SPECIFICATION SHEET

pH/ORP TRANSMITTER (INTRINSICALLY SAFE pH/ORP TRANSMITTER)

SHBM-161/163(transmitter) SHC-7/8(detector)

This product is a two-wire intrinsically safe explosion proof pH/ORP transmitter. It complies with Exia II CT4X.

Features

- One-touch automatic stability judgment function to eliminate operating errors, allowing for accurate calibrations (check) with standard solutions. Transmitter automatically judges the electrode character and displays the results on the screen.
- ○9 water-resistant switches on the outside of the front panel, making it possible to conduct routine maintenance operations without opening the enclosure.
- ○Equipped with a wide range of analyzer/transmitter functions, such as pH electrode crack detection, temperature compensation for sample pH values, and pH/ORP value shift.



○In maintenance mode (ST·BY), output signal would be held. It could not disrupt control system like chemical feed.

Unit automatically switches back to measurement mode after two hours in maintenance mode (ST-BY).

Specifications

Product Name	pH TRANSMITTER	ORP TRANSMITTER			
	(INTRINSICALLY SAFE pH TRANSMITTER)	(INTRINSICALLY SAFE ORP TRANSMITTER)			
Model	SHBM-161	SHBM-163			
Explosion-proof type	TIIS Exia II CT4, System Model: SHBM·	2-1, TIIS Certification Number: TC18098			
Measurement display	-1.00 to 15.00pH	-2000 to +2000mV			
range	(Temp: -5 to 100°C)	(Temp: -5 to 100°C)			
Power supply / Power	2-mins sustant 94	V DC 0 CWA or loss			
consumption	2*wire system, 24v DC 0.6vA or less				
Transmission output	4 to 20mA DC, isolated. Max. load resistance: 550Q or less (when using the Zener Barrier KFD2-STC4-Ex1				
Transmission output range	Adjustable in 0.1pH steps, with a minimum width of 2pH Adjustable in 10mV steps, with a minimum				
Performance	Linearity: Within ±0.02pH (equivalent input)	Linearity: Within ±3mV (equivalent input)			
	Repeatability: Within ±0.02pH (equivalent input)	Repeatability: Within ±2mV (equivalent input)			
Construction	Outdoor installation, dust/jet-proof (IP65)				
Case material and color	Case Material: Aluminum die-cast alloy Paint color: Metallic silver				
Case material and color	(Display keypad, operation panel: Polyester resin, Munsell N1.5)				
Mounting	Mounted on a 50A pipe, wall, or rack mount				
Ambient temperature/humidity	-20 to 55°C, 0 to 95% RH (when in transport and storage: -30 to 65°C, 0 to 98% RH)				
External dimensions/Weight	181 (W) x 180 (H) x 95 (D) mm, Approx. 2kg				
	Temperature compensation for sample pH value: Temperature coefficient setting range; ±0.100pH/°C,				
	Standard temperature; 25°C				
Other functions	Manual temperature compensation for glass electrode: By setting the sample water temperature.				
	pH/ORP value shift: ±1.00 pH/±100 mV. (Shift width for temperature: ±5°C)				
	Burnout: The output signal would be shifted to the upper limit when problems occur, such as when				
	the glass membrane cracks or the temperature sensor fails.				







Mounted on a wall or rack





Product code SHBM163-1-SHBM161-1-Transmission output range (4 to 20 mA DC) Transmission output range (4 to 20 mA DC) A ±200mV Α 0 to 14pH В $\pm 500 \text{mV}$ В 0 to 10pH С $\pm 700 \text{mV}$ С 0 to 8pH D ±1000mV D 2 to 12pH Е ±1400mV Е 4 to 14pH ±2000mV F F 4 to 10pH G 0 to +1000mV G 6 to 14pH н 0 to +1400mV Custom spec.*1 Υ Y Custom spec.*1 System model System model SHBM-2-1(Certification Number: TC18098) A А SHBM-2-1(Certification Number: TC18098) Y The other Y The other Power/Transmission cable entry Power/Transmission cable entry 0 Cable gland for ø6 to 12 cable 0 Cable gland for ø6 to 12 cable G1/2 (3 adapters included) G1/2 (3 adapters included) 1 1 2 NPT1/2 supplied with adapter 2 NPT1/2 supplied with adapter Surface finish (coating)*2 Surface finish (coating)*2 Standard coating А A Standard coating В Heavy-duty coating В Heavy-duty coating Mounting bracket Mounting bracket А For mounting on 50A pipe А For mounting on 50A pipe В For mounting on rack or wall В For mounting on rack or wall Hood (sunshade) Hood (sunshade) 0 None None Equipped (for mounting on 50A pipe) Equipped (for mounting on 50A pipe) 1 2 Equipped (for mounting on rack or wall) 2 Equipped (for mounting on rack or wall) Marking Marking A Standard (Japanese) Standard(Japanese) А English В English В

*1: There are 3 wiring ports with $\phi 6$ to $\phi 12$ cable glands. When using conduit, select G1/2 or NPT1/2.

Three SUS adapters (with gaskets) are included, so remove the cable gland and attach the required number to the wiring port.

In addition, leave the cable gland attached to the unused wiring port and use it as a plug (hole plug).

*2: Standard coating: Melamine primer and topcoat. Average film thickness; Greater than 30µm

Heavy-duty coating: Epoxy primer and middle coat, polyurethane resin topcoat. Average film thickness; Greater than 100µm

Combined Zener Barrier

Product 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 Tempe	erature (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. $134\mathrm{C620})$ from M-System Co., Ltd.

External Dimensions Unit : mm



Applicable detectors

This is intrinsically safe detectors (holders) for the transmitter (SHBM-161/163).

2 types are available (immersion type and flow-through type) and pH / ORP electrodes are combined.

You can select wetted part materials and length.

	Application	Model	Wetted part material	pH electrode	ORP electrode
	General purpose use (60°C or lower	SHC-703	PVC FKM	5600 5605(hydrofluoric acid-resistant)	2600
Immersion type	High temperature use (80°C or lower)	SHC-763	PP FKM	5600 5601(high- temperature use)	2600
	High temperature use Chemical resistant	SHC-703 (F)	PVDF FKM	5601	2601
	Organic solvent-resistant	SHC-703 (T)	PFA Perfluor	5602	2602
	Insertion type (with no case)	SHC-880	PP FKM	5610	2610
Flow-through type	with PP case	SNHC-882	PP FKM	5610	2610
	with SUS case	SNHC-883	PP SUS316 FKM	5610, 5611(high- temperature use)	2610

pH Electrode

The latest electrodes, employing a newly developed glass membrane with an excellent linearity to suppress AgCl exudation from the liquid junction of the reference electrode (the non-leak AgCl inner electrode). They are capable of performing stable and continuous measurement under various measurement conditions such as high temperature, low concentration solution or solution containing reducing agents. The type that employs hydrofluoric acid solution, and the type resistant to organic solvents with the use of Perfluoro (fluoro-rubber, new material) are also available as standard options. In addition, the projected construction of the temperature compensation element (TC: $10k\Omega$ at 25°C) from the main electrode body further improves the response of temperature compensation. The electrolyte for the electrodes listed in the following table is 3M-KCl solution.



Mada	Electrolyte	Type of glass	pH measurement	Service temperature	Seal material of	Lead wire	Applicable
wode	exudation method	membrane	range	range	reference electrode	material	electrode holder
5600-[F Non-pressurized type	Standard membrane	pH0 to 14	−5 to 70°C	FKM	Heat resistant PVC	SHC-703/763
5601-[IF Non-pressurized type	Standard membrane	pH0 to 14	−5 to 95°C	FKM	Silicone	
5602-	IF Non-pressurized type	Standard membrane	pH0 to 14	−5 to 70°C	Perfluoro rubber	Heat resistant PVC	SHC-703
5603-[F Non-pressurized type	Standard membrane	pH0 to 14	−5 to 95°C	Perfluoro rubber	Silicone	SHC-703(F)
5605-	E Non-processized type	Hydrofluoric acid	$pH2 \neq 0.11$	-5 to 50°C	FKM	Heat registant DVC	SHC-703(T)
5005-⊔F	in inon pressurized type	$resistant \ membrane$	p112 to 11	31030 0	I'IXIVI	fieat resistant 1 vO	
5610-[F Pressurized type	Standard membrane	pH0 to 14	-5 to 70° C	FKM	Heat resistant PVC	
5611-	F Pressurized type	Standard membrane	pH0 to 14	−5 to 95°C	FKM	Silicone	SUC-000
5612-	F Pressurized type	Standard membrane	pH0 to 14	−5 to 70°C	Perfluoro rubber	Heat resistant PVC	SHC-000
5613-[F Pressurized type	Standard membrane	pH0 to 14	−5 to 95°C	Perfluoro rubber	Silicone	SNHC-882
	Duccounited trues	Hydrofluoric acid		E to E090	EZM	Heat mariatant DVC	SNUC-883
5015-L	r ressurized type	resistant membrane	pH2 to 11	-5 to 50°C	F KIVI	Heat resistant PVC	

— Electrode lead length (5: 5 m, 10: 10 m)

ORP Electrode

The sensing tip of the ORP electrode is made of platinum (Pt) or gold alloy. The platinum electrode is used in ORP measurement and in most plants processes, while the alloy electrode is used in that of metal plating waste liquid processing. Temperature sensor (T) is built in electrode. The temperature in sample water and standard solution can be checked on a display.

The construction of each reference electrode is the same as the abovementioned pH electrodes, and its electrolyte is 3M KCL solution.

Model	Component electrodes	Electrolyte exudation method	Service temperature range	Seal material for reference electrode	Lead wire material	Typical combination holder
2600-□F	Pt+R+T	Non-pressurized type	−5 to 70°C	FKM	Heat resistant PVC	
2601-🛛 F	Pt+R+T	Non-pressurized type	−5 to 95°C	FKM	Silicone	SHC-709/709
2602-□F	Pt+R+T	Non-pressurized type	-5 to 70° C	Perfluoro rubber	Heat resistant PVC	SHC-703/763
2605-□F	M+R+T	Non-pressurized type	-5 to 70° C	FKM	Heat resistant PVC	
2610-□F	Pt+R+T	Pressurized type	-5 to 70°C	FKM	Heat resistant PVC	SHC-880
2615-□F	M+R+T	Pressurized type	−5 to 70°C	FKM	Heat resistant PVC	SNHC-882/883

Electrode lead length (5: 5m, 10 : 10m)

External Dimensions and product code (immersion type holder)

SHC-703 (PVC, semitransparent)



*. Please select "Equipped", when various washing devices or fixture (ZN-7) are equipped.

Note:

- 1) This is intrinsically safe immersion type holder made of PVC for open tank, filled with electrolyte (KCl). In addition, pH or ORP electrode is equipped.
 - When holder length is 3m or more and used in overseas, electrolyte cannot be filled and supplied
- 2) Although the temperature of heat-resistance is 60°C, because of its strongness, the length of piping made of PVC is up to 4.0m.

Because PVC piping is good at weather proof, you can use it for a long time under the condions of outdoor installation and direct sunlight.



SHC-763 (PP, semitransparent)



Alphabet: Z

*. Please select "Equipped", when various washing devices or fixture (ZN-7) are equipped.

Note:

- This is intrinsically safe immersion type holder made of PP for open tank, filled with electrolyte (KCl). In addition, pH or ORP electrode is equipped.
 - When holder length is 3m or more and used in overseas, electrolyte cannot be filled and supplied.
- 2) In the case of outdoor installation under direct sunlight and the temperature of sample water is 60°C or less, SHC-703C is recommended.
- 3) The heat-resistant temperature of PP holder is 80°C. When general use electrode (5600, 2600) is used, the heat-resistant temperature is 70°C.



• SHC-703 (PFA, semitransparent)



*. Please select "Equipped", when various washing devices or fixture (ZN-7) are equipped.

Note:

1) This is intrinsically safe immersion type holder made of PVDF for open tank, filled with electrolyte (KCl). In addition, pH or ORP electrode is equipped.

When holder length is 3m or more and used in overseas, electrolyte cannot be filled and supplied.

2) PVDF is fluororesin, excellent in chemical or solvent and heat-resistance (max.100°C). Thus, this is safe holder resistant to high temperature or chemical, solvent on process online.

This semi-transparent PVDF holder is robust, the length is up to 4.0m.

Electrode packing is fluororubber (FKM).

*. Please select "Equipped", when various washing devices or fixture (ZN-7) are equipped.

Note:

- This is intrinsically safe immersion type holder made of PFA for open tank, filled with electrolyte (KCl). In addition, pH or ORP electrode is equipped.
- When holder length is 3m or more and used in overseas, electrolyte cannot be filled and supplied.
- 2) PFA is fluororesin, resistant to almost all the chemicals or solvents and high temperature (max.80°C). Thus, this is safe holder resistant to high temperature or chemicals, solvents on process online.

The electrode packing is made of perflogom excellent resistant to heat and chemicals, solvents.

Metal Fixtures for Immersion type holder

Model	Application	Installation Example
ZN-7 (Support)	Used in combination with A, B, and C type metal fittings when a claener is not equipped. The holder can be detached / attached in a single action. The length L is shorter than the holder length.	Li0 Holder guide Holder clamp 500 (L: 1000) 1000 (L: 1500, 2000) 1500 (L: 2000, 2500) 2000 (L: 2500, 3000) 2500 (L: 3000, 3500) Material : SUS316 3000 (L: 3500, 4000) Weight : Approx.3kg/1m
ZC-1 type B	Mounted on a pole (50A). When the holder has no cleaner, ZC-1 type B is used in combination with ZN-7. Total length: 600mm, Material: SPCC or SUS	Max. applicable holder length: 1.5m
ZC-1 type C	Mounted on a pole (50A). When the holder has no cleaner, ZC-1 type C is used in combination with ZN-7. Total length: 600mm, Material: SPCC or SUS	Max. applicable holder length: 2.0 to 4.0m
ZC-2	Fastened with the anchor bolts or on a 50A pole. Up to 2 holders (pH and ORP or DO) can be mounted. Holders are detachable /attachable by a single action. Fixture length: 500mm Material: SUS304 Length of holder to be combined: max. 2m or less Mounting of holders with cleaner is also possible.	Holder (pH or ORP) Holder (DO) Nut (M10) Anchor bolt (M10×200) to be procured by the customer. Holder(DO) Holder with cleaner SOA steel pipe SoA steel pipe Holder (DO) Holder with cleaner SoA steel pipe SoA steel pipe Holder (DO) Holder with cleaner SoA steel pipe SoA steel pipe SoA steel pipe Holder (DO) Holder with cleaner SoA steel pipe SoA steel pipe SoA steel pipe SoA steel pipe SoA steel pipe Holder (DO) Holder with cleaner SoA steel pipe SoA steel pipe Holder (DO) Holder with cleaner Holder (DO) Holder with cleaner SoA steel pipe SoA

Immersion type holder Mounting Flange

	Model	Application	Material	Flange Standard *1	Construction, Example of installation
Flange	ZFL-11	For mounting KCl-	PVC or PP	50A JIS 10K FF	490 Washer PP Tapered packing FKM
Loose	ZFL-2	holder	SUS316	50A JIS 10K RF	Cap nut PP Cap nut PP Flange PVC PP SUS316

*Allowable nominal size: Up to 200A Standards (JIS, 5K, ANSI, JPI) are possible.



*1. Please select 0.15MPa in the case of non-pressurized type (head pressure.Non-pressurized type (head pressure): The way electrolyte (KCl) outflows by utilizing the fall of electrolyte (KCl) (water head). This is possible only when measurement tank or the pipe connecting to this holder are opened to the air.

In case of air pressurized type , pressure gauge is equipped. Pressure gauge scale: 0 to 0.2MPa (pressure resistance; 0.15MPa) 0 to 0.4MPa (pressure resistance; 0.3MPa)

- *2. This is the dimension from connection part (capnut or flange). As a rule, more than 260mm is impossible.
- *3. Manual pressurization pump is not standard equipment. When this pump is necessary, please consult us.

Notes

- 1. Piping insertion type holder (intrinsically safe). Major wetted part material is resin such as polypropylene (PP).
- Resistance of sample water temperature: PP-80°C PVC-60°C 2. This product is electrode holder except a case (chamber) from SNHC-882/883 (flow-through type detector)

				[Non-pressurized type]
3.St	tandaı	rd Applicable Electrode	[Air pressurization]	(head pressure)
		Classification	Product Code	Product Code
	рН	General use	EL5610-2-0F0	EL5600-2-0F0
		High temperature	EL5611-0-□F	$EL5601-2-\Box F\Box$
		HF-resistance	EL5615-2-□F□	EL5605-2-□F□
	ORP	General use (Pt)	EL2610-1-□F	EL2600-1-□F
		Sewerage (waste water) (M)	EL2615-0-□F	EL2605-0-□F

When the electrode except the table above is combined, please consult us.

- 4. Installing outdoor in direct sunlight is not recommended. Especially PP-made holder or PE-made capnut are subjected to ultraviolet light and easy to deteriorate.
- Inevitably installing in above conditions, please consult us about corresponding methods (ex. PVC-made product is used).
- 5. When temperature and pressure in sample water are over 80°C or 0.3MPa, please selects SHC-81/811/812 made of all stainless steel.

*1. Construction of case (chamber) and scale of pressure gauge (pressure display of electrolyte (KCl)) are different depending on sample water pressure (pressure resistance). Pressure gauge scale: 0 to 0.2MPa (pressure resistance; 0.15MPa)

0 to 0.4MPa (pressure resistance; 0.3MPa)

*2. Manual pressurization pump is not standard equipment. When this pump is necessary, please consult us.

Notes

1. This is intrinsically safe flow-through type holder. Wetted part material is resin-made (PP). Sealing rubber is Fluorine rubber (FKM)

The durable temperature of holers is 80°C (PP-made) and 60°C (PVC-made).

2. Electrodes to be combined are separated. Please select an electrode from the table below based on measurement conditions or combined transmitter.

Standard Applicable	Classification		Product Code
Electrode	pH General use		$EL5610-2-\Box F\Box$
		High temperature	EL5611-0-□F
		HF-resistance	$EL5615-2-\Box F\Box$
	ORP	General use (Pt)	EL2610-1-DF
		Sewerage (waste water)(M)	EL2615-0-□F

When the electrode except the table above is combined, please consult us.

3. Installing outdoor in direct sunlight is not recommended. Especially PP-made case (chamber) or PE-made capnut are subjected to ultraviolet light and easy to deteriorate.

• SNHC-883 (PP / SUS316)



*1. The materials of electrode holder: Polypropylene (PP) and PVDF

The materials of case (chamber): SUS316 and SUS316L If organic solvent is mixed in sample water, please select PVDF and Perfluor rubber as wetted part materials, and the electrode (5612).

*2. pressure gauge scale: 0 to 0.2MPa (pressure resistance; 0.15MPa) 0 to 0.4MPa

(pressure resistance; 0.3MPa)

*3. Manual pressurization pump is not standard equipment. When this pump is necessary , please consult us.

Notes

1. This is intrinsically safe flow-through type holder. Wetted part material is resin made (PP or PVDF).

Case (chamber) is made of SUS316.

- The durable temperature of holder is $80^{\circ}\mathrm{C}$ (PP-made) and $95^{\circ}\mathrm{C}$ (PVDF-made).
- The pressurization holder of this product except a case (chamber) is SHC-880.
- 2. Electrodes to be combined are separated. Please select an electrode from the table below based on measurement conditions or combined transmitter

	Classification	Product Code
pH General use		EL5610-2-□F□
	High temperature	EL5611-0-□F
	Chemical resistant	EL5612-0-□F
	HF-resistance	EL5613-0-□F
ORP	General use (Pt)	EL2610-1-□F
	Sewerage (waste water)(M)	EL2615-0-□F

3. Installing outdoor in direct sunlight is not recommended. Especially PP-made case (chamber) or PE-made capnut are subjected to ultraviolet light and easy to deteriorate.

KCl reservoir tank (optional)

Integrated type KCl reservoir tank (approx.250mL) can be added as an option to the head pressure type detector of flow-through and general use model.

This is used to reduce the supply frequency of electrolyte (KCl), extending the service period up to about 1 month (integrated type). The material of tank is made of clear PVC, enabling to check the residual quantity easily.

<Integrated type>



Air set PAS-10

The air set, used when the KCl-supply type pressurized holder is pressurized with instrument air. A spiral tube convenient for holder attaching/ detaching is connected to the pressure regulator valve equipped with the filter set at outlet pressure 0 to 0.3MPa or 0 to 0.1MPa.



Manual pressurization pump

When instrumental air is not equipped, pressurization inlet (check valve) and manual pressurization pump are available. In this case, pressure operation is necessary.

Related Equipments

Connector box

When the transmitter is installed remotely to the sensor (mainly for panel mounted transmitters) and the standard electrode lead length is too short, a junction box is required.

: SFC-4G
· Field installation type
: Piero mistanation type
· 25 to 50A Fipe, wall or panelmount
· ABS resin
: Matted chromium plating, metallic silve
: Approx. 0.9kg

Dedicated cable

The extension cable is a special cable manufactured for using with pH/ORP analysers. It is used for connection between transmitter and connector box.

: EC-10
:8mm
: Polyethylene and Vinyl
: Vinyl
: At least $10^5M\Omega/100m$
: 5 to 100m, in the unit of 5m
: Approx. 0.5kg/5m

Applicable cleaner

This ultrasonic cleaner with its flameproof, explosion-protected construction (d2G4), can be combined with the SHBM-161/163.

The sensing portion of the electrode is continuously irradiated by ultrasonic waves and the cavitation effect caused by this prevents adhesion of fouling.

• Standard Specification

Product Name	Flameproof type explosion-protected Ultrasonic cleaner		
Туре	SUHC·70	SUHC-813	
Cleaning method	Continuous irradiation of ultrasonic waves		
Certification pass number	No. T56354 No. T56355		
Cleaning object	pH / ORP electrodes		
Installation	Immersion type	Flow through	
Service temp- Sample water	0 to 80°C		
erature range Ambient	$0 \text{ to } 50^{\circ}\text{C}$		
Pressure resistance	Atmospheric pressure	0.1MPa or less	
Oscillation frequency	Approx. 70kHz	Approx. 60kHz	
Power supply	$100VAC \pm 10\% 50/60Hz$		
Power consumption	Approx. 30VA		
Weight	Approx. 9kg	Approx. 15kg	
Applicable electrodes	5600	5500	
and holders	SHC·703/763	SHC·81	
Materials of wetted part	SUS316 or SUS316L		
Standard color	Metallic silver (no paint on stainless steel surfaces)		
Construction	Flameproof type explosion-protected,		
	rainproof construction d2G4		
Connection	—	$25 \mathrm{A} \mathrm{JIS} 10 \; \mathrm{KRF}$	







SUHC-813

The other cleaners (flameproof type explosion-protected) are as follows.

Model	Method	Applicable detector
SJH-7A	Immersion water-jet cleaning (using flameproof electromagnetic valve)	
SRH-7A	Immersion chemical cleaning (using flameproof electromagnetic valve)	SHC-763, SHC-703
SBJH-7A	Immersion water-jet/brush cleaning (using flameproof electromagnetic valve)	



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Please read the operation manual carefully before using producuts.