ST3000
Smart Multivariable Flow Transmitter
Model JTD720A

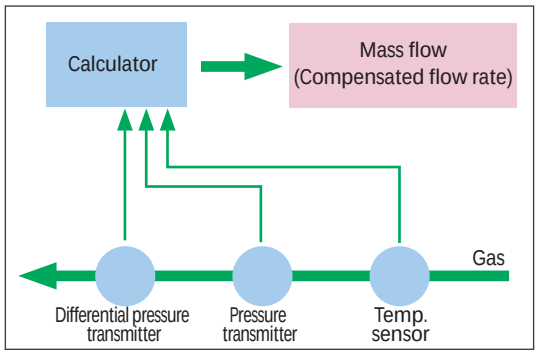
OVERVIEW

ST3000 Smart Multivariable Flow transmitter is a differential pressure transmitter for mass flow measurement for gas. It measures process DP, SP, and temperature simultaneously and outputs analog 4 to 20mA signal proportional to the mass flow (volume flow at the standard condition).

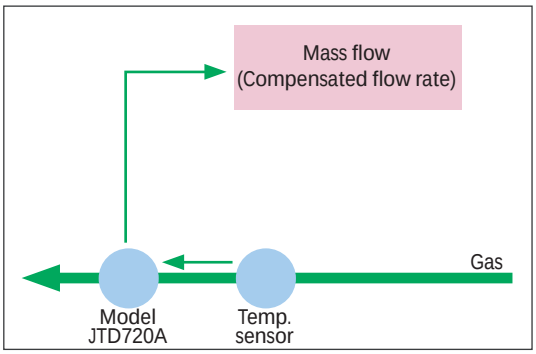
FEATURES

- Three process variable measurements and a mass flow calculation with one transmitter.
- High accuracy and high range ability

■ **Past instrumentation**



■ **Instrumentation of model JTD720**



APPLICATIONS

Measurement fluid

N_2, O_2, H_2, Ar, Steam, Natural gas, Air, etc.

Applications

- Custody transfer of gas at chemical/steal market.
- Flow control of fluid gas for an incinerator or a boiler.
- Management of utility such as steam and air.
- Flow rate measurement of H_2 or other flamable gases at hazardous area.

FUNCTIONAL SPECIFICATIONS

Type of protection

JIS C 0920 watertight: NEMA 3 and 4X
JIS F 8001 class 2 watertight IEC IP67
JIS Flame-proof approval
Exd IIB+H2 T4

Measuring span/Setting range/Working pressure range

See Table 1.

Temperature input

RTD (Pt 100Ω or JPt 100Ω)

Output / Communication

Analog output (4 to 20 mA)
Digital output (DE protocol)

Power supply and load resistance
17 to 45V DC. A load resistance of 250Ω or more is necessary between loops. (See Figure 2.)

Ambient temperature

Normal operating range
-15 to 65°C (for general purpose models)
-10 to 65°C (for oxygen service models)
-15 to 65°C (digital indicator model)

Operative limits
-40 to 70°C (for general purpose models)
-40 to 70°C (for oxygen service models)
-30 to 70°C (digital indicator model)

JIS flame-proof model
-15 to 60°C (JIS flame-proof model)

Temperature range of wetted parts

Normal operating range
-15 to 65°C (for general purpose models)
-10 to 65°C (for oxygen service models)

Operative limits
-40 to 70°C (for general purpose models)
-40 to 80°C (for oxygen service models)
-30 to 70°C (digital indicator model)

JIS frame-proof model
-15 to 60°C (JIS flameproof model)

Ambient humidity
10 to 90% RH

Stability against supply voltage change
±0.005% F.S./V

Lightning protection
Peak value of voltage: 100 kV
Peak value of current: 1000A

Dead time
Approx. 0.4 sec.

Damping time
Selectable from 0 to 32 sec. in ten stages

Output saturation point
Upper limit: 20.8 mA
lower limit: 3.8 mA

Vibration characteristics
Amplitude 1.5 mm / Frequency 0 to 9 Hz
Acceleration 5 m/S2 (0.5 G) / 9 to 60 Hz

PHYSICAL SPECIFICATIONS

Materials

Fill fluid
For general purpose (Silicone oil)
For oxygen service (Fluorine oil)

Center body
SUS316

Transmitter case
Aluminum alloy

For wetted parts

Meter body cover
SCS14A (SUS316 equivalent)

Centerbody
SUS316 (Diaphragm SUS316L)

Vent plugs
SUS316

Gaskets
FEP

Bolts and nuts (for meterbody covers)
Carbon steel (SNB7), SUS304

Finish

Housing
Light beige (Munsell 4Y7.2/1.3)

Cap
Dark beige (Munsell 10YR4.7/0.5)

Weight
Approx. 4.4 kg

INSTALLATION

Electrical connection
G1/2 internal thread

Grounding
Resistance 100Ω max.

Mounting
Can be installed on a 2-inch horizontal or vertical pipe (can be directly mounted on a process pipe).

Process connection
Rc1/2, Rc1/4

DP: Differential pressure
$DP_{LRV.}$: Value to output 0% (4 mA) of differential pressure
DP_{SPAN}: Span of differential pressure range
PP: Static pressure (process pressure)
$PP_{REF.}$: Designed process pressure
$PP_{ELV.}$: Elevation value of static pressure
PT: Process temperature
$PT_{REF.}$: Designed process temperature
$PT_{ELV.}$: Elevation value of temperature

Figure 1 Calculation equation

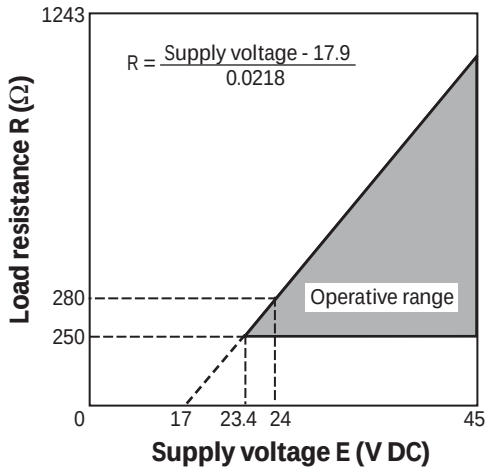


Figure 2 Supply voltage and load resistance characteristics

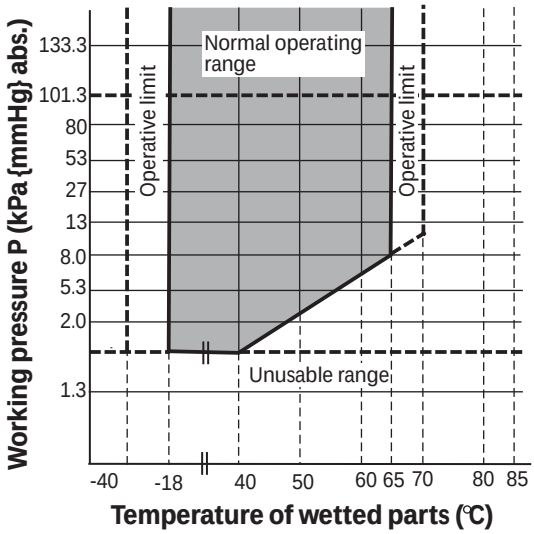


Figure 3 Working pressure and temperature of wetted parts

OPTIONAL SPECIFICATIONS

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 free treatment (including oil free treatment)

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

Oil free treatment

The transmitter is shipped with oil-free wetted parts.

Test report

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

Material certificate

The material certificate shows the chemical composition, heat-treatment conditions, and mechanical properties of the materials used for the wetted parts.

Strength calculation sheet

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

Withstand pressure and air tight test (for general purposes)

The withstand pressure and air tight test result sheet shows the results of a pressure resistance test (under water pressure for 10 minutes) and a gas-tightness test (using N_2 gas for 10 minutes) performed on the wetted parts.

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 user's 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 result in 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 explosionproof product is a pull-in pressure-resistant packing-cable, be sure to use a pressure-resistant packing-cable adapter certified by Yamatake Corporation.
- Be sure to use the cable which allowable temperature is more than 65°C.

⚠ CAUTION

- After installing the transmitter, do not stand on it. Using it as a foothold could cause it to collapse and cause physical injury.
- Be careful not to hit the glass indicator with tools etc. This could break the glass and cause injury.
- The 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 malfunction or irreparable damage to the instrument.
- Use a power supply that conforms to the specifications. Use of an improper power supply may result in malfunction or irreparable damage to the instrument.

PERFORMANCE SPECIFICATIONS

Table 1 Performance specifications

DP Measuring span	0.75 to 100 kPa
DP setting range	-100 ≤ URV ≤ 100 kPa (*1) -100 ≤ LRV ≤ 100 kPa (*2) *Note)*1: URV denotes the value for 100% (20 mA) output.* **2: LRV denotes the value for 0% (4 mA) output.*
Design pressure setting range	0.17 to 3.5 MPa abs.
Design temperature setting range	-100 to 650°C
Calculation equation	See Figure 1.
Accuracy (output after compensation)	Shown are the upper limit (URV) and lower limit (LRV) of the calibration range or the percentage ratio of the maximum value of the span to χ (kPa.) $PP_{REF.}$: designed pressure $PP_{MAX.}$: max. pressure of process Accuracy% = ± (*0.025 + A + B + C + D + E*) *(* E: only when the temperature is input.)* A: *0.075%*..... $\left(x \times \frac{PP_{REF}}{PP_{MAX}}\right) \geq 12.5kPa$ $0.075\% \times \frac{12.5}{x} \times \frac{PP_{MAX}}{PP_{REF}}\%$..... $\left(x \times \frac{PP_{REF}}{PP_{MAX}}\right) \leq 12.5kPa$ B: $0.1 \times \frac{PP_{MAX}}{3.5}\%$..... $\left(x \times \frac{PP_{MAX}}{PP_{REF}}\right) \geq 25kPa$ $0.1 \times \frac{25}{x} \times \frac{PP_{MAX}}{PP_{REF}} \times \frac{PP_{MAX}}{3.5}\%$..... $\left(x \times \frac{PP_{MAX}}{PP_{REF}}\right) \leq 25kPa$ C: *0.075%*..... $PP_{REF} \geq 0.35MPa$ *abs.* $0.075 \times \frac{0.35}{PP_{REF}}\%$ ..... $PP_{REF} \leq 0.35MPa$ abs. D: $0.15 \times \frac{x}{PP_{REF} \times 1000}\%$ E: *0.1*% (Only when the temperature is input.) Square root output: When output is 50 to 100%; same as that of linear output. When output is 7.1 to 50%; value of linear output × $\frac{50}{Output}\%$ (Not specified for dropout area) When output is 7.1% or below;Not specified

Table 1 Performance specifications

Working pressure rating	3.5 MPa max. (For vacuum pressure, see Figure 3).
Low flow cut-off	Value of cut-off: The output is changeable from 0 to 20%. $-100 \leq URV \leq 100\ kPa$ Drop-out type: Zero or linear output
Working pressure range	3.5 MPa abs. max. (refer to Figure 3 for negative pressure.)
Temperature effect (after compensation)	Shown are the upper limit (URV) and lower limit (LRV) of the setting range or the percentage ratio of the maximum value of the span to χ (kPa.) PP_{REF}: designed pressure PP_{MAX}: max. pressure of process Zero shifts: ± 0.47% / 30°C change (differential pressure 25 kPa, design pressure 0.5 MPa, process pressure 0.6 MPa abs. max.) Zero shift% / 30°C = ± (*0.15* + *A* + *B* + *D*) *(* D: only when the temperature is input.)* A: $0.16\% \times \frac{12.5}{x} \times \frac{PP_{MAX}}{PP_{REF}}$ B: $0.1 \times \frac{25}{x} \times \frac{PP_{MAX}}{3.5} \times \frac{PP_{MAX}}{PP_{REF}}$ D: *0.2*% (Only when the temperature is input.) Total shifts: ±0.76% / 30°C change (included zero span shifts) (differential pressure 25 kPa, design pressure 0.5 MPa, process pressure 0.6 MPa abs. max.) Zero shift% / 30°C change = ± (*0.2* + *A* + *B* + *D*) *(* D: only when the temperature is input.)* A: 0.24% ..... $\left(x \times \frac{PP_{REF}}{PP_{MAX}}\right) \geq 12.5kPa$ $0.24 \times \frac{12.5}{x} \times \frac{PP_{MAX}}{PP_{REF}}\%$ ..... $\left(x \times \frac{PP_{REF}}{PP_{MAX}}\right) \leq 12.5kPa$ B: $0.1 \times \frac{PP_{MAX}}{3.5}\%$ ..... $\left(x \times \frac{PP_{REF}}{PP_{MAX}}\right) \geq 25kPa$ $0.1 \times \frac{25}{x} \times \frac{PP_{MAX}}{PP_{REF}} \times \frac{PP_{MAX}}{3.5}\%$. $\left(x \times \frac{PP_{REF}}{PP_{MAX}}\right) \leq 25kPa$ C: 0.1% ..... $PP_{REF} \geq 0.35MPa\ abs.$ $0.1 \times \frac{0.35}{PP_{REF}}\%$ ..... $PP_{REF} \leq 0.35MPa\ abs.$ D: *0.2*% (Only when the temperature is input.)
Calibration accuracy for differential pressure transmitter	Shown are the upper limit (URV) and lower limit (LRV) of the calibration range or the percentage ratio of the maximum value of the span to χ (kPa.) Linear output: ± 0.1% ..... $\chi \geq 5kPa$ $\pm \left(0.025 + 0.075 \times \frac{5}{\chi}\right)\%$ ..... $\chi \leq 5kPa$
Calibration accuracy for pressure transmitter	Shown are the upper limit (URV) and lower limit (LRV) of the calibration range or the percentage ratio of the maximum value of the span to χ (kPa.) Linear output: ± 0.1% ..... $\chi \geq 0.35kPa\ abs.$ $\pm \left(0.025 + 0.075 \times \frac{0.35}{\chi}\right)\%$ ..... $\chi \leq 0.35kPa\ abs.$
Calibration accuracy for temperature transmitter	$-100°C \leq LRV$, $URV \leq 650°C$ and span 50°C or more. $\pm \left(0.3 \times \frac{50}{span} + 0.05\right)$ % F.S.
Temperature input type	Resistance thermobulb Pt100Ω or JPt100Ω

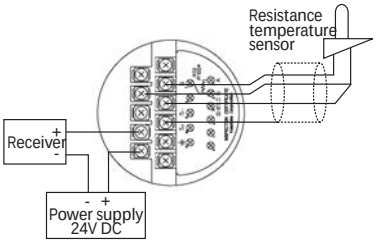
MODEL SELECTIONS

JTD720A - I II III IV V - VI VII VIII IX X - Options

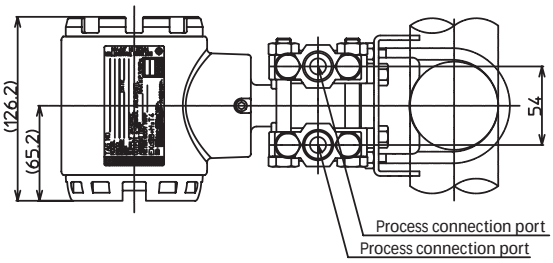
			Basic model no.	Selections						Optional specifications					Options	
	Measuring span	0.75 to 100 kPa	JTD720A	-					-							
Selections																
I	Output / Communications	4 to 20 mA		1											XX	No options
		Digital output (DE protocol)		3											A5	Long vent/drain plugs
II	Material	Meterbody cover	Vent / drain plugs	Wetted parts of center body											F1	Without temperature compensation *2
		SCS14A	SUS316	SUS316	E										G1	With one elbow
III	Fill fluid	Regular type (Silicon oil)				1									D1	Water free finish (with oil free finish)
		For oxygen service (Fluorine oil) *1				2										
IV	Process connection	Rc1/2, top connection					A								D2	Oil free finish
		Rc1/2, bottom connection					B								T1	Test report
		Rc1/2, front connection					D								T2	Material certificate (Mill sheet)
		Rc1/4, top connection					L									
		Rc1/4, top connection					L								T3	Document for high pressure gas regulation
		Rc1/4, bottom connection					M									
		Rc1/4, front connection					P								T5	Strength calculation sheet
V	Bolts / nuts material	Carbon steel (SNB7)						1							T6	Withstand pressure and air tight test
		SUS304						2								
Option 1									-						C7	Process connection; reverse
VI	Electrical connection / explosion-proof	G1/2, watertight								X						
		G1/2, JIS Flameproof with 1 pc. of cable gland attached								2						
		G1/2, JIS Flameproof with 2 pcs. of cable gland attached								3						
VII	Built-in indicating smart meter	None									X					
		0 to 100% linear scales									1					
		Engineering unit scales									2					
VIII	Finish	Standard										X				
IX	Fail safe	None											X			
		Upper limit of output at abnormal condition											U			
		Lower limit of output at abnormal condition											D			
X	Mounting bracket	None												X		
		Carbon steel												1		
		SUS304												2		
		For replacement												F		

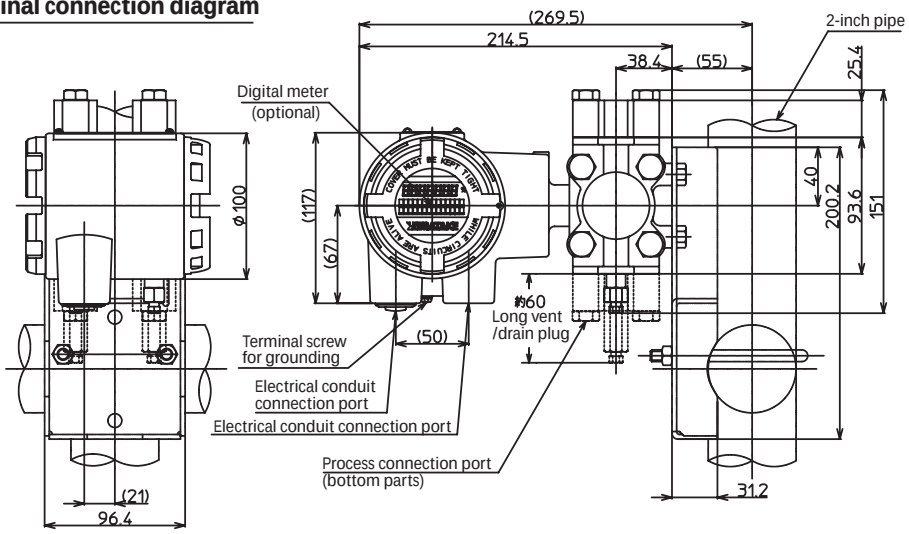
Note **1: Included oil-free finish.*
**2: Code "F1" option must be selected when the temperature compensation is not needed.*

DIMENSIONS

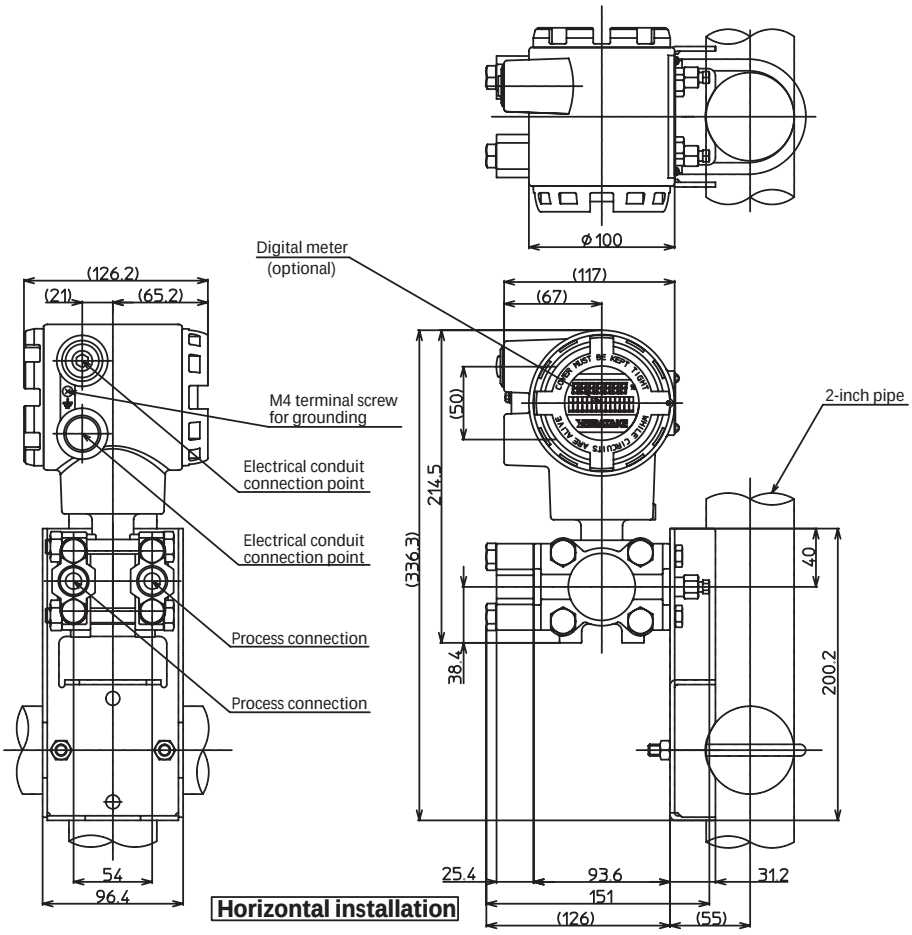


Terminal connection diagram





Vertical installation



Horizontal installation

YAMATAKE

Savemation

Saving through Automation

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