

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 you 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 rangeability

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 transmitter/indicator requires no impulse piping to save installation cost.



Matching any flow direction

It can measure either 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.

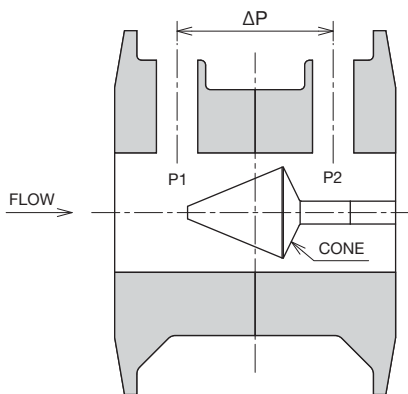
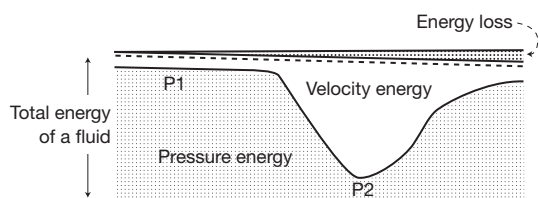
MEASUREMENT PRINCIPLE

The principle of V-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]

STANDARD SPECIFICATION

- Meter size 25, 40, 50, 65, 80, 100 mm
1, 1-1/2, 2, 2-1/2, 3, 4 inch
 - Connection Wafer type
 - Rating JIS10K,20K
ANSI Class150, 300
DIN PN16, 40
GB PN1.6, 4.0
 - Connection size Same as meter size
 - Materials See Dimensions and Materials as described later.
 - Measuring fluid 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. Rangeability 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 Either horizontal, vertical, upward, or downward flow

INDICATOR SPECIFICATION

Refer to the DT series TECHNICAL GUIDANCE [TG-EM125E](#) for the details of digital indicator.

● Required straight runs

[Measuring fluid : Liquids general and Gases with Reynolds No. < 200,000]

Type of joints	Upstream side	Downstream side
1 piece of 90° bend	0D	0D
2 pieces of 90° bend	0D	0D
T joint	0D	0D
Butterfly valve (Flow control valve)	3D	3D
Butterfly valve (Fully open)	3D	0D
Gate valve (Fully open)	0D	0D
Expander (Diameter 0.67D expands to 1D, length 2.5D)	1D	1D
Reducer (Diameter 3D reduces to 1D, length 3.5D)	1D	1D

[Measuring fluid : Gases with Reynolds No. >200,000]

Type of joints	Upstream side	Downstream side
1 piece of 90° bend	1D	1D
2 pieces of 90° bend	1D	1D
T joint	1D	1D
Butterfly valve (Flow control valve)	10D	5D
Butterfly valve (Fully open)	5D	3D
Gate valve (Fully open)	1D	1D
Expander (Diameter 0.67D expands to 1D, length 2.5D)	2D	2D
Reducer (Diameter 3D reduces to 1D, length 3.5D)	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"
- Indication cycle : 1 sec.(Sampling ;0.5sec.)
- 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.

● Specification and function of indicator type

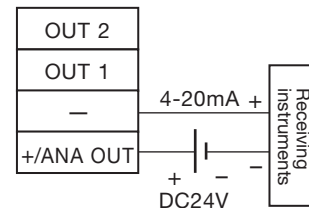
1) Battery type

- Battery : AA alkali dry battery (LR6) × 2 pieces
- Battery life : Approximately 2 year's 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
Applicable cable outer diameter 3 mm ∅ to 8 mm ∅

Connection diagram :



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.

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 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]	
25A	1"	DN25	Min.	(5.51)
			Max.	(7.50)
40A	1-1/2"	DN40	Min.	(8.62)
			Max.	19.03
50A	2"	DN50	Min.	(11.24)
			Max.	31.10
65A	2-1/2"	DN65	Min.	(13.42)
			Max.	42.64
80A	3"	DN80	Min.	(16.71)
			Max.	68.79
100A	4"	DN100	Min.	(22.15)
			Max.	119.73

· 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.

· You can find following calculation results by using the Wafer-Cone® sizing program: Fluids other than ones in the list, Flow range at operating conditions, Maximum differential pressure, Permanent pressure loss

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

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

Meter size /connection size			Maximum flow rate [m³/h(nor)]						
			Fluid pressure [MPa]	0.0	0.1	0.2	0.3	0.4	0.5
25A	1"	DN25	Min.	(77)	108	108	108	108	108
			Max.	(99)	198	296	381	430	475
40A	1-1/2"	DN40	Min.	(120)	168	168	168	181	169
			Max.	252	502	753	969	1094	1206
50A	2"	DN50	Min.	(155)	217	217	217	230	252
			Max.	412	821	1231	1585	1788	1971
65A	2-1/2"	DN65	Min.	(186)	261	260	301	337	369
			Max.	565	1126	1688	2173	2452	2703
80A	3"	DN80	Min.	(232)	328	403	466	522	572
			Max.	912	1818	2724	3505	3956	4361
100A	4"	DN100	Min.	(308)	570	701	811	908	996
			Max.	1587	3164	4742	6102	6886	7591

MODEL CODES

MODEL CODES									CONTENTS			
VDT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	/	<input type="checkbox"/>			
Materials of detector	1									SCS14A/SUS316		
Meter size /Connection size	3									25A	1"	DN25
	4									40A	1-1/2"	DN40
	5									50A	2"	DN50
	6									65A	2-1/2"	DN65
	7									80A	3"	DN80
	8									100A	4"	DN100
Connection rating	J1									JIS10K		
	J2									JIS20K		
	A2									ANSI Class 150		
	A5									ANSI Class 300		
	G1									GB PN1.6		
	G4									GB PN4.0		
	D1									DIN PN16		
	D4									DIN PN40		
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		

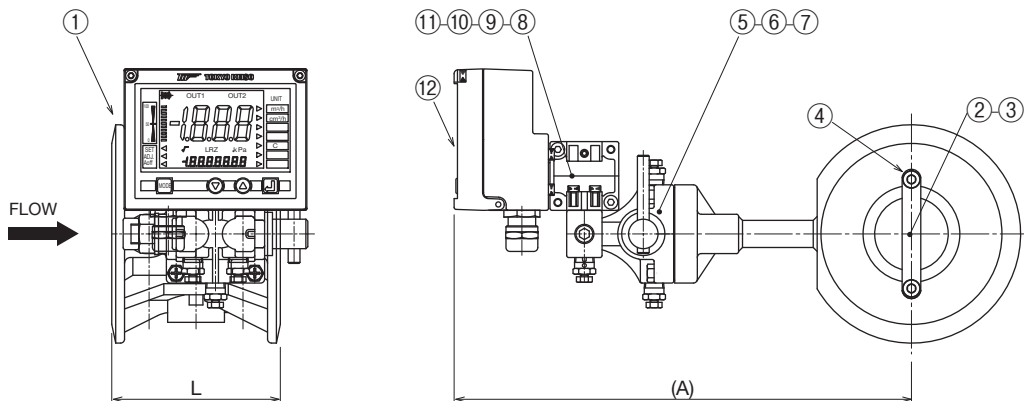
STUD BOLT SIZE

Following size of stud bolts for the mounting are recommended.

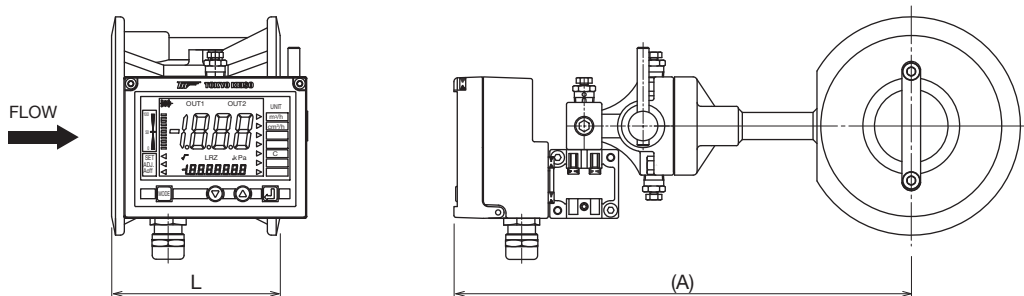
Meter size	Connection rating			JIS		ANSI		DIN		GB	
				10K (mm)	20K (mm)	Class150 (inch)	Class300 (inch)	PN16 (mm)	PN40 (mm)	PN1.6 (mm)	PN4.0 (mm)
25A	1"	DN25	M16×130	M16×140	1/2×5	5/8×5-1/4	M12×130	M12×130	M12×130	M12×130	
40A	1-1/2"	DN40	M16×160	M16×160	1/2×6	3/4×6-3/4	M16×160	M16×160	M16×160	M16×160	
50A	2"	DN50	M16×170	M16×170	1/2×6-1/2	5/8×6-3/4	M16×170	M16×170	M16×170	M16×170	
65A	2-1/2"	DN65	M16×190	M16×190	5/8×7-1/2	3/4×8	M16×190	M16×190	M16×190	M16×190	
80A	3"	DN80	M16×210	M20×220	5/8×8-1/4	3/4×9	M16×210	M16×220	M16×210	M16×220	
100A	4"	DN100	M16×240	M20×260	5/8×9-1/2	3/4×10-1/2	M16×240	M20×260	M16×240	M20×260	

DIMENSIONS

● For gases



● For liquids



● Materials

Part No.	Part name		Materials
1	Detector	Body	SCS14A
2		Cone	SUS316
3		Support	SUS316
4		Fastening bolts	SUS316L
5	Cock piece	Body	SCS14
6		Cock axis	SUS316
7		O-ring	Fluorocarbon rubber
8	Indication part	Diaphragm	SUS316L
9		Body	SUS316
10		O-ring	Fluorocarbon rubber
11		Drain hole Seal	Alumina Ceramics
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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