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Tuning Fork Level Switch

FineTek

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PRODUCT INTRODUCTION

WORKING PRINCIPLE

The piezoelectric component is used to drive the tuning fork and feedback signal, which produces the resonation on the fork. When the fork comes into contact with a material, the fork will release some frequency signal as feedback. It will be converted into the output of the contact signal when the circuit detects the frequency decrease of the signal.
The product relies on the damping effect by covering the testing material on the tuning fork which reduces the vibration frequency of the tuning fork and outputs a switch signal. Therefore, there is no signal amplification circuit inside, which can eliminate the trouble of frequent sensitivity adjustment due to the material change.

FEATURE

- SPDT Relay output, SSR MOSFET output.
- Wide voltage supply range 20~250 Vac/Vdc,50/60Hz
- No frequent calibration required, easy-to-use, sturdy and durable design. High/low failure safe mode, safe and reliable.
- Sensitivity adjustment is available for different densities of media. Fine powder can be detected.
- Suitable for liquid, powder, and solid application.
- Dual insulation can reduce damage on the PCB board caused by great changes in temperature and humidity, as well as condensation effects (SC3□ series).
- It can be tested by pressing the test button after installation (SC3□ series).
- Output switch delay function (SC3□ series).
- Self-diagnosis mechanism can detect the abnormality such as the abrasion of the tuning fork or the material viscosity (SC3□ series).
- The compact built-in wiring box can save the installation space (SC3□ series).
- The wiring box can rotate 270 degrees, facilitating adjustment of the inlet direction (SC3□ series).
- The minimum measurable specific gravity can reach 0.01 g/cm3 (SC35 series).
- Ultra protection mechanism can set the secondary output contact point as alarm output (SC35 series).
- Support the function of detecting underwater sediments (SC35 series).
- All-in-one design, 3/4" (SC38 series) 、1" (SC39 series) thread is suitable for the installation of a small tube.
- Adjustment setting for different densities of media ρ>0.5 g/cm3 or ρ.0.7 g/cm3 (SC38 & 39 series).
- Switch delay setting function (SC3□ series).
- Alarm indicators based on failure status or output status selected according to the customer's habits (SC3□ series).
- Automatic calibration of the operation points for different densities of media as required by the customer (SC38 & 39 series).

APPLICABLE MATERIALS

The tuning fork level switch can be widely applied to detect the min. and max. level in tanks, silos and hoppers filled with materials of different densities and state. The following list shows its applications.

POWDER

1. Powdered milk
2. Frozen potato chips
3. Beans
4. Sugar
5. Sweets
6. Coffee beans
7. Coffee powder
8. Frozen dry coffee
9. Tea
10. Salt
11. Flour
12. Foundry sand
13. Spices
14. Animal food
15. Pellets
16. Peanuts
17. Tobacco
18. Wood shavings
19. Chalk
20. Stearin chips
21. Powdered cellulose
22. Glass fine power
23. Granular plastics
24. Gravel
25. Powdered clay
26. Polystyrene powder
27. Styrofoam
28. Soda

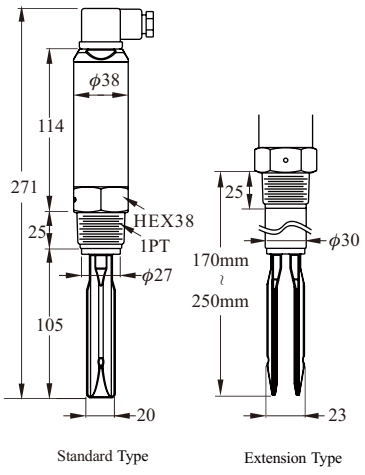
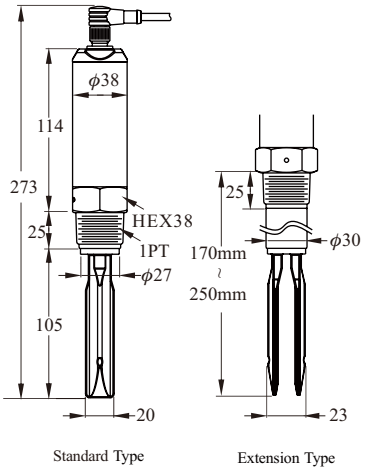
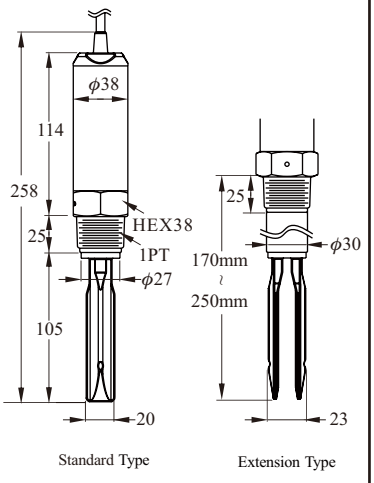
LIQUID

1. Water & Solutions
2. General Purpose Solvent
3. Soy sauce
4. Heavy oil
5. Petroleum
6. Oil
7. Ink
8. Cream
9. Drink & Beverage
10. Corrosive liquid

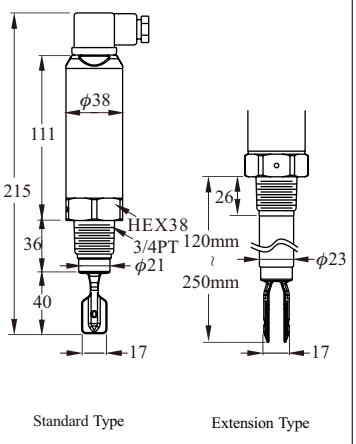
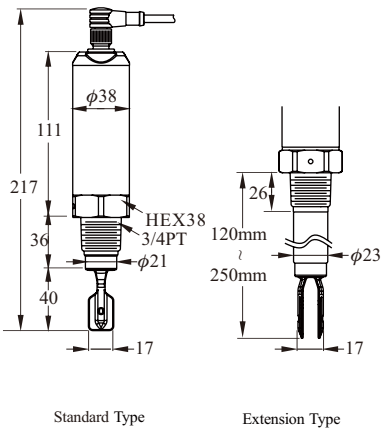
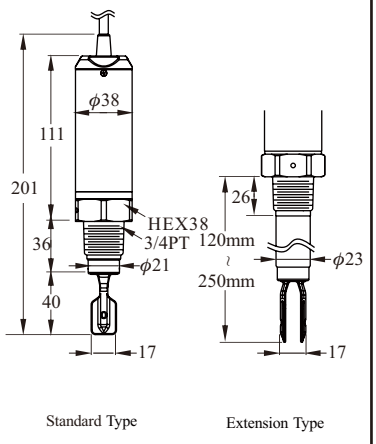
APPLICATION SCOPE

It is applicable to the max. and min. level detection of the tanks or tubes filled with various solid/liquid media. The product has a variety of applications, such as in the chemical fiber industry, rubber industry, tire industry, cement industry, steel industry, food industry, pharmaceutical industry, and animal feed factories in terms of the level detection for the bins of the raw material/process/finished products.

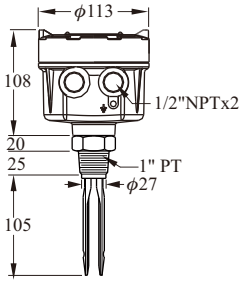
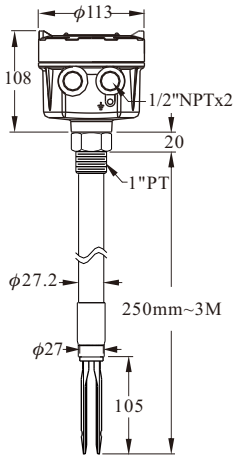
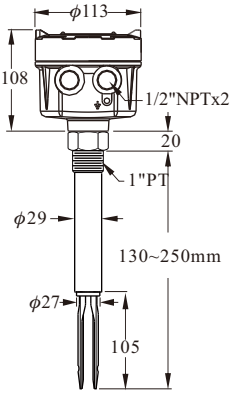
LITE-TYPE

Dimensions (Unit:mm)			
Model no.	**SC2400/2410 【DIN Connector】**	**SC2400/2410 【M12 Connector】**	**SC2400/2410 【Cable Wire Type】**
Supply voltage & output	SC240 □□:20~250Vac / Vdc 2 wire Contactless electronic switch. SC241□□:12~55 Vdc 3 wire PNP/ NPN Output.		
Fork length	100mm		
Ambient temp.	-40~80℃		
Ambient humidity	80% RH non-condensed		
Storage temp.	-40~85℃		
Process temp.	SC24□□□T: -40~+150℃ SC24□□□: -40~+100℃		
Process pressure	Maximum 40 Bar		
Min. material density sensed	**Solid:**density: ≥0.07g/cm^3 **Liquid:**density: ≥0.7g/cm^3 Viscosity:1~10000 cSt		
Magnetic testing	Output function test performed by putting magnets near the indicated spot		
Vibrating frequency	350~370Hz		
Status indication	Green light:indicate power supply Red light:indicate operating mode		
Housing material	SUS304		
Fork material	SUS304, SUS316, SUS316L		
IP protection	IP65	IP67	IP67
Mounting	1" more		
Conduit	Valve plug DIN 43650	M12x1 Connector(180° / 90°)	Cable connector

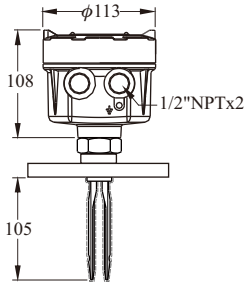
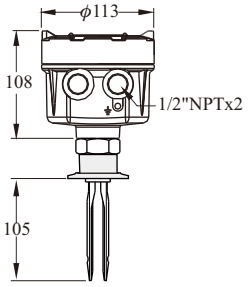
MINI-TYPE

Dimensions (Unit:mm)			
Model no.	**SC2800/2810 【DIN Connector】**	**SC2800/2810 【M12 Connector】**	**SC2800/2810 【Cable Wire Type】**
Supply voltage & output	SC280□:20~250,50/60Hz Vac/Vdc 2 wire Contactless electronic switch. SC281□:12~55 Vdc 3 wire PNP/ NPN Output		
Fork length	40mm		
Ambient temp.	-40°C~80°C		
Ambient humidity	80% RH non-condensed		
Storage temp.	-40°C~85°C		
Process temp.	SC28□□□: -40°C~100°C SC28□□□T: -40°C~150°C		
Process pressure	−1~600PSI (40BAR)		
Min. material density sensed	**Liquid:**density: ≥0.7g/cm^3 Viscosity:1~10000 cSt		
Magnetic testing	Output function test performed by putting magnets near the indicated spot		
Vibrating frequency	1 KHz±10%		
Status indication	Green light:indicate power supply Red light:indicate operating mode		
Housing material	SUS304		
Fork material	SUS304, SUS316, SUS316L		
IP protection	IP65	IP67	IP67
Mounting	3/4"more		
Conduit	Valve plug DIN 43650	M12x1 Connector(180° / 90°)	Cable connector

STANDARD TYPE

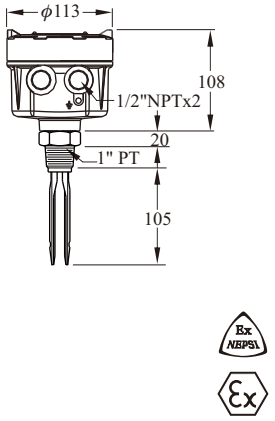
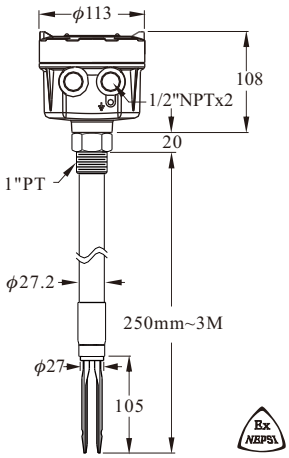
Dimensions (Unit:mm)			
Model No.	**SC1400 【Standard Type】**	**SC1410【Tuning Fork Ultra Extension Type】**	**SC1420【Tuning Fork Extension Type】**
Level sensor housing	Aluminum / IP65		
Probe construction	SUS 304 / 316 / 316L		
Mounting	1"PT		
Conduit	1/2"NPT×2		
Max. vertical load on rod.	177in.Lbs(20Nm)		
Process pressure.	-1~600PSI (40BAR)		
Power supply	20~250Vac/Vdc,50/60Hz		
Power consumption	10VA		
Ambient temp.	-40°C~60°C		
Process temp.	-40°C~130°C		
Signal output	Relay, SPDT, 5A/250Vac/ 28Vdc, 1 set or 2 set SSR(MOSFET) 400mA/60 Vac/ Vdc, 1 set or 2 set		
Min. material density sensed	Solid:≥0.07g/cm^3, Liquid: ≥0.7g/cm^3		
Time delay	0.6 Second / Operate; 1~3 Seconds / Reset		
Vibrating frequency.	350~370Hz		
Selectable Fail-safe	Hi./ Lo.		
Selectable sensitivity	Hi./ Lo.		

STANDARD TYPE

Dimensions (Unit:mm)		
Model No.	**SC1540 【Corrosion Proof Type】**	**SC1600 【Sanitary Type】**
Level sensor housing	Aluminum / IP65	
Probe construction	316L Coating TEFLON	316L
Mounting	1" Flange (min.)	2" Sanitary
Conduit	1/2"NPT × 2	
Max. vertical load on rod.	177in.Lbs(20Nm)	
Process pressure.	-1~600PSI (40BAR)	
Power supply	20~250Vac/dc, 50/60Hz	
Power Consumption	10VA	
Ambient temp.	-40℃~60℃	
Process temp.	-40℃~130℃	
Signal output	Relay, SPDT, 5A/250Vac/ 28Vdc, 1 set or 2 set SSR(MOSFET) 400mA/60 Vac/ Vdc, 1 set or 2 set	
Min. material density sensed	Solid: ≥0.07g/cm^3, Liquid: ≥0.7g/cm^3	
Time delay	0.6 Second / Operate; 1~3 Seconds / Reset	
Vibrating frequency.	350~370Hz	
Selectable Fail-safe	Hi./ Lo.	
Selectable sensitivity	Hi./ Lo.	

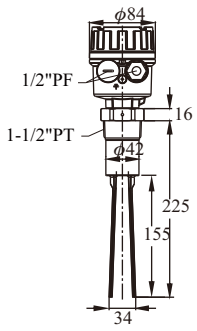
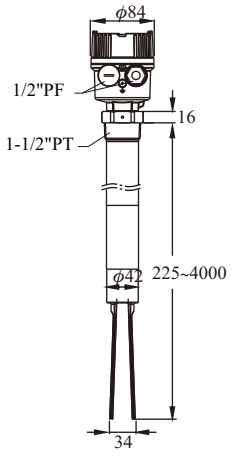
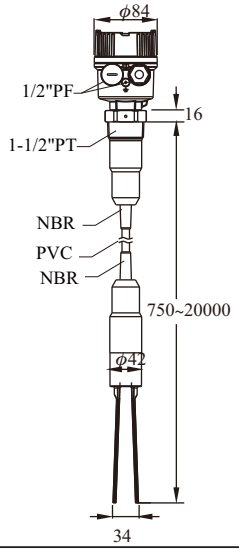
EX-PROOF TYPE

NEPSI PROOF No.GYB16.1938X Exd IIC T3~T6 Gb ExtD A20/A21 IP65 T80°C or T95°C or T130°C or T195°C
PTB PROOF No. 09 ATEX 1058 ⟨Ex⟩ II 2G Ex d IIB T4
⟨Ex⟩ II 2D Ex tD A21 IP65 T130°C or T95°C or T80°C

Dimensions (Unit:mm)		
Model No.	**SC1740 【Standard Type】**	**SC1741【Tuning Fork Ultra Extension Type】**
Level sensor housing	Aluminum	
Probe construction	SUS 304 / 316 / 316L	
Mounting	1"PT	1"PT
Conduit	1/2"NPT×2	
Max. vertical load on rod.	177in.Lbs(20Nm)	
Process pressure.	-1~600PSI (40BAR)	
Power supply	20~250,50/60Hz Vac/Vdc	
Power consumption	10VA	
Ambient temp.	-20°C~70°C	
Process temp.	-40°C~130°C	
Signal output	Relay, SPDT, 3A/250Vac/ 28Vdc, 1 set or 2 set SSR(MOSFET) 400mA/60 Vac/ Vdc, 1 set or 2 set	
Min. material density sensed	Solid: ≥0.07g/cm^3, Liquid: ≥0.7g/cm^3, viscosity : 1~10000 cst	
Time delay	0.6 Second / Operate; 1~3 Seconds / Reset	
Vibrating frequency.	350~370Hz	
Selectable Fail-safe	Hi./ Lo.	
Selectable sensitivity	Hi./ Lo.	

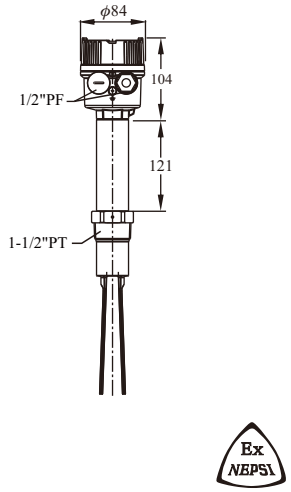
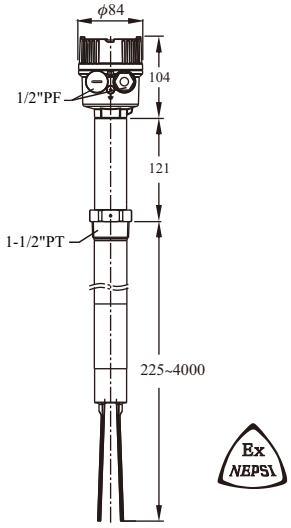
SC35 TUNING FORK LEVEL SWITCH

NEPSI PROOF No.GYJ14.1150
DIP A20/21 T_A,T2~T6 IP66/67

Dimensions (Unit:mm)			
Model No.	**SC350【Standard Type】**	**SC351【Extension Type】**	**SC352【Cable Type】**
Level sensor housing	Built-in box, aluminum coating IP66/IP67		
Power supply	19 ~253 Vdc / Vac, 50/60 Hz ; NPN / PNP(10~55Vdc)		
Probe construction	Max. 1.5 W		
Voltage endurance capability	3.7 kV		
Overvoltage protection	overvoltage category II		
Storage temp.	-40~85 °C		
Ambient temp.	-40~85 °C		-40~75 °C
Process temp.	-40~150 °C	-40~150 °C	-40~80 °C
Material density	≥ 0.01 g/cm^3 or ≥ 0.05 g/cm^3		
Measuring frequency	140 Hz ± 5 Hz		
Material dimension	Max.10 mm		
Conduit	1/2”PF / 1/2”NPT(Ex-proof type only supports 1/2”NPT)		
External diameter of cable applicable to conduit	ϕ6~ϕ10 mm		
Pressure resistance	Max.25 Bar		Max. 2 Bar
Output signal	2 sets of SPDT relay output/2 sets of transistor output / 3 wires NPN/PNP transistor output		
Contact capacity	Relay: 6A / 250Vac，6A / 28Vdc ; Transistor: 350mA，60Vac / Vdc NPN / PNP / Transistor: 350mA，55Vdc		
Ex-proof certification	Dust ex-proof (DIP A20/21 T_A，T2~T6 IP66/67, optional)		

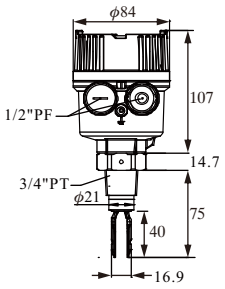
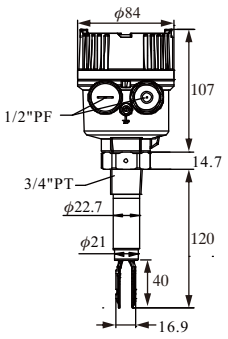
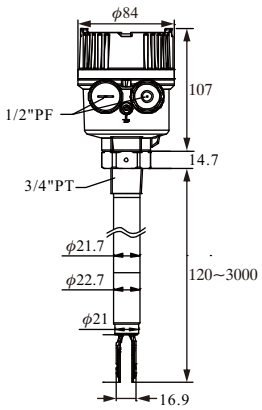
SC35 TUNING FORK LEVEL SWITCH

NEPSI PROOF No.GYJ14.1150
DIP A20/21 T_A,T2~T6 IP66/67

Dimensions (Unit:mm)		
Model No.	**SC350【High-temp. Type】**	**SC351【 High-temp. Extension Type】**
Level sensor housing	Built-in box, aluminum coating IP66/IP67	
Power supply	19 ~253 Vdc / Vac, 50/60 Hz	
Probe construction	Max. 1.5 W	
Voltage endurance capability	3.7 kV	
Overvoltage protection	overvoltage category II	
Storage temp.	-40~85 °C	
Ambient temp.	-40~85 °C	
Process temp.	-40~280 °C	
Material density	≥ 0.01 g/cm^3 or ≥ 0.05 g/cm^3	
Measuring frequency	140 Hz ± 5 Hz	
Material dimension	Max.10 mm	
Conduit	1/2”PF / 1/2”NPT(Ex-proof type only supports 1/2”NPT)	
External diameter of cable applicable to conduit	ϕ6~ϕ10 mm	
Pressure resistance	Max. 25 Bar	
Output signal	2 sets of SPDT relay output/2 sets of transistor output	
Contact capacity	Relay: 6A / 250Vac，6A / 28Vdc Transistor: 350mA，60Vac / Vdc	
Ex-proof certification	Dust ex-proof (DIP A20/21 T_A，T2~T6 IP66/67, optional)	

SC38 MULTI-FUNCTIONAL TUNING FORK LEVEL SWITCH

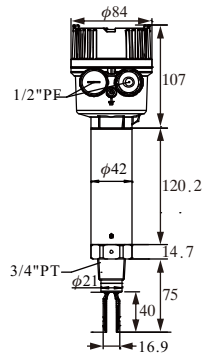
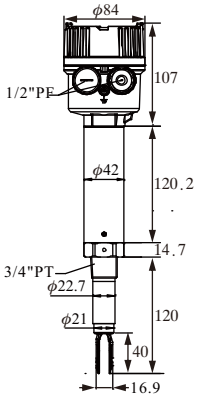
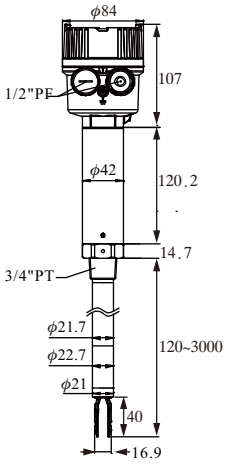
NEPSI PROOF No.GYB14.1796X
Ex ia IIC T3~T6 Ga
※ Output type is 8/16mA current output type has certified by NEPSI.

Dimensions (Unit:mm)	 **SC380** **【Standard Type】**	 **SC381** **【Extension Type】**	 **SC382** **【Ultra Extension Type】**
Output type	8/16mA output type	3 wires (NPN/PNP) output type	Dual-relay output type
Working voltage	11 ~36 Vdc	10 ~55 Vdc	19~253Vac/dc,50/60Hz
Power consumption	< 600mW	< 830mW	Max. 1.3W
Input protection	Reversed power supply protection function		NA
Overvoltage protection	overvoltage category III		
Measuring error	Max.±1mm		
Repeatability	0.5mm		
Hysteresis band	Approx.2mm		
Storage temp.	-40~85 °C		
Ambient temp.	-40~85 °C (Intrinsically safe type-40~70 °C)	-40~85 °C(Refernce operation manual)	
Process temp.	-40~150 °C (Refernce operation manual)		
Applicable density liquid	≥0.5 g/cm^3 or ≥0.7 g/cm^3		
Liquid viscosity	Max.10000mm^2 / S(10000cst)		
Granule size contained in the liquid	Max.ϕ5 mm		
External diameter of cable applicable to conduit	ϕ6~ϕ10 mm		
Pressure resistance	Max.40 Bar		
Output signal	Intrinsically safe signal 8/16mA	Transistor output (NPN/PNP)	2 sets of SPDT relay output
Contact capacity	NA	350mA，55Vdc	6A / 250Vac，6A / 28Vdc
Protection level	IP66/67		
Intrinsically safe parameters	Ui(V)=36V，Ii=100mA,Pi=1W Ci(nF)=0，Li(uH)=0	NA	NA

※It shall combine with the ex-proof fence meeting level Ex ia to form the intrinsically safe system. Please refer to page 28 for more details.

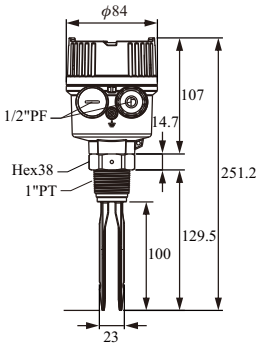
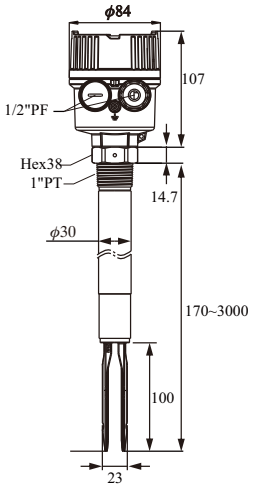
SC38 MULTI-FUNCTIONAL TUNING FORK LEVEL SWITCH

NEPSI PROOF No.GYB14.1796X
Ex ia IIC T3~T6 Ga
※ Output type is 8/16mA current output type has certified by NEPSI.

Dimensions (Unit:mm)	 **SC380 【High-temp. Type】**	 **SC381 【High-temp. Extension Type 】**	 **SC382 【High-temp. Extension Type】**
Output type	8/16mA output type	3 wires (NPN/PNP) output type	Dual-relay output type
Working voltage	11 ~36 Vdc	10 ~55 Vdc	19~253Vac/dc,50/60Hz
Power consumption	< 600mW	< 830mW	Max. 1.3W
Input protection	Reversed power supply protection function		NA
Overvoltage protection	overvoltage category III		
Measuring error	Max.±1mm		
Repeatability	0.5mm		
Hysteresis band	Approx.2mm		
Storage temp.	-40~85 °C		
Ambient temp.	-40~85 °C(Refernce operation manual)		
Process temp.	-40~150 °C		
Applicable density liquid	≥0.5 g/cm^3 or ≥0.7 g/cm^3		
Liquid viscosity	Max.10000mm^2 / S(10000cst)		
Granule size contained in the liquid	Max.ϕ5 mm		
External diameter of cable applicable to conduit	ϕ6~ϕ10 mm		
Pressure resistance	Max.40 Bar		
Output signal	Intrinsically safe signal 8/16mA	Transistor output (NPN/PNP)	2 sets of SPDT relay output
Contact capacity	NA	350mA，55Vdc	6A / 250Vac，6A / 28Vdc
Protection level	IP66/67		
Intrinsically safe parameters	Ui(V)=36V，Ii=100mA,Pi=1W Ci(nF)=0，Li(uH)=0	NA	NA

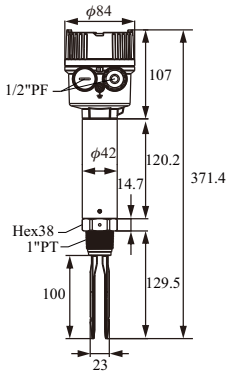
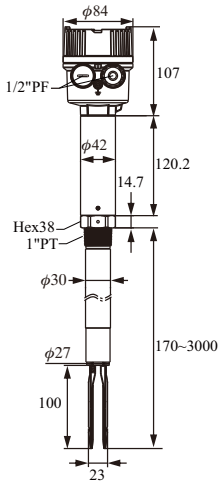
※It shall combine with the ex-proof fence meeting level Ex ia to form the intrinsically safe system. Please refer to page 28 for more details.

SC39 MULTI-FUNCTIONAL TUNING FORK LEVEL SWITCH

Dimensions (Unit:mm)	**SC390 Standard Type**  **SC391 Extension Type** 

Output type	8/16mA output type	3 wires (NPN/PNP) output type	Dual-relay output type	Dual-MOSFET output type
Working voltage	11 ~36 Vdc	10 ~55Vdc	19 ~253Vac/dc, 50/60Hz	19 ~253Vac/dc, 50/60Hz
Power consumption	< 600mW	< 830mW	Max. 1.3W	Max. 1.3W
Input protection	Reversed power supply protection function		NA	NA
Overvoltage protection	overvoltage category III			
Hysteresis band	Approx.5mm			
Ambient temp.	-40~85 °C (Refernce operation manual)			
Process temp.	-40~150 °C (Refernce operation manual)			
Applicable density liquid	≥0.5 g/cm^3 or ≥0.7 g/cm^3			
Liquid viscosity	Max.10000mm^2 / S(10000cst)			
External diameter of cable applicable to conduit	ϕ6~ϕ10 mm			
Pressure resistance	Max.60Bar			
Output signal	Intrinsically safe signal 8 / 16mA	Transistor output NPN / PNP	2 sets of SPDT relay output	MOSFET SPST×2
Contact capacity	NA	350mA · 55Vdc	6A/250Vac/28Vdc	350mA · 60Vac/dc
Protection level	IP66/67			

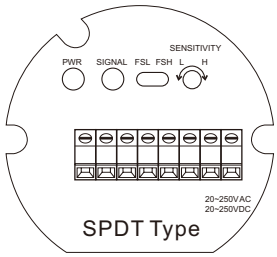
SC39 MULTI-FUNCTIONAL TUNING FORK LEVEL SWITCH

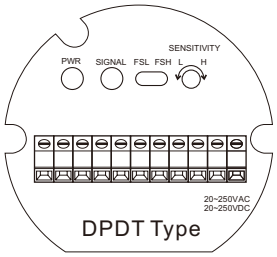
Dimensions (Unit:mm)	**SC390 High-temp. Type** 	**SC391 High-temp. Extension Type** 

Output type	8/16mA output type	3 wires (NPN/PNP) output type	Dual-relay output type	Dual-MOSFET output type
Working voltage	11 ~36 Vdc	10 ~55Vdc	19 ~253Vac/dc, 50/60Hz	19 ~253Vac/dc, 50/60Hz
Power consumption	< 600mW	< 830mW	Max. 1.3W	Max. 1.3W
Input protection	Reversed power supply protection function		NA	
Overvoltage protection	overvoltage category III			
Hysteresis band	Approx.5mm			
Ambient temp.	-40~85 °C (Refernce operation manual)			
Process temp.	-40~150 °C			
Applicable density liquid	≥0.5 g/cm^3 or ≥0.7 g/cm^3			
Liquid viscosity	Max.10000mm^2 / S(10000cst)			
External diameter of cable applicable to conduit	ϕ6~ϕ10 mm			
Pressure resistance	Max.60Bar			
Output signal	Intrinsically safe signal 8 / 16mA	Transistor output NPN / PNP	2 sets of SPDT relay output	MOSFET SPST×2
Contact capacity	NA	350mA · 55Vdc	6A/250Vac/28Vdc	350mA · 60Vac/dc
Protection level	IP66/67			

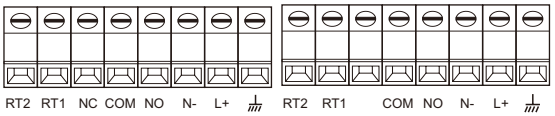
WIRING INSTRUCTIONS (STANDARD TYPE)

SC1400X, SC1410X, SC1420X, SC1540X,SC1600X, SC1740X, SC1741X

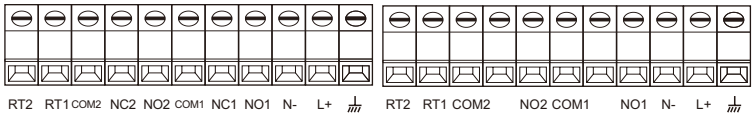




Relay output type(SPDT) SSR(MOSFET) output type



Relay output type (DPDT) SSR(MOSFET) output type



FUNCTIONAL DESCRIPTION

Description of terminal functions

- L+, N-: Power Supply
- NC, COM, No: Relay Output
- RT1, RT2: Remote-Test
- ⏚ : Ground Connection
- COM1, NO1 : SSR(MOSFET) Output
- COM2, NO2 : The second set of SSR (MOSFET) output (Optional)

DESCRIPTION OF PANEL FUNCTIONS

- PWR: Power Supply (Green Light)
- SIGNAL: Output Indication (Red Light)
- FSH: Power On. The signal lamp is on and the relay is conductive. While the tuning fork switch senses the material, the signal lamp is off and relay is not conductive.
- FSL: Power On. The signal lamp is off and the relay is not conductive. While the tuning fork switch senses the material, the signal lamp is on and relay is conductive.
- SENSITIVITY L: Low Sensitivity
- SENSITIVITY H: High Sensitivity

FAIL-SAFE HIGH / LOW PROTECTION

FSH (Fail-Safe High) Protection:

Switch to FSH mode.

Normal Status: The signal lamp is on. It indicates that the tuning fork switch does not sense the material and the relay is conductive.

Failure: When the power shuts down, the signal lamp is off. It indicates that the tuning fork switch is voided and the relay is not conductive.

FSL (Fail-Safe Low) Protection:

Switch to FSL mode.

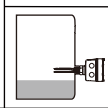
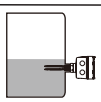
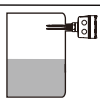
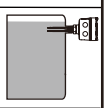
Normal Status: The signal lamp is on.

The tuning fork switch senses the material and the relay is conductive.

Failure: When the power shuts down, the signal lamp is off. The tuning fork switch is voided and the relay is not conductive.

SENSITIVITY ADJUSTMENT

The SENSITIVITY is located on the right side of the panel. The user is able to do the minor adjustment by the screw driver when it rotates for 22 turns. If it turns to H position clockwise, the sensitivity increases; if it turns to L position anti-clockwise, the sensitivity decreases. The sensitivity is originally set at max. value. The switching point is at 15mm from the tip of the tuning fork.The switching point position will be changed by the sensitivity value. If the sensitivity adjusts to lower value, the switching point position is moving backward; if the sensitivity adjusts to high value, the switching point position is moving forward. User may change the switching point position by adjusting the sensitivity. The changing range of switching point is about 60mm. For example, if the switching point needs to be moved backward by 30mm, the user needs to adjust SENSITIVITY anti-clockwise by 10 turns. In general cases, there is no need for sensitivity adjustment.

	FSL		FSH	
Level				
Contact form				
Indication				
Status	Fail	Normal	Normal	Fail

WIRING INSTRUCTIONS (LITE-TYPE/MINI-TYPE)

SC240X/SC280(Two wires) WIRING

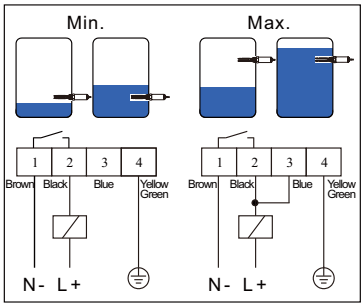
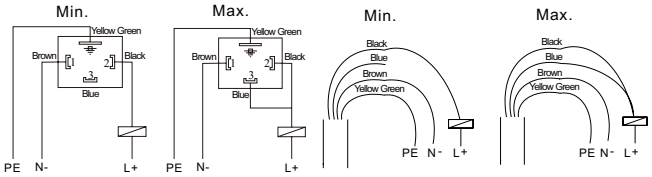


Figure 1 Two wires wiring



Wiring
Power can be AC/DC switching. Two wires are connected with terminals (L+/N-) as in Figure 1.

Low (Min.) Mode:
Pin 1 (Brown) is connected to N-. Pin 2 (Black) is connected to L+ with relay. Pin 4 (Yellow Green) connects to tank ground.

High (Max.) mode:
Pin 1 (Brown) is connected to N-. Pin 3 is connected to pin 2 (Black) to L+ with Relay . Pin 4 (Yellow Green) connects to tank ground.

SC241X/SC281(Three wires) WIRING

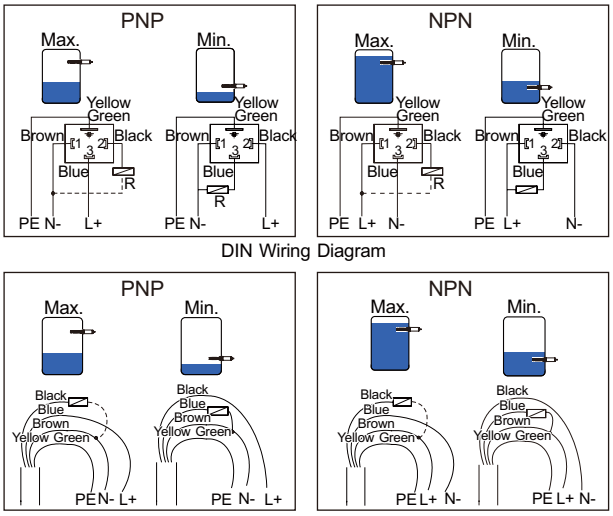


Figure 2 PNP / NPN Output Wiring Diagram

Wiring
Power supply is for DC only. Output is PNP / NPN. Please see Figure 2.

PNP wiring：
High(Max.) Mode:
Pin 1(Brown) connects to N-. Pin 3 (Blue) connects to L+. To output, it is pin 2. (Black) connects to N- with relay. Pin 4 (Yellow Green) connects to tank ground.

Low(Min.)Mode:
Pin 1 (Brown) connects to N-. Pin 2 (Black) connects to L+. To output, Pin 3 (Blue) connects to N- with relay. Pin 4 (Yellow Green) should contact to tank ground.

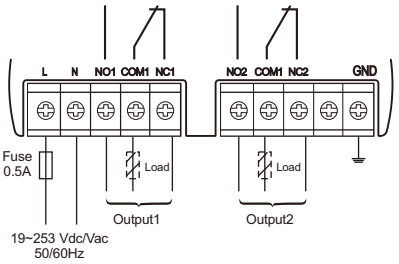
NPN wiring：
High(Max.) Mode:
Pin 1 (Brown) connects to L+. Pin 3 (Blue) connects to N-. To output, Pin 2 (Black) connects to L+ with relay. Pin 4(Yellow Green) should contact to tank ground.

Low(Min.)Mode:
Pin1 (Brown) connects to L+. Pin 2 (Black) connects to N-. To output Pin 3 (Blue) connects to L+ with relay. Pin 4 (Yellow Green) should contact to tank ground.

WIRING INSTRUCTIONS (SC35)

WIRING CONFIGURATION DIAGRAM AND INTRODUCTION OF FEATURES

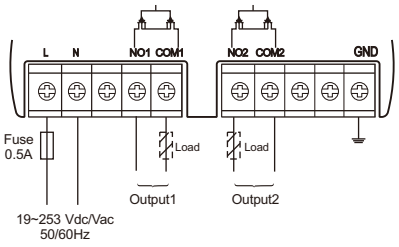
Dual-relay output



Load: External load
U ~ max. 250Vac@I_L ~ max. 6A
U ⎓ max. 28Vdc@I_L ⎓ max. 6A

Failure mode	Material level	Output signal			LED indicators		
		output1	output2		Power	Status	Alarm
			S.S. OFF	S.S. ON	Green	Yellow	Red
MAX		NO1 COM1 NC1	NO2 COM2 NC2	NO2 COM2 NC2	☼	O.S. ☼ / F.S. ○	○
		NO1 COM1 NC1	NO2 COM2 NC2	NO2 COM2 NC2	☼	O.S. ○ / F.S. ☼	○
MIN		NO1 COM1 NC1	NO2 COM2 NC2	NO2 COM2 NC2	☼	O.S. ☼ / F.S. ○	○
		NO1 COM1 NC1	NO2 COM2 NC2	NO2 COM2 NC2	☼	O.S. ○ / F.S. ☼	○
Viscous material		Maintain the previous state		NO2 COM2 NC2	☼	O.S. ○ / F.S. ☼	⊘
Wear of tuning fork		NO1 COM1 NC1	NO2 COM2 NC2	NO2 COM2 NC2	☼	○	☼

Dual-transistor output



Load: External load
U ~ max. 60Vac@I_L ~ max. 350mA
U ⎓ max. 60Vdc@I_L ⎓ max. 350mA
※External load R must be connected

Failure mode	Material level	Output signal			LED indicators		
		output1	output2		Power	Status	Alarm
			S.S. OFF	S.S. ON	Green	Yellow	Red
MAX		NO1 I_L COM1	NO2 I_L COM2	NO2 I_L COM2	☼	O.S. ☼ / F.S. ○	○
		NO1 <100μA COM1	NO2 <100μA COM2	NO2 I_L COM2	☼	O.S. ○ / F.S. ☼	○
MIN		NO1 I_L COM1	NO2 I_L COM2	NO2 I_L COM2	☼	O.S. ☼ / F.S. ○	○
		NO1 <100μA COM1	NO2 <100μA COM2	NO2 I_L COM2	☼	O.S. ○ / F.S. ☼	○
Viscous material		Maintain the previous state		NO2 <100μA COM2	☼	O.S. ○ / F.S. ☼	⊘
Wear of tuning fork		NO1 <100μA COM1	NO2 <100μA COM2	NO2 <100μA COM2	☼	○	☼
Output1>350mA		NO1 <100μA COM1	Maintain the previous state	NO2 <100μA COM2	☼	⊘	☼
Output2>350mA		Maintain the previous state	NO2 <100μA COM2	NO2 <100μA COM2	☼	☼	☼
Output1 & Output2>350mA		NO1 <100μA COM1	NO2 <100μA COM2	NO2 <100μA COM2	☼	⊘	⊘

※When output is off, there will be no error current status

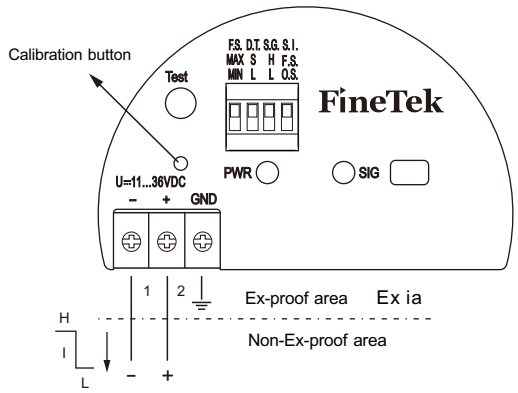
☼ : ON ⊘ : Flash ○ : OFF

⎍ | : Relay ON | ⎍ : Relay OFF I_L : Load current

WIRING INSTRUCTIONS (SC38 & SC39)

WIRING CONFIGURATION DIAGRAM AND INTRODUCTION OF FEATURES

8/16mA output

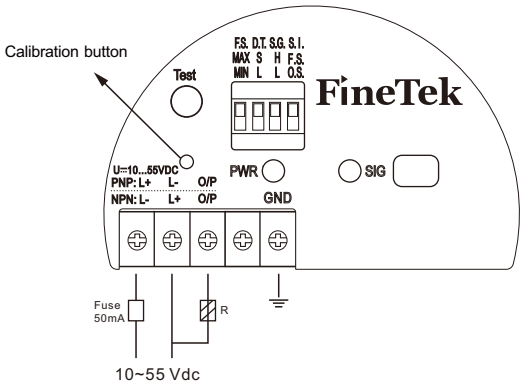


Failure mode	Material level	Output signal	LED indicators
MAX		+ 2 ~16mA 1	O.S. ☼ F.S. ○
		+ 2 ~8mA 1	O.S. ○ F.S. ☼
MIN		+ 2 ~16mA 1	O.S. ☼ F.S. ○
		+ 2 ~8mA 1	O.S. ○ F.S. ☼
Instrument failure		+ 2 <3.6mA 1	☼ ⌀

~16mA=16mA ±5%
~8mA=8mA ±5%

☼ :ON ⌀ :Flash ○ :OFF

PNP/NPN Output

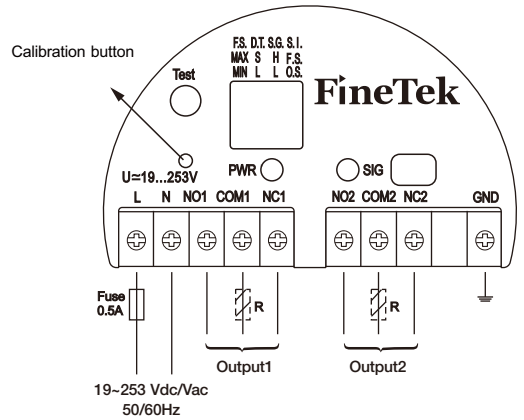


Failure mode	Material level	Output signal	LED indicators
MAX		□ I_L □	O.S. ☼ F.S. ○
		□ <100μA □	O.S. ○ F.S. ☼
MIN		□ I_L □	O.S. ☼ F.S. ○
		□ <100μA □	O.S. ○ F.S. ☼
Instrument failure		□ <100μA □	☼ ⌀
Over Load(I_L>350mA)		□ <100μA □	⌀ ☼

I_L : Load current
R : External load
U ⎓ max. 55Vdc@I_L ⎓ max. 350mA

☼ :ON ⌀ :Flash ○ :OFF

Dual Relay output



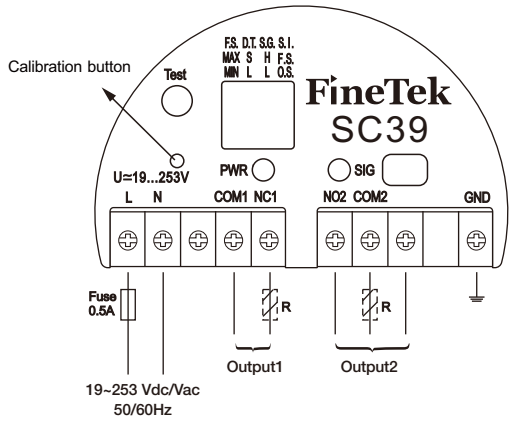
Failure mode	Material level	Output signal	LED indicators PWR	LED indicators SIG
MAX		NO1 COM1 NC1 NO2 COM2 NC2	☼	O.S. ☼ F.S. ○
		NO1 COM1 NC1 NO2 COM2 NC2	☼	O.S. ○ F.S. ☼
MIN		NO1 COM1 NC1 NO2 COM2 NC2	☼	O.S. ☼ F.S. ○
		NO1 COM1 NC1 NO2 COM2 NC2	☼	O.S. ○ F.S. ☼
Instrument failure		NO1 COM1 NC1 NO2 COM2 NC2	☼	⌀

R: External load
U ~ max. 250Vac@I_L ~ max. 6A
U ⎓ max. 28Vdc@I_L ⎓ max. 6A

☼ :ON ⌀ :Flash ○ :OFF

WIRING INSTRUCTIONS (SC38 & SC39)

Dual MOSFET Output (SC39 only)



Load: External load
U ~ max. 60Vac@I_L ~ max. 350mA
U ⎓ max. 60Vdc@I_L ⎓ max. 350mA
※Extermal load R must be connected

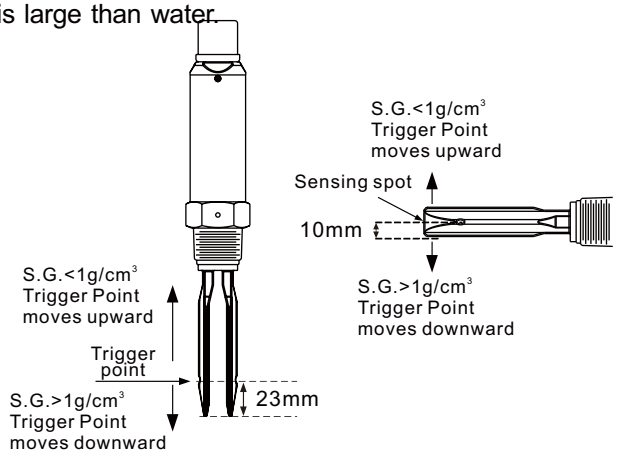
Failure mode	Material level	Output signal		LED indicators
MAX		NO1 I_L COM1	NO2 I_L COM2	O.S. ☼ / F.S. ○
		NO1 <100mA COM1	NO2 <100mA COM2	O.S. ○ / F.S. ☼
MIN		NO1 I_L COM1	NO2 I_L COM2	O.S. ☼ / F.S. ○
		NO1 <100mA COM1	NO2 <100mA COM2	O.S. ○ / F.S. ☼
Instrument failure		NO1 <100mA COM1	NO2 <100mA COM2	☼ / ☼
Over Load(IL>350mA)		NO1 <100mA COM1	Maintain the previous state	☼ / Maintain the previous state
Output2>350mA		Maintain the previous state	NO2 <100mA COM2	☼ / Maintain the previous state
Output1 & Output2>350m		NO1 <100mA COM1	NO2 <100mA COM2	☼ / ☼

I_L : Load current ☼ : ON ☼ : Flash ○ : OFF

TUNING AND INDICATION DETAILS

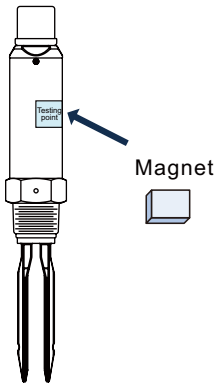
FORK TRIGGER POINT

SC14/15/16/17/24 fork trigger point is shown as below figure.
The testing medium is water(S.G.=1 g/cm^3),
and its trigger point is about 23mm from the fork tip.
If testing medium with S.G (specific gravity) lower than 1g/cm^3 (water), the trigger point would increase.
Similarly, the trigger point will downward while the S.G is large than water.



MAGNETIC TEST

After the switch is installed and powered, magnetic test function can be performed accordingly. The testing point is marked on the housing label. User holds the magnet and moves it close to testing point, the output status will switch from NO. to NC. or NC to NO. and red LED would switch ON or OFF while fork continues to vibrate. When magnet is pulled away from the testing point, the output status and red LED would return as default while fork continues to vibrate. The purpose of testing is to confirm the wiring and functioning are correct.



Output Status for Relay

Low (Min.) Mode: Tuning fork switch will be active after 3 seconds while power on. Relay is on NO status and red LED indication is off. When tuning fork is covered by testing medium, the vibration will stop and relay becomes NC status. Red LED indication then is on.

High(Max.) Mode: Tuning fork switch will be active after 3 seconds while the power on. Relay is on NC status and red LED indication is on. When tuning fork covered by testing medium, the vibration stops and relay becomes NO status. Red LED indication is on.

◎ Flashing red indicates abnormal: Possible causes overloads or short-circuit load back, equipment malfunction or wear tuning fork probe.

	Min. Mode		Max.Mode		
Level					Instrument faliure
Contactless electronic switch	1 2 Switch open	1 2 Switch closed	1 2 Switch closed	1 2 Switch open	Switch open
Red LED	○	☀	☀	○	☀

☀ It represents Blinking

Output Status for PNP / NPN Transistor

Low(Min.) Mode : Tuning fork switch will be active after 3 seconds while power on. Output transistor is on NO status and red LED indication is off. When tuning fork covered by testing medium, vibration will stop and output transistor becomes NC status. Red LED indication is on.

High(Max.) Mode: Tuning fork switch will be active after 3 seconds while power on. Output transistor is on NC status and red LED indication is on. When tuning fork covered by testing medium, vibration will stop and output transistor becomes NO status. Red LED indication is off.

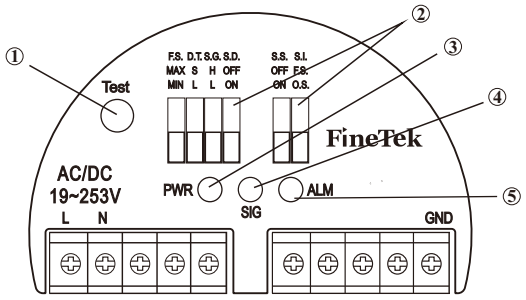
◎ Flashing red indicates abnormal: Possible causes overloads or short-circuit load back, equipment malfunction or wear tuning fork probe.

	Min. Mode		Max.Mode		
Level					Instrument faliure
PNP/ NPN Output	1 2 Switch open	1 2 Switch closed	1 2 Switch closed	1 2 Switch open	Switch open
Red LED	○	☀	☀	○	☀

☀ It represents Blinking

DESCRIPTION OF FEATURES (SC35)

PANEL INTRODUCTION

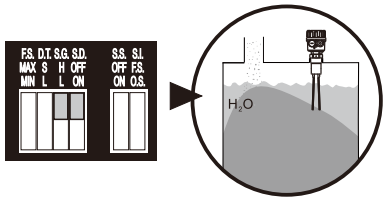


①: Test button
②: Function adjustment button
③: Power indicator
④: Status indicator
⑤: Alarm indicator

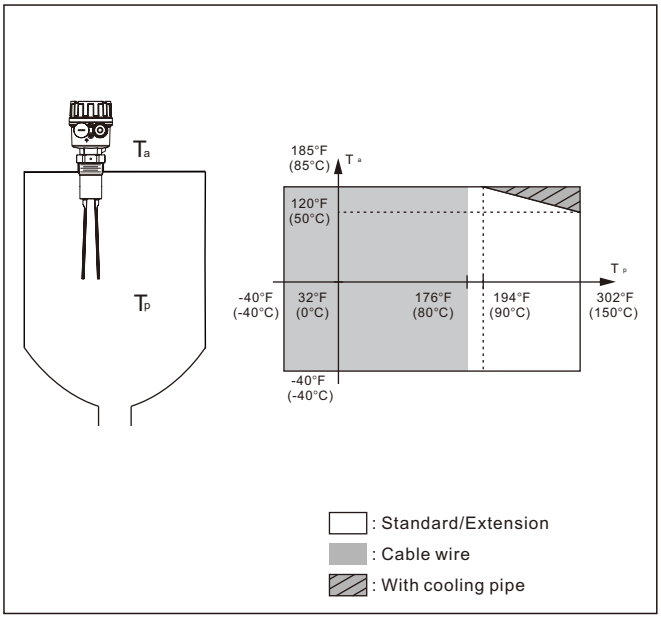
Abbreviation	Function	Option Description	Remarks
Test	Test button	Reverse the signal output	It is for the test after the installation is completed.
F.S.	Fail-Safe	MAX: High MIN: Low	It is for the high and low Fail-Safe mode.
D.T.	Delay Time	S: General setting L: Delay for 5 seconds	Covered by material: 0.5s Not covered by material: 150℃:≤1.5s 230℃/280℃:≤2s Switch to L to set it at 5 seconds for either covered or not covered by material.
S.G.	Specific Gravity	H: ≥0.05 g/cm^3 L: ≥0.01 g/cm^3	The switch to set the material density.
S.D.	Self Diagnosis	OFF: Disabled ON: Enabled	Detect the wear of the tuning fork or the viscous material and control the ON/OFF of the alarm indicator
S.S.	Super Switch	OFF: Disabled ON: Enabled	Switch the second set of output switch to the alarm indicator of the wear of the tuning fork or the viscous material for output
S.I.	Signal Indication	F.S.: Fail-Safe mode O.S.: Output mode	Turn ON/OFF the yellow indicator based on the output status or the fail-safe status.

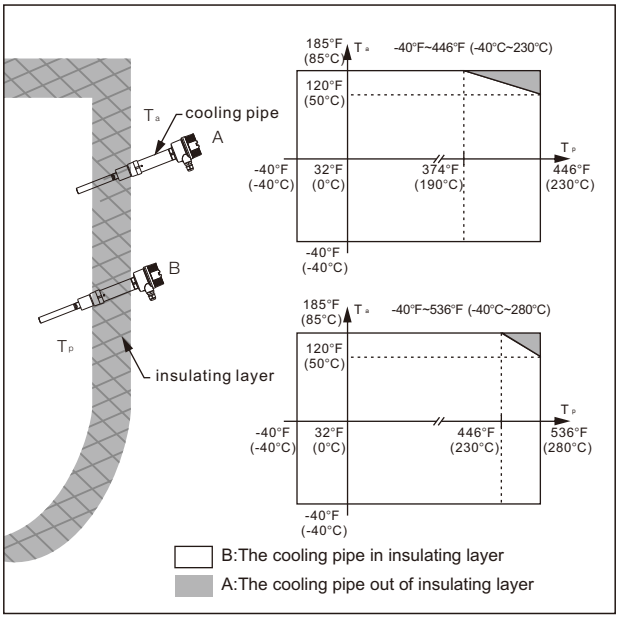
SEDIMENT DETECTION

1. It is only used to detect the sediment under the water, but can't be used for the level detection of the liquid or the doped liquid.
2. S.G. (Specific Gravity) shall be adjusted to H position.
3. S.D. (Self Diagnosis) shall be switched to OFF position.
4. SC352 cable type is inapplicable to this working environment



ENVIRONMENT/PROCESS TEMPERATURE LIMITATION

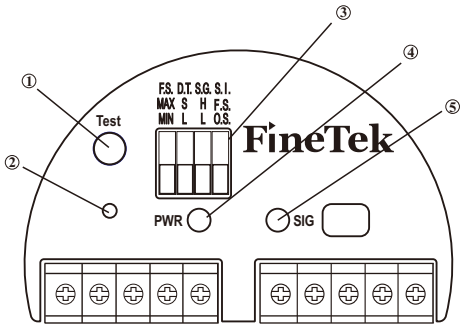




※ ETFE coating:T_p max.=150°C
※ PTFE coating:T_p max.=230°C

DESCRIPTION OF FEATURES (SC38 & SC39)

PANEL INTRODUCTION



①: Test button
②: Operation point calibration button
③: Function adjustment button
④: Power indicator
⑤: Status indicator

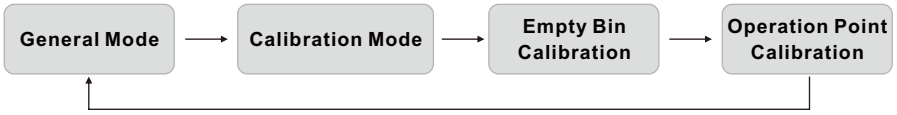
Abbreviation	Function	Option Description	Remarks
Test	Test button	Reverse the signal output	It is for the test after the installation is completed.
F.S.	Fail-Safe	MAX: High MIN: Low	It is for the high and low Fail-Safe mode.
D.T.	Delay Time	S: General setting L: Delay for 5 seconds	Covered by material: Approx. 0.5s Not covered by material: Approx. 1s Switch to L to set it at 5 seconds for either covered or not covered by material.
S.G.	Specific Gravity	H: ≥0.7 g/cm^3 L: ≥0.5 g/cm^3	The switch to set the material density.
S.I.	Signal Indication	F.S.: Fail-Safe mode O.S.: Output mode	Turn ON/OFF the yellow indicator based on the output status or the fail-safe status.

DESCRIPTION OF THE TEST BUTTON

This button is mainly provided for the user to check whether the output operation works normally after the installation is completed. When the button is pressed, the output current (8mA<->16mA) and indicator (ON<->OFF) will be reversed. Once the button is released, it will recover the original status.

FUNCTION OF CUSTOMIZED OPERATION POINT POSITION

SC38 & SC39 provides the function of customizing the operation point position according to what is required by the user.



Settings

1.Keep pressing “Calibration Button” for 3 seconds. When the red and green LED indicators flash in turn every 0.5 second, it enters the calibration mode. Press the calibration button again to enter the Empty Bin Calibration mode.

[Empty Bin Calibration]

2.Calibration status: The red LED indicator flashes every 0.5 second, and the output current switches to operate every 0.5 second (8<->16mA).

3.This mode is to calibrate the vibration frequency of the tuning fork in the air. Thus, it shall press “Calibration Button” when the tuning fork doesn’t sense any material. In this case, it will write the vibration frequency in the air, and enter the operation point calibration mode.

[Operation Point Calibration]

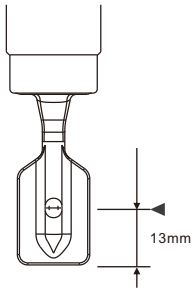
1. Calibration status: The red LED indicator flashes every 0.25 second, and the output current switches to operate every 0.25 second (8<->16mA).
2. Cover the material to the desired operating point position under this mode, and then press “Calibration Button”. It will be adjusted to the corresponding operating point position according to the H/L setting of the S.G.

DESCRIPTION OF FEATURES (SC38 & SC39)

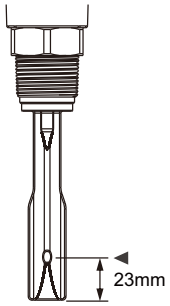
FORK TRIGGER POINT

The position of the SC38 & SC39 fork trigger point depends on the mounting position as shown in the figure below: (When the testing medium is water, S.G.=1 g/cm^3, temperature is 23˚C， and working pressure is 0 Bar). If the testing medium has an S.G lower than 1g/cm^3, the trigger point would rise. Similarly, the trigger point will move downward while the S.G is greater than water. The moving distance is subject to the S.G.

※Operating point position:◄

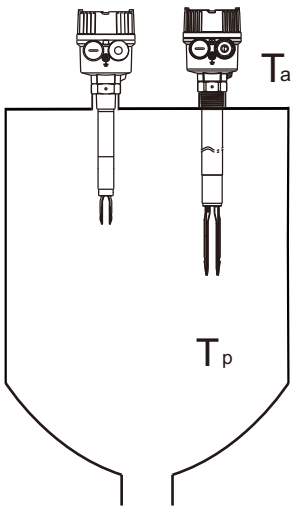


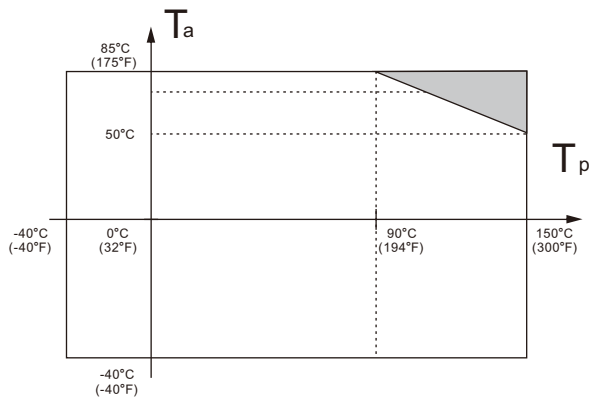
Top Mounting
SC38



Top Mounting
SC39

ENVIRONMENT AND PROCESS TEMPERATURE LIMITATION





Temp. range for general type

Temp. range for the high-temp. type installed with external radiating pipe.

MODEL NUMBER / ORDER CODE COMPARISON TABLE

Model Number	Order Code
SC1400	SCX10000-AAB
SC1410	SCX10000-CAB
SC1420	SCX10000-BAB
SC1540	SCX10000-EAB
SC1600	SCX10300-GAB
SC1740	SCX1001C-AAB
SC1741	SCX1001C-CAB

SC2400	SCX2□□00-□B
SC2410	SCX2□□00-□B
SC2800	SCX2□□00-□A
SC2810	SCX2□□00-□A

SC350	SCX3□□□□-EC(HC,JC)
SC351	SCX3□□□□-FC(IC,KC)
SC352	SCX3□□□□-DC
SC380	SCX3□□□□-AA(EA)
SC381	SCX3□□□□-BA(FA)
SC382	SCX3□□□□-CA(GA)
SC390	SCX3□□□□-AB(EB)
SC391	SCX3□□□□-BB(FB)

ORDER INFORMATION

SCX1 ⑤⑥⑦⑧-⑨ A B ⑫⑬⑭⑮⑯⑰⑱⑲⑳㉑㉒㉓㉔㉕㉖

⑤⑥ Model

00：Standard
03：Sanitary

⑦⑧ Certification

00：None
1C：ATEX-Exd
7C：NEPSI-Exd
5C：TS

⑨ Construction

A：Standard
B：Extended type
C：Lengthened type
D：Cable type
E：Anti-Corrosion probe type
F：Anti-Corrosion probe type
G：Sanitary joint type

(Next page)

⑫ Power supply

A：20~250Vac/Vdc, 50/60Hz ; Relay O/P-UL Type
B：20~250Vac/Vdc, 50/60Hz ; SSR(MOSFET)-UL Type
C：20~250Vac/Vdc, 50/60Hz ; Relay O/P - Euro Type
D：20~250Vac/Vdc, 50/60Hz ; SSR(MOSFET) - Euro Type
E：20~250Vac/Vdc, 50/60Hz ; Relay O/P*2 - Euro Type
F：20~250Vac/Vdc, 50/60Hz ; SSR(MOSFET)*2 - Euro Type

Connection

⑬⑭

Flange
AK：JIS-FF
AN：ANSI-RF
AS：DIN-FF
AI：3A

Thread
AA：JIS
AC：ANSI

⑮⑯

A8：1"
A9：1-1/4"
B1：1-1/2"
B2：2"
B4：2-1/2"
B5：3"
B7：4"
D8：DN25
E1：DN40

⑰⑱

01：PT male
03：PF male
07：NPT male
40：5 kg/cm^2
42：10 kg/cm^2
48：150 Lbs
49：300 Lbs
57：PN10
58：PN16

ORDER INFORMATION

⑲⑳ **Probe material**

MA：SUS304
MB：SUS316
MC：SUS316L

㉑㉒ **Insulated material**

00：None
14：PFA
34：ECTFE

㉓㉔㉕㉖ **Length**

Code	Probe Length
0001~9999	0001~9999mm

ORDER INFORMATION

SCX2 ⑤⑥ 0 0 - ⑨⑩⑪⑫⑬⑭⑮⑯⑰⑱⑲⑳㉑㉒㉓㉔

⑤⑥ Model

00：Standard
02：Hi-temperation

⑨ Construction

A：Standard
B：Extended type

⑩ Probe type

A：40mm
B：100mm

⑪ Power supply

A：20~250Vac/Vdc, 50/60Hz; 2 wire Contactless electronic switch
B：12~55Vdc; 3 wire PNP/NPN Output

Connection

⑫⑬

Flange
AK：JIS-FF
AN：ANSI-RF
AS：DIN-FF
AI：3A

Thread
AA：JIS
AC：ANSI

⑭⑮

A7：3/4"
A8：1"
A9：1-1/4"
B1：1-1/2"
B2：2"
B4：2-1/2"
B5：3"
B7：4"
D8：DN25
E1：DN40

⑯⑰

01：PT male
03：PF male
07：NPT male
40：5 kg/cm^2
42：10 kg/cm^2
48：150 Lbs
49：300 Lbs
57：PN10
58：PN16

⑱⑲ Probe material

MA：SUS304
MB：SUS316
MC：SUS316L

⑳ Connection

A：M12x1(180°)
B：M12x1(90°)
C：Cable
D：DIN 43650

㉑㉒㉓㉔ Length

Code	Probe Length
0076~0250	0076~0250mm

ORDER INFORMATION (SC39)

⑤⑥ Model

00：Standard
02：Hi-temperation
08：High temperature type 1
09：High temperature type 2

(Next page)

⑦⑧ Certification

01：None; 1/2" PF
02：None; 1/2" NPT
03：None; M20x1.5
2C：IECEX
5D：TS; 1/2" NPT
7B：NEPSI-Exia; 1/2" NPT
7D：NEPSI-Exd; 1/2" NPT

⑨ Construction

A：Standard
B：Extended type
C：Lengthened type
D：Cable type
E：High temperature general type
G：High temperature lengthening type
F：High temperature extension type
H：Ultra - high temperature standard type
I：Ultra - high temperature extension type
J：High temperature type 2 (280°C)
K：High temperature extended type 2 (280°C)

⑩ Probe Type

A：40mm
B：100mm
C：155mm

⑪ Housing

F：Aluminum
R：stainless steel (No explosion protection)

⑫ Housing cover

A：No Lens
B：Lens(only stainless steel)

ORDER INFORMATION (SC39)

SCX3 ⑤⑥⑦⑧-⑨⑩⑪⑫⑬⑭⑮⑯⑰⑱⑲⑳㉑㉒㉓㉔㉕㉖㉗㉘

⑬ Power supply

A：19~253Vac/Vdc, 50/60Hz; Two Relay output
B：19~253Vac/Vdc, 50/60Hz; Two Transistor output
C：10~55Vdc; 3 wire PNP/NPN Output
D：11~36Vdc; 8/16mA Output

Connection

⑭⑮
Flange
AK：JIS-FF
AN：ANSI-RF
AS：DIN-FF
AI：3A

Thread
AA：JIS
AC：ANSI

⑯⑰
A7: 3/4"
A8：1"
A9：1- 1/4"
B1：1-1/2"
B2：2"
B4：2-1/2"
B5：3"
B7：4"
D8：DN25
E1：DN40

⑱⑲
01：PT male
03：PF male
07：NPT male
40：5 kg/cm^2
42：10 kg/cm^2
48：150 Lbs
49：300 Lbs
57：PN10
58：PN16

⑳㉑ Probe material

MA：SUS304
MB：SUS316
MC：SUS316L

㉒㉓ Coating material

00：None
14：PFA
21：PTFE
34：ECTFE
36：ETFE

㉔ Surface roughness

A：Ra≦3.2um
B：Ra≦1.5um
C：Ra≦0.8um
D：Ra≦0.3um

㉕㉖㉗㉘ Length

Code	Probe Length
0075	75mm
0225~4000	225~4000mm
0075~A200	750~2000mm
0120~3000	120~3000mm

TX10 ISOLATED SAFETY BARRIER

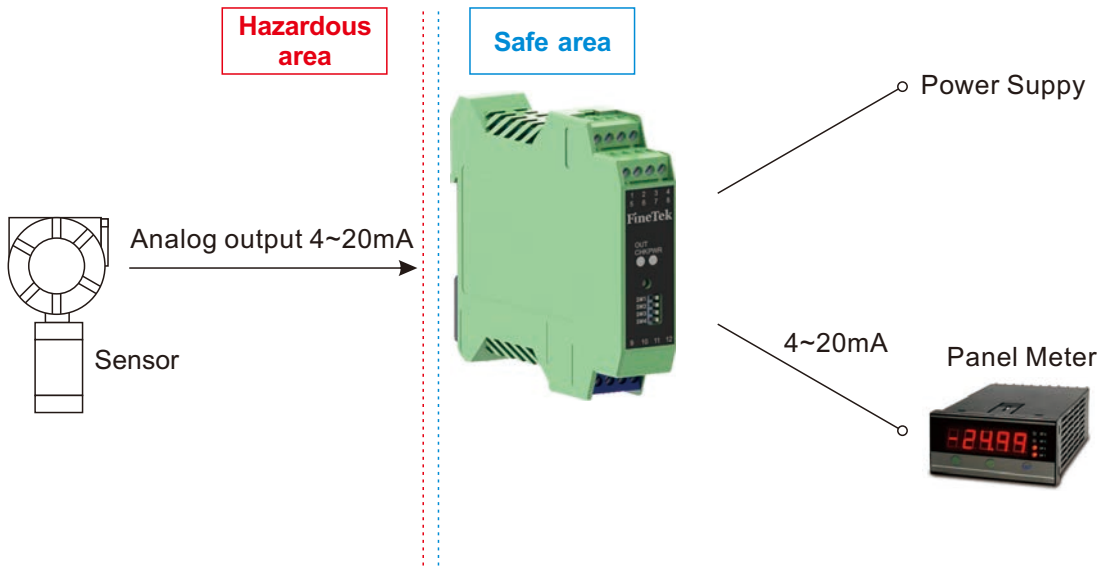
OPERATING PRINCIPLE

Isolated safety barrier provides power supply to transmitters located in hazardous zone and transmit isolated supply current signal to safe zone. Max. input 0~20mA which can be transformed to different analog outputs, such as 0~20mA / 4~20mA / 0~5V / 0~10V.

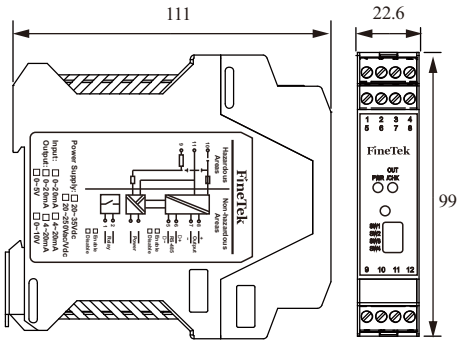
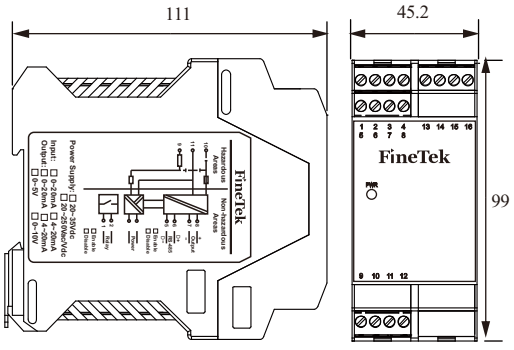
FEATURES

- 1 current input port to connect with continuous current or current output products. Applicable for use in hazardous zone.
- 3 output ports - relay output, current output, and RS-485.
- LED indicator, user friendly.
- DIP switch for function selection.
- In house programming per customers' criteria.
- Self-test function for system function monitoring.
- Setting relay output as alarm for optional external sensing unit connection.
- Optional RS-485 interface enables easy system configuration & supply current data retrieve.
- Product design complies with explosion proof standard.
- 2 dual-color LEDs
  - PWR LED: Green - Normal
    Red - Abnormal
  - OUT/CHK LED: Yellow - Relay activated
    Red (Flash) - Input current abnormal

SCHEMATIC DIAGRAM

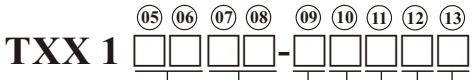


STANDARD SPECIFICATIONS

Dimensions (Unit:mm)		
Model No.	**TX100R**	**TX101F**
Supply voltage	20~35 Vdc	20~250 Vdc/Vac, 50/60 Hz
Power supply protection	Reversed power supply protection	Non-directional input
Power consumption	< 100 mA @24 V, Load 20mA	< 200 mA @24 V, Load 20mA
Hazardous Area		
Current input	0~20/4~20	
Open-circuit voltage	< 28 Vdc	
Distribution voltage	> 15 Vdc (Load 20 mA)	
Safe Area		
Output	Current: 0~20/4~20 mA Load impedance: <550 ohm or Voltage: 0~5/0~10 V Load impedance: <20k ohm	
Reaction time	5 ms (Reach 90% of the final value)	
Transmission precision	0.1 % F.S.,0.5%@<0.3V (20°C)	
Temp. coefficient	< 100 ppm/°C	
Insulation strength	2500 Vac ; Leakage current <1 mA ; 1min 1. Intrinsically safe end and non-intrinsically safe end 2. Non-intrinsically safe power supply end and output end	
Operating temp. in ambient air	-20~60 °C	
Application environment	Area 0 , Area 1, Area 2, IIA、IIB、IIC T4~T6	
Field equipment	1. Two-wire sensor 2. Three-wire sensor 3. Current output sensor	

MODEL NUMBER / ORDER CODE COMPARISON TABLE
ORDERING INFORMATION

Model Number	Order Code
TX100R	TXX1017BB
TX101F	TXX1007BC



⑤⑥Model
00：Standard(W45.2×H113.6×D99)
01：Economic(W22.6×H113.6×D99)

⑦⑧Certification
00：None
7B：NEPSI-Exia

⑨ Power supply
B：DC 20~35 Vdc
C：AC 20~250 Vac

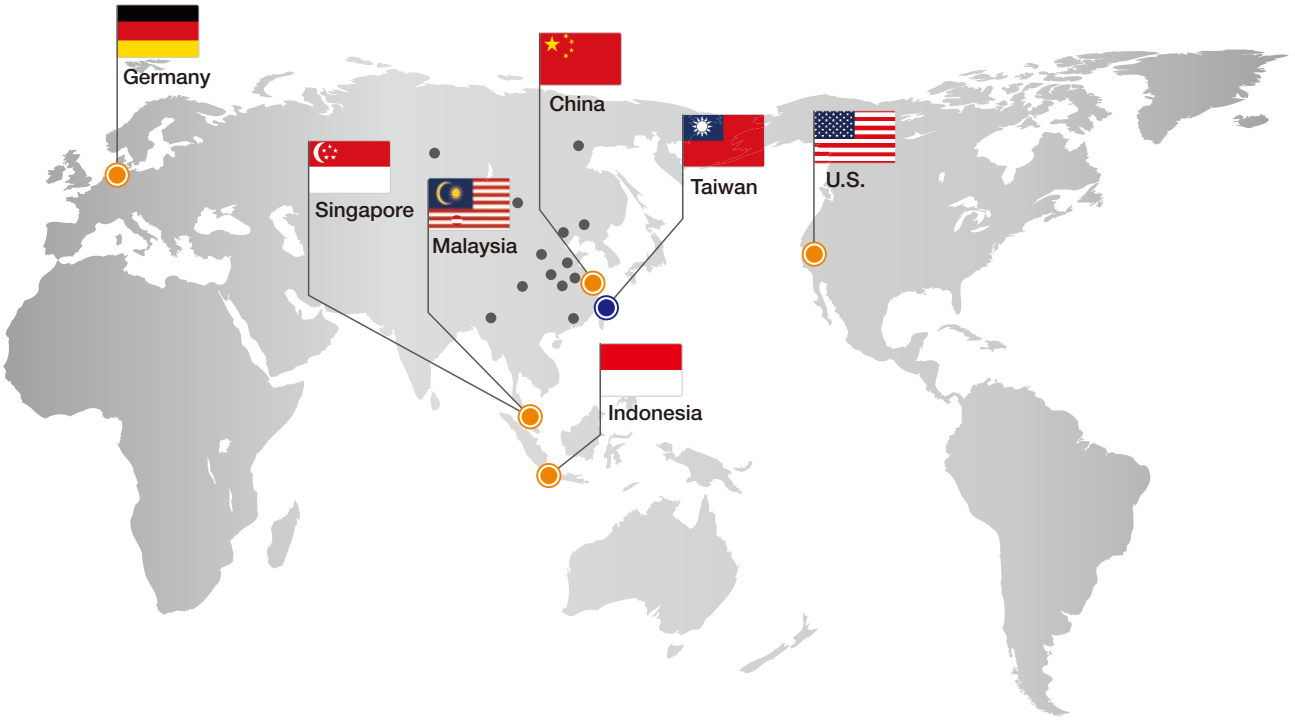
⑩ Input
A：4~20mA
B：0~20mA

⑪ Output 1
A：4~20 mA
B：0~20 mA
C：0~5 V
D：0~10 V

⑫ Output 2
0：None
A：RS485

⑬ Output 3
0：None
C：Relay

Global Network



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