

Outline

VH series Wafer-Cone® differential pressure flowmeter and DT series multi digital differential indicator are integrated into one flowmeter. As the meter requires little straight runs and little head loss compared to orifice plate, it offers our reduction of construction cost and energy saving.

Features

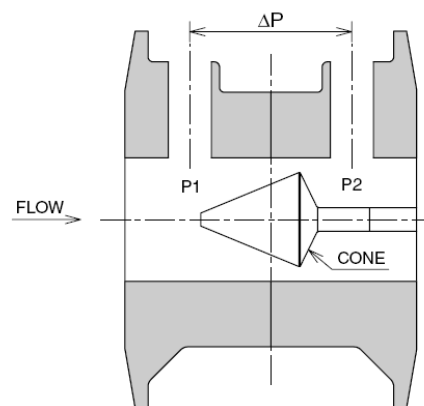
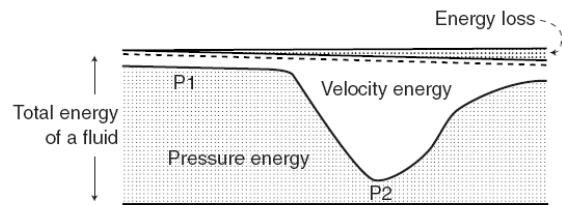
- **Simple installation**
Wafer connection makes installation simple. Flowmeter body flanges designed to match the pipe flanges guides to the pipe center line.
- **Short straight runs**
The required straight runs are less than 1/5 of those required for orifice and vortex flowmeters. The narrow installation space allows simple and flexible piping arrangement plan. It leads to space and cost saving.
- **Low pressure loss**
A proper selection of β ratio allows lower pressure loss than orifice plate with the same flow rate. It improves energy efficiency of the plant.
- **Wide range-ability**
Since the differential pressure created by the meter is stable at low flow rate, it can measure the flow rate in the range of the turn down ratio 14:1 to cover the wide flow range with one flowmeter.
- **Wear and adhesion resistant**
V shape cone has durable structure against wear or adhesion. It can measure challenging slurry or flue-gas process lines that ordinary orifice could not deal with.
- **No impulse piping work required**
Direct mounting of digital differential transmitter/indicator requires no impulse piping to save installation cost.
- **Matching any flow direction**
It can measure horizontal, vertical, upward, or downward flow. The orientation of the indicator can be set in a simple way at field.
- **Various functions of indicator**
Battery type or current output type can be chosen. Indicator part is interchangeable. The differential pressure range can be changed by changing indicator.
- **Easy-to-read big LED display**
The instantaneous flow rate is indicated with the 18mm high characters on the LCD display. Optionally, the integrated flow quantity is also indicated with the 5mm high characters at the same time.



Measuring Principle

The principle of Wafer-Cone® flowmeter is the same as that of a common differential pressure type flowmeter, and it is based on the Bernoulli's theorem of the conservation of a fluid energy. As shown in Fig. 1, the pressure P1 at the approaching point to V-cone decreases to P2 at the edge point with increasing fluid velocity by throttling the flow path along the contoured shape of V-Cone. P1 and P2 are measured from the pressure taps and the difference of the two pressures is given as:

$$\Delta P = P1 - P2 \quad (\Delta P \text{ is differential pressure output})$$



[Fig. 1]

VDT Series Integral type Wafer-Cone® Differential pressure flowmeter

Standard Specification

Meter Size	: 25, 40, 50, 65, 80, 100 mm
Connection	: Wafer type
Rating	: JIS10/20K, ANSI Class 150/300
Connection Size	: 25A(1"), 40A(1-1/2"), 50A(2"), 65A (2-1/2"), 80A(3"), 100A(4")
Materials	: See Dimensions and Materials as described later
Measuring fluids	: Liquids and Gases (Steam can not be measured.)
Fluid pressure	: Maximum 0.5MPa
Fluid temperature	: Maximum 70°C
Ambient temperature	: -20°C to 60°C
Humidity	: 35% to 85% RH (No condensate, No freezing)
Measuring Range*	Liquids: 0 to 10 m/s Gases: 0 to 80 m/s
*Where low cut is set as 0%. As standard the low cut is set as 7%.	
Guaranteed accuracy range	: Max. Range-ability 14:1 Depends on differential pressure range.
Accuracy of the reading	: ±1.5 to 2.5% of Full Scale Depends on differential pressure range.
Flow direction	: Horizontal, Vertical, upward, or downward flow

Required Straight Runs

Measuring Fluid	Liquids general, Gases and Steam Re No < 200,000		Gases and Steam Re No > 200,000	
	Up-stream side	Down-stream side	Up-stream side	Down-stream side
Type of joints				
1 piece of 90° bend	0D	0D	1D	1D
2 pieces of 90° bend	0D	0D	1D	1D
T joint	0D	0D	1D	1D
Butterfly valve (Flow control valve)	3D	3D	10D	5D
Butterfly valve (Fully open)	3D	0D	5D	3D
Gate valve (Fully open)	0D	0D	1D	1D
Expander (Diameter 0.67D expands to 1D, length 2.5D)	1D	1D	2D	2D
Reducer (Diameter 3D reduces to 1D, length 3.5D)	1D	1D	1D	1D
[Notes] D shows the nominal size of Wafer-Cone® flowmeter. The required straight runs are the distance from the flange faces of Wafer-Cone® flowmeter. Add 1D to the above mentioned figures for the service β ratio is 0.65 or more.				

● Indicator type and its function All indicator types have local indicators

Type	Function
Battery type	Battery driven, Local indication only
Current output type	4 to 20 mA two wire system

● Indicator function

Flow rate indication	: 3-1/2 digits LCD (Character height 18mm) Indicated as "0 to 1999" 11 segment bar graph indication
Totalizer indication	: 7-1/2 digits LCD (Character height 5mm) Indicated as "0 to 19999999"
Filter	: Selectable from 0, 2, 4, 8, 16, 32s (Moving average method)
LCD Back light	: light on during 10 seconds at key operation excluding current output type.

Accessories

● Indicator protection cover

Provide the indicator protection cover to avoid direct sunshine and water splash if required.
The protection cover might make the reading difficult.

Option (Provided at the factory)

● Totalizer Indication

If the totalized flow quantity indication is required, add the Code TLZ.

● Specification and function of indicator type

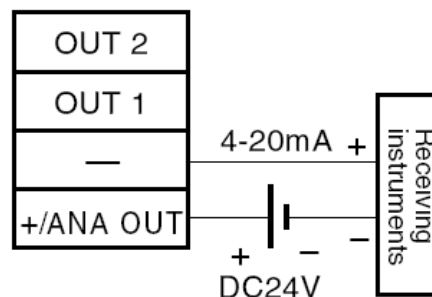
1) Battery type

Battery	: AA alkali dry battery (LR6) x 2 pieces
Battery Life	: Approximately 2 years continuous service at 23°C Auto power off mode selectable Low battery monitor attached as standard

2) Current output type

Power supply	: 24V DC ±10%
Output signal	: 4 – 20mA DC (2 wire system)
Maximum load	: 600 Ω
Output accuracy	: ±0.5% F.S. at 23°C
Response	: Less than 2 seconds with filter set as 0
Wiring connection	: Water-proof cable gland Application cable outer diameter 3mmΦ to 8mmΦ

Connection diagram :



Sizing

Based on a selected Wafer-Cone® β ratio, the differential pressure at maximum flow range is determined by the meter size and fluid properties. The maximum differential pressure corresponds to the maximum flow range of indicator. The maximum differential pressure can be selected as required by designating a Wafer-Cone® β ratio and a flow range if meter size and fluid properties are given.

The Wafer-Cone® sizing program presents a solution to meet your requirements such as low pressure loss measurement or more precise flow measurement.

Please contact Tokyo Keiso Thailand for further information of the Wafer-Cone® sizing program.

Maximum Flow Range

- Maximum flow range when measuring 20°C water

Meter size /connection size	Maximum flow rate [m³/h]	
	Min.	(Max.)
25A (1")	Min.	(5.51)
	Max.	(7.50)
40A (1-1/2")	Min.	(8.62)
	Max.	19.03
50A (2")	Min.	(11.24)
	Max.	31.10
65A (2-1/2")	Min.	(13.42)
	Max.	42.64
80A (3")	Min.	(16.71)
	Max.	68.79
100A (4")	Min.	(22.15)
	Max.	119.73

- Maximum flow range when measuring 0°C air with gage pressure

Meter size /connection size	Fluid Pressure [MPa]	Maximum flow rate [m³/h(nor)]					
		0.0	0.1	0.2	0.3	0.4	0.5
25A (1")	Min.	(77)	108	108	108	108	108
	Max.	(99)	198	296	381	430	475
40A (1-1/2")	Min.	(120)	168	168	168	181	169
	Max.	252	502	753	969	1094	1206
50A (2")	Min.	(155)	217	217	217	230	252
	Max.	412	821	1231	1585	1788	1971
65A (2-1/2")	Min.	(186)	261	260	301	337	369
	Max.	565	1126	1688	2173	2452	2703
80A (3")	Min.	(232)	328	403	466	522	572
	Max.	912	912	2424	3505	3956	4361
100A (4")	Min.	(308)	308	701	811	908	996
	Max.	1587	1587	4742	6102	6886	7591

Stud Bolt Size

Connection rating	JIS		ANSI	
	10K (mm)	20K (mm)	Class 150 (inch)	Class 300 (inch)
25A (1")	M16 x 130	M16 x 140	1/2 x 5	5/8 x 5-1/4
40A (1-1/2")	M16 x 160	M16 x 160	1/2 x 6	3/4 x 6-3/4
50A (2")	M16 x 170	M16 x 170	1/2 x 6-1/2	5/8 x 6-3/4
65A (2-1/2")	M16 x 190	M16 x 190	5/8 x 7-1/2	3/4 x 8
80A (3")	M16 x 210	M20 x 220	5/8 x 8-1/4	3/4 x 9
100A (4")	M16 x 240	M20 x 260	5/8 x 9-1/2	3/4 x 10-1/2

Model Code

Model Code								Description	
VDT	1	3	J1	-45	-05	4	L	/TLZ	(Example)
Material	1								SCS14A/SUS316
Meter size /Connection size		3							25A (1")
		4							40A (1-1/2")
		5							50A (2")
		6							65A (2-1/2")
		7							80A (3")
		8							100A (4")
Connection rating			J1						JIS10K
			J2						JIS20K
			A2						ANSI Class 150
			A5						ANSI Class 300
			Z						Other
V-Cone β ratio				-45					0.45
				-50					0.50
				-55					0.55
				-60					0.60
				-65					0.65
				-70					0.70
				-75					0.75
				-80					0.80
Differential pressure range of indicator					-02				2kPa
					-05				5kPa
					-10				10kPa
					-20				20kPa
Indicator Type						4			Battery Type
						5			Current output Type
Measuring fluids							L		Liquids
							G		Gases
Option								TLZ	Totalizer Indication

The accuracy is guaranteed up to the maximum flow rate in the list at the written size and fluid pressure. The minimum flow rate at which the accuracy is guaranteed is 1/14 or 1/10 of the maximum flow rate. The maximum flow rate in parenthesis in the list guarantees the accuracy within 1:10 of the maximum flow rate.

These figures can be calculated by using Wafer-Cone® sizing program. Fluids other than ones in the list, Flow range at operation conditions, Maximum differential pressure, Permanent pressure loss, etc.

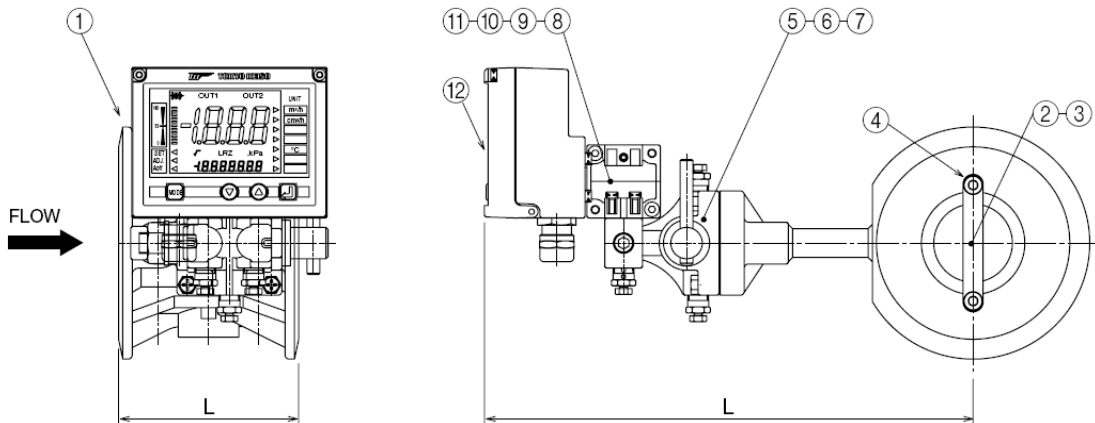
When pressure and temperature compensation is required for gas measurement, calculate maximum flow rate using the Wafer-Cone® sizing program.

For sizing program, contact Tokyo Keiso Thailand.

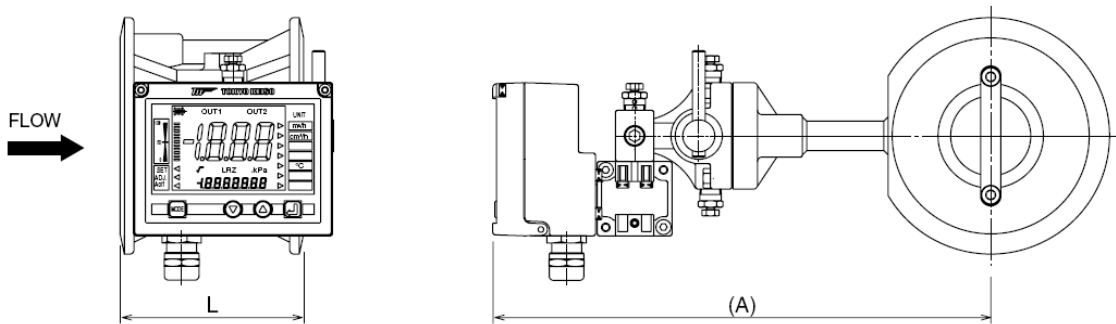
VDT Series Integral type Wafer-Cone® Differential pressure flowmeter

Dimensions and Materials

● For gases



● For Liquids



● Materials

Part No.	Part Name	Materials
1	Detector	Body
2		Cone
3		Support
4		Fastening bolts
5	Cock piece	Body
6		Cock axis
7		O-ring
8	Indication part	Diaphragm
9		Body
10		O-ring
11		Drain hole Seal
12	Indicator housing	ADC12

● Dimension List

Meter size (mm)	L (mm)	A (mm)	Weight (kg)
25	57	219	2.7
40	76	228	3.7
50	86	234	4.2
65	102	249	6.2
80	121	264	8.2
100	152	282	12.7

- Wafer-Cone® is registered trademarks of McCROMETER, Inc
- Specification is subject to change without notice.

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