



# Mass flow meter CLEAN FLOW

## SPECIFICATION

SSM11551 16.09

### 1. Outline

CLEAN FLOW is a mass flow meter which realize high performance and high reliability. It can measure mass flow directly by detecting phase difference of measuring tube which is generated by Coriolis.

High-functionality transmitter has capacitance touch panel which makes setting and operation easy. And 3 lines LCD indication can be set various kind of indication article.

### 2. Feature

- It can measure mass flow directly, it is not affected temperature, pressure, viscosity, density, or flow distribution due to its measurement principle.
- Compact design
- It does not need special fixture. Easy installation.
- New type measuring tube realizes low pressure loss.
- Various indication article by 3 line LCD.
- Good visibility by Buck-light display.
- Plug-in card can add out/input easily. (Option)



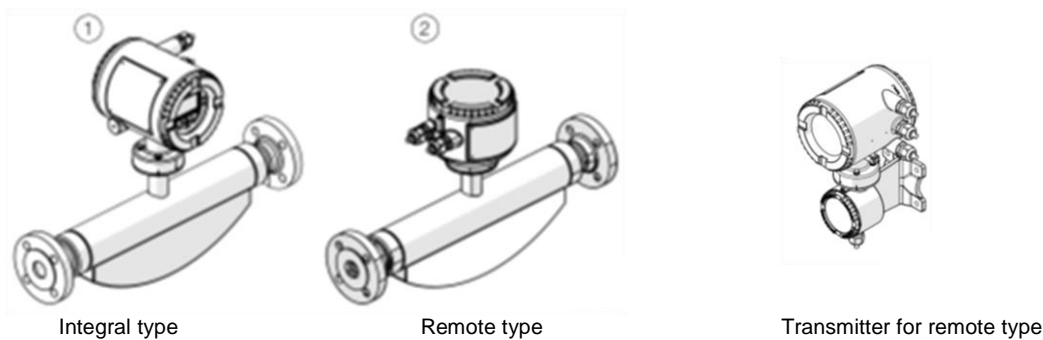
### 3. General specification

#### ● Sensor

Size	015	025	050	080	100	150
Nominal diameter	10A, 15A, 20A, 25A, 40A, 50A, 65A, 80A, 100A, 150A, 200A					
Connection end	JIS10K, 20K ASME/ANSI 150, 300, 600 JPI 150, 300, 600 DIN PN16, 40, 63 Tri-clamp					
Fluid	Liquid/Gas					
Flow range	0 ~ 860,000 Kg/h (6 type)					
Accuracy	Volume	Liquid	General:	Mass flow	±0.4%	
				Volume flow	±0.4%	
			High accuracy:	Mass flow	±0.15% (±0.1%option)	
				Volume flow	±0.15%	
	Gas	General:	Mass flow	±1.0%		
		High accuracy:	Mass flow	±0.5%		
Density	Liquid	General:	0.010kg/L			
		High accuracy:	0.002kg/L (0.001kg/L option)			
Temperature	General:		-50 ~ 160 °C			
	High accuracy:		-50 ~ 205 °C			
Explosion-proof type is depending on the specification						
Pressure	Depending on the connection end					
Wetted parts material	Stainless steel (Standard), Alloy C (Option)					
Explosion-proof	ATEX / IECEx, cFMus, TIIS (Applying)					

#### ● Transmitter

Power	100 ~ 240V AC, 50/60Hz 11 ~ 30V DC
Power consumption	20W
Protection level	Unit type : IP65 / IP67, NEMA 4X Remote type: IP65 / IP67 / IP68 (Sensor only, Immersion depth 5m), NEMA 4X
Housing material	Aluminum Stainless (Remote type: Option)
Output signal	Analog: 4-20mA DC (Active mode or Passive mode) Digital: 2 points (Pulse or switch) (Passive mode) HART (Protocol Ver. 7.1)
Dumping	0.8 sec. (Available setting 0.2 ~ 100 sec)
Low cut-off	1% of Max. flow rate. (Available setting 0~5%)
Transmission distance	Max. 200m (Remote type)



#### 4. Flow range, Accuracy

●Liquid measurement

Size	015	025	050	080	100	150	
Flow range	MASS flow[kg/h]	0~8,000	0~35,000	0~90,000	0~250,000	0~560,000	0~860,000
	Volume flow [L/h] (※1)	0~8,000	0~35,000	0~90,000	0~250,000	0~560,000	0~860,000
(※1) Volume flow is according to the 1g/mL of density. In case of other than 1mg/mL Volume flow = Mass flow / Density.							
Zero-stability [kg/h]	0.64	2.16	7.2	20	41.6	68.8	

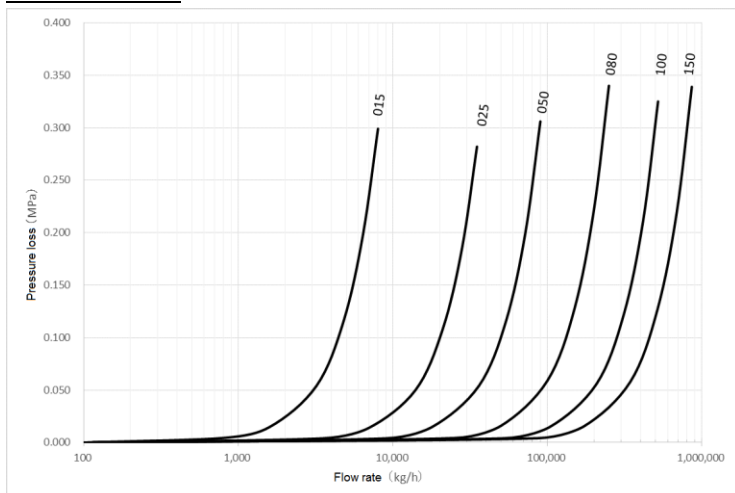
●Basic accuracy

Model	430 (General type)	450 (High accuracy type)
Mass flow (Liquid)	±0.4%	±0.15%
	±0.25% (Option)	±0.10% (Option)
	±0.20% (Option)	
Mass flow (Gas)	±1.0%	±0.5%
Volume flow	±0.4%	±0.15%
	±0.25% (Option)	
	±0.20% (Option)	
Repeatability (volume)	Refer to below table	
Density (Liquid)	0.010kg/L	0.002kg/L
		0.001kg/L
Repeatability (density)	0.002kg/L	0.002kg/L
		0.001kg/L

●Measuring accuracy

		Max. measuring accuracy	Repeatability
1	Flow rate $\geq \frac{\text{Zero-stability}}{(\text{General accuracy}/100)}$	±General accuracy	±1/2×General accuracy
2	Flow rate $< \frac{\text{Zero-stability}}{(\text{General accuracy}/100)}$	± (Zero-stability/Measured value) ×100%	±1/2× (Zero-stability/Measured value) ×100%

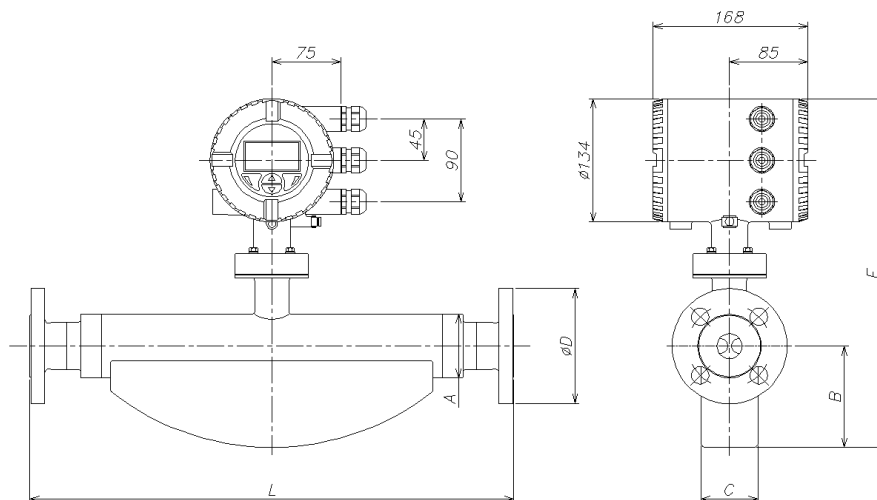
#### 5. Pressure loss



Pressure loss (result by water @ 20°C /1mPa.s)  
Please inquiry in case of other viscosity.

6. External dimensions

● Integral type

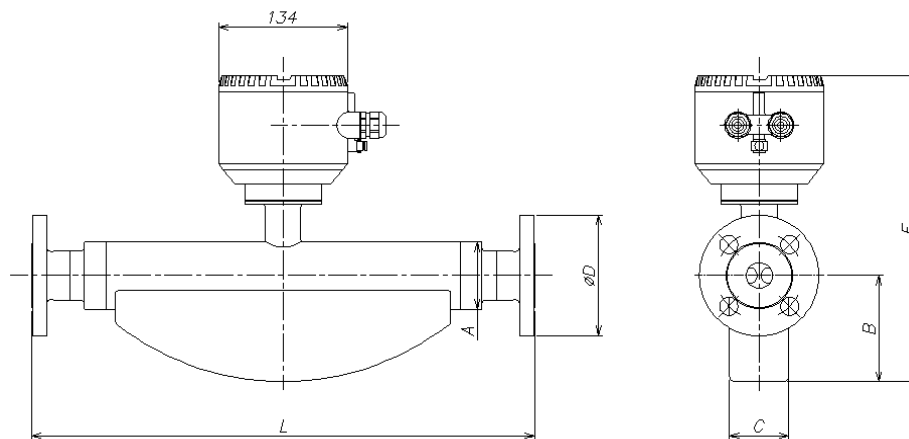


Meter size	Size (mm)				Approx. weight (kg)
	A	B	C	E	
0 1 5	φ 4 4 . 5	7 7	4 6	3 4 0	9
0 2 5	φ 6 9 . 5	1 0 3	6 2	3 7 9	1 1
0 5 0	φ 9 9	1 2 5	8 0	4 1 6	2 7
0 8 0	φ 1 5 5	1 8 3	1 2 3	5 0 5	7 1
1 0 0	φ 1 8 5	2 6 1	1 6 8	6 0 3	1 2 3
1 5 0	□ 2 6 0	3 2 0	2 0 5	6 9 1	1 8 1

Note) Approximate weight may be changed as per connection end and material.

External dimensions are changed as per meter size.

● Remote type



Meter size	Size (mm)				Approx. weight (kg)
	A	B	C	E	
0 1 5	φ 4 4 . 5	7 7	4 6	3 4 0	9
0 2 5	φ 6 9 . 5	1 0 3	6 2	3 7 9	1 1
0 5 0	φ 9 9	1 2 5	8 0	4 1 6	2 7
0 8 0	φ 1 5 5	1 8 3	1 2 3	5 0 5	7 1
1 0 0	φ 1 8 5	2 6 1	1 6 8	6 0 3	1 2 3
1 5 0	□ 2 6 0	3 2 0	2 0 5	6 9 1	1 8 1

Note) Approximate weight may be changed as per connection end and material.

External dimensions are changed as per meter size.

●015 sensor connection standard

Connection end	Specification code	L (mm)	D (mm)
10A JIS10K	015E1J1	385	90
15A JIS10K	015R0J1	385	95
1/2" CL150 (ASME B 16.5)	015R0A1	435	89
1/2" CL300 (ASME B 16.5)	015R0A3	421	95
20A JIS10K	015R1J1	421	100
3/4" CL150 (ASME B 16.5)	015R1A1	421	98
Conform to DIN 32676 1/2" Tri-clamp	015R0T1	413	34
Conform to ASME BPE 1/2" Tri-clamp	015R0T3	433	25

●025 sensor connection standard

Connection end	Specification code	L (mm)	D (mm)
20A JIS10K	025E1J1	576	100
3/4" CL150 (ASME B 16.5)	025E1A1	575	98
25A JIS10K	025R0J1	525	125
1" CL150 (ASME B 16.5)	025R0A1	575	108
1" CL300 (ASME B 16.5)	025R0A3	576	124
40A JIS10K	025R2J1	576	140
1-1/2" CL150 (ASME B 16.5)	025R2A1	576	127
In accordance with DIN 32676 1" Tri-clamp	025R0T1	590	50.5
In accordance with ASME BPE 1" Tri-clamp	025R0T3	590	50.4

●050 sensor connection standard

Connection end	Specification code	L (mm)	D (mm)
40A JIS10K	050E1J1	763	140
1-1/2" CL150 (ASME B 16.5)	050E1A1	763	127
1-1/2" CL300 (ASME B 16.5)	050E1A3	756	156
50A JIS10K	050R0J1	715	155
2" CL150 (ASME B 16.5)	050R0A1	715	152
2" CL300 (ASME B 16.5)	050R0A3	763	165
65A JIS10K	050R1J1	763	175
2-1/2" CL150 (ASME B 16.5)	050R1A1	756	178
In accordance with DIN 32676 2" Tri-clamp	050R0T1	740	64
In accordance with ASME BPE 2" Tri-clamp	050R0T3	740	63.9

●080 sensor connection standard

Connection end	Specification code	L (mm)	D (mm)
65A JIS10K	080E1J1	910	175
2-1/2" CL300 (ASME B 16.5)	080E1A3	920	178
80A JIS10K	080R0J1	870	185
3" CL150 (ASME B 16.5)	080R0A1	880	191
3" CL300 (ASME B 16.5)	080R0A3	895	210
100A JIS10K	080R1J1	1060	210
4" CL150 (ASME B 16.5)	080R1A1	880	229
In accordance with DIN 32676 3" Tri-clamp	080R0T1	910	106
In accordance with ASME BPE 3" Tri-clamp	080R0T3	910	90.9

●100 sensor connection standard

Connection end	Specification code	L (mm)	D (mm)
80A JIS10K	100E1J1	1275	185
3" CL300 (ASME B 16.5)	100E1A3	1244	210
100A JIS10K	100R0J1	1150	210
4" CL150 (ASME B 16.5)	100R0A1	1144	229
4" CL300 (ASME B 16.5)	100R0A3	1324	254
150A JIS10K	100R2J1	1300	280
6" CL150 (ASME B 16.5)	100R2A1	1330	279

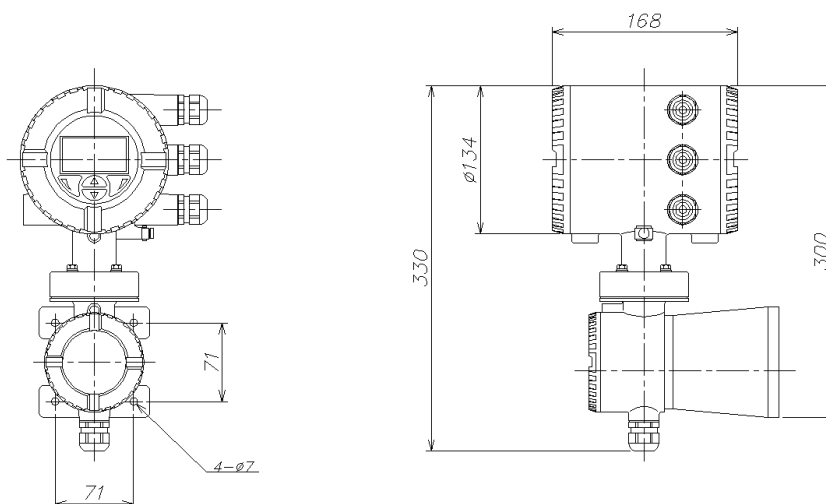
Note) This size is for major item. Unavailable for manufacturing depend on the combination.

● 150 sensor connection standard

Connection end	Specification code	L (mm)	D (mm)
4" PN16 (EN 1092-1)	150E2D2	1569	220
6" PN16 (EN 1092-1)	150R0D2	1421	285
6" CL150 (ASME B 16.5)	150R0A1	1485	279
6" CL300 (ASME B 16.5)	150R0A3	1505	318
8" CL150 (ASME B 16.5)	150R2A1	1650	343
8" CL300 (ASME B 16.5)	150R2A3	1670	381

Note) This size is for major item. Unavailable for manufacturing depend on the combination.

● Transmitter for remote type (Type FT)



Weight: 4.5Kg.

7. Transmitter

● Indication contents

Mass flow, Volume flow, Density, Temperature, and any others (Available for select).

4 kind of monitor for operator can be set, and it can indicate several measuring result simultaneously.

Indicator has 3 line LCD, and variety of indication is available.

● Operation

Operated by capacitance touch panel through the glass is available.

Set according to the menu by 4 operation keys.

● Standard output

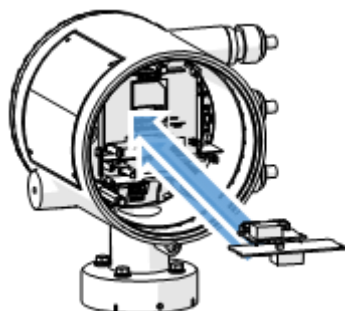
Analog output: 1 point (4~20mA/DC/HART7)





Digital output: 2 points (Pulse, frequency)

● Optional plug-in cards (for additional output)

The transmitter has two slots in which plug-in cards can be inserted to provide additional inputs and outputs.

The slots are located on the transmitter motherboard and can be accessed after removing the front housing cover.



Plug-in card	Description	Number <sup>1)</sup>
	Passive current output, 4~20 mA (red)	Two cards
	Passive digital output (green)	One card
	Passive digital input (yellow)	One card
	24 V DC power supply (blue)	One card

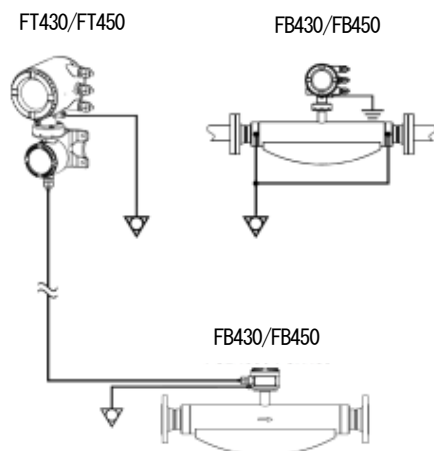
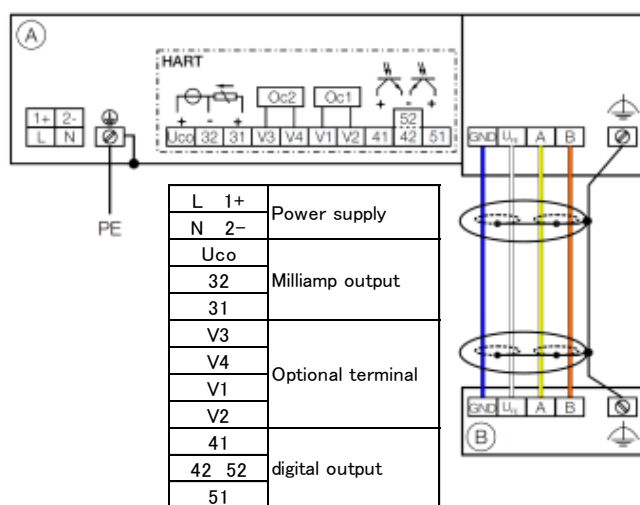
1) The "Number" column indicates the maximum number of plug-in cards of the same type that can be used.

Note: Please refer to next page for the possible combination of plug-in cards

● The possible combination of plug-in cards

Output code	Additional output code		Slot OC1	Slot OC2
	Output 1	Output 2	Terminals V1 / V2	Terminals V3 / V4
G0	—	—	—	—
G1	x	—	24 V DC power supply (blue)	—
G2	—	x	—	Passive current output, 4~20 mA (red)
G3	x	x	Passive current output, 4~20 mA (red)	Passive current output, 4~20 mA (red)
G0	DRT	DSN	24 V DC power supply (blue)	Passive digital input (yellow)
G0	DRT	DSG	24 V DC power supply (blue)	Passive digital output (green)
G0	DRT	DSA	24 V DC power supply (blue)	Passive current output, 4~20 mA (red)
G0	DRN	—	Passive digital input (yellow)	—
G0	DRN	DSG	Passive digital input (yellow)	Passive digital output (green)
G0	DRN	DSA	Passive digital input (yellow)	Passive current output, 4~20 mA (red)
G0	DRG	DSN	Passive digital output (green)	Passive digital input (yellow)
G0	DRG	DSA	Passive digital output (green)	Passive current output, 4~20 mA (red)

● Terminal block



● IP rating

In accordance with EN 60529 : IP65/IP67, NEMA4X

● Vibration

In accordance with EN 60068-2

10~58Hz, Max deflection 0.15mm (Peak load)

58~150Hz, Max. acceleration 2G (Peak load)

● Ambient temperature

Standard : -20~70°C Option : -40~70°C

Note) When operating below -20°C, visibility of the LCD display may be worse.

● Signal cable (Remote type: between sensor and transmitter)

Impedance 100~200Ω

Withstand voltage 120V

Outer diameter 6~12mm

Cable design 4 core shielded cable (2 wire pairs as a star-quad cable)

Max. signal cable length

0.25mm<sup>2</sup> : 50m

0.34mm<sup>2</sup> : 100m

0.50mm<sup>2</sup> : 150m

0.75mm<sup>2</sup> : 200m

●Power

AC Power Terminal	:	L/N
Operating voltage	:	100~240VAC 50/60Hz
Power consumption	:	20VA
DC Power Terminal	:	1+/2-
Operating voltage	:	11~30VDC
Power consumption	:	20W

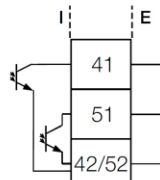
●Output

Standard output

Current output

Current output	Active mode	Passive mode
Terminal	Uco(+)/32(-)	31 (+) /32 (-)
Output signal	4~20mADC or 4~12~20mADC Switchable	4~20mADC
Load resistance	250~300Ω	250~600Ω
Source voltage	—	12~30V
Measuring error	0.1% or less of measured value	

Digital output

Digital output	Pulse/frequency output (passive)	Binary output (passive)	
Terminal	41(+)/42(-), 51(+)/52(-)	41(+)/42(-), 51(+)/52(-)	
Output "closed"	Voltage 3VDC or less 2.5kHz or less : 2~30mA More than 2.5kHz : 10~30mA	Voltage 3VDC or less 2~30mA	
Output "open"	Voltage 16~30VDC 0.2mA or less	Voltage 16~30VDC 0.2mA or less	
Max. frequency	10.5kHz	—	
Pulse width	0.1~2,000ms	—	

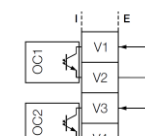
Option output

Option (by plug-in card)

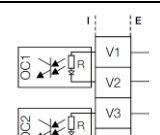
• Passive current output (red)

Terminal	V1(+)/V2(-), V3(+)/V4(-)	The plug-in card can be used in slot OC1 or OC2
Output signal	4~20mA	
Load resistance	250~600Ω	
Source voltage	12~30VDC	
Measuring error	0.1% or less of measured value	

• Digital output (green): Binary output (Passive)

Terminal	V1/V2, V3/V4	The plug-in card can be used in slot OC1 or OC2	
Output "closed"	Voltage 3VDC or less 2~30mA		
Output "open"	Voltage 16~30VDC 0.2mA or less		

• Digital input (Yellow)

Terminal	V1(+)/V2(-), V3(+)/V4(-)	The plug-in card can be used in slot OC1 or OC2	
Input "ON"	Voltage 16V~30VDC		
Input "OFF"	Voltage 3VDC or less		
Internal resistance	6.5kΩ		

• 24VDC Power supply (blue)

Terminal	V1(+)/V2(-)	The plug-in card can be used in slot OC1 only.
Function	For active connection of passive outputs	
Output voltage	24VDC at 0mA 17VDC at 25mA	
Load rating	25mA, permanently short circuit-proof	

8. Specification code

Unit type/ Remote type sensor

Article	Specification code		Note
Model	FB450		Coliolis Mass flow meter / High accuracy type
	FB430		Coliolis Mass flow meter / General type
Explosion Protection Certificate	Y0		General Purpose
	A2		ATEX/IECEX (Zone 2/22)
	A1		ATEX/IECEX (Zone 1/21)
	F2		cFMus version Class 1 Div. 2 (Zone 2/21)
	F1		cFMus version Class 1 Div. 1 (Zone 1/21)
Transmitter type / Material / Cable Gland	Y0		When select "Unit type"
	U1		Remote type / Aluminum / 1-M20x1.5
	U2		Remote type / Aluminum / 1-NPT1/2
	A1		Remote type / Stainless / 1-M20x1.5
	A2		Remote type / Stainless / 1-NPT1/2
Meter size / Connection size	015E1		015/10A (3/8B)
	015R0		015/15A (1/2B) : Standard
	015R1		015/20A (3/4B)
	025E1		025/20A (3/4B)
	025R0		025/25A (1B) : Standard
	025R2		025/40A (1-1/2B)
	050E1		050/40A (1-1/2B)
	050R0		050/50A (1B) : Standard
	050R1		050/65A (2-1/2B)
	080E1		080/65A (2-1/2B)
	080R0		080/80A (3B) : Standard
	080R1		080/100A (4B)
	100E1		100/80A (3B)
	100R0		100/100A (4B) : Standard
	100R2		100/150A (6B)
	150E2		150/100A (4B)
150R0		150/150A (6B) : Standard	
150R2		150/200A (8B)	
Process Connection Type	J1		Flange JIS 10K
	J2		Flange JIS 20K
	D2		Flange DIN PN16
	D4		Flange DIN PN40
	D5		Flange DIN PN63
	D6		Flange DIN PN100
	A1		Flange ANSI/ASME B16.5 Class 150
	A3		Flange ANSI/ASME B16.5 Class 300
	A6		Flange ANSI/ASME B16.5 Class 600
	A7		Flange ANSI/ASME B16.5 Class 900
	A8		Flange ANSI/ASME B16.5 Class 1500
	T1		In accordance with DIN 32676 Tri-clamp
T3		In accordance with ASME BPE Tri-clamp	
F1		In accordance with DIN 11851 Fitting	
Material of Wetted Parts	A1		Stainless steel
	C1		Ni-Alloy (Alloy-C)
Flow Calibration	A		Flow forward : Liquid±0.4 %, Gas : ±1.0 %.....General type
	B		Flow forward : Liquid±0.25 %, Gas : ±1.0 %.....General type
	E		Flow forward : Liquid±0.2 %, Gas : ±1.0 %.....General type
	C		Flow forward : Liquid±0.15 %, Gas : ±0.5 %.....High accuracy type
	D		Flow forward : Liquid±0.1 %, Gas : ±0.5 %.....High accuracy type
	J		Flow forward/reverse : Liquid±0.4 %, Gas : ±1.0 %.....General type
	K		Flow forward/reverse : Liquid±0.25 %, Gas : ±1.0 %.....General type
Density Calibration	N		Flow forward/reverse : Liquid±0.2 %, Gas : ±1.0 %.....General type
	L		Flow forward/reverse : Liquid±0.15 %, Gas : ±0.5 %.....High accuracy type
	M		Flow forward/reverse : Liquid±0.1 %, Gas : ±0.5 %.....High accuracy type
	1		Density 10 g/L.....General type
	3		Density 2 g/L.....High accuracy type
4		Density 1 g/L.....High accuracy type	
9		Others	
Transmitter Type / Material / Cable Grand	D1		Unit type / Aluminum / 3-M20x1.5
	D2		Unit type / Aluminum / 3-NPT1/2
	D5		Unit type / Aluminum / 3-NPT1/2 (Explosion protection)
	D6		Unit type / Aluminum / 3-M20x1.5 (Explosion protection)
	Y0		When select "Remote type"
Output	G0		Current output 1 (AorP), Digital output 1&2(P), HART
	G1		Current output 1 (AorP), Digital output 1&2(P), 24VDC loop supply, HART
	G2		Current output 1 (A), Digital output 1&2(P), current output 2(P), HART
	G3		Current output 1 (A), Digital output 1&2(P), current output 2&3(P), HART
Y0		Without: when select remote type	
Power supply	A		100~230VAC
	C		11~30VDC
	Y		Without: when select remote type

Note) A: Active mode



Sensor option

Article	Additional specification code		Note
Additional output 1	DRN		1xDigital input
	DRG		1xDigital output
	DRA		1xAnalog output (P) (4~20mA)
	DRT		24VDC transmitter loop power supply
Additional output 2	DSN		1xDigital input
	DSG		1xDigital output
	DSA		1xAnalog output (P) (4~20mA)
Special operation mode	N6		Standard + DensiMass : concentration measurement :only 450 type
	N5		Standard + Filling application
	N7		VeriMass function: Meter verification : only 450 type
Pressure-resistance Sensor Housing	PR5		Max. burst pressure 6MPa (Include tower length extension)
	PR6		Max. burst pressure 10MPa(Include tower length extension): Meter size 015
	PR7		Max. burst pressure 15MPa(Include tower length extension): Meter size 015
Signal Cable Length	SC0		Without
	SC1		5m
	SC2		10m
	SC4		20m
	SC5		25m
	SC6		30m
	SC8		40m
	SCA		50m
	SCE		100m
	SCG		150m
SCJ		200m	
TAG No. Plate	T1		With TAG No. Plate
Ambient Temperature Range		TA9	-40~70°C
Extend Tower Length	TE1		Tower length extension 1, Meter insukation Single
	TE2		Tower length extension 2, Meter insukation Double

Note) P:Passive mode

Remote type (Transmitter)

Article	Specification code		Note
Model	FT450		Coliolis Mass flow meter High accuracy type
	FT430		Coliolis Mass flow meter General type
Explosion Protection Certificate	Y0		General Purpose
	A2		ATEX/IECEX (Zone 2/22)
	A1		ATEX/IECEX (Zone 1/21)
	F2		cFMus version Class 1 Div 2 (Zone 2/21)
	F1		cFMus version Class 1 Div 1 (Zone 1/21)
Transmitter type / Material / Cable Grand	R1		Remote type / Aluminum / 1-M20x1.5
	R2		Remote type / Aluminum / 1-NPT1/2
	R5		Remote type / Staineless / 1-M20x1.5
	R6		Remote type / Staineless / 1-NPT1/2
Output	G0		Current output 1 (AorP), Digital output 1&2 (P), HART
	G1		Current output 1 (AorP), Digital output 1&2 (P), 24VDC loop power, HART
	G2		Current output 1 (A), Digital output 1&2 (P), Current output 2 (P), HART
	G3		Current output 1 (A), Digital output 1&2 (P), Current output 2&3 (P), HART
Power supplu	A		100~230VAC
	C		11~30VDC

Option

Mounting Bracket Shape/ Material	B1		2B Pipe mounting / Carbon steel
Additional output 1	DRN		1xDigital input
	DRG		1xDigital output
	DRA		1xAnalog output (P) (4~20mA)
	DRT		24VDC transmitter loop power supply
Additional output 2	DSN		1xDigital input
	DSG		1xDigital output
	DSA		1xAnalog output (P) (4~20mA)
TAG No. Plate	T1		With TAG No. Plate

Note) A: Active mode  
P: Passive mode

▼ The contents of description are subject to change without notice.



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