^2}	Zero shift:	$\pm(0.75 \times \frac{700}{\chi})$%
	Combined shift:	$\pm(1.00 \times \frac{700}{\chi})$%

JTR929A (for high-temperature vacuum and high-temperature high-vacuum models)
Material for Wetted Parts: Hastelloy C, Tantalum

Accuracy	Linear output:	$\pm 0.4\%$	($\chi \geqq 12.5$kPa {1250mmH$_2$O})
		$\pm(0.4\times\frac{12.5}{\chi})\%$	($\chi < 12.5$kPa {1250mmH$_2$O})
	Square-root output:	When output is 50 to 100%: same as the linear output When output is 7.1 to 50%: linear output $\times\frac{50}{\text{square-root output \%}}$ When output is less than 7.1%: dropout	
Temperature characteristics (Shift from the set range) Change of 30°C (Range from -5 to 55°C)	Zero shift:	$\pm 2.15\%$	($\chi \geqq 25$kPa {2500mmH$_2$O})
		$\pm 2.15\times\frac{25}{\chi}\%$	($\chi < 25$kPa {2500mmH$_2$O})
	Combined shift: (including zero and span shifts)	$\pm 3.0\%$	($\chi \geqq 25$kPa {2500mmH$_2$O})
		$\pm 3.0\times\frac{25}{\chi}\%$	($\chi < 25$kPa {2500mmH$_2$O})
Static pressure effect (Shift with respect to setting range) Change of 7MPa {70kgf/cm^2}	Zero shift:	$\pm 6.00\%$	($\chi \geqq 25$kPa {2500mmH$_2$O})
		$\pm(6.00\times\frac{25}{\chi})\%$	($\chi < 25$kPa {2500mmH$_2$O})
	Combined shift: (including zero and span shifts)	$\pm 7.00\%$	($\chi \geqq 25$kPa {2500mmH$_2$O})
		$\pm(7.00\times\frac{25}{\chi})\%$	($\chi < 25$kPa {2500mmH$_2$O})

JTR930A (for high-temperature vacuum and high-temperature high-vacuum models)
Material for Wetted Parts: Hastelloy C, Tantalum

Accuracy (*3)	Linear output:	$\pm 0.2\%$	($\chi \geqq 210$kPa {2.1kgf/cm^2})
		$\pm(0.05+0.15\times\frac{2.1}{\chi})\%$	($\chi < 210$kPa {2.1kgf/cm^2})
	Square-root output:	When output is 50 to 100%: same as the linear output When output is 7.1 to 50%: linear output $\times\frac{50}{\text{square-root output \%}}$ When output is less than 7.1%: dropout	
Temperature characteristics (Shift from the set range) Change of 30°C (*3) (Range from -5 to 55°C)	Zero shift:	$\pm(0.15+0.7\times\frac{210}{\chi})\%$	
	Combined shift: (including zero and span shifts)	$\pm 1.75\%$	($\chi \geqq 210$kPa {2.1kgf/cm^2})
		$\pm(1.00+0.75\times\frac{210}{\chi})\%$	($\chi < 210$kPa {2.1kgf/cm^2})
Static pressure effect (Shift with respect to setting range) (*3) Change of 7MPa {70kgf/cm^2}	Zero shift:	$\pm(0.75\times\frac{700}{\chi})\%$	
	Combined shift: (including zero and span shifts)	$\pm(1.00\times\frac{700}{\chi})\%$	

Notes) (*1): URV denotes the value for 100% (20 mA dc) output.
(*2): LRV denotes value for 0% (4 mA dc) output.
(*3): Within a range of URV $\geqq$ 0 and LRV $\geqq$ 0

Model Number Configuration Table

ST3000 Ace Remote-Sealed Differential Pressure Transmitter (JTR) with Flush Diaphragm Flange for General Purpose and High-Temperature Models

Basic model number	Selections									Optional selections						Options

Measuring span	2.5～100kPa	J T R 9 2 9 A	
	35～700kPa	J T R 9 3 0 A	
Forms of output/ communication	4 to 20mA dc (analog standard communication)		1
	4 to 20 mA dc (analog FSK communication)		2
	DE output		3
Wetted parts material	SUS316 (diaphragm: SUS316L)		2
	Tantalum		4
	Hastelloy C		H
	SUS316L		8
Sealing liquid	For general purposes: silicone oil		1
	For oxygen service: fluorine oil		2
	High-temperature model: silicone oil Note 1)		3
	For chlorine service: fluorine oil		5
Flange standard	JIS10K		A
	JIS20K		C
	JIS30K		D
	JIS63K		F
	ANSI150		G
	ANSI300		H
	ANSI600		J
	JPI150		N
	JPI300		P
	JPI600		Q
Flange diameter	3 B／80 A		2
Flange shape	Standard		1
Flange material/ Bolt/nut material	Carbon steel／Carbon steel		A
	Carbon steel／SUS630		C
	SUS304／Carbon steel		D
	SUS304／SUS630		F
	SUS316／Carbon steel		G
	SUS316／SUS630		J
	SUS316L／Carbon steel		K
	SUS316L／SUS630		M
Capillary length	2 m		2
	3 m		3
	4 m		4
	5 m		5
	6 m		6
	7 m		7
	8 m		8
	9 m		Q
	10 m		A
	2 m (Olefin covering)		B
	3 m (Olefin covering)		C
	4 m (Olefin covering)		H
	5 m (Olefin covering)		D
	6 m (Olefin covering)		J
	7 m (Olefin covering)		E
	8 m (Olefin covering)		F
	9 m (Olefin covering)		K
	10 m (Olefin covering)		G

X	Electrical conduit and explosion-proof status	G1/2, not explosion-proof
1		G1/2, JIS explosion-proof, with single standard conduit fittings
H		G1/2, JIS explosion-proof, with double standard conduit fittings
2		G1/2, JIS explosion-proof, with single standard packing
3		G1/2, JIS explosion-proof, with double standard packing
6		G1/2, JIS intrinsically safe
A		1/2 NPT, not explosion-proof
□		Other

X	Indicator	No meter
1		Digital meter with standard reading (0 to 100%)
2		Digital meter with actual reading

X	Anticorrosion treatment	Standard coating
A		Anticorrosion treatment
B		Heavy-duty anticorrosion treatment
D		Silver anticorrosion treatment

X	Flange processing	None (Standard: JISRa3.2 (12.5 S))
□		Other

X	Burnout feature	None
U		Upper limit of output at abnormal condition
D		Lower limit of output at abnormal condition

X	Mounting bracket	None
1		Carbon steel (mounted on 2B pipe)
P		Direct mounting (general purpose model only)
□		Other

X X	No optional specifications
A 2	External zero adjustment
A 4	Additional lightning protection
B 7	For special local field meter
G 1	One elbow (left)
G 2	One elbow (right)
G 3	Two elbows
D 1	Water inhibiting treatment (including oil inhibition)
D 2	Oil inhibition
D 3	FEP protective film
J 2	Power specifications
J 8	Special burnout (3.2 mA)
T 1	Test report
T 2	Mill sheet
T 3	Document conforming to High Pressure Gas Control Law (for general purposes)
T 5	Strength calculation sheet
T 6	Pressure resistance/gas-tightness test (for general purposes)
T 8	Traceability certificate
U 2	Non-SI unit conformance
□□	Other

Note 1) The temperature range of tantalum wetted parts is -10 to 180°C.

ST3000 Ace Remote-Sealed Differential Pressure Transmitter (JTR) with Extended Diaphragm Flange for General Purpose and High-Temperature Models

Basic model number | Selections | Optional selections | Options

Measuring span	2.5～100kPa	JTR929A	
	35～700kPa	JTR930A	

Forms of output/ communication	4 to 20mA dc (analog standard communication)	1
	4 to 20 mA dc (analog FSK communication)	2
	DE output	3
Wetted parts material	SUS316 (diaphragm: SUS316L)	2
	SUS316L	8
Sealing liquid	For general purposes: silicone oil	1
	For oxygen service: fluorine oil	2
	High-temperature model: silicone oil	3
Flange standard	JIS10K	A
	JIS20K	C
	JIS30K	D
	ANSI150	G
	ANSI300	H
	JPI150	N
	JPI300	P
Flange diameter	4 B／100A	1
Flange shape	Length of extension 50mm	2
	Length of extension 100mm	3
	Length of extension 150mm	4
	Length of extension 200mm	5
	Length of extension 250mm	6
	Length of extension 300mm	7
Flange material/ Bolt/nut material	Carbon steel／Carbon steel	A
	Carbon steel／SUS630	C
	SUS304／Carbon steel	D
	SUS304／SUS630	F
	SUS316／Carbon steel	G
	SUS316／SUS630	J
	SUS316L／Carbon steel	K
	SUS316L／SUS630	M
Capillary length	2 m	2
	3 m	3
	4 m	4
	5 m	5
	6 m	6
	7 m	7
	8 m	8
	9 m	Q
	10m	A
	2 m (Olefin covering)	B
	3 m (Olefin covering)	C
	4 m (Olefin covering)	H
	5 m (Olefin covering)	D
	6 m (Olefin covering)	J
	7 m (Olefin covering)	E
	8 m (Olefin covering)	F
	9 m (Olefin covering)	K
	10m (Olefin covering)	G

XX	No optional specifications	
A2	External zero adjustment	
A4	Additional lightning protection	
B7	For special local field meter	
G1	One elbow (left)	
G2	One elbow (right)	
G3	Two elbows	
D1	Water inhibiting treatment (including oil inhibition)	
D2	Oil inhibition	
J2	Power specifications	
J8	Special burnout (3.2 mA)	
T1	Test report	
T2	Mill sheet	
T3	Document conforming to High Pressure Gas Control Law (for general purposes)	
T5	Strength calculation sheet	
T6	Pressure resistance/gas-tightness test (for general purposes)	
T8	Traceability certificate	
U2	Non-SI unit conformance	
□□	Other	

X	Electrical conduit and explosion-proof status	G1/2, not explosion-proof
1		G1/2, JIS explosion-proof, with single standard conduit fittings
H		G1/2, JIS explosion-proof, with double standard conduit fittings
2		G1/2, JIS explosion-proof, with single standard packing
3		G1/2, JIS explosion-proof, with double standard packing
6		G1/2, JIS intrinsically safe
A		1/2 NPT, not explosion-proof
□		Other

X	Indicator	No meter
1		Digital meter with standard reading (0 to 100%)
2		Digital meter with actual reading

X	Anticorrosion treatment	Standard coating
A		Anticorrosion treatment
B		Heavy-duty anticorrosion treatment
D		Silver anticorrosion treatment

X	Flange processing	None (Standard: JISRa3.2 (12.5S))
□		Other

X	Burnout feature	None
U		Upper limit of output at abnormal condition
D		Lower limit of output at abnormal condition

X	Mounting bracket	None
1		Carbon steel (mounted on 2B pipe)
P		Direct mounting (general purpose model only)
□		Other

ST3000 Ace Remote-Sealed Differential Pressure Transmitter (JTR) with Flush Diaphragm Flange for High-Temperature Vacuum and High-Temperature High-Vacuum Models

Basic model number | Selections | Optional selections | Options

Measuring span	2.5～100kPa	J T R 9 2 9 A	
	35～700kPa	J T R 9 3 0 A	
Forms of output/ communication	4 to 20mA dc (analog standard communication)	1	
	4 to 20 mA dc (analog FSK communication)	2	
	DE output	3	
Wetted parts material	SUS316（diaphragm: SUS316L）	2	
	Tantalum	4	
	Hastelloy C	H	
	SUS316L	8	
	Other	□	
Sealing liquid Note 1)	For high-temperature vacuum models: silicone oil	4	
	For high-temperature high-vacuum models: silicone oil	7	
Flange standard	JIS10K	A	
	JIS20K	C	
	JIS30K	D	
	JIS63K	F	
	ANSI150	G	
	ANSI300	H	
	ANSI600 Note 2)	J	
	JPI150	N	
	JPI300	P	
	JPI600 Note 2)	Q	
Flange diameter	3 B／80 A	2	
Flange shape	Standard	1	
Flange material/ Bolt/nut material	Carbon steel／Carbon steel	A	
	Carbon steel／SUS630	C	
	SUS304／Carbon steel	D	
	SUS304／SUS630	F	
	SUS316／Carbon steel	G	
	SUS316／SUS630	J	
	SUS316L／Carbon steel	K	
	SUS316L／SUS630	M	
Capillary length	2 m		2
	3 m		3
	4 m		4
	5 m		5
	6 m		6
	7 m		7
	8 m		8
	9 m		Q
	10m		A

X X	No optional specifications	
A 2	External zero adjustment	
A 4	Additional lightning protection	
B 7	For special local field meter	
G 1	One elbow (left)	
G 2	One elbow (right)	
G 3	Two elbows	
D 1	Water inhibiting treatment (including oil inhibition)	
D 2	Oil inhibition	
D 3	FEP protective film	
J 2	Power specifications	
J 8	Special burnout (3.2 mA)	
T 1	Test report	
T 2	Mill sheet	
T 3	Document conforming to High Pressure Gas Control Law (for general purposes)	
T 5	Strength calculation sheet	
T 6	Pressure resistance/gas-tightness test (for general purposes)	
T 8	Traceability certificate	
U 2	Non-SI unit conformance	
□□	Other	

X	Electrical conduit and explosion-proof status		G1/2, not explosion-proof
1			G1/2, JIS explosion-proof, with single standard conduit fittings
H			G1/2, JIS explosion-proof, with double standard conduit fittings
2			G1/2, JIS explosion-proof, with single standard packing
3			G1/2, JIS explosion-proof, with double standard packing
6			G1/2, JIS intrinsically safe
A			1/2 NPT, not explosion-proof
□			Other
	X	Indicator	No meter
	1		Digital meter with standard reading (0 to 100%)
	2		Digital meter with actual reading
		X Anticorrosion treatment	Standard coating
		A	Anticorrosion treatment
		B	Heavy-duty anticorrosion treatment
		D	Silver anticorrosion treatment
			X Flange processing None（Standard: JISRa3.2 (12.5 S)）
			□ Other
			X Burnout None
			U feature Upper limit of output at abnormal condition
			D Lower limit of output at abnormal condition
			X Mounting None
			1 bracket Carbon steel
			□ Other

Note 1) The temperature range of tantalum wetted parts section is -10 to 180°C.

Note 2) ANSI600 and JPI600 are not usable with high-temperature high-vacuum models at the flange standard.

ST3000 Ace Remote-Sealed Differential Pressure Transmitter (JTR) with Extended Diaphragm Flange for High-Temperature Vacuum and High-Temperature High-Vacuum Models

Basic model number | Selections | Optional selections | Options

Measuring span	2.5～100kPa	JTR929A	
	35～700kPa	JTR930A	
Forms of output/communication	4 to 20mA dc (analog standard communication)	1	
	4 to 20 mA dc (analog FSK communication)	2	
	DE output	3	
Wetted parts material	SUS316（diaphragm: SUS316L）	2	
	SUS316L	8	
Sealing liquid	For high-temperature vacuum models: silicone oil	4	
	For high-temperature high-vacuum models: silicone oil	7	
Flange standard	JIS10K	A	
	JIS20K	C	
	JIS30K	D	
	ANSI150	G	
	ANSI300	H	
	JPI150	N	
	JPI300	P	
Flange diameter	4 B／100A	1	
Flange shape	Length of extension 50mm	2	
	Length of extension 100mm	3	
	Length of extension 150mm	4	
	Length of extension 200mm	5	
	Length of extension 250mm	6	
	Length of extension 300mm	7	
Flange material/Bolt/nut material	Carbon steel／Carbon steel	A	
	Carbon steel／SUS630	C	
	SUS304／Carbon steel	D	
	SUS304／SUS630	F	
	SUS316／Carbon steel	G	
	SUS316／SUS630	J	
	SUS316L／Carbon steel	K	
	SUS316L／SUS630	M	
Capillary length	2 m		2
	3 m		3
	4 m		4
	5 m		5
	6 m		6
	7 m		7
	8 m		8
	9 m		Q
	10m		A

X	Electrical conduit and explosion-proof status	G1/2, not explosion-proof
1		G1/2, JIS explosion-proof, with single standard conduit fittings
H		G1/2, JIS explosion-proof, with double standard conduit fittings
2		G1/2, JIS explosion-proof, with single standard packing
3		G1/2, JIS explosion-proof, with double standard packing
6		G1/2, JIS intrinsically safe
A		1/2 NPT, not explosion-proof
□		Other

X	Indicator	No meter
1		Digital meter with standard reading (0 to 100%)
2		Digital meter with actual reading

X	Anticorrosion treatment	Standard coating
A		Anticorrosion treatment
B		Heavy-duty anticorrosion treatment
D		Silver anticorrosion treatment

X	Flange processing	None（Standard: JISRa3.2 (12.5S)）
□		Other

X	Burnout feature	None
U		Upper limit of output at abnormal condition
D		Lower limit of output at abnormal condition

X	Mounting bracket	None
1		Carbon steel
□		Other

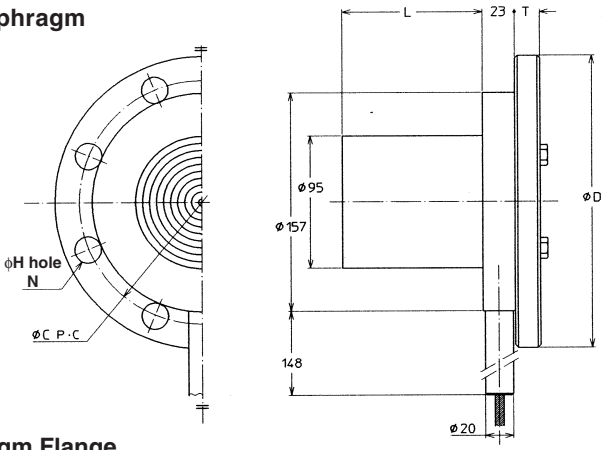
X X	No optional specifications
A 2	External zero adjustment
A 4	Additional lightning protection
B 7	For special local field meter
G 1	One elbow (left)
G 2	One elbow (right)
G 3	Two elbows
D 1	Water inhibiting treatment (including oil inhibition)
D 2	Oil inhibition
J 2	Power specifications
J 8	Special burnout (3.2 mA)
T 1	Test report
T 2	Mill sheet
T 3	Document conforming to High Pressure Gas Control Law (for general purposes)
T 5	Strength calculation sheet
T 6	Pressure resistance/gas-tightness test (for general purposes)
T 8	Traceability certificate
U 2	Non-SI unit conformance
□□	Other

Dimensions

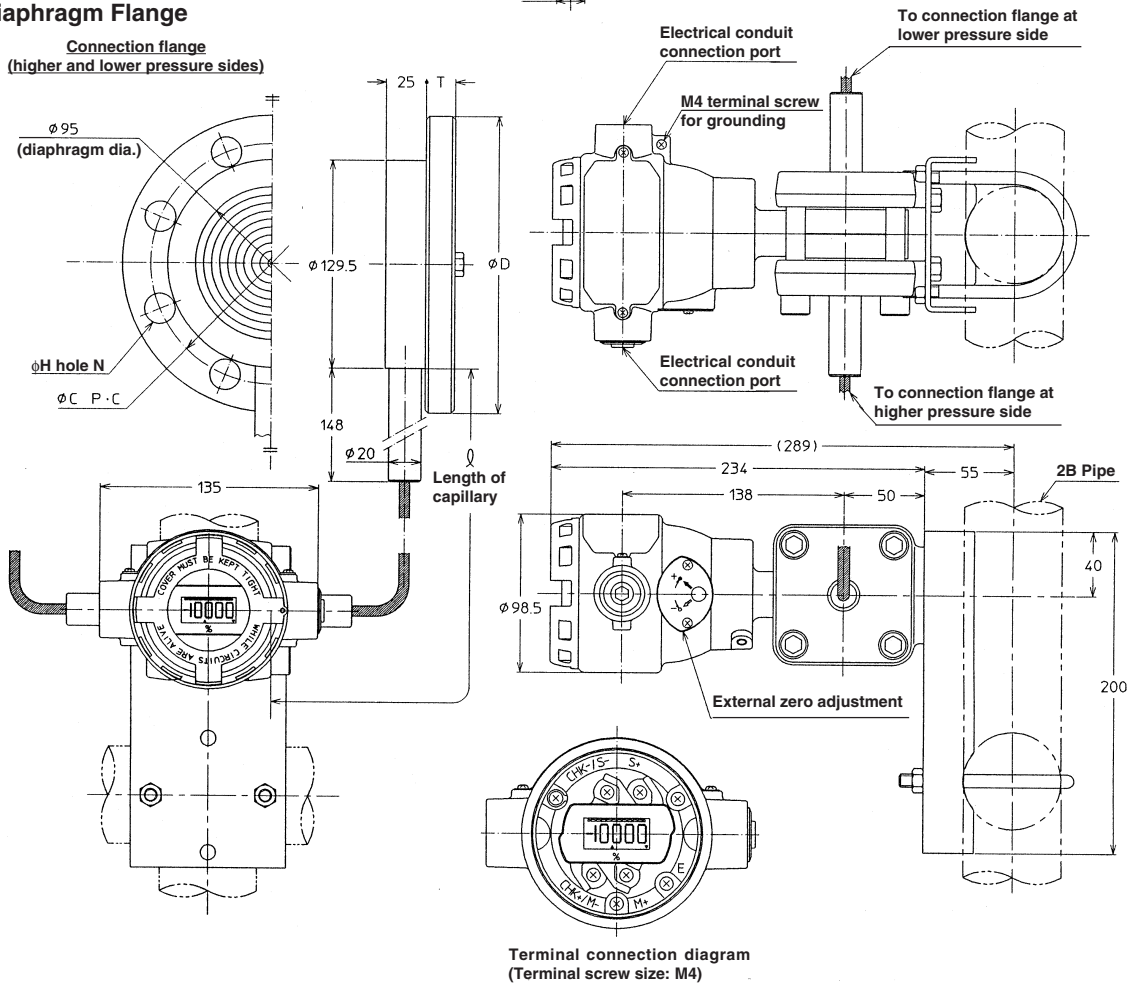
(Unit: mm)

JTR929A/930A General Purpose and High-Temperature Models

Extended Diaphragm Flange

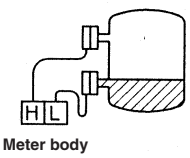


Flush Diaphragm Flange



Notes)

1. The transmitter can be mounted in various ways by changing the position of the mounting bracket. (A typical example is shown in the figure.)
2. To prevent vibration, you are recommended to fasten the capillary tube mid-length.
3. Select a gasket that will not contact the diaphragm after it is tightened.
4. When the volume of suppression is larger than one half of the adjustment span, the higher pressure side and the lower pressure side of the process connection end flange are opposite to those shown in the figure. When using the transmitter to measure liquid levels, connect at H and L marks on the meter body as shown in the figure below.

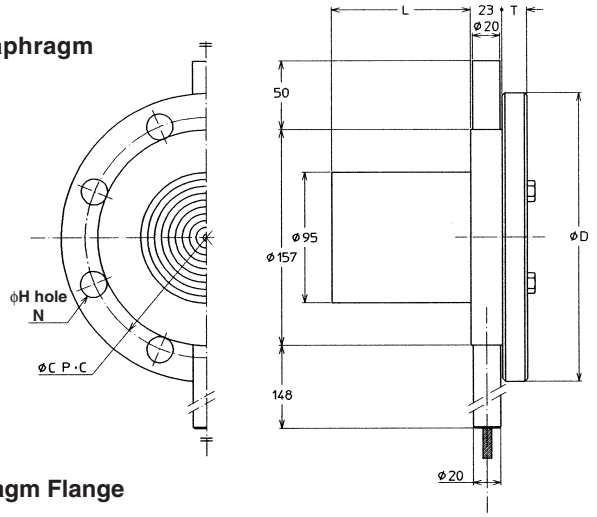


Meter body

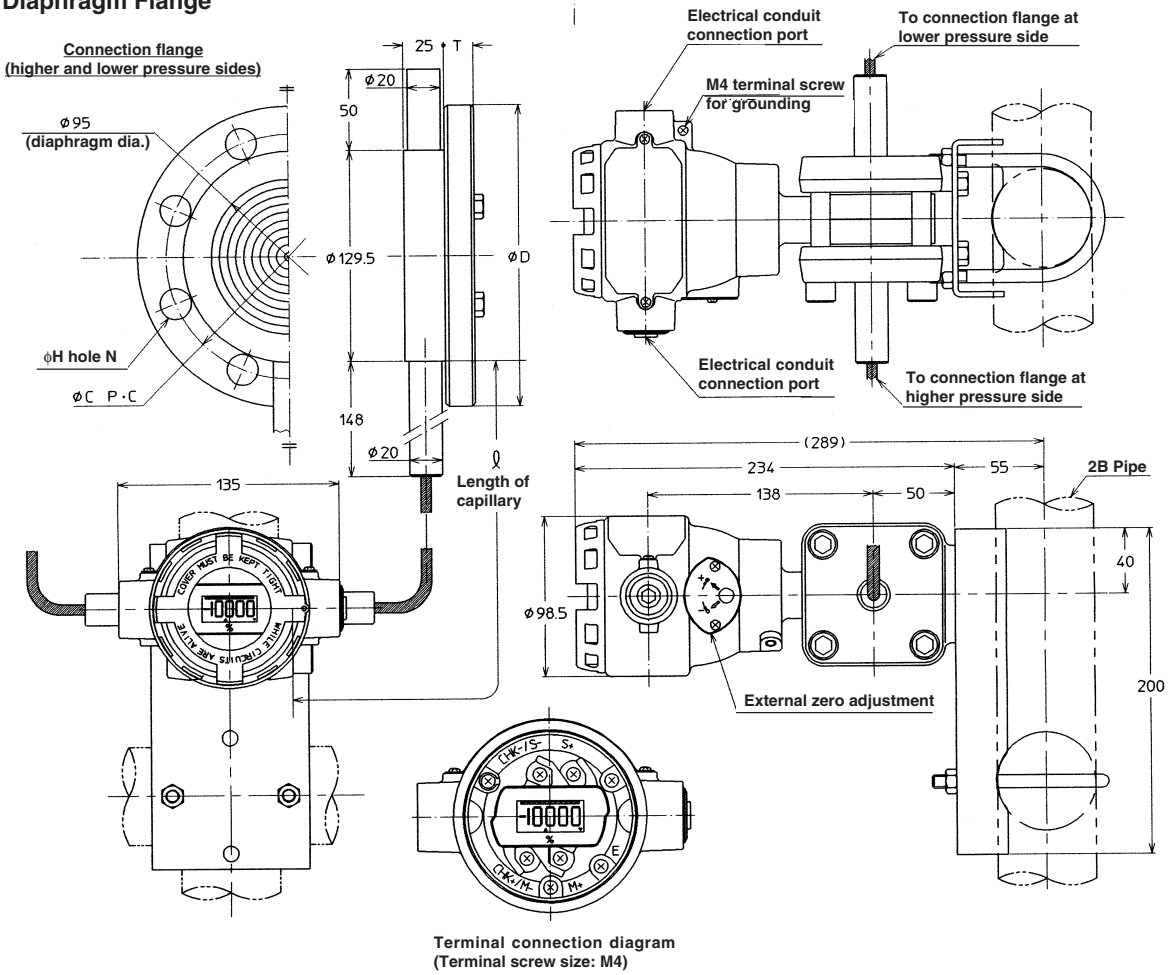
JTR929A/930A High-Temperature Vacuum and High-Temperature High-Vacuum Models

(Unit: mm)

Extended Diaphragm Flange



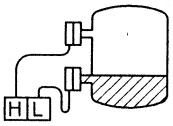
Flush Diaphragm Flange



Terminal connection diagram
(Terminal screw size: M4)

Notes)

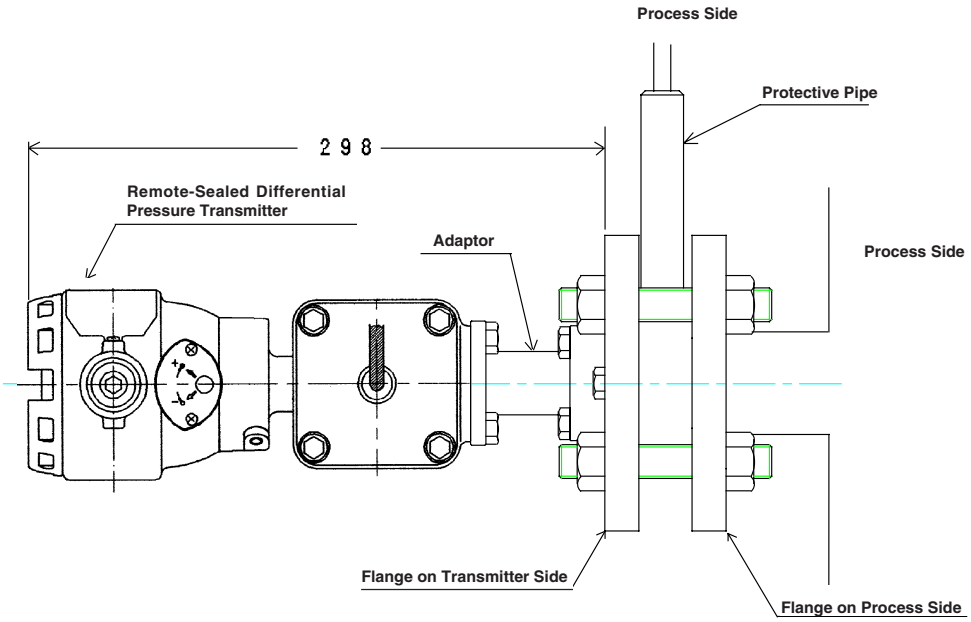
1. The transmitter can be mounted in various ways by changing the position of the mounting bracket. (A typical example is shown in the figure.)
2. To prevent vibration, you are recommended to fasten the capillary tube mid-length.
3. Select a gasket that will not contact the diaphragm after it is tightened.
4. When the volume of suppression is larger than one half of the adjustment span, the higher pressure side and the lower pressure side of the process connection end flange are opposite to those shown in the figure. When using the transmitter to measure liquid levels, connect at H and L marks on the meter body as shown in the figure below.



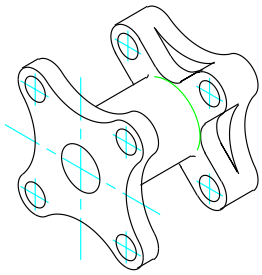
Meter body

Dimension Drawing for Direct Mounting

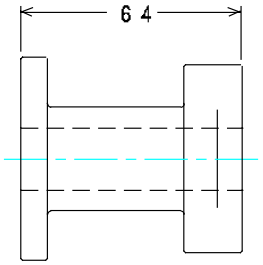
(Unit: mm)



Adaptor Assembly Drawing (JTR Type + Adaptor)



Adaptor Outline Drawing



Adaptor Dimension Drawing

Table of Flange Dimensions
(Flush Diaphragm Flange)

(Unit: mm)

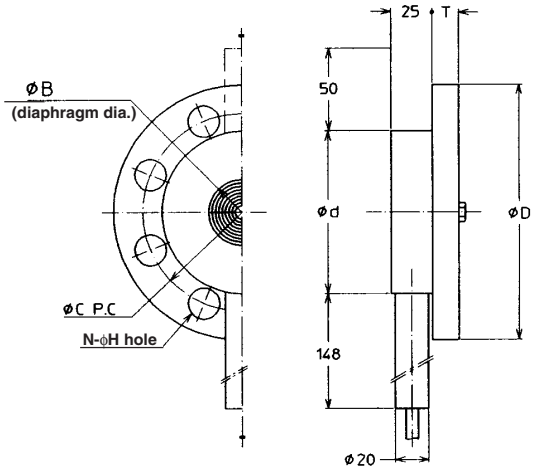


Table of Flange Dimensions

Flange standard	ØD	T	ØC	N	ØH	Ød	ØB
JIS 10K-80A	185	18	150	8	19	129.5	95
JIS 20K-80A	200	22	160	8	23		
JIS 30K-80A	210	28	170	8	23		
JIS 63K-80A	230	40	185	8	25		
ANSI 150-3B	190	24	152.4	4	19		
ANSI 300-3B	210	28.5	168.1	8	22		
ANSI 600-3B	210	32	168.1	8	22		
JPI 150-3B	190	24	152.4	4	19		
JPI 300-3B	210	28.5	168.1	8	22		
JPI 600-3B	210	32	168.1	8	22		

(Extended Diaphragm Flange)

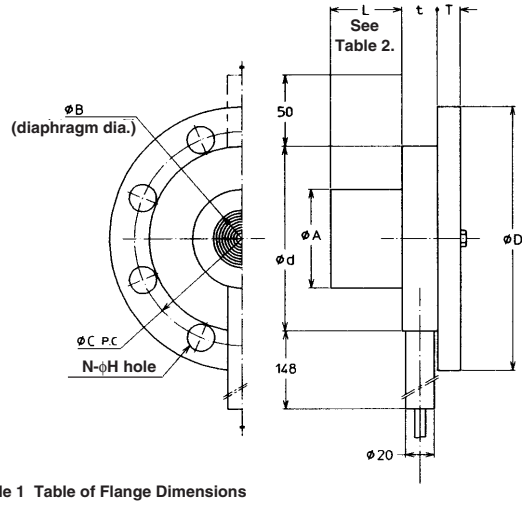


Table 1 Table of Flange Dimensions

Flange standard	ØD	T	t	ØC	N	ØH	Ød	ØA	ØB
JIS 10K-100A	210	18	23	175	8	19	95	95±1	90
JIS 20K-100A	225	24		185	8	23			
JIS 30K-100A	240	32		195	8	25			
ANSI 150-4B	229	24		190.5	8	19			
ANSI 300-4B	254	32		200.2	8	22			
JPI 150-4B	229	24		190.5	8	19			
JPI 300-4B	254	32		200.2	8	22			

Table 2 Length of Extension

L
50
100
150
200
250
300

YAMATAKE

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Saving through Automation

Yamatake Corporation

Totate International Building
2-12-19 Shibuya
Shibuya-ku, Tokyo 150-8316
Japan

Tel : 81-3-3486-2310
Fax: 81-3-3486-2593

Certificate No. Q17862

Certificate No. E8318
For Shonan Factory

http://www.yamatake.co.jp