

AM-2000 series HYBRID FLOWMETER

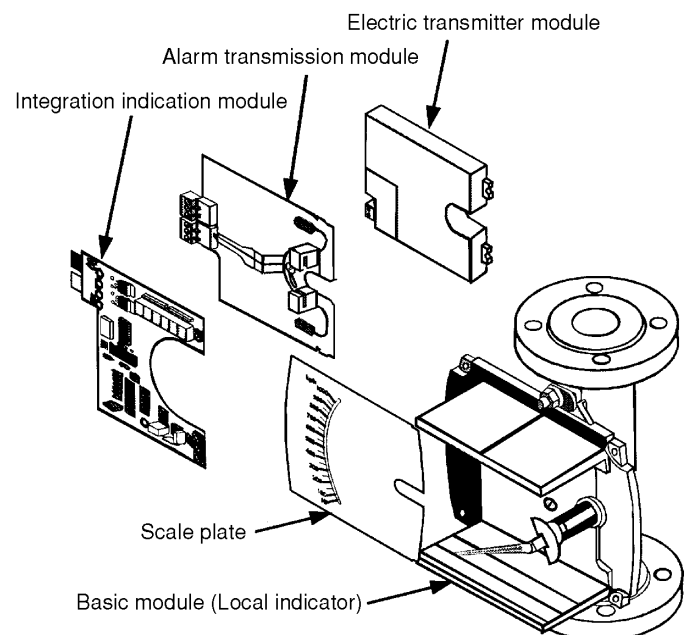
OUTLINE

AM-2000 series is a new all metal type flowmeter. AM-2000 series integrates formerly separate functional devices to facilitate mounting in restricted spaces. Suitable for liquid, gas and steam applications requiring installation onto vertical pipes. Modular additional functions are integrated in basic local indicator.



FEATURES

- ❑ Standardized total length
Easy piping with standardized product concept of 250mm total length. (Sizes are 15mm to 100mm)
- ❑ Strong chemical properties
Stainless steel (equivalent to SUS316L) is adopted as standard material.
- ❑ Modular parts construction
Easy maintenance is available with modular parts.
- ❑ HART® communication protocol (Option) can be connected.
- ❑ Intrinsically safe version [Ex ia IIC T4, T2] and CENELEC (ATEX) certification is available.
- ❑ Type of protection for high temperature is available [Ex ia IIC T2] (MAX. 252°C).



HART® is a registered trademark of the HART® Communication Foundation

STANDARD SPECIFICATION

- **SIZE**
Meter size : 15mm ~ 100mm
- **CONNECTION SIZE** :
15A ~ 100A (JIS flange)
1/2" ~ 4" (ANSI flange)
Note) Only JIS 20K flange is available for connection sizes 15A to 40A.
In case of JIS 10K, the dimension is 2 mm thicker than standard dimension.
Other flanges dimensions do not charge.
- **PRESSURE RATING**
Flange connection : JIS 10K RF, JIS 20K RF, ANSI Class 150, 300 RF.
Note) Max. operating pressure subjects to fluid temperature.
Please refer to either flange rating JIS B 2238 or ASME/ANSI B16.5.
- **FLUID TEMPERATURE**
-80 ~ +300°C (In case of no additional function)
In case that additional function is needed, refer to below table.
(Unit:°C)

Meter size	Additional function	Ambient temperature						
		General purpose (Non Ex)		Intrinsically safe version				
		<40°C	<60°C	T6	T5	T4	T3	T2, T1
15	E2	200	180	85	100	135	183	183
	E2/HT	300	300	85	100	135	200	300
	TZ	200	80	-	-	-	-	-
	TZ/HT	300	130	-	-	-	-	-
	K□*	200	200	-	-	135	156	156
25	K□*/HT	300	300	-	-	135	200	300
	E2	200	165	85	100	135	165	165
	E2/HT	300	300	85	100	135	200	300
	TZ	180	75	-	-	-	-	-
	TZ/HT	300	100	-	-	-	-	-
50	K*	200	200	-	-	135	141	141
	K*/HT	300	300	-	-	135	200	239
	E2	200	150	85	100	135	150	150
	E2/HT	300	250	85	100	135	200	252
	TZ	150	70	-	-	-	-	-
80	TZ/HT	270	85	-	-	-	-	-
	K*	200	200	-	-	135	125	125
	K*/HT	300	300	-	-	135	192	192

Note) The asterisk* stands for :
KU/high alarm, KB/low alarm, or KD/high and low alarm, as the case may be.

- **AMBIENT TEMPERATURE**
-25 ~120°C (No additional function)
-25 ~ 60°C (With additional function E2/K*/TZ)
-20 ~ 60°C (Intrinsically safe version)
- **MATERIAL**
Wetted part : Stainless steel (equivalent to SS316L)
Alumina ceramic (Al₂O₃)*
*With damper
- **FLOW RANGE**
25 ~ 100000 L/h (Water, 20°C)
0.7 ~ 600 m³/h (Air, 0MPa, 0°C)
- **ACCURACY (LOCAL INDICATION)**
: Standard ±1.6%F.S.
- **STANDARD SCALE LENGTH**
: Approx. 100mm
- **RANGEABILITY** : 10 : 1
(Rangeability can be 10 : 2 dependent on specification)
- **INDICATOR CONSTRUCTION** :
Protection class IP65 (IEC 529)
Equivalent to NEMA 12/13
- **FINISH**
Standard : Melamine resin (Painting only indicator cover)
Color : Munsell 7.5BG4/1.5

ADDITIONAL FUNCTIONS

Functions

Function	Function code	Description
Local indication	None	Basic model
Electric transmitter	/E2	Capable of combining with all types
HART communication	/HC	Capable of combining with E2
High alarm (1point)	/KU	Choose one entry only
Low alarm (1point)	/KB	
High and low alarm (2 points)	/KD	
Total indication	/E2/TZ	Not available for intrinsically safe version (JI & EI)
TIIS (Intrinsically safe version)	/JI	Impossible to select total indication (/TZ)
ATEX (Intrinsically safe version)	/EI	
Extension for high temperature	/HT	Refer to fluid temperature specification
Cable entry 1/2NPT (F)	/NP	Choose one entry only
Cable entry G 1/2 (F)	/GH	
Cable entry Watertight connector	/MC	

Refer to type code table

Electric transmitter (Code:E2)

It is possible to add transmission function of 0 to 100% of flow signal with 2-wire, 4 to 20mA current output by installation of non-contact type, non hysteresis electric transmitter to local indicator of basic model.

This EST electric transmitter can be selected from intrinsically safe version under observing Japanese standard.

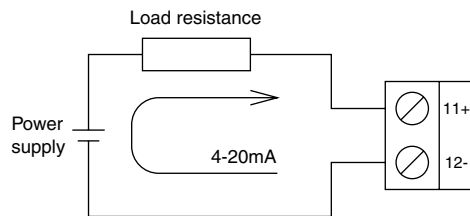
In addition to this, HART® communication function is available and this HART® function is also applicable to for function of multi drop. (Code : HC)

Basic specification

- Power supply voltage : 12 ~ 30 V DC
18 ~ 30 V DC
(In case of HART® selection)
- Current output : 4 ~ 20mA
(Max. output 20.4mA = 102.5%)
- Output accuracy : ±1.0%F.S.
- Repeatability : ≤ 0.1%F.S.
- Power supply fluctuation influence : ≤ 0.1%F.S.
- Load resistance influence : ≤ 0.1%F.S.
- Allowable load resistance : (0 to 800Ω)
(250 to 800Ω) HART®
Calculate the marimum in each supply voltage from the following formula.

$$R_{ext} = \frac{\text{Supply voltage (V)} - 12V}{22(\text{mA})} \text{ (k}\Omega\text{)}$$

Wiring



Integrator and pulse transmitter (Code:E2/.../TZ)

Integrator receives signal from electric transmitter and indicates total flow which is transformed into specified total rate in 6 digits in red LED. In addition, external output of scaled pulse is provided. (Open collector output)

4 to 20mA of electric transmission can be used simultaneously.

Note) Intrinsically safe version for integrator is not available.

TZ basic specification

Power supply voltage : 14 ~ 30 V DC

Current output : 4 ~ 20mA DC

Power consumption : Max. 2W

Pulse output : Open collector output

Pulse width 80ms (fix)

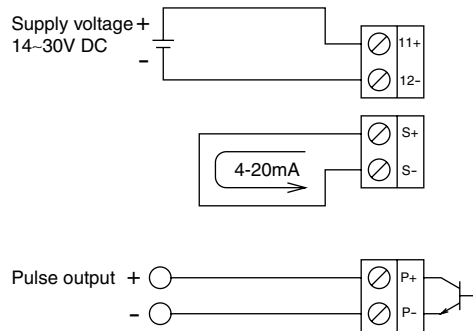
Power supply 10 ~ 30 V DC, Max. 50mA

Permissible power consumption 0.25W

Count rate : 10 ~ 10990 c/h (Scaled to indication count)

Integration accuracy : Within $\pm 1.0\%$ F.S. of current output

Wiring



Alarm transmitter (Code:KB/KU/KD)

It is possible to add alarm function by installing alarm PCB to local indicator of basic model.

Low alarm, high alarm or high and low alarm can be selected for alarm mode.

Low alarm : (Code : KB)

High alarm : (Code : KU)

High and low alarm : (Code : KD)

Alarm output specification (NAMUR)

Type : Proximity switch SC3.5-NO-Y
(NAMUR rating)

Power supply voltage : 8 V DC

Operating current : ON : 1mA or less, OFF : 3mA or more

Terminal No.

Alarm output	Low			High		
Plug colour	Black			Grey		
Terminal No.	1	2	3	4	5	6
Polarity	-	+	/	-	+	/

Enclosure (Code:**/JI and**/EI)

Intrinsically safe version under Japanese standard is available for additional functions such as an electric transmitter or an alarm output function and the both.

Japanese I/S standard : Ex ia IIC T4, T2

(TIIS Certification No. TC15336, TC15335)

ATEX protection : II 2 G EEx ia IIC T6...T1

(PTB Certification No.PTB 01, ATEX 2182)

Intrinsically safe specification of electric transmitter

Rating

Max. voltage for intrinsically safe circuit (Ui) 30V

Max. current for intrinsically safe circuit (Ii) 100 mA

Max. power consumption for intrinsically safe circuit (Pi) 1W

Capacitance inside intrinsically safe circuit (Ci) 20nF

Inductance inside intrinsically safe circuit (Li) ≈ 0

Intrinsically safe specification of alarm transmitter

Rating

Max. voltage for intrinsically safe circuit (Ui) 16V

Max. current for intrinsically safe circuit (Ii) 52 mA

Max. power consumption for intrinsically safe circuit (Pi) 169 mW

Capacitance inside intrinsically safe circuit (Ci) 150nF

Inductance inside intrinsically safe circuit (Li) 150 μ H

Extension for high temperature specification (Code:HT)

In case application fluid temperature being over 200°C, installation of extension will be needed for protection of indication system, transmitter, etc.

Indication part is extended 80 mm perpendicular to the scale plate from standard installation point and to ensure heat is insulation.

Cable entry

Select from following

Water tight resin connector (Code:None/Standard)

G1/2 (F) (Code:GH)

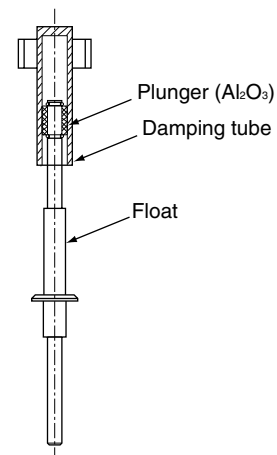
1/2NPT (F) (Code:NP)

Watertight metallic connector (Code:MC)

Damper

A damper can be provided for gas or liquid application with heavy pulsation to prevent fluctuation of indication and output.

A plunger for damper is made of alumina ceramic (Al_2O_3) which has high anticorrosive property and durability against abrasion.



Flow rate table

Meter size	Q _{water} L/h	Q _{air} m ³ /h (nor)	ΔP kPa
15	25-1000	0.7-28	2.1-5.0
25	630-6300	14-170	2.4-10.3
50	6300-25000	80-600	1.3-10.4
80	25000-40000	350-400	1.6-8.9
100	63000-100000	-	12.0

Indicated flow rate is value of 20°C water flow. Air flow rate is converted value of 0MPa (1atm) 0°C flow to 0MPa (1atm) 0°C. Both of them shows max. flow range when the measurement range is 10:1.

Selection of meter size

1. Liquid application

Flow rates on the model code table are for liquid application equivalent to water (Density 1.0g/cm³ and Viscosity 1.0 mPa·s). If actual fluid condition has different values, a conversion calculation is required per following formula:

$$Q_w = QX2.59 / \sqrt{((7.5/\gamma)-1)}$$

Q_w : Water converted flow rate (m³/h)

Q : Flow rate of actual fluid (m³/h)

γ : Density of actual fluid (g/cm³)

In case water converted flow rate is close to the high limit of each meter size, meter size must be selected by reference to viscosity factor in the table.

Refer to below table for viscosity limit of each meter size.

Meter size	Max. water converted flow rate L/h	Upper limit of viscosity mPa·s
15	1000	30
25	6300	150
50	25000	200
80	40000	200
100	100000	200

2. Gas application

Flow rates on the model code table are measurable flow rates for air 0°C, 0MPa (1atm). If actual fluid condition has different from values, a conversion calculation is performed by the following formula:

$$Q_A = QX0.0169X \sqrt{(\gamma X (273+t))/(0.1013+P)}$$

Q_A : Converted flow rate in air 0°C, 0MPa [m³/h(nor)]

Q : Flow rate of gas to be measured [m³/h(nor)]

γ : Specific weight of gas to be measured [kg/m³(nor)]

P : Operating pressure (MPa)

t : Operating temperature (°C)

STANDARD FLOW RATE TABLE FOR LIQUID

Fluid specification : Water, Density 1.0g/cm³ and Viscosity 1.0 mPa•s

Meter size	Conn. size	Model code	100% Flow rate		Rangeability		
			L/h	L/h	m ³ /h	L/min	
15	15A (1/2") 20A (3/4")	AM-21□1 AM-22□1	-1111	25	5-25	0.005-0.025	0.08-0.4
			-1211	40	8-40	0.008-0.04	0.12-0.6
			-1311	60	12-60	0.012-0.06	0.2-1
			-1411	100	10-100	0.01-0.1	0.15-1.5
			-1511	150	15-150	0.015-0.15	0.25-2.5
			-1611	250	25-250	0.025-0.25	0.4-4
			-1711	400	40-400	0.04-0.4	0.6-6
			-1811	600	60-600	0.06-0.6	1-10
25	25A (1") 40A (1 1/2")	AM-23□1 AM-24□1	-1821	1000	100-1000	0.1-1	1.5-15
			-3111	600	60-600	0.06-0.6	1-10
			-3211	1000	100-1000	0.1-1	1.5-15
			-3311	1500	150-1500	0.15-1.5	2.5-25
			-3411	2500	250-2500	0.25-2.5	4-40
			-3511	4000	400-4000	0.4-4	6-60
50	50A (2") 65A (2 1/2")	AM-25□1 AM-26□1	-3521	6000	600-6000	0.6-6	10-100
			-5111	6000	600-6000	0.6-6	10-100
			-5211	10000	1000-10000	1-10	15-150
			-5311	15000	1500-15000	1.5-15	25-250
80	80A (3") 100A (4")	AM-27□1 AM-28□1	-5321	25000	2500-25000	2.5-25	40-400
			-7111	25000	2500-25000	2.5-25	40-400
			-7211	40000	4000-40000	4-40	60-600
100	100A (4")	AM-28□1	-8112	60000	6000-60000	6-60	100-1000
			-8122	100000	10000-100000	10-100	150-1500

STANDARD FLOW RATE TABLE FOR GAS

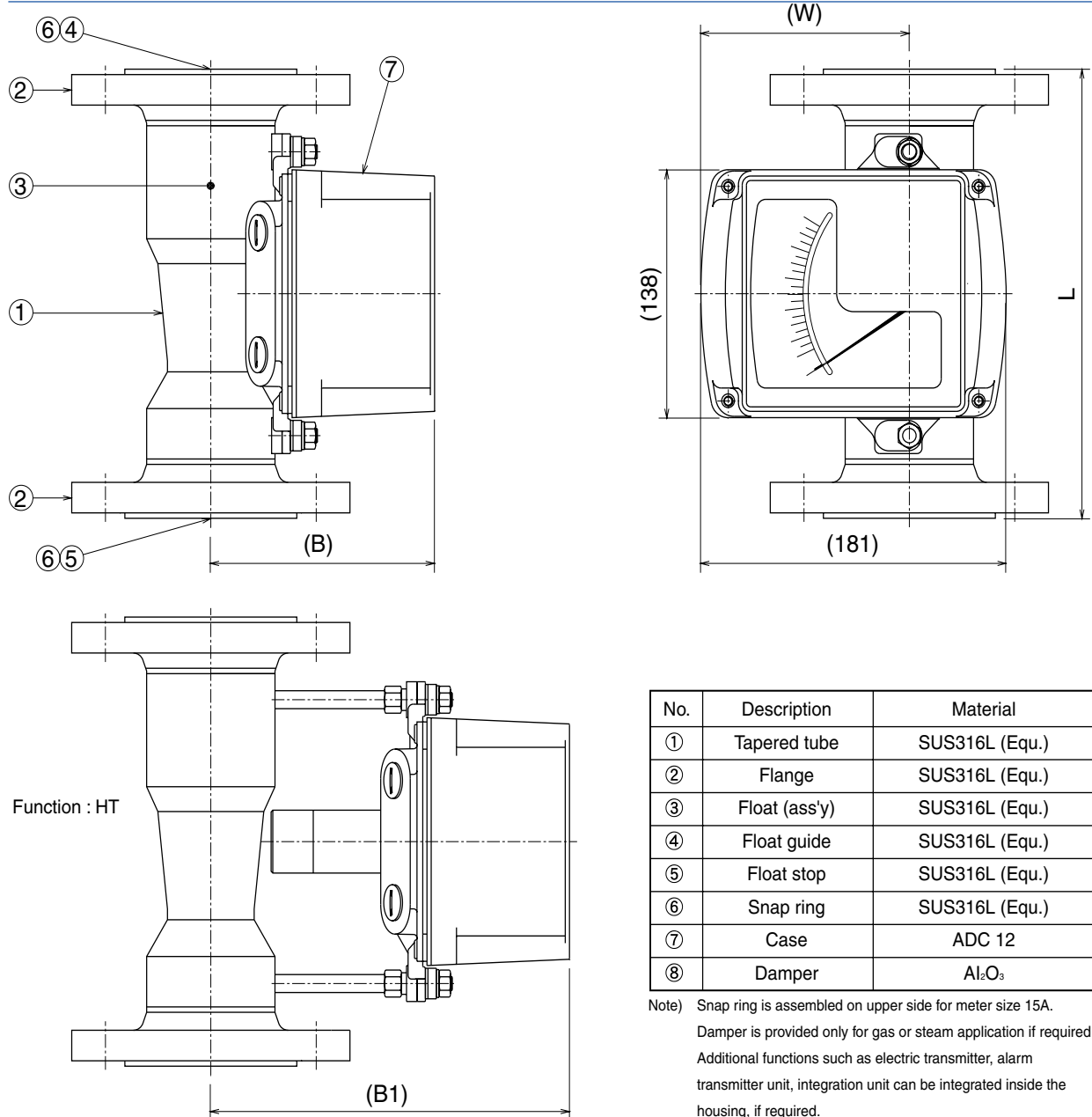
Fluid specification : AIR, Temperature 0°C and Pressure 0 MPa

Meter size	Conn. size	Model code	100% Flow rate		Rangeability		
			m ³ /h	m ³ /h	L/h	m ³ /min	
15	15A (1/2") 20A (3/4")	AM-21□1 AM-22□1	-1132	0.7	0.07-0.7	70-700	0.001-0.01
			-1232	1	0.1-1	100-100	0.0015-0.015
			-1332	1.5	0.15-1.5	150-1500	0.0025-0.025
			-1432	2	0.2-2	200-2000	0.003-0.03
			-1532	3.5	0.35-3.5	350-3500	0.006-0.06
			-1632	5	0.5-5	500-5000	0.008-0.08
			-1732	10	1-10	1000-10000	0.015-0.15
			-1832	12	1.2-12	1200-12000	0.02-0.2
			-1722	18	1.8-18	1800-18000	0.03-0.3
25	25A (1") 40A (1 1/2")	AM-23□1 AM-24□1	-1822	25	2.5-25	2500-25000	0.04-0.4
			-3132	12	1.2-12	1200-12000	0.02-0.2
			-3232	20	2-20	2000-20000	0.03-0.3
			-3332	35	3.5-35	3500-35000	0.06-0.6
			-3432	50	5-50	5000-50000	0.08-0.8
			-3532	80	8-80	8000-80000	0.12-1.2
50	50A (2") 65A (2 1/2")	AM-25□1 AM-26□1	-3422	100	10-100	10000-100000	0.15-1.5
			-3522	150	15-150	15000-150000	0.25-2.5
			-5132	80	8-80	8000-80000	0.12-1.2
			-5232	100	10-100	10000-100000	0.15-1.5
			-5332	150	15-150	15000-150000	0.25-2.5
			-5342	180	18-180	18000-180000	0.3-3
80	80A (3") 100A (4")	AM-27□1 AM-28□1	-5122	200	20-200	20000-200000	-
			-5222	350	35-350	35000-350000	0.6-6
			-5322	600	60-600	60000-600000	1-10
80	80A (3") 100A (4")	AM-27□1 AM-28□1	-7132	350	35-350	35000-350000	0.6-6
			-7232	400	40-400	40000-400000	0.7-7

MODEL CODE

AM-2		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Specification	Fluid : liquid		Fluid : gas		
Connection size	1										15A (1/2")	Qw (L/h) 20°C water	25-1000	Qa (m ³ /h) 0°C	0.7-28	
	2									20A(3/4")	14-170					
	3									25A(1")	630-6300		0MPa air	80-600		
	4									40A(1 1/2")						
	5									50A(2")	6300-25000		350-400			
	6									65A(2 1/2")						
	7									80A(3")	25000-40000					
	8									100A(4")	63000-100000					
Flange rating	1										JIS 10K RF	Min. connection size 50A				
	2										JIS 20K RF	Applicable for all types				
	A										ANSI Class150 RF					
	B										ANSI Class 300 RF					
Main material	1										Equivalent to SUS316L	Only SUS316L				
Meter size	-1										Meter size 15	Connection size : 15A, 20A				
	-3										Meter size 25	Connection size : 25A, 40A				
	-5										Meter size 50	Connection size : 50A, 65A				
	-7										Meter size 80	Connection size : 80A, 100A				
	-8										Meter size 100	Connection size : 100A	X			
Inside of tapered tube											Tapered tube type	(Maker selection code)				
Float											Float type	(Maker selection code)				
Float damper	1										Not provided	Standard	X			
	2										Provided	X	Standard			
Additional function	Transmitter function	/E2									Electric transmitter	Applicable for all types				
		/HC									HART communication	Required to select electric transmitter				
		/KU									With high alarm (1 point)	Choose one entry only				
		/KB									With low alarm (1 point)					
		/KD									With high and low alarm (2 points)					
	/TZ										Integrator	Required to select electric transmitter, not available for intrinsically safe version				
	Flameproof specification	/JI										TIIS Intrinsically safe version	Impossible to select total indication (/TZ)			
		/EI										ATEX Intrinsically safe version				
	High temperature	/HT										With extension	Applicable for all types			
	Cable entry	/NP										NPT 1/2(F)	Choose one entry only			
/GH											G1/2(F)					
/MC											With metallic watertight connector					

SIZE AND WEIGHT



No.	Description	Material
①	Tapered tube	SUS316L (Equ.)
②	Flange	SUS316L (Equ.)
③	Float (ass'y)	SUS316L (Equ.)
④	Float guide	SUS316L (Equ.)
⑤	Float stop	SUS316L (Equ.)
⑥	Snap ring	SUS316L (Equ.)
⑦	Case	ADC 12
⑧	Damper	Al ₂ O ₃

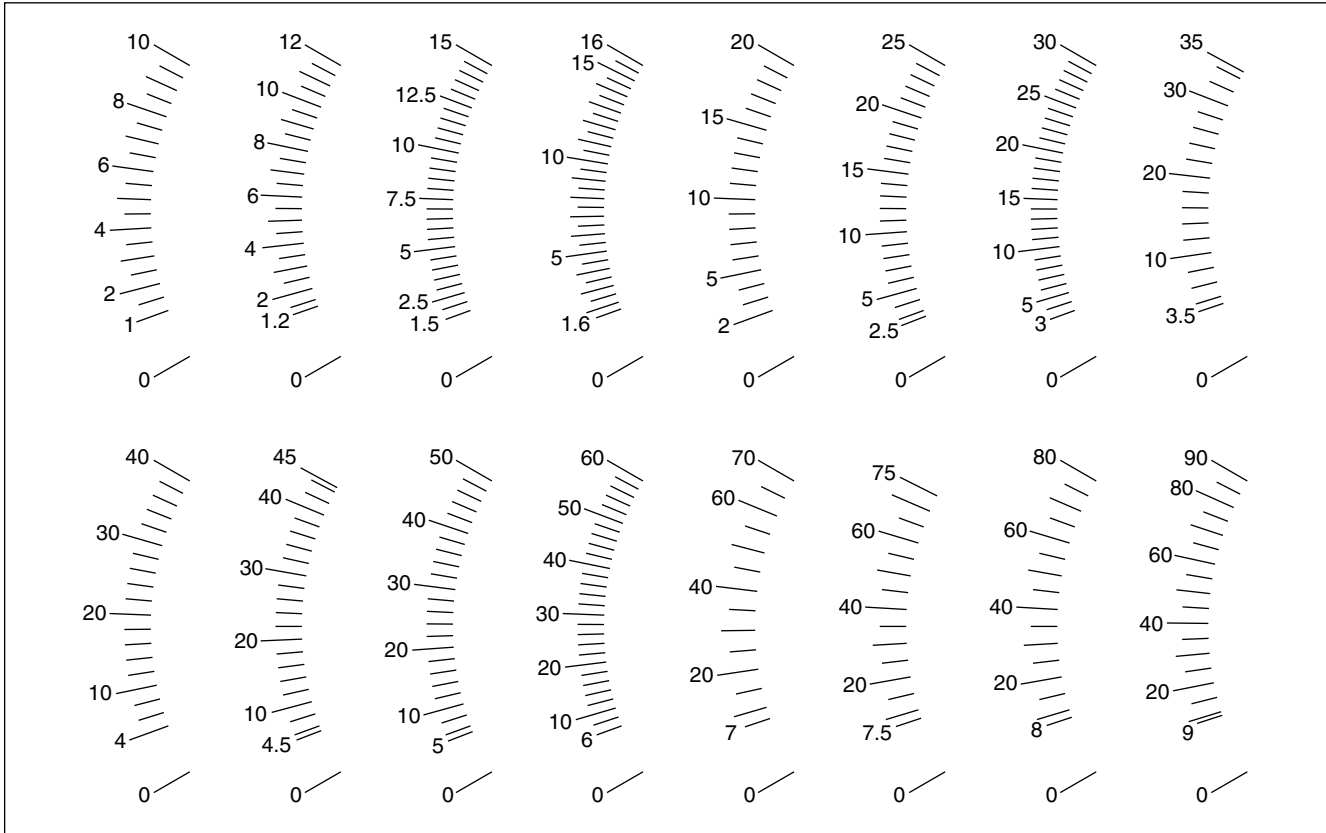
Note) Snap ring is assembled on upper side for meter size 15A.
 Damper is provided only for gas or steam application if required.
 Additional functions such as electric transmitter, alarm transmitter unit, integration unit can be integrated inside the housing, if required.

Meter size	Connection size	Dimension (mm)				Approx. weight (kg)			
		L	B(B1)	Int. diameter d	W	JIS 10K	JIS 20K	ANSI 150	ANSI 300
15	15A (1/2")	250	107 (187)	20	110.5	-	3.6	3.5	3.6
	20A (3/4")	250				-	4.0	3.8	4.5
25	25A (1")	250	119 (199)	32	110.5	-	5.6	5.2	5.2
	40A (1 1/2")	250				-	6.4	6.1	8.0
50	50A (2")	250	132 (212)	65	123.5	8.7	8.7	9.1	10.7
	65A (2 1/2")	250				10.5	10.5	11.5	13.5
80	80A (3")	250 (300*1)	148 (228)	89	123.5	12.0	14.0	15.0	18.0
	100A (4")	250 (300*1)				13.5	18.0	17.5	27.0
100	100A (4")	250 (300*1)	158 (238)	114	123.5	14.0	18.0	18.0	27.0

*1 Size within the brackets () is for flange rating : ANSI300

STANDARD SCALE GRADUATION

Scale specification is per following 16 standard scale graduation.
Max. scale is calculated by flow rate conversion after confirming actual specifications.
Therefore be sure to inform us standard flow range.



Marketed by:

Malema Sensors
1060 S.Rogers Circle
Boca Raton, FL 33487
U.S.A
Tel: 1-561-995-0595, Fax: 1-561-995-0595
email: IndustrialSales@malema.com
URL: www.malema.com

