

# SPECIFICATION SHEET



## INTRINSICALLY SAFE CONDUCTIVITY TRANSMITTER

## SWBM-161 (Transmitter) SA6 (Sensor)

This product is a two-wire intrinsically safe explosion proof electro conductivity transmitter.

It complies with Exia II CT4X explosion proofing standard and features an IP65-compliant protective construction.

By selecting from four types of reference cell constants, a wide measurement range from ultrapure water to plant wastewater is supported.



Transmitter



Sensor  
(screwed type)

### Features

#### ○ Modifiable transmission output range

Within the designated measurement range, transmission output of DC 4-20mA can be freely set with a width of at least 25% or more of the maximum scale value of the measuring range.

#### ○ Adjustment of measurement values

Measurement values can be adjusted to match electro conductivity values such as a secondary standard instrument.

#### ○ Simple operation with waterproof sheet-enclosed keys on front panel

Operations such as mode switching can be performed using waterproof sheet-enclosed keys without having to open the door.

#### ○ Sensor supporting a wide range of applications

The model SA6 Sensor comes in a screwed type and flange type, and is available as an immersion type with a length of up to 2m, or a flow liquid type (with case).

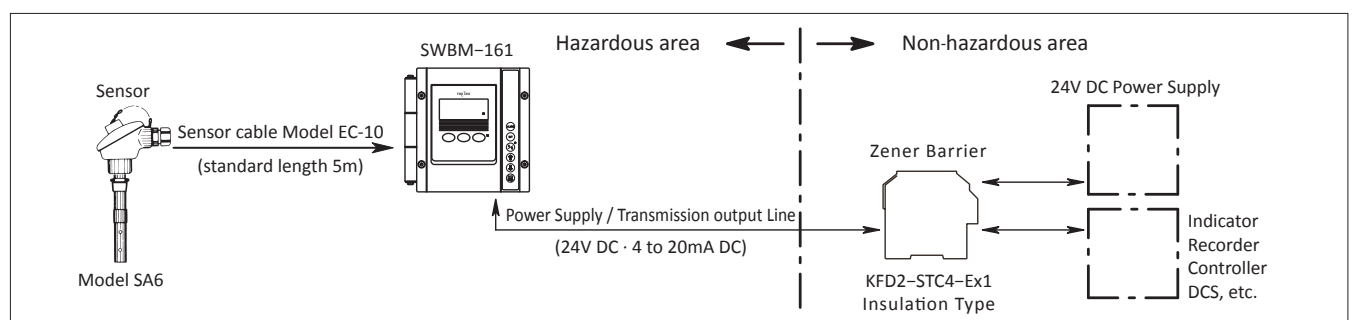


Insulation type  
Zener barrier

### Standard Specifications

Product Name	: INTRINSICALLY SAFE CONDUCTIVITY TRANSMITTER
Model	: SWBM-161
Explosion Proofing Standard	: Exia II CT4X, System Model; SWBM-2-1 TIIIS Certification pass number; TC21495
Measurement Range	: Selectable one from 4 types (reference cell constants) below.
Display range ..1.	0 to 20.00μS/cm [reference cell constant] (0 to 0.2/0 to 2/0 to 20μS/cm)[0.01/cm]
2.	0 to 200.0μS/cm (0 to 2/0 to 20/0 to 200μS/cm)[0.1/cm]
3.	0 to 2000μS/cm (0 to 20/0 to 200/0 to 2000μS/cm)[1.0/cm]
4.	0 to 20.00mS/cm (0 to 0.2/0 to 2/0 to 20mS/cm)[10.0/cm]
Temperature Display range...	-5.0 to 105.0°C

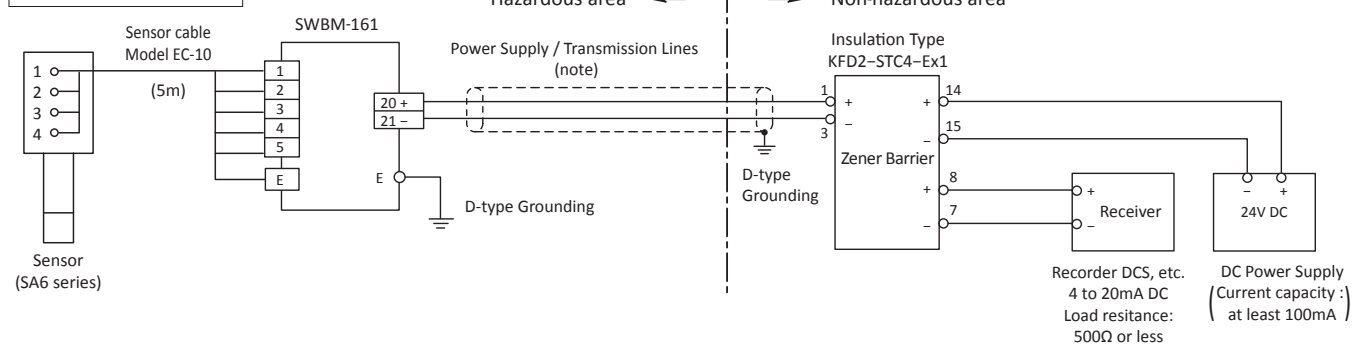
### Configuration Diagram



Transmission : 25% width or more of the measuring  
 Output Range range can be arbitrarily set.  
 Temperature : -5 to 105°C  
 Compensation Range  
 Temperature : Within  $\pm 4.0\%$  F.S. (equivalent input)  
 Compensation (when sensor cable length is 10m or less)  
 Precision Within  $\pm 4.5\%$  F.S. (equivalent input)  
 (when sensor cable length is from 11 to 50m)  
 Performance : Linearity;  
 Within  $\pm 3.0\%$  F.S. (equivalent input)  
 (when sensor cable length is 10m or less)  
 Within  $\pm 3.5\%$  F.S. (equivalent input)  
 (when sensor cable length is from 11 to 50m)  
 Repeatability;  
 Within  $\pm 1.4\%$  F.S. (equivalent input)  
 Display : LCD Display

Transmission Output : Insulation Type -4 to 20mA DC  
 Structure : Outdoor installation, IP65  
 (dust-proof / water jet-proof type)  
 Ambient Temperature : -20 to 55°C, 95%RH or less  
 and Humidity (no condensation)  
 Outer Dimensions : 181(W) $\times$ 180(H) $\times$ 95(D)mm  
 (excluding cable gland)  
 Mounting : 50A pipe mounting  
 (optional; wall / rack mounting)  
 Materials : Main Unit - aluminum die cast  
 Window - polyester resin  
 Coating Color : Metallic Silver  
 Wiring Inlet : Cable gland (for  $\phi 6$  to  $\phi 12$  cables)  
 Weight : Approx. 2.2kg

### Connection Diagram

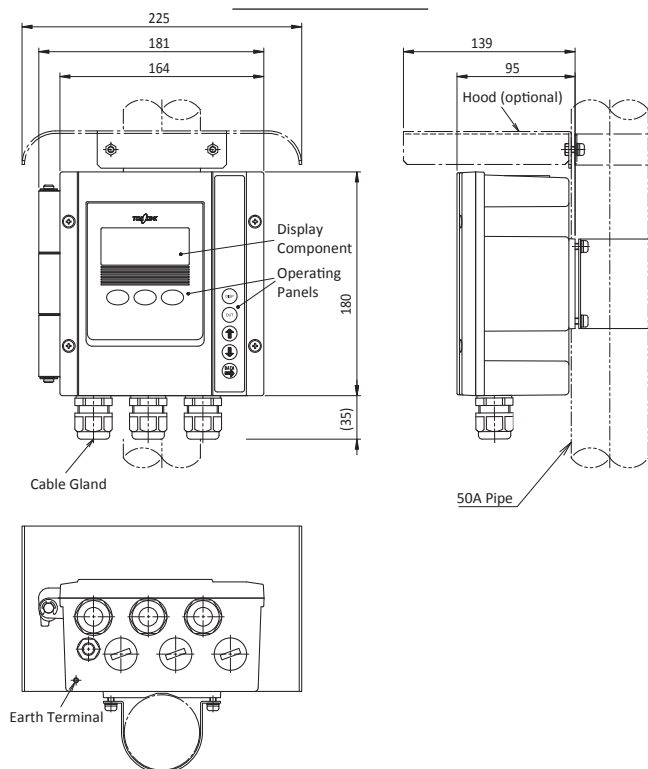


(Note) Must be 2-core shielded cable with inductance of 0.5mH or less and capacitance of 0.04 $\mu$ F or less.  
 For reference: CVVS 2□ ; Maximum length of 260m.  
 CVVS 1.25□ ; Maximum length of 320m.  
 CEES 2□ or 1.25□ ; Maximum length of 480m

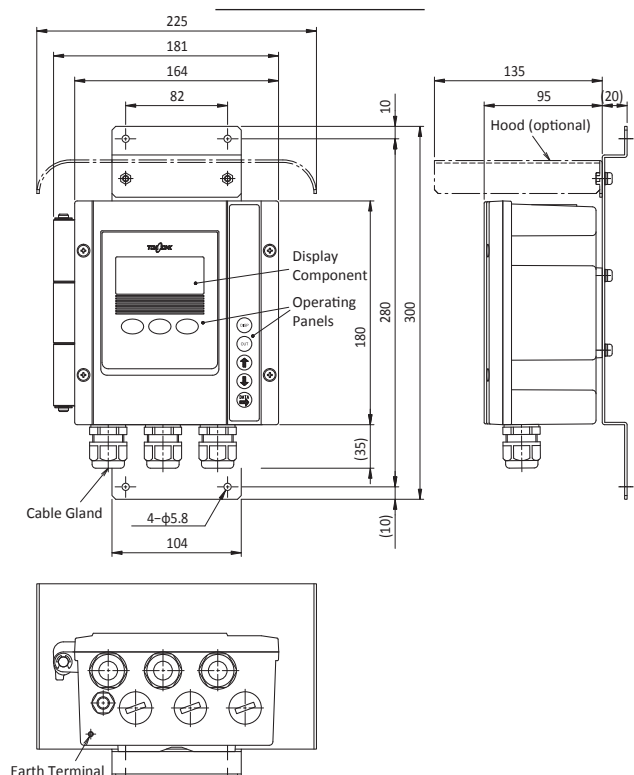
### Dimensions

Unit : mm

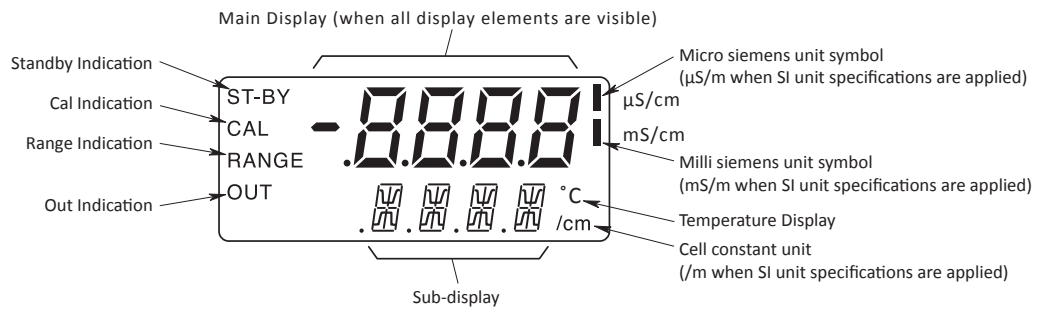
#### 50A Pipe Mounting



#### Wall / rack Mounting



**Indicator Panel**



**Product code**

SWBM161-0-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
A	.....	0.01/cm	0 to .2000/2.000/20.00	μS/cm		SI Unit Type
B	.....	0.1/cm	0 to 2.000/20.00/200.0	μS/cm		
C	.....	1.0/cm	0 to 20.00/200.0/2000	μS/cm		
D	.....	10/cm	0 to .2000/2.000/20.00	mS/cm		
E	.....	1/m	0 to 20.00/200.0/2000	μS/m		
F	.....	10/m	0 to .2000/2.000/20.00	mS/m		
G	.....	100/m	0 to 2.000/20.00/200.0	mS/m		
H	.....	1000/m	0 to 20.00/200.0/2000	mS/m		
			Transmission Output (4 to 20mA DC) Range*2			
A	.....	standard measurement (display) range above				
Y	.....	Other specification				
		Sensor simultaneously fabricated				
0	.....	No				
1	.....	Yes				
		Surface Treatment (coating)*3				
A	.....	Standard coating				
B	.....	Heavy-duty anticorrosion coating				
		Mounting Tools				
1	.....	For 50A pipe mounting				
2	.....	For wall/rack mounting				
		Inclusion of hood (sunshade)				
0	.....	No				
1	.....	Yes				
		Display Language				
A	.....	Standard (Japanese)				
B	.....	English specification				

- \*1. The above measurement (display) range is determined based on the basic cell constant of the combined sensor, with low, middle and high ranges, respectively.
- \*2. When the standard measurement (display) range has been selected the middle range is set. When setting a range other than the middle range, select "other specification" and advise your sales representative of the range. Range can be set with a width of at least 25%. E.g. when the measurement display range is 0 to 20.00μS/cm, minimum of 0 to 5.00μS/cm or 5.00 to 10.00μS/cm, etc.
- \*3. The standard coating includes a melamine resin primer coating and final coating, and an average coating thickness of at least 30μm. The heavy-duty anticorrosion coating includes an epoxy resin primer coating and intermediate coating with a polyurethane final coating, with a coating thickness of at least 100μm.

## ■ Combined Zener Barrier

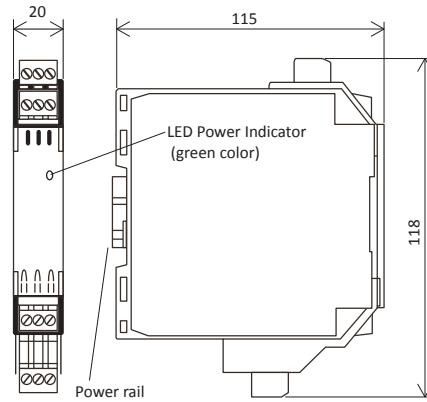
Component Name : Single Channel Insulation Type  
Intrinsically Safe Barrier  
For 4 to 20mA DC Transmitter

Model : KFD2-STC4-Ex1  
Code No. : 134G838  
Manufacturer : P&F  
Rated Voltage : 24V DC  
Environmental Temperature (non-hazardous location): -20 to 60°C  
Weight : Approx. 200g

The insulation-type barrier does not require type A independent grounding. As a power supply unit with output current capacity of at least 100mA (per unit) is required, the DKK-TOA PA-24 power supply unit cannot be used due to its insufficient output current capacity.

We recommend the HDC1-K power supply unit (Code No. 134C620) from M-System Co., Ltd.

Unit : mm

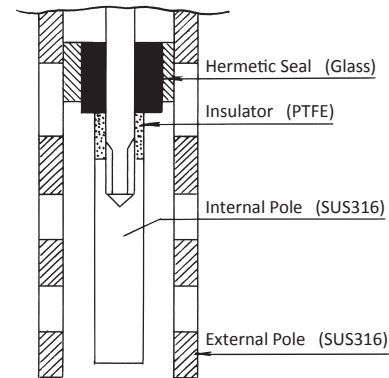


## ■ Combined SA6 Sensor

### Product code

SA	□	□	□	
	6			Cable Connection Type
				Connector box relay
				Always 1
				(temperature compensation: common construction for regular water and ultrapure water)
				Process Interface
			1	Piping insertion or immersion type screwed connection
			2	Piping insertion or immersion type flange connection
			3	Flow-through type screwed connection with SUS316 case
			4	Flow-through type flange connection with SUS316 case
				Cell constant (design value)
			1	0.01/cm (1/m)
			2	0.1/cm (10/m)
			3	1.0/cm (100/m)
			4	10/cm (1000/m)

### Structural Diagram



### Standard Specifications

Product Name : Intrinsically Safe Conductivity Sensor  
Model : SA6  
Measurement Targets : Electroconductivity of ultrapure water, pure water, industrial water, wastewater and so on  
Cell Constant : 0.01/cm, 0.1/cm, 1.0/cm, 10/cm  
Ambient Temperature : -10 to 55°C, 95%RH or less and Humidity  
Water Sample : No freezing  
Conditions  
Temperature : 0 to 100°C  
Range  
Pressure Range : Up to 2.0MPa (however, in the case of a flange connection, up to the nominal pressure of the flange)

Flow velocity or flow rate : 0.01 to 5 m/s (however, when a case is included, a flow rate of 0.5 to 10L/min.)  
Temperature Element : Thermistor  
Material : Sensor  
Connector Box: Aluminum casting  
Sensor Insulator: Glass (hermetic seal)  
Case: SUS316  
Cable Connection Type : Connector box  
Weight : Screw type R 3/4 - Approx. 0.5kg  
Coating Color : Connector box - metallic silver  
Construction : Rain-proof type

**Reference Cell Constant and Measurement Range** (S/m is SI unit)

Examples of Sample Water	Ultrapure Water · Pure Water (boiler water) · Rainwater (ground water) · Tap water · River water · Plant wastewater				
Reference Cell Constant	0.01/cm (1.0/m)		0.1/cm (10/m)	1.0/cm (100/m)	10/cm (1000/m)
Examples of Temperature Ranges	0 to 0.2 (20)	0 to 2.0 (200)	0 to 2.0 (0.2)	0 to 20 (2)	0 to 0.2 (20)
	0 to 0.5 (50)	0 to 10.0 (1000)	0 to 10.0 (1.0)	0 to 100 (10)	0 to 1.0 (100)
	0 to 1.0 (100)	0 to 20.0 (2000)	0 to 20.0 (2.0)	0 to 200 (20)	0 to 2.0 (200)
			0 to 100.0 (10.0)	0 to 1000 (100)	0 to 10.0 (1000)
			0 to 200.0 (20.0)	0 to 2000 (200)	0 to 20.0 (2000)
Units	μS/cm (μS/m)		μS/cm (mS/m)		mS/cm (mS/m)

**Product code**

- Intrinsically Safe Conductivity Sensor  
Screw Type SA6-11

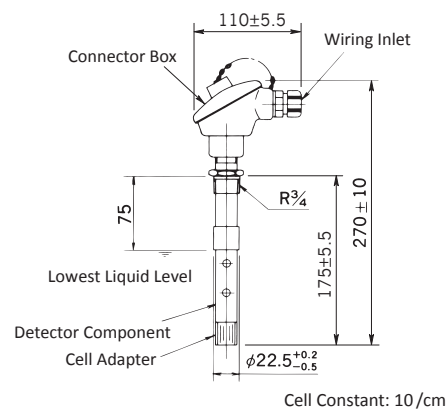
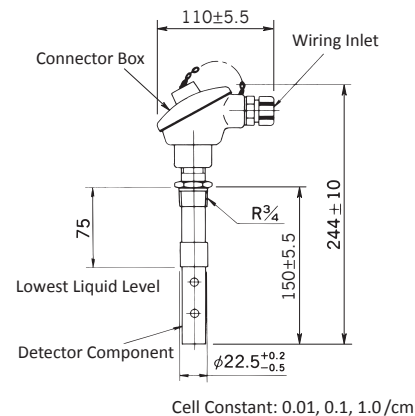
SA61D-3-□□□□□□□□

A	.....	Main Sensor Materials	SUS316 : Standard
B	.....		SUS316L (Including screw component)
1	.....	Connecting Screw Standard*1	R3/4 : Standard
2	.....		R1
3	.....		NPT3/4
4	.....	M42 Ball head lock nut (for combination with flow-through type case)*2	
		"L" dimensions under screw*1	
			0.01/0.1/1   10 ← Cell Constant
0	.....		150mm   175mm : Standard
2	.....		525mm   550mm
3	.....		1025mm   1050mm
4	.....		1525mm   1550mm*1
5	.....		2025mm   2050mm*1
Y	.....		N/A
Y	.....		N/A
		Model	Reference Cell Constant
1	.....	SA6-111	0.01/cm
2	.....	SA6-112	0.1/cm
3	.....	SA6-113	1.0/cm
4	.....	SA6-114	10/cm
5	.....	SA6-111	1/m
6	.....	SA6-112	10/m
7	.....	SA6-113	100/m
8	.....	SA6-114	1000/m
			SI Unit Type
0	.....		N/A
		Custom spec. code;	
		Numeric digit: 9	
		Alphabet: Z	
A	.....	Display Language	
			Standard (Japanese)
B	.....		English specification
		Combined Transmitter Model	
3	.....		SECP-20T
4	.....		SWBM-161
		Combined Transmitter*3	
A	.....		Simultaneously fabricated
B	.....		No

**Dimensions**

Unit : mm

- Screwed Type SA6-11



\*1. When "L" dimension under screw exceeds 1025 (1050) mm, as the extension part will become thicker, screw size will be R1 (R 3/4 cannot be used)  
In addition, when the sample water flow velocity exceeds 0.1m/s (rough guide) with "L" dimension of 525mm or greater, protective piping for detector reinforcement or similar is required.

\*2. When combined with a flow-through type case (chamber), select with M42 ball head lock nut.

\*3. When not simultaneously fabricated with the transmitter, please advise us of the model and manufacturing number of the transmitter to be combined.

**Product code**

● Intrinsicly Safe Conductivity Sensor  
Flange Connection Type SA6-12

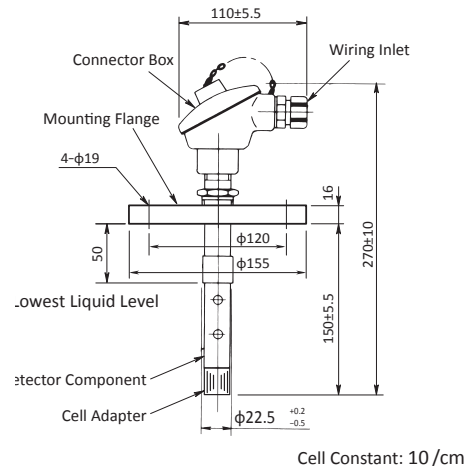
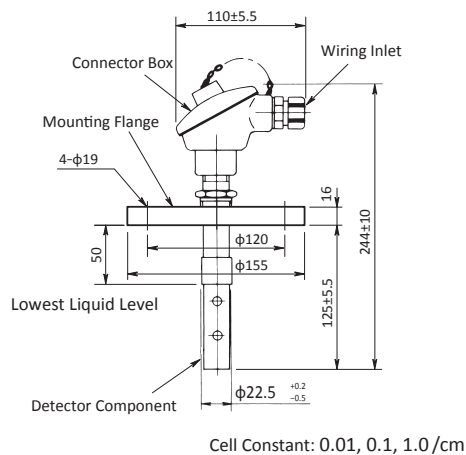
SA61D-3-□□□□□□□□

A	Main Sensor Materials	SUS316 : Standard
B		SUS316L (including flange)
Y		N/A
Y		N/A
A	Flange Connection Standards	50A JIS10K FF : Standard
B		50A JIS5K FF
C		2" ANSI 150LB RF
	"L" dimension under flange*1	0.01/0.1/1      10 ← Cell Constant
0		125mm      150mm : Standard
1		150mm      175mm
2		500mm      525mm
3		1000mm     1025mm
4		1500mm     1525mm
5		2000mm     2025mm
	Model	Reference Cell Constant
1	SA6-121	0.01/cm
2	SA6-122	0.1/cm
3	SA6-123	1.0/cm
4	SA6-124	10/cm
5	SA6-121	1/m
6	SA6-122	10/m
7	SA6-123	100/m
8	SA6-124	1000/m
		SI Unit Type
0		N/A
A	Display Language	Standard (Japanese)
B		English specification
	Combined Transmitter Model	
3		SECP-20T
4		SWBM-161
	Combined Transmitter*2	
A		Simultaneously fabricated
B		No

Custom spec. code;  
Numeric digit: 9  
Alphabet: Z

**Dimensions** Unit : mm

● Flange Type SA6-12



\*1. When the sample water flow velocity exceeds 0.1m/s (rough guide) with "L" dimension of 500 (525) mm or greater, protective piping for detector reinforcement or similar is required.

\*2. When not simultaneously fabricated with the transmitter, please advise us of the model and manufacturing number of the transmitter to be combined.

## Product code

- Intrinsicly Safe Conductivity Sensor
- Stainless Steel Case Screw Connection Flow-through Type SA6-13
- Stainless Steel Case Flange Connection Flow-through Type SA6-14

SA61F-3-□□□□□□□□		Main Sensor Materials (excluding case material)
A	.....	SUS 316 : Standard
B	.....	SUS 316L
Screw connection with SUS316 case*1		
Y	.....	N/A
1	..... SA6-13□□	Rc1/2 : Standard
2	..... SA6-13□□	Rc1/4
3	..... SA6-13□□	NPT1/2
4	..... SA6-13□□	NPT1/4
Flange connection with SUS316 case*2		
Y	.....	N/A
A	..... SA6-14□□	15A JIS 10K RF : Standard
B	..... SA6-14□□	25A JIS 10K RF*3
C	..... SA6-14□□	1/2 " ANSI 150LB RF
D	..... SA6-14□□	1" ANSI 150LB RF*3
W	..... SA6-14□□	25A JIS 10K RF — Flange Interplanar dimensions
Reference Cell Constant		
Y	.....	N/A
Y	.....	N/A
1	..... SA6-1□1	0.01/cm
2	..... SA6-1□2	0.1/cm
3	..... SA6-1□3	1.0/cm
4	..... SA6-1□4	10/cm
5	..... SA6-1□1	1/m
6	..... SA6-1□2	10/m
7	..... SA6-1□3	100/m
8	..... SA6-1□4	1000/m
SI Unit Type		
0	.....	N/A
Custom spec. code;		
Numeric digit: 9	A	Display Language
Alphabet: Z	B	Standard (Japanese)
	B	English specification
Combined Transmitter Model		
3	.....	SECP-20T
4	.....	SWBM-161
Combined Transmitter*4		
A	.....	Simultaneously fabricated
B	.....	No

- \*1. When the case material is SUS316L, please advise us of the connection standards as "9: Special"
- \*2. When the case material is SUS316L, please advise us of the connection standards as "Z: Special"
- \*3. The sample in/out pipe size is 15A (1/2").
- \*4. When not simultaneously fabricated with the transmitter, please advise us of the model and manufacturing number of the transmitter to be combined.

## ■ Sensor Cable

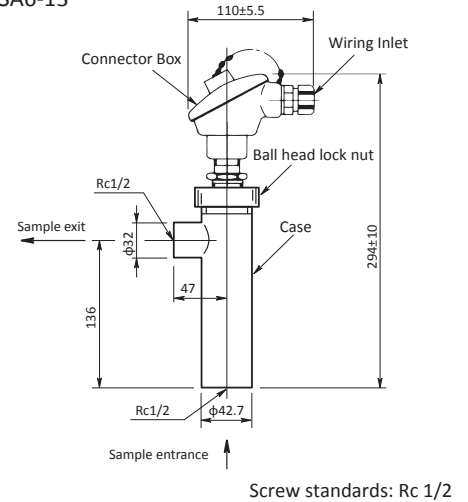
The sensor cable is a special cable for electro conductivity measurement and is used between the transmitter and sensor.

Model	: EC-10
Outer Diameter	: φ8 mm
Insulation	: Polyethylene and vinyl
Casing	: Vinyl
Insulation resistance between core wires	: At least 10 <sup>6</sup> MΩ / 100m
Extension distance	: Maximum length of 50m, intermediate connection cannot be used
Standard length	: 5m to 50m in 5-meter units
Weight	: Approx. 0.5kg / 5 m

## Dimensions Unit : mm

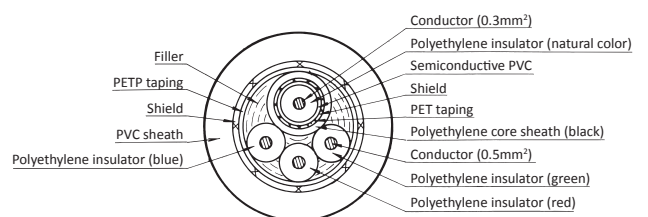
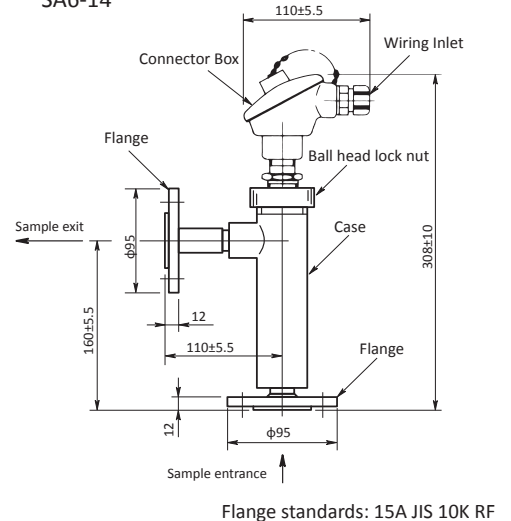
- Flow-through type with case (SUS) (screw connection)

SA6-13



- Flow-through type with case (SUS) (flange connection)

SA6-14



EC-10 Cross-sectional Diagram

■ Please observe the following cautions when installing the electro conductivity detector.

1. Install in a location free from harsh vibrations where maintenance work can be performed easily.
2. Install in a location free from corrosive gases that is not exposed to chemicals and suchlike.

3. Guidelines for Piping Insertion-type Installation

For piping insertion-type installation using screwing-in or flange connection, we recommend installation on top of horizontal pipe. (Figure A)

When mounting to the side of vertical pipe, the sensor is positioned horizontally on its side (Figure B).

For the types with cell constant of 0.01/cm and 0.1/cm, horizontal positioning does not pose any issues.

For the types with cell constant of 1.0/cm and 10/cm, please mount at an offset of at least 45 degrees from horizontal (Figure C).

As the construction makes the sensor difficult to remove when air bubbles are entrained, mounting the sensor on an angle makes it easier to remove the air bubbles. (Indications will fluctuate when air bubbles are entrained.)

4. Guidelines for Flow-through Type Installation with Case

Please mount by installing a bypass valve on the bypass piping and stop valve on in/out (Figure D).

Even during plant operation, the sensor can be removed to perform maintenance by closing the stop valve.

In the case of a sensor for ultrapure water, please try to make this bypass piping as short as possible.

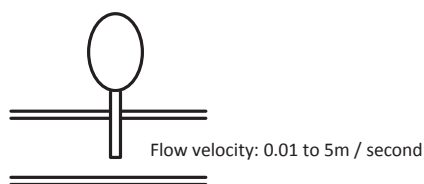


Figure A: Vertical installation on horizontal piping

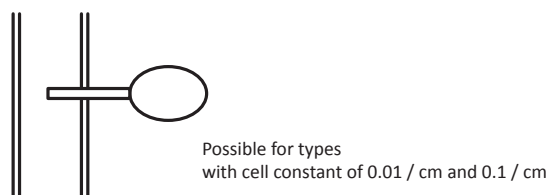


Figure B: Horizontal installation on vertical piping

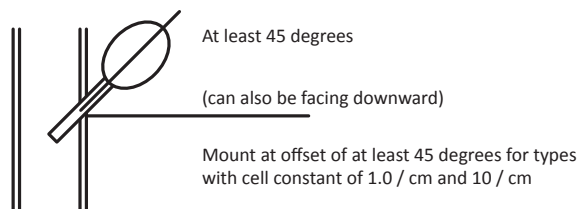


Figure C: Tilted installation on vertical piping

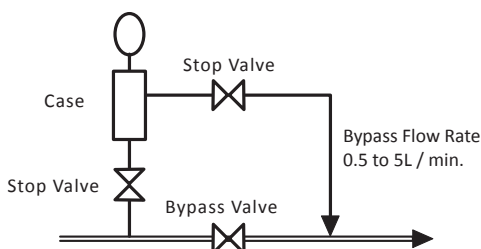


Figure D: Flow-through type bypass piping installation



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**CAUTION**

Please read the operation manual carefully before using products.