TECHNICAL GUIDANCE

MASSMAX 2400R Series

Coriolis-type Mass Flowmeter with a Large Straight Twin Tube

OUTLINE

MASSMAX 2400R Series is a Coriolis-type mass flowmeter specially developed for large pipes and flow rates.
Using a straight twin tube as the measuring pipe, which are generally difficult to manufacture for large-size pipes, it is designed to reduce pressure loss.
Also, thanks to the enhanced pressure resistance of the outer housing of the sensor, as well as the use of stainless steel for the wetted parts, it offers a pressure resistance of up to 10 MPa as standard, providing higher safety.
The meter is available in four sizes from 100 to 400 mm (400 mm will also be available).
It can support applications for controlling and transferring liquids with large flow rates.

FEATURES

- ❑ For low-cost applications requiring self-cleaning and low pressure loss
- ❑ High accuracy: ±0.1% of reading (+ zero stability)
- ❑ Secondary pressure container made of stainless steel (maximum working pressure: 10 MPa), can support chemical/petrochemical applications which require advanced safety
- ❑ Mass flow rate (instantaneous and total), density, and temperature can be measured by a single meter
- ❑ Available as a compact type and a remote type (sensor/converter)
- ❑ Compliant with DNV GL and Lloyd's ship classifications (remote type)
- ❑ Compliant with Japanese standard explosionproof

STANDARD SPECIFICATIONS

- Measuring principle : Coriolis force
- Meter size : 100, 150, 400 mm
- Measuring range:

Meter size	Max. flow rate	Min. flow rate	Max. flow rate	Min. flow rate
	Kg/h		Kg/min	
100	420,000	1,560	7,000	26
150	900,000	4,000	15,000	66.7
250	2,300,000	11,000	38,333	183.3
* 400	4,600,000	23,000	76,000	383.3

* Meter size 400 is currently in preparation

- Enclosure : IP66/67 (NEMA4X)
- Ambient temperature: –40 to +60°C (compact type)
  –40 to +65°C (remote type sensor/converter)
  See [Explosionproof] for the ambient temperature range of Ex types.

Fluid specifications

- Fluid : Liquids
- Fluid temperature : –40 to +130°C
- Outer housing pressure resistance
  : 10 MPa (standard)
  4 MPa PED-certified
  (Option: Sizes S100, S150, and S250)

- Fluid pressure:

Certified by	Pressure
	Fluid temperature 20°C
PED 97/23/EC	15 MPa
FM	14MPa (S100, S150, S250) 11MPa (S400)
ASME B31.3	10 MPa

Note: Pressure in this table means the maximum allowable working pressure of the measuring tube and is lower than the maximum pressure of the flange or fitting.

- Density : 400 to 3000 kg/m^3

Sensor specifications

- Process connection :
  Flange : JIS10K, 20K R.F.
  ASME Class 150 to 600 R.F. etc.
- Materials:
  Wetted parts:

Wetted parts	Material
Measuring tube	Standard: Stainless Steel UNS S31803 (1.4462) *Equivalent to JIS SUS329J3L Option: Super duplex stainless steel UNS S32760 (1.4501)
Flow splitter	Standard: Stainless Steel UNS J92205 (1.4470) Option: UNS J93404 (1.4469)
Flange	Standard: Stainless Steel 316/316L (1.4401/1.4404) dual certified Option: UNS S31803 (1.4462) (NACE approved) UNS S32760 (1.4501) (NACE approved)

Non-wetted parts:
Outer cylinder;
Standard : Stainless Steel 304/304L (1.4301/1.4307) dual certified
Option : Stainless Steel 316/316L (1.4401/1.4404) dual certified, etc.

Converter

- Housing material : Aluminum alloy, SS316L as an option
- Painting : Siloxane coating
- Color : Silver for converter housing, jade green for converter cover and terminal cover
- Power supply : 100 V to 230 V AC (85 V to 253 V AC)
  Option; 24 V DC (11 to 31 V DC)
  Voltages in parentheses indicate the acceptable voltage range.
- Supply frequency : 50/60Hz
- Power consumption : AC; approx. 22 VA, DC; approx. 12 W
- Grounding : Grounding resistance must be less than 100Ω for Non-ex types (D-type), less than 10Ω for Ex types (A-type)
- Cable Entry : G1/2 Female adapter × 2 or 1/2 NPT Female adapter × 2 or M20 × 1.5 Female thread × 2
  Note: Up to 3 cable entries can be provided.

Indication and outputs

- Display : Blue dot matrix LCD with backlight 128 × 64 pixels (59 × 31 mm) Each of 4 screens shows data in up to 3 lines. Data include instantaneous mass flow rate (bar graph indication available), totalized mass flow, instantaneous volume flow rate, totalized volume flow rate, density, temperature, and instantaneous flow rate trend graph (percentage indication). Setting parameters and self-diagnosis results are also displayed.

  Units of instantaneous mass flow rate
  : kg/h, kg/min, kg/sec, t/h, and others
  Forward and reverse flow directions are indicated with "+" or "−".

  Units of totalized mass flow rate
  : kg, t, g, and others
  Totalization of flow rates in forward and reverse directions is possible.

  Units of density : g/cm^3, kg/m^3, and others

  Units of temperature : °C, and others
- Current output : 4 to 20 mA (max. 22 mA)
  *Preparing for HART communication
  Load resistance is less than 1000Ω ±5μA
  Select from among instantaneous mass flow rate, density, and temperature.
- Pulse output : Open collector output

  Load rating : 32 V DC

  20 mA or less (100 Hz < f ≤ 10 kHz)

  Residual voltage at close <1.5 V (load current ≤ 1 mA)
  <2.5 V (load current ≤ 10 mA)
  <5 V (load current ≤ 20 mA)

  100 mA or less (f ≤ 100 Hz)

  Residual voltage at close <0.2 V (load current ≤ 10 mA)
  <2 V (load current ≤ 100 mA)

  Output frequency : Max. 10 kHz

  Pulse rate : 2 to 36,000,000 pulse/h (0.01 Hz to 10 kHz)

  Pulse width : Selectable from:
  (1) Automatic: Pulse width which makes duty 50% at full scale frequency
  (2) Fixed duty ratio: Always 1:1
  (3) Arbitrary setting: 0.05 to 2000 ms
- Status output : Open collector output

  Load rating : 32 V DC, 100 mA or less

  Residual voltage at close <0.2 V (load current ≤ 10 mA)
  <2 V (load current ≤ 100 mA)

  Contents : Selectable from:
  (1) No status output (default setting)
  (2) Flow direction identification
  (3) Flow over-range
  (4) Totalization preset
  (5) Range identification (when double ranges are used)
  (6) Errors and measurement alarms for flow rate, density, temperature, and others
- Control input

  Input voltage : 3 to 32 V DC (ON) / 2.5 V DC, 0.4 mA or less (OFF)

  Max. current : 9.5 mA (input voltage ≤ 24 V DC)

  Max. current : 9.5 mA (input voltage ≤ 32 V DC)

  Control target : Selectable from:
  (1) No control input (default setting)
  (2) Hold output
  (3) Lock output at 0%
  (4) Reset totalization counter
  (5) Reset errors
  (6) Range identification (when double ranges are used)
  (7) Others
- Communication : HART communication protocol (in preparation)
- Combination of outputs

  Standard : 4 to 20 mA output × 1 or pulse output × 1 (selectable)

  Option 1 : 4 to 20 mA output × 1, pulse output × 1, status output × 1, control input × 1

  Option 2 : 4 to 20 mA output × 2, pulse output or status output × 1 (selectable)

  Option 3 : 4 to 20 mA output × 3, pulse output or status output × 1 (selectable)

  Option 4 : 4 to 20 mA output × 2, pulse output × 1, pulse output or status output × 1 (selectable)
  See "Converter code" on page 11 for details.
- Low cut-off:
  Current output and pulse output (can be set separately for each indication)

  Range : 0 to 20% F.S. (0.1% step)

  Hysteresis : 0 to 5% F.S. (0.1% step)
- Time constant:
  Current output and pulse output (can be set separately for each indication)

  Range : 0.0 to 100.0 sec (0.1 sec step)

Standard functions

- User-defined measuring units
  : Units for mass, volume, and time can be defined (max. 7 letters).
- Bi-directional flow measurement
  : Flow rates in both directions can be measured. Flow direction is output as status output.
- Self-diagnosis : Error messages and status messages are displayed.

  Function : CPU, memory, software, hardware, output connection

  Status : Over-range, count-over, power failure

  Application : Oscillating balance of measuring tube, vibration energy, other sensor circuit diagnosis
- Power failure compensation
  : EEPROM (non-volatile memory) function retains data for the function settings and totalization for more than 10 years.
- Testing : Built-in simulator of current and pulse outputs Allows for loop check without calibrator.
- Touch sensor (optical key)
  : Four touch sensors enable data to be set from outside without the need for opening the cover.
  These serve as push buttons while the cover is opened.

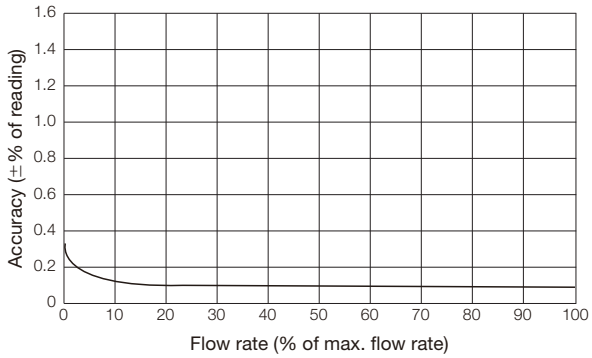
Accuracy (calibrated at the factory)

• Mass flow rate (pulse output)

5% or more of max. flow rate	±0.1% of reading (standard) ±0.05% of reading (optional)
Less than 5% of max. flow rate	±zero stability (see below) S100: 11 kg/h S150: 25 kg/h S250: 60 kg/h S400: 120 kg/hh

Reference conditions: Water at 20°C, 0.1 MPa

Measurement error (accuracy + zero stability: standard)



		Measurement error (±% of reading)
% of max. flow rate	100%	0.1 (standard) 0.05 (optional)
	50%	
	20%	
	10%	
	5%	
	1%	0.262
	Min. flow rate	S100 : 0.705 S150 : 0.625 S250 : 0.545 S400 : 0.522

Note: Accuracy is not assured for flow rates less than the min. flow rate.

Effects of changes in process conditions:

Fluid temperature: ±0.0008% of max. flow rate per 1°C

Example

When the temperature of size S100 changes by 1°C: 220,000 kg/h × 0.000008 = 1.76 kg/h

Fluid pressure: ±0.0002% of max. flow rate per 0.1 MPa

These effects should be considered when process conditions change after zero adjustment.

Meter size	Flow rate (kg/h)
S100	220,000
S150	550,000
S250	1,200,000
S400	2,400,000

Measuring range	400 to 3000kg/m^3
Accuracy	±1kg/m^3
Accuracy (on-site calibration)	±0.2kg/m^3

Note: Calibration with certification at the factory test to be performed as an option.

• Temperature (indicated value)

Measuring range	–45 to +130°C
Accuracy	±1°C

Ship class specifications and certification

Available for remote types only

DNV GL : Certification number TAA00000HE Revision No. 2

Lloyd's Register : Certification number 17/20075 (E2)

Explosion Proof

- Japanese standard explosionproof
  Type of protection and class:
  Compact type MMM2400RC-JEx
  (Certificate number: CML21JPN1739X, CML21JPN21175X)
  Ex db ia IIC T6...T1 Ga/Gb
  Ex db eb ia IIC T6...T1 Ga/Gb
  Ex tb IIIC T160°C Db

  Remote type sensor MMS2000RF-JEx
  (Certificate number: CML21JPN2904X, CML21JPN21181X)
  Ex ia IIC T6...T1 Ga
  Ex ia IIIC T160°C Da

  Remote type converter MMC400RF-JEx
  (Certificate number: CML21JPN1740X, CML21JPN21182X)
  Ex db [ia] IIC T6 Gb
  Ex db eb [ia] IIC T6.Gb
  Ex tb IIIC T75°C Db

  Compact type MMM2400RC-JEx
  (Japanese standard explosionproof)
  Compact type MMM2400C-Ex (ATEX/IECEx explosionproof)
  Aluminum alloy converter housing (standard)

Ambient temperature °C	Fluid temperature °C	Temperature class	Max. surface temperature °C
–40 to +40	40	T6–T1	T70
	55	T5–T1	T85
	90	T4–T1	T120
	130	T3–T1	T160
–40 to +50	55	T5–T1	T85
	90	T4–T1	T120
	130	T3–T1	T160
–40 to +60	65	T5–T1	T95
	100	T4–T1	T130
–40 to +65	65	T5–T1	T95

  Stainless steel converter housing (optional)

Ambient temperature °C	Fluid temperature °C	Temperature class	Max. surface temperature °C
–40 to +40	40	T6–T1	T70
	55	T5–T1	T85
	90	T4–T1	T120
	130	T3–T1	T160
–40 to +50	55	T5–T1	T85
	90	T4–T1	T120
–40 to +60	60	T5–T1	T90

  Remote type MMS2000RF-JEx
  Remote type MMS2000F-Ex (ATEX/IECEx explosionproof)
  Aluminum alloy housing with heating Jacket

Ambient temperature °C	Fluid temperature °C	Temperature class	Max. surface temperature °C
–40 to +40	40	T6–T1	T70
	55	T5–T1	T85
	90	T4–T1	T120
	130	T3–T1	T160
–40 to +50	55	T5–T1	T85
	90	T4–T1	T120
	130	T3–T1	T160
–40 to +65	65	T5–T1	T95
	90	T4–T1	T120
	130	T3–T1	T160

- ATEX explosionproof
  Type of protection and class:
  Compact type MMM2400C-Ex
  (Certificate number: PTB17 ATEX 2008 X)
  II 1/2(1)G Ex db ia [ia Ga] IIC T6...T1 Ga/Gb or
  II 1/2(1)G Ex db eb ia [ia Ga] IIC T6...T1 Ga/Gb or
  II 1/2 G Ex db ia IIC T6...T1 Ga/Gb
  II 1/2 G Ex db ea ia IIC T6...T1 Ga/Gb
  II 2(1)D Ex tb [ia Da] IIIC Txxx°C Db or
  II 2D Ex tb IIIC Txxx°C Db

  Remote type sensor MMS2000F-Ex
  (Certificate number: PTB17 ATEX 2007 X)
  II 1 G Ex ia IIC T6...T1 Ga or II 1 D Ex ia IIIC Txxx°C Da

  Remote type converter MMC400F-Ex
  (Certificate number: PTB17 ATEX 2009 X)
  II 2(1) G Ex db [ia Ga] IIC T6 Gb
  II 2(1)G Ex db eb [ia Ga] IIC T6 Gb or
  II 2 G Ex db [ia] IIC T6 Gb or
  II 2 G Ex db eb [ia] IIC T6 Gb or
  II 2(1)D Ex tb [ia Da] IIIC T75°C Db or
  II 2D Ex tb IIIC T75°C Db

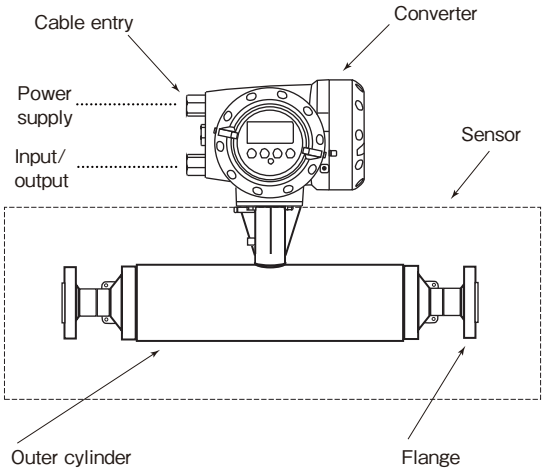
- IECEx explosionproof
  Type of protection and class:
  Compact type MMM2400C-Ex
  (Certificate number: IECEx PTB17.0029X)
  Ex db ia [ia Ga] IIC T6...T1 Ga/Gb or
  Ex db eb ia [ia Ga] IIC T6...T1 Ga/Gb or
  Ex ia IIC T6...T1 Ga/Gb or
  Ex eb ia IIC T6...T1 Ga/Gb or
  Ex tb [ia Da] IIIC Txxx°C Db or
  Ex tb IIIC Txxx°C Db

  Remote type sensor MMS2000F-Ex
  (Certificate number: IECEx PTB17.0028X)
  Ex ia IIC T6...T1 Ga or II 1 D Ex ia IIIC Txxx°C Da

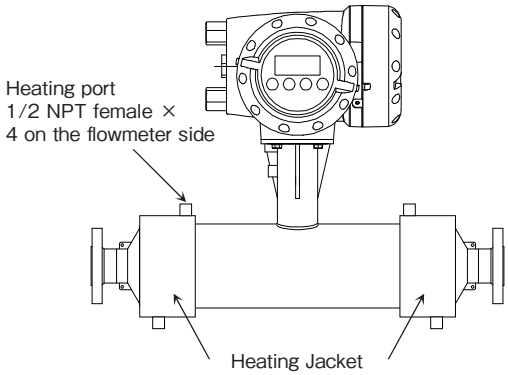
  Remote type converter MMC400F-Ex
  (Certificate number: IECEx PTB17.0030X)
  Ex db [ia Ga] IIC T6 Gb
  Ex db eb [ia Ga] IIC T6 Gb or
  Ex db [ia] IIC T6 Gb or
  Ex db eb [ia] IIC T6 Gb or
  Ex tb [ia Da] IIIC T75°C Db or
  Ex tb IIIC T75°C Db

NAMES OF PARTS

[Compact type]



[With heating jacket]



FLOW RANGE

Meter size	Kg/h		Kg/min	
	Max. flow rate	Min. flow rate	Max. flow rate	Min. flow rate
100	420,000	1,560	7,000	26
150	900,000	4,000	15,000	66.7
250	2,300,000	11,000	38,333	183.3
400	4,600,000	23,000	76,666	383.3

PROCESS CONNECTION

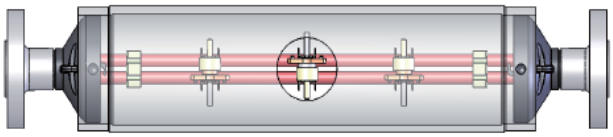
• Flange connection

Meter size	Standard	Semi standard	Optional (One rank larger)
	JIS	ANSI	JIS/ANSI
100	100A 10K	4" class 150	100A 20K 4"6" class 150, 300, 600, 900, etc.
150	6" class 150		6"8" class 150, 300, 600, 900, etc. Contact us for JIS flange.
250	10" class 150		10"12" class 150, 300, 600, 900, etc. Contact us for JIS flange.
400	14" class 150		12"14"16" class 150, 300, 600, 900, etc. Contact us for JIS flange.

MEASURING TUBE DIMENSIONS

Meter size	Number of measuring tubes	Dimensions (mm)	
		Inside diameter	Wall thickness
100	2	46	1.3
150	2	69	2.11
250	2	108	3.05
400	4	108	3.05

A straight twin tube (with 2 measuring tubes for sizes 100, 150, and 250) is used for the sensor tube as shown below.

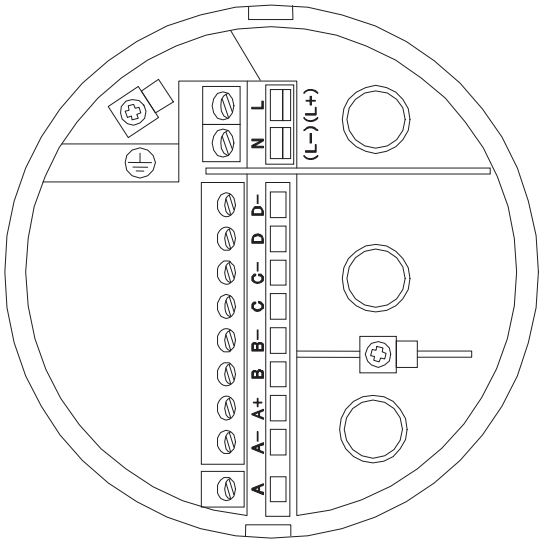


Meter size 400 is in a four-zone structure.

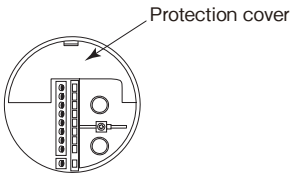
ELECTRICAL CONNECTION

[I/O terminals of MMC400RC/F converters]

- Two terminals for current output and pulse or status output (standard output)
- When other inputs/outputs are required, select them from the options.



The power supply terminal block has a protection cover.



Terminals	Description
L/L+	L and N for AC power supply L+ and L− for DC power supply
N/L−	
⏚	Grounding

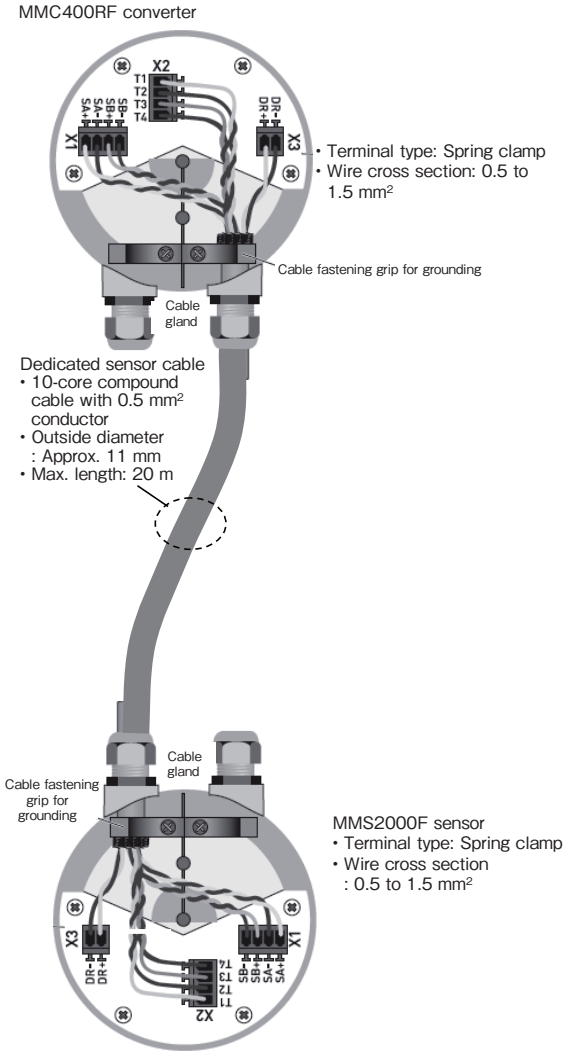
Terminals	Polarity	Description (Standard: Code 600)
D−	−	Pulse or status output, frequency pulse, alarm output
D	+	
C−	−	Current output (4 to 20 mA/internal power supply)
C	+	
B−		
B		
A+		
A−		
A		

- Terminal type : Plug-in type screw terminal
- Wire cross section : 0.5 to 2.5 mm²
- Cable outside diameter : 7 to 12 mm

- Connection diagram for optional outputs (modular I/O print circuit)

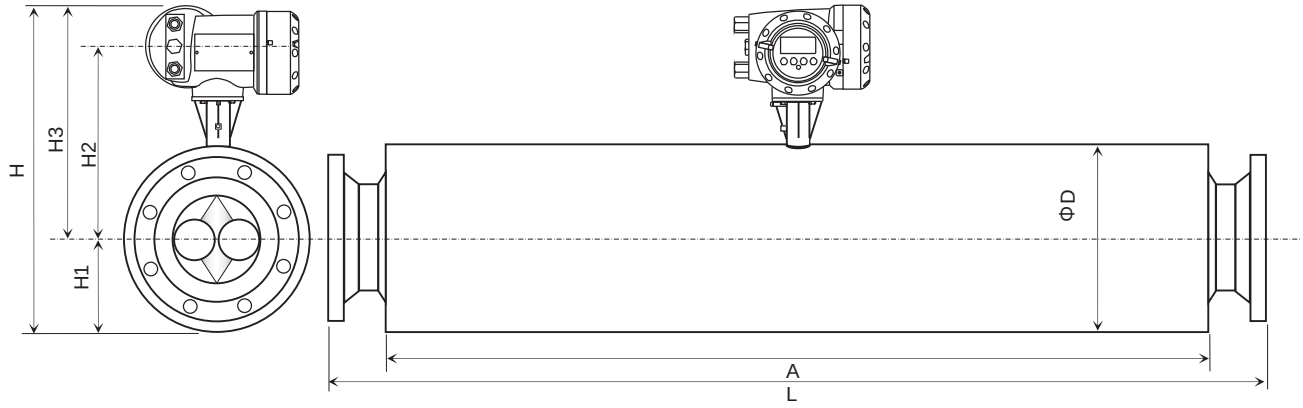
Converter specifications		Polarity	Option 1 Current output, pulse or status output, control input (6EK)	Option 2 Current output × 2, pulse or status output (6A8)	Option 3 Current output × 3, pulse or status output (6AA)	Option 4 Current output × 2, pulse or status output× 2 (6AE)
Terminal	D−	−	Pulse or status output, frequency pulse, alarm output	Pulse or status output	Pulse or status output	Pulse or status output No. 1
	D	+				
	C−	−	Current output	Current output No. 1	Current output No. 1	Current output No. 1
	C	+				
	B−	−	Control input		Current output No. 2	Pulse or status output No. 2
	B	+				
	A+					
	A−	−	Status output or pulse, frequency pulse, alarm output	Current output No. 2	Current output No. 3	Current output No. 2
	A	+				

Remote type sensor cable MMS2000F + MMC400RF



DIMENSIONS

MMM2400RC compact type with flange connection



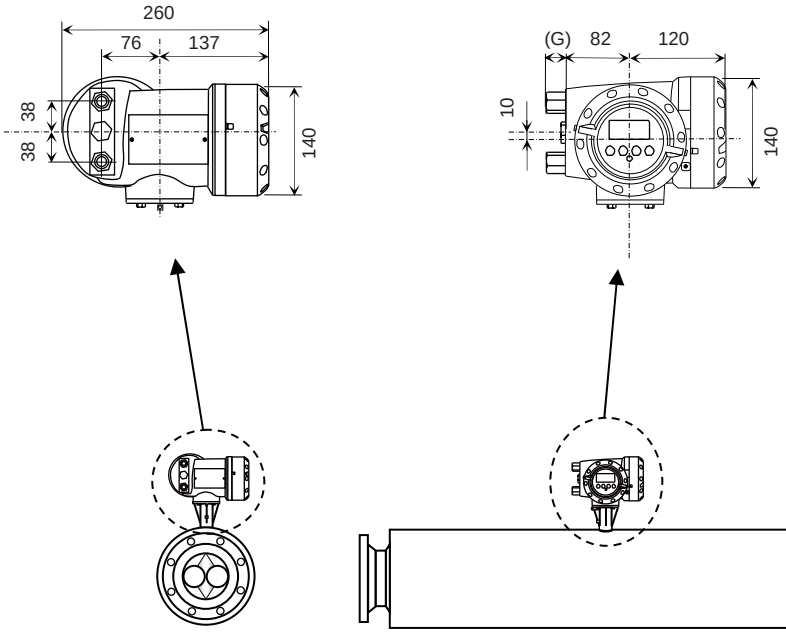
Meter size	Dimensions (mm)							Approx. mass (kg)
	L	A	H	H1	H2	H3	D	
100	See the table below	–	480	110	300	370	219	85
150		–	584	162	352	422	323	212
250		–	666	203	393	463	406	445
400		–	770	254	446	516	508	940

Face-to-face dimension depends on the size and the connection flanges. See the table below for face-to-face dimension (L) for details.

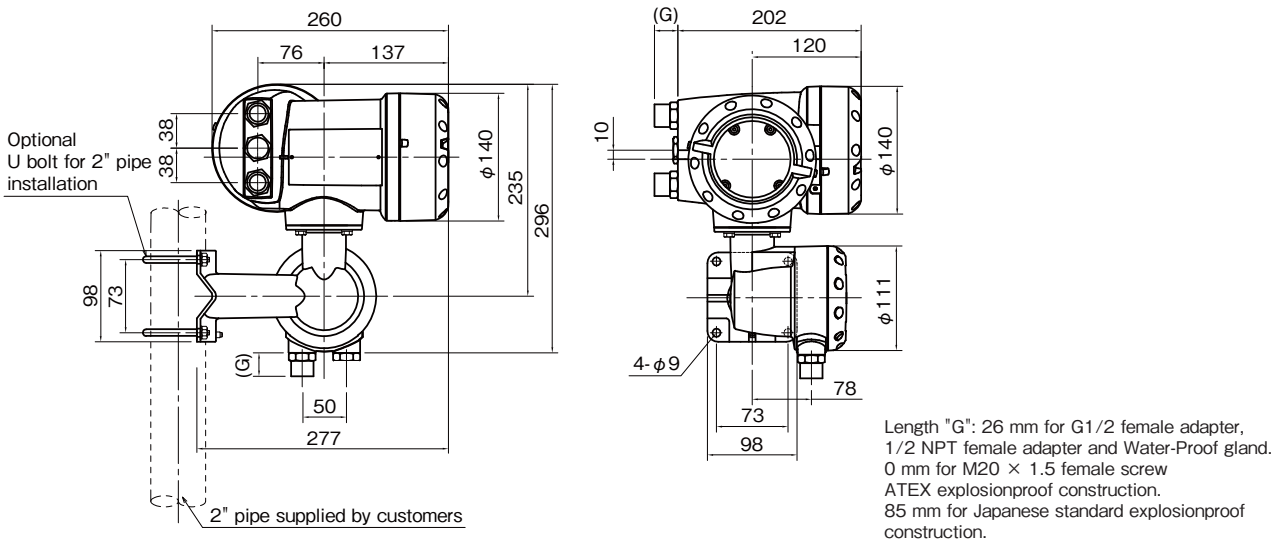
L (face-to-face dimension)

Meter size	Dimensions (mm)																													
	JIS10K JIS20K		ASME Class 150							ASME Class 300							ASME class 600							ASME class 900						
	100A	350A	4"	6"	8"	10"	12"	14"	16"	4"	6"	8"	10"	12"	14"	16"	4"	6"	8"	10"	12"	14"	16"	4"	6"	8"	10"	12"	14"	16"
100	1270 1296	–	1334	1358	–	–	–	–	–	1352	1378	–	–	–	–	–	1398	1428	–	–	–	–	–	1422	1474	–	–	–	–	–
150	–	–	–	1652	1678	–	–	–	–	–	1672	1698	–	–	–	–	–	1722	1754	–	–	–	–	–	1768	1812	–	–	–	–
250	–	–	–	–	–	2017	2043	–	–	–	–	–	2049	2075	–	–	–	–	–	2195	2227	–	–	–	–	–	2131	2139	–	–
400	–	2284 2346	–	–	–	–	–	2380	2380	–	–	–	–	–	2412	2414	–	–	–	–	–	2566	2572	–	–	–	–	–	2470	2496

Meter size	ASME Class 1500						
100	1442	1554	–	–	–	–	–
150	–	–	1914	–	–	–	–
250	–	–	–	2335	2393	–	–
400	–	–	–	–	–	2736	2762

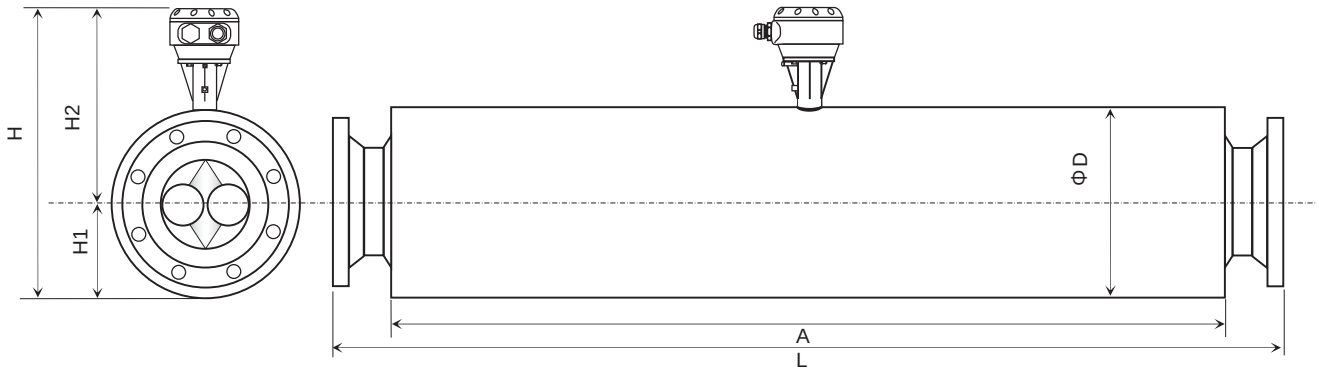


• MMC400RF remote type converter



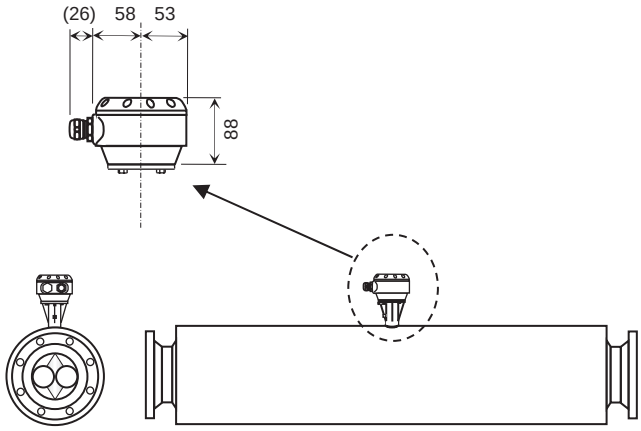
Mass: Approx. 5.8 kg

• MMS2000RF remote type sensor with flange connection

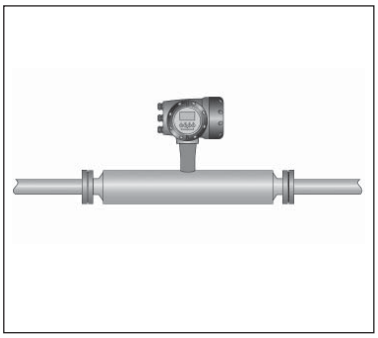


Meter size	Dimensions (mm)						Approx. mass (kg)
	L	A	H	H1	H2	D	
100	See the table on the previous page	–	417	110	307	219	81
150		–	521	162	359	323	208
250		–	603	203	400	406	441
400		–	707	254	453	508	936

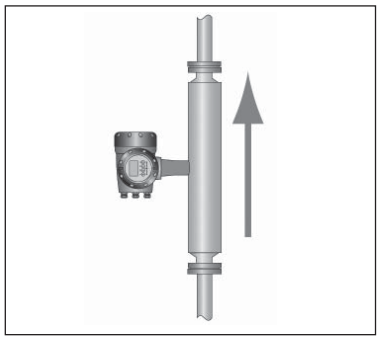
Face-to-face dimension depends on the size and the connection flanges. See the face-to-face dimension table (L) on the previous page for details.



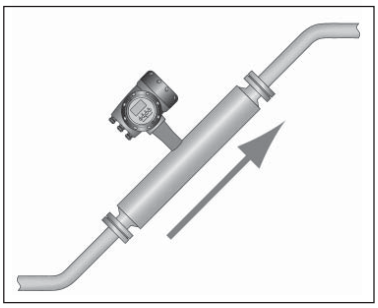
INSTALLATION NOTES



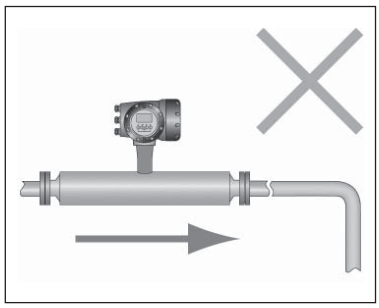
①When installing the flowmeter on the horizontal line, place the converter or the terminal box of remote type above the measuring tube.



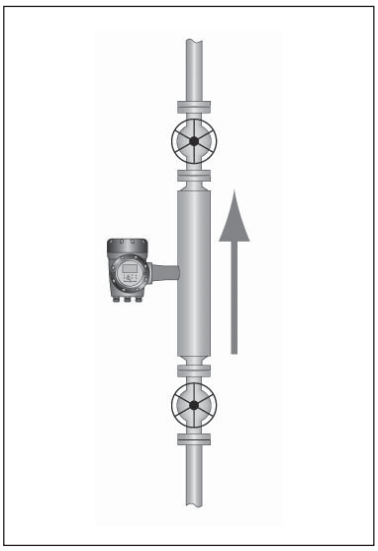
②When installing the flowmeter on the vertical line, install it in upward flow direction.



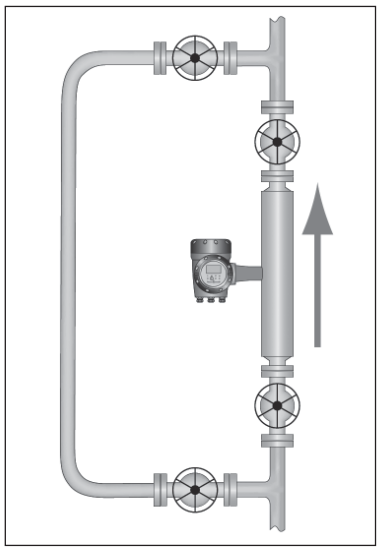
③When installing the flowmeter on the slant line with upward flow, place the converter or the terminal box of remote type above the measuring tube.



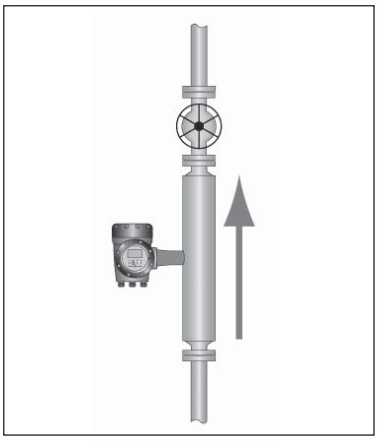
④When installing the flowmeter on the horizontal line, make the upstream and downstream pipings be filled with liquids. Do not bend these pipings downward at the vicinity of flowmeter. To avoid unnecessary accumulation of gasses, do not install the flowmeter on the upper part of associated pipings in such processes containing air or gas.



⑤When installing the flowmeter on the vertical line, provide with stop valves at both upstream and downstream to keep the flowmeter to be filled with liquids, which is necessary to perform zero adjustment.



⑥It is highly recommended to equip with bypass and stop valves for maintenance purpose.



⑦Install a control valve downstream if required to avoid the cavitations caused by throttling of valve.

MODEL AND SPECIFICATION CODES

- Sensor tube material: S type (Stainless steel UNS S31803)
  Sensor tube material, flow splitter: UNS S31803/Flange SS316/316L

Specifications	Compact type (Sensor + Converter)	Remote type	
		Sensor	Converter
General purpose (non explosionproof)	MMM2400RC-S □□□	MMS2000RF-S □□□	MMC400RF
Japanese standard explosionproof	MMM2400RC-JEx-S □□□	MMS2000RF-JEx-S □□□	MMC400RF-JEx
ATEX/IECEx explosionproof	MMM2400C-Ex-S □□□	MMS2000-Ex-S □□□	MMC400F-Ex

Note: □□: 100 or 150 or 250 or 400 are assigned as size codes.

[Sensor code]

Sensor Spec. Code	VE		4	S	0		0	K										Description	Std.
Sensor Code	VE																	MMS2000R sensor (for large pipes)	○
Meter Size		87																Meter Size 100	○
		88																Meter Size 150	○
		89																Meter Size 250	○
		90																Meter Size 400	○
(Fixed code)			4															Always 4	○
Measuring Tube Material				S														Stainless Steel UNS S31803	○
Measuring Tube Surface Finish					0													Standard	○
Process connection						ZG												100A JIS10K flange	○
						ZH												100A JIS20K flange	
						SD												4" ASME Class 150 flange	
						SE												4" ASME Class 300 flange	
						SF												4" ASME Class 600 flange	
						4D												6" ASME Class 150 flange	○
						4E												6" ASME Class 300 flange	
						4F												6" ASME Class 600 flange	
						5D												8" ASME Class 150 flange	○
						5E												8" ASME Class 300 flange	
						5F												8" ASME Class 600 flange	
						6D												10" ASME Class 150 flange	
						6E												10" ASME Class 300 flange	
						6F												10" ASME Class 600 flange	
						7D												12" ASME Class 150 flange	○
						7E												12" ASME Class 300 flange	
						7F												12" ASME Class 600 flange	
						TD												14" ASME Class 150 flange	○
						TE												14" ASME Class 300 flange	
						TF												14" ASME Class 600 flange	
						UD												16" ASME Class 150 flange	○
						UE												16" ASME Class 300 flange	
						UF												16" ASME Class 600 flange	
(Fixed code)							0											Always 0	○
Outer cylinder (material, certification, and pressure resistance) * Only H and 6 are available for Size 400								G										SS304/304L No certification, 10 MPa or less	○
								H										SS316/316L No certification, 10 MPa or less	
								0										SS304/304L PED-certified, Max. 4 MPa	
								A										SS316/316L PED-certified, Max. 4 MPa	
								6										UNS 31803 PED-certified, Max. 15 MPa	
Option * 2 and C (heating jacket) are not available for Sizes 250 and 400									0									Without	○
									2									Heating jacket (1"ASME class150 flange)	
									C									Heating jacket (NPT 1" female on the flowmeter side)	
									3									Purge air connection (1/2 NPT female on the flowmeter side)	
									B									With bursting disc (3/4 NPT male on the flowmeter side) * Operating pressure must be 10 MPa or higher	
Explosionproof Approvals										0								Without	○
										1								ATEX explosionproof (Ex)	
										R								IECEx explosionproof (Ex)	
										9								Japanese standard explosionproof (JEx)	
(Fixed code)											0							Always 0	○
Type												0						Compact type (max. temperature up to 230°C)	○
												1						Remote type (aluminum alloy wiring terminal housing)	
												2						Remote type (stainless steel wiring terminal housing)	
Calibration													0					Standard 3-point flow calibration	○
													1					5-point flow calibration	
													2					5-point flow calibration for both forward and reverse directions + UKAS-certified calibration (ISO/IEC 17025)	
													A					3-point flow calibration + density calibration (water: temperature, 3-point)	
													B					5-point flow calibration + density calibration (water: temperature, 3-point)	
													D					5-point flow calibration + UKAS-certified calibration (ISO/IEC 17025)	
													G					10-point flow calibration + UKAS-certified calibration (ISO/IEC 17025)	
													K					10-point flow calibration for both forward and reverse directions + UKAS-certified calibration (ISO/IEC 17025)	
													R					0.05% 5-point flow calibration + UKAS-certified calibration (ISO/IEC 17025)	
(Fixed code)														0				Always 0	○
(Fixed code)															0			Always 0	○
Converter type																6		Compact type	○
																7		Remote type (mandatory for ship class specifications)	
Special specifications																	00	Without	○
																	00/Z	Special	

Meter size	100	150	250	400
○ : Standard	○	–	–	–
△ : Semi-standard	△	–	–	–
▲ : Option	▲	▲	▲	▲

Note:
Special requirements not included in the above coding system should be designated by adding "/Z" at the end of the code. Consult us for the availability of such requirements before ordering.
Outer cylinder codes "G" and "H" are recommended for services in the food industry and waste water treatment, which do not require pressure resistance. Codes "0", "A" and "6" comply with the EU pressure equipment directive (PED). These are recommended for services in the oil and chemical industries and high-pressure processes, which require pressure resistance and higher safety.
Calibration codes "A" or "B" with the density calibration function are recommended for density meters and mass flowmeters. Select codes "2", "D", "G", "K" and "R" if UKAS calibration (ISO/IEC 17025) is required.

[Converter code]

MMC400RC/RF

Converter spec. code	VE	54	4				2	0	0		2				0	0			Description	Std.
Converter code	VE	54																	MMC400R converter	○
(Fixed code)			4																Always 4	○
Type				4															Compact type	○
				H															Remote type (mandatory for ship class, high temperature, and low temperature models)	
Power supply					A														100 to 230 V AC	○
					1														12 to 24 V DC	
Explosionproof Approval						0													Without	○
						1													ATEX explosionproof (Ex)	
						F													IECEx explosionproof (Ex)	
						9													Japanese standard explosionproof (JEx)	
Cable entries for input, output, and power supply							0												M20 × 1.5 female for ATEX explosionproof	
							4												1/2NPT female adapter	
							5												G1/2 female adapter	○
							6												M20 × 1.5 with waterproof gland	
							9												G1/2 flameproof gasket adapter for Japanese standard explosionproof	
Language for indication								2											English	○
(Fixed code)									0	0									Always 00	○
Converter housing										1									Aluminum alloy	○
										2									SS316L (compact type)	
										3									SS316L (remote type)	
(Fixed code)											2								Always 2	○
Output												6	0	0					4 to 20 mA × 1, pulse or status × 1, total 2	○
												6	E	K					4 to 20 mA × 1, pulse × 1, status × 1, control input × 1	
												6	A	8					4 to 20 mA × 2, pulse or status × 1 (selectable)	
												6	A	A					4 to 20 mA × 3, pulse or status × 1 (selectable)	
												6	A	E					4 to 20 mA × 2, pulse × 1, pulse or status × 1 (selectable)	
Measurement															0				Mass flow rate, density, temperature as standard	○
(Fixed code)																0			Always 0	○
Sensor cable																	0		Without (compact type)	○
																	4		5 m cable (only for remote type)	
																	1		10 m cable (only for remote type)	
																	5		20 m cable (only for remote type)	
Special specifications																		00	Without	
																		00/Z	Special	

Note: Special requirements not included in the above coding system should be designated by adding "/Z" at the end of the code. Consult us for the availability of such requirements before ordering.

- Sensor tube material: D type (Duplex stainless steel UNS S31803 or super duplex stainless steel UNS S32760
  Sensor tube material, flow splitter, flange (all welded parts) : UNS S31803 or UNS S32760

Specifications	Compact type (Sensor + Converter)	Remote type	
		Sensor	Converter
General purpose (non explosionproof)	MMM2400RC-S □□	MMS2000RF-S □□	MMC400RF
Japanese standard explosionproof	MMM2400RC-JEx-S □□	MMS2000RF-JEx-S □□	MMC400RF-JEx
ATEX/IECEx explosionproof	MMM2400C-Ex-S □□	MMS2000-Ex-S □□	MMC400F-Ex

Note: □□: 100 or 150 or 250 or 400 are assigned as size codes.

[Sensor code]

Sensor Spec. Code	VE		4	S	0		0	K										Description				
Sensor Code	VE																	MMS2000R sensor				
Meter Size		87																Meter Size 100				
		88																Meter Size 150				
		89																Meter Size 250				
		90																Meter Size 400				
(Fixed code)			4															Always 4	○: Standard △: Semi-standard ▲: Option			
Measuring tube and welded part materials * Only E is available for Size 400				D														Stainless Steel UNS S31803 (Globally Source)				
				E														Stainless Steel UNS S31803 (EU Sourced)				
				U														Stainless Steel UNS S32760 (EU Sourced)				
Measuring Tube Surface Finish					0													Standard	Meter Size 100	150	250	400
Process connection						ZG												100A JIS10K flange	▲	–	–	–
						ZH												100A JIS20K flange	▲	–	–	–
						SD												4" ASME Class 150 flange	▲	–	–	–
						SE												4" ASME Class 300 flange	▲	–	–	–
						SF												4" ASME Class 600 flange	▲	–	–	–
						S1												4" ASME Class 900 flange	▲	–	–	–
						S2												4" ASME Class 1500 flange	▲	–	–	–
						4D												6" ASME Class 150 flange	▲	▲	–	–
						4E												6" ASME Class 300 flange	▲	▲	–	–
						4F												6" ASME Class 600 flange	▲	▲	–	–
						41												6" ASME Class 900 flange	▲	▲	–	–
						42												6" ASME Class 1500 flange	▲	▲	–	–
						5D												8" ASME Class 150 flange	–	▲	–	–
						5E												8" ASME Class 300 flange	–	▲	–	–
						5F												8" ASME Class 600 flange	–	▲	–	–
						51												8" ASME Class 900 flange	–	▲	–	–
						52												8" ASME Class 1500 flange	–	▲	–	–
						6D												10" ASME Class 150 flange	–	–	▲	–
						6E												10" ASME Class 300 flange	–	–	▲	–
						6F												10" ASME Class 600 flange	–	–	▲	–
						61												10" ASME Class 900 flange	–	–	▲	–
						62												10" ASME Class 1500 flange	–	–	▲	–
						7D												12" ASME Class 150 flange	–	–	▲	▲
						7E												12" ASME Class 300 flange	–	–	▲	▲
						7F												12" ASME Class 600 flange	–	–	▲	▲
						71												12" ASME Class 900 flange	–	–	▲	▲
						72												12" ASME Class 1500 flange	–	–	▲	▲
						TD												14" ASME Class 150 flange	–	–	–	▲
						TE												14" ASME Class 300 flange	–	–	–	▲
						TF												14" ASME Class 600 flange	–	–	–	▲
						T1												14" ASME Class 900 flange	–	–	–	▲
						T2												14" ASME Class 1500 flange	–	–	–	▲
						UD												16" ASME Class 150 flange	–	–	–	▲
						UE												16" ASME Class 300 flange	–	–	–	▲
						UF												16" ASME Class 600 flange	–	–	–	▲
						U1												16" ASME Class 900 flange	–	–	–	▲
						U2												16" ASME Class 1500 flange	–	–	–	▲
(Fixed code)							0											Always 0				
Outer cylinder (material, certification, and pressure resistance) * Only H and 6 are available for Size 400								G										SS304/304L No certification, 10 MPa or less				
								H										SS316/316L No certification, 10 MPa or less				
								0										SS304/304L PED-certified, Max. 4 MPa				
								A										SS316/316L PED-certified, Max. 4 MPa				
								6										UNS 31803 PED-certified, Max. 15 MPa				
Option * 2 and C (heating jacket) are not available for Sizes 250 and 400									0									Without				
									2									Heating jacket (1"ASME class150 flange)				
									C									Heating jacket (NPT 1" female on the flowmeter side)				
									3									Purge air connection (1/2 NPT female on the flowmeter side)				
									B									With bursting disc (3/4 NPT male on the flowmeter side) * Operating pressure must be 10 MPa or higher				
Explosionproof Approvals										0								Without				
										1								ATEX explosionproof (Ex)				
										R								IECEx explosionproof (Ex)				
										9								Japanese standard explosionproof (JEx)				
(Fixed code)											0							Always 0				
Type												0						Compact type				
												1						Remote type (aluminum alloy wiring terminal housing)				
												2						Remote type (stainless steel wiring terminal housing)				
Calibration													0					Standard 3-point flow calibration				
													1					5-point flow calibration				
													2					5-point flow calibration for both forward and reverse directions + UKAS-certified calibration (ISO/IEC 17025)				
													A					3-point flow calibration + density calibration (water: temperature, 3-point)				
													B					5-point flow calibration + density calibration (water: temperature, 3-point)				
													D					5-point flow calibration + UKAS-certified calibration (ISO/IEC 17025)				
													G					10-point flow calibration + UKAS-certified calibration (ISO/IEC 17025)				
													K					10-point flow calibration for both forward and reverse directions + UKAS-certified calibration (ISO/IEC 17025)				
													R					0.05% 5-point flow calibration + UKAS-certified calibration (ISO/IEC 17025)				
(Fixed code)														0				Always 0				
(Fixed code)															0			Always 0				
Converter type																6		Compact type				
																7		Remote type (mandatory for ship class specifications)				
Special specifications																	00	Without				
																	00/Z	Special				

* Specification is subject to change without notice.

TOKYO KEISO CO., LTD.

Head Office : Shiba Toho Building, 1-7-24 Shibakoen, Minato-ku, Tokyo 105-8558
Tel : +81-3-3431-1625 (KEY) ; Fax : +81-3-3433-4922
e-mail : overseas.sales@tokyokeiso.co.jp ; URL : https://www.tokyokeiso.co.jp