

TAPLESS VENTURI FLOWMETER

MODEL: NZ11

General

The Tapless Venturi Flowmeter, which requires no pressure taps for differential pressure measurement, can be effectively used (with less pressure drop) for flow measurement of a slurry fluid, a fluid with suspensions, or a corrosive fluid. It also can measure a liquid which solidifies at low temperatures, or a liquid which vaporizes at high temperatures.

Specifications

Tapless Venturi Flowmeter

Instrument used in combination:

Electronic or pneumatic remote seal diaphragm type differential pressure transmitter

Applicable temperature range:
-40 to +280°C

Pressure ratings:
JIS 10K RF flange or
ANSI 150 RF flange

Accuracy:
±2% FS

Straight pipe length required:
Upstream side: 5D (5 times of
pipe diameter)
Downstream side: Not
required.

Materials:
SUS304, SUS316, SUS316L

Diameters:
50, 80, 100, 150, 200, 250, 300,
350, 400(mm)

Remote Seal Diaphragm Type Differential Pressure Transmitter

Model:

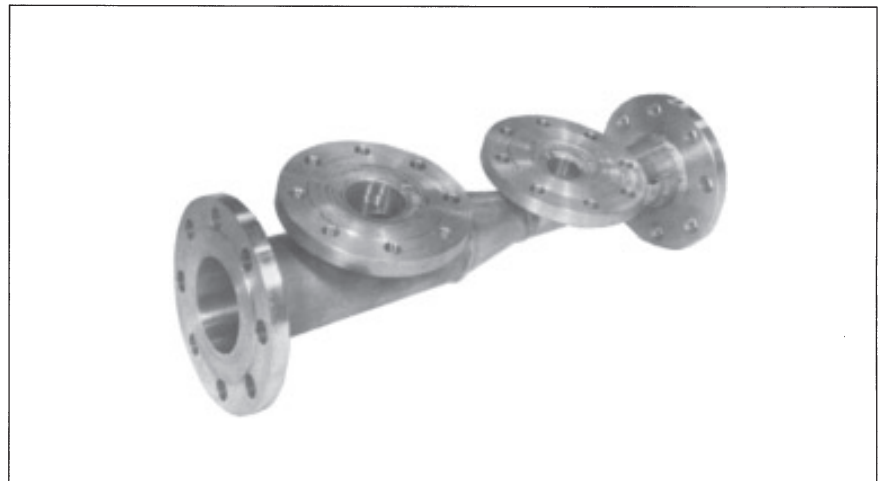
JTR226 (electronic), KDP72 (pneumatic) or KFDB□□72 (pneumatic controller)

Differential pressure measuring range:

JTR226; 0-250 to
0-10.000 mm H₂O
KDP72; 0-250 to
0-5500mmH₂O
KFDB□□72; 0-250 to
0-5500mmH₂O

Accuracy:

JTR226;
±0.2% ... $x \geq 1250\text{mmH}_2\text{O}$
±[0.15+(0.05x $\frac{1250}{x}$)]% ...
 $x < 1250\text{mmH}_2\text{O}$



KDP/KFD; ±0.5% FS
(x ... Differential pressure
measuring range)
Applicable temperature range:
Transmitter (ambient);
-30 to +75°C (JTR226)
-30 to +80°C (KDP/KFD)
Process fluid;
Standard type
-40 to +110°C (JTR226)
-40 to +120°C (KDP/KFD)
Hi-temp. type
-5 to +280°C (JTR226)
-10 to +200°C (KDP/KFD)

Capillary tube length:

2, 3, or 5 meters

Wet part material:

SUS316 (diaphragm;
SUS316L),
Monel, Titanium, or Tantalum

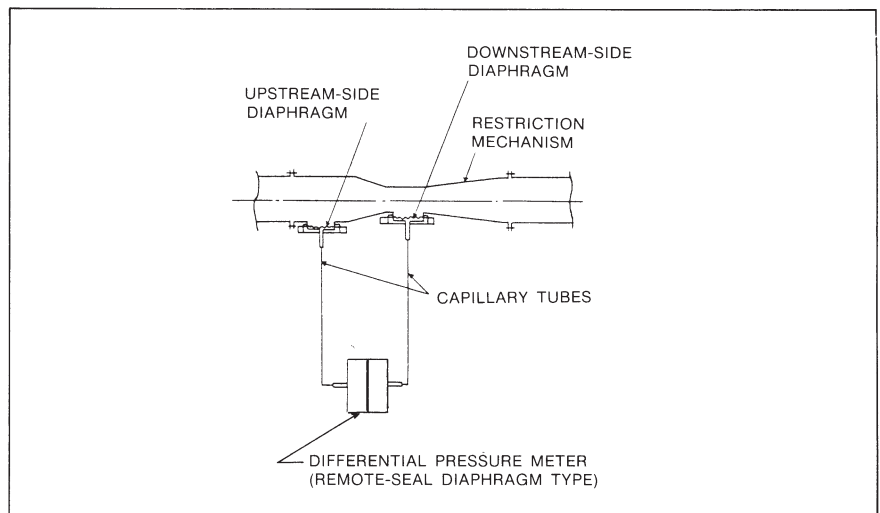
Case construction:

Weatherproof type,
Explosion-proof type or
Intrinsic safety type

Output:

Electronic; 4 to 20mA DC
Pneumatic; 0.2 to 1.0 kgf/cm²

Construction:



Diameter and Throat Selection Charts

[For fluids conversion between flow rate and differential pressure, with water]

Application Example

Measured fluid: Water
Flow rate: 80m³/hr (at 15°C)
Pipe diameter: 100mm

- 1) Since the pipe diameter is 100mm, throat No. 4, No. 5, or No. 6 can be used.
- 2) Differential pressure produced at flow rate 80 m³/hr is 900mmH₂O for No. 6 throat, 3400mmH₂O for No. 5 throat, or 6500mmH₂O for No. 4 throat.
- 3) Throats which provide optimal differential pressure is No. 5.

Conversion of Flow Rates of Liquid Fluids Other than Water into Water-Equivalent Flow Rates:

To use the below chart for a fluid other than water, the flow rate is converted once into a water-equivalent flow rate (at 15°C) employing the below equations.

$$Q_{BW} = Q_B \times G_B \times \sqrt{\frac{1}{G_O}} \quad \dots \dots \dots (1)$$

$$Q_{BW} = Q_O \times \sqrt{\frac{1}{G_O}} \quad \dots \dots \dots (2)$$

$$Q_{BW} = W \times \sqrt{\frac{1}{G_O}} \quad \dots \dots \dots (3)$$

where,
Q_{BW}: Water flow rate (at 15°C) [m³/hr]
Q_B: Flow rate of measured liquid (at 15°C) [m³/hr]
Q_O: Flow rate of measured liquid (at measuring temperature) [m³/hr]

G_B: Ratio between density of measured liquid (at 4°C) and that of water (at 4°C)

G_O: Ratio between density of measured liquid (at measuring temperature) and that of water (at 4°C)

W: Weight flow [t/hr]

Calculation Example

Measured fluid: Air/liquid 2-phase fluid

Flow rate: 90m³/hr (at measuring temperature)

Specific-gravity of measured liquid: 0.79 (st measuring temperature)

Since the measured fluid is a 2-phase fluid, its flow rate is converted into that of water (at 15°C) employing equation (2).

$$Q_{BW} = 90 \times \sqrt{0.79} = 80 \text{ m}^3/\text{hr}$$

[For gases conversion between flow rate and differential pressure, with air]

Application Example

Measured fluid: Air
Flow rate: 8000 Nm³/hr
Pipe diameter: 150mm

- 1) Since the pipe diameter is 150mm, throat No. 6, No. 7, or No. 8 is applicable.
- 2) Differential pressure produced at flow rate 8000Nm³/hr is 6500mmH₂O or over with No. 6 throat, 6500mmH₂O with No. 7 throat, 2600mmH₂O with No. 8 throat.
- 3) Throats which provide optimal differential pressure is No. 8.

Conversion of Flow Rates of Gas Fluids Other than Air into Air-Equivalent Flow Rates:

To use the below chart for a fluid other than air, the flow rate is converted once into an air-equivalent flow rate (at 0°C, 1 atm) employing the below equations.

$$Q_{NA} = Q_N \sqrt{\frac{T}{273}} \times \frac{1.03}{P} \times G \quad \dots \dots \dots (1)$$

$$Q_{NA} = \sqrt{\frac{273}{T}} \times \frac{P}{1.03} \times G \quad \dots \dots \dots (2)$$

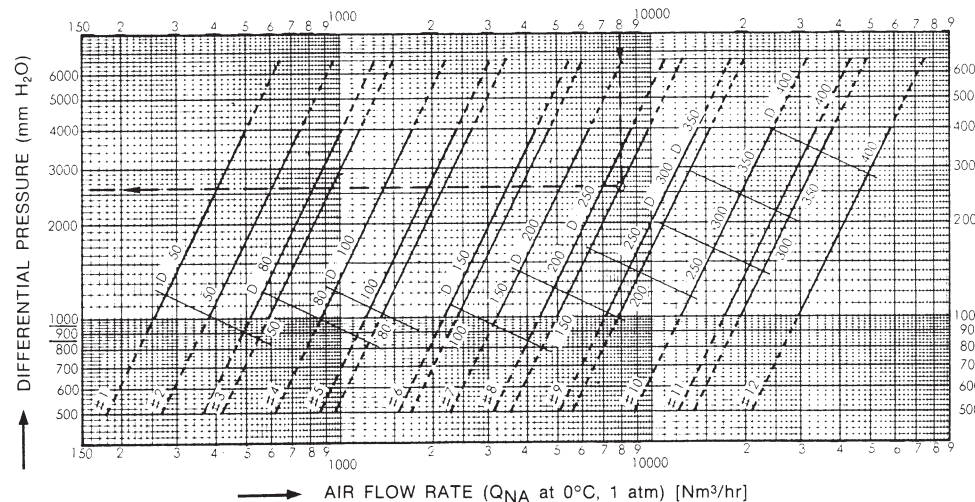
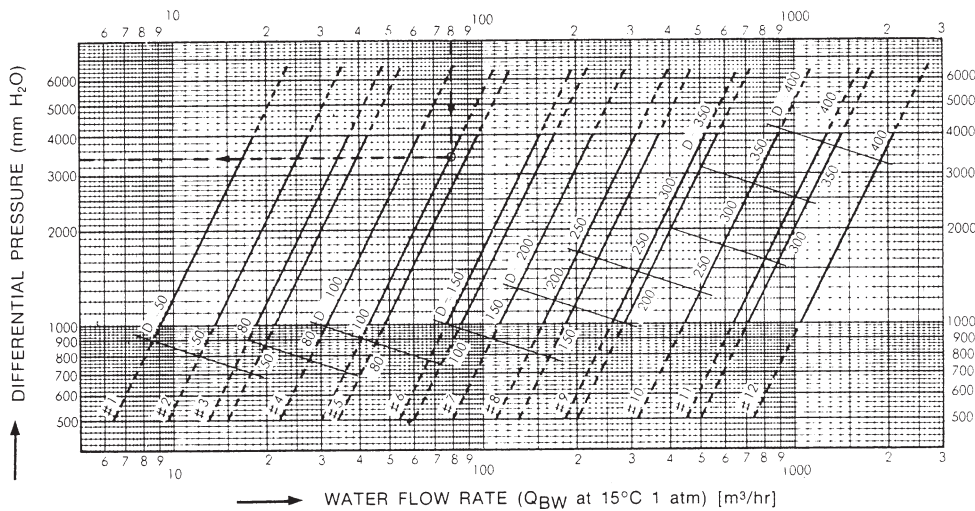
where,
Q_{NA}: Air flow rate (at 0°C, 1 atm.) [Nm³/hr]
Q_N: Flow rate of measured fluid (at 0°C, 1 atm.) [Nm³/hr]
Q: Flow rate of measured fluid (under measuring conditions) [m³/hr]
T: Absolute temperature of measured fluid [°K]
P: Absolute pressure of measured fluid [kgf/cm² abs.]
G: Specific-gravity of measured fluid (with 1.00 for air as reference)

Calculation Example

Measured fluid: Wet gas
Flow rate: 7000 m³/hr (under measuring conditions)
Specific-gravity of fluid: 0.6
Fluid temperature: 95°C
Fluid pressure: 2 kgf/cm² G

Since the flow rate is as under the measuring conditions, the flow rate is converted into an air-equivalent flow rate employing equation(2)

$$Q_{NA} = 7000 \sqrt{\frac{273}{273+95}} \times \frac{1.03+2}{1.03} \times 0.6 = 8000 \text{ Nm}^3/\text{hr}$$



Application Examples

- For measurements of separative and adhesive fluids, causing adhesions on diaphragm surfaces. (Latex, Black liquid, Concentrated ammonium sulfide, and various super-saturated liquids.)
- Liquids containing fibers. (Pulp liquid, etc.)
- Highly corrosive liquids. (Electrolytic of copper sulfide, Benzylchloride, and other chemicals)
- Fluids which solidifies and require to be heated for melting. (High viscosity oils, Naphthalene, Dehydrated tar, Fatty acid, Sodium Sulfide, etc.)
- 2-phase fluids (Gas + Liquid, Liquid + Solid)
- Fluids with suspensions. (Waste water, Drain water, Sludge, etc.)
- Slurries (Various slurries containing solid suspensions, Dehydrated tar, Heavy oil, etc.)
- Sublime liquids (Liquid chlorine)
- Gases (Hydrogen sulfide gas, Formalin gas, etc.)
- Foods for which no pressure taps can be used. (Sugar, Juice, etc.)

Model Number Table

Ex: NZ11-04SIFJ04A-X

Basic Model No.	Selections									Descriptions		
	Diameter		JIS Schedule No of St. St. Pipe		Flange Rating	Throat No.		Material	Option			
	I	II	III	IV	V	IV	VII	VIII	IX		—	X
NZ11												Tapless Venturi Flowmeter
	—	02										50mm
	—	03										80mm
	—	04										100mm
	—	06										150mm
	—	08										200mm
	—	10										250mm
	—	12										300mm
	—	14										350mm
	—	16										400mm
			S1									10S
			S2									20S
				FJ								JIS10K RF
				FA								ANSI 150RF
					01							No. 1 : 50 (mm)
					02							No. 2 : 50 (mm)
					03							No. 3 : 50, 80 (mm)
					04							No. 4 : 80, 100 (mm)
					05							No. 5 : 80, 100 (mm)
					06							No. 6 : 100, 150 (mm)
					07							No. 7 : 150, 200 (mm)
					08							No. 8 : 150, 200, 250 (mm)
					09							No. 9 : 200, 250, 300, 350 (mm)
					10							No.10 : 250, 300, 350, 400 (mm)
					11							No.11 : 300, 350, 400 (mm)
					12							No.12 : 400 (mm)
						A						SUS304 st. st.
						B						SUS316 st. st.
						L						SUS316L st.st.
							—	X				No option

Overall Dimensions

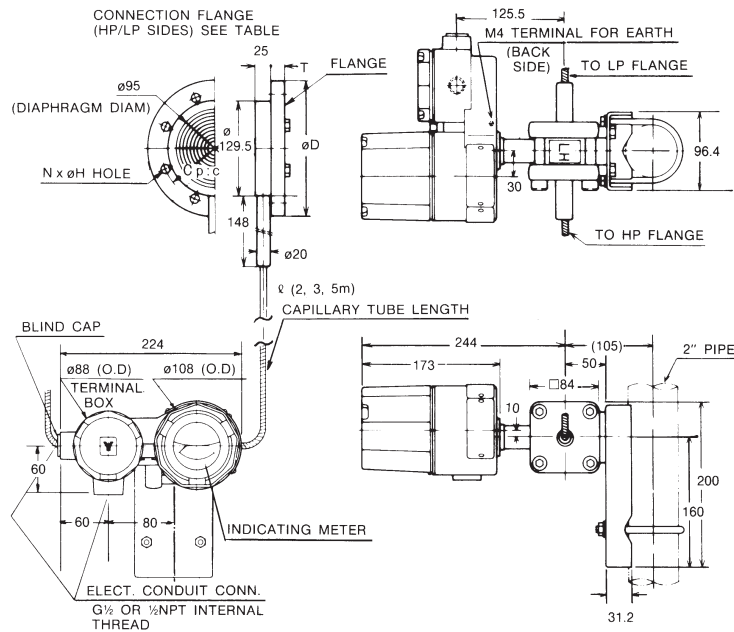
Tapless Venturi		Sizes (mm)										
Face to Face Dimensions		50	80	100	150	200	250	300	350	400		
L		540	620	740	955	1220	1475	1660	1900	2030		
Weight (kg)	JIS	S1	16.4	18.3	21.7	39.7	60.2	89.4	118.9	159.2	198.5	
		10K	S2	16.6	18.9	22.6	41.9	64.4	98.6	128.9	170.6	212.8
		ANSI	S1	21.5	26.0	34.0	53.4	85.2	123.0	184.5	238.1	301.5
			150	S2	21.7	26.6	34.9	55.6	89.5	132.2	194.5	249.4

(Unit: mm)

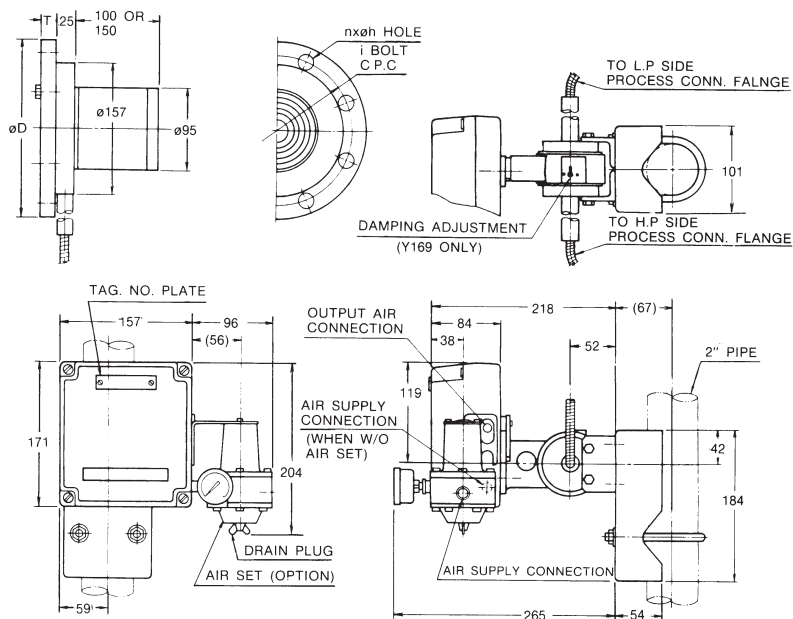
Electric Transmitter (JTR226)

(Unit: mm)

Flange Rating	D	T	G	C	H	N
JIS10K	80mm	185	26	130	150	18
ANSI 150	3"	191	31	127	152.5	19



Pneumatic Transmitter (KDP72)



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Specifications are subject to change without notice.

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