

WORKING PRINCIPLE

The tuning fork of level switch operated by using two piezoelectric elements built-in on vibration tube. The first piezoelectric element triggered by pulse signal that created from circuit to transport vibration energy out, and the other piezoelectric element receives the vibration and transmits it to output electric signal. While the probe contacts material, it will cause the frequency change of output signal and the vibration will hold and send out the relay on at the same time. Tuning fork of level switch provides reliable & maintenance-free for bulk solids. Just a simple mounting and calibration procedure that keep your facility in save and monitoring. This device can withstand fiercely lateral loads and static electricity. For friendly use, Fail-safe is equipped as standard to prevent malfunction caused by power shortage.

FEATURE

- Sturdy and durable design. No calibration needed. Special design to avoid the accumulation of material on probe.
- High / Low fail safe modes
- Field-operatable in sensitivity adjustment to fit versatile density of material.

APPLICATION

- Most materials in powder can be measurable, includes the grounded coffee, milk power, chocolate, coal ash, bulk, sugar, salt, wheat, grains, glass debris, plastic pellet, cement
- Sludge level detection in waste water

The SC series detects the min. and max of level in bins, silos and hoppers, filled with powdered materials. The following list shows its applications.

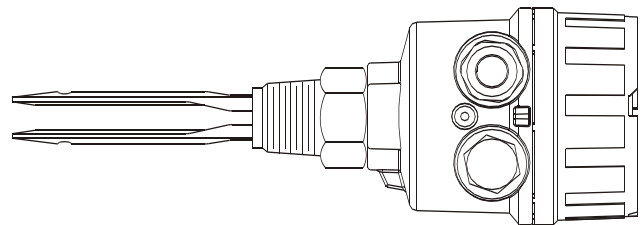
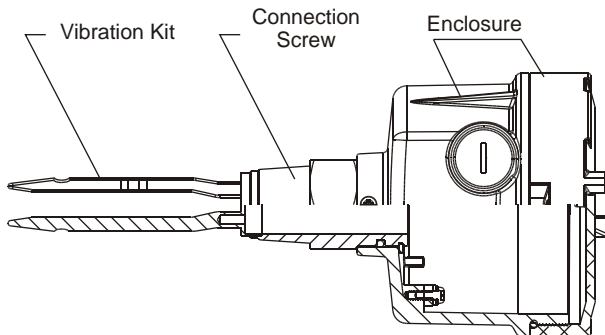
Solid Level Detection

- | | |
|---------------------------|-----------------------|
| * Powdered milk | * Peanuts |
| * Frozen potato chips | * Tobacco |
| * Beans | * Wood shavings |
| * Sugar | * Chalk |
| * Sweets | * Stearin chips |
| * Coffee beans | * Powdered cellulose |
| * Coffee ground | * Glass finely ground |
| * Coffee Powder | * Granular plastics |
| * Tea | * Gravel |
| * Salt | * Powdered clay |
| * Flour (in a flour mill) | * Polystyrene powder |
| * Foundry sand | * Styrofoam |
| * Spices | * Soda |
| * Animal food | * Soot dry |
| * Pellets | |

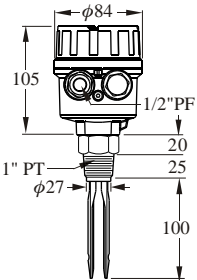
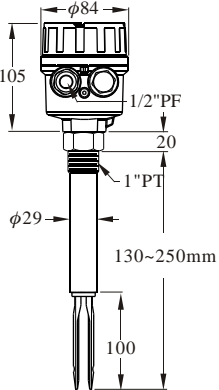
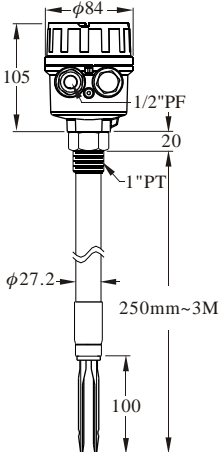
For Liquid:

- | | |
|---------------------------|--------------------|
| * Water & Solutions | * Ink |
| * General Purpose Solvent | * Liquid Resist |
| * Petroleum | * Cream |
| * Oil | * Drink & Beverage |
| * Heavy oil | |

CONSTRUCTURE



SPECIFICATION (Multi-Function Tuning Fork Level Switch)

Dimensions (Unit:mm)			
Order No.	SC3400 [Standard Type]	SC3410 [Tuning Fork Extension Type]	SC3420 [Tuning Fork Ultra Extension Type]
Level Sensor Housing	Aluminum / IP65		
Probe Construction	SUS 304 / 316		
Mounting	1"PT		
Conduit	1/2"PF × 2		
Max. Vertical load on rod.	177in.Lbs(20Nm)		
Operating Pressure.	-1~600PSI (40BAR)		
Power Supply	20~250,50/60Hz Vac/Vdc		
Power Consumption	10VA		
Operating Temp. In Ambient Air	-40°C~60°C		
Operating Temp. In Bin	-40°C~130°C		
Signal Output	Relay, SPDT, 5A/250Vac, PNP/NPN(MOSFET) 400mA/60 Vac/ Vdc		
Min. material density sensed	Solid: density: $\geq 0.07\text{g/cm}^3$ Liquid: density: $\geq 0.7\text{g/cm}^3$ 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.		

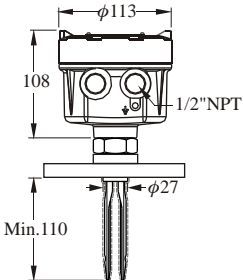
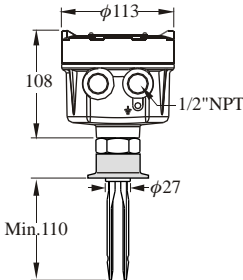
SPECIFICATION (Multi-Function Tuning Fork Level Switch)

Dimensions (Unit:mm)		
Order No.	SC3440 【Corrosion Proof Type】	SC3450 【Sanitary Type】
Level Sensor Housing	Aluminum / IP65	
Probe Construction	SUS 304/316 Coating TEFLON	SUS 304 / 316
Mounting	Flange 1"(min.)	2" Sanitary
Conduit	1/2"PF × 2	
Max. Vertical load on rod.	177in.Lbs(20Nm)	
Operating Pressure.	-1~600PSI (40BAR)	
Power Supply	20~250,50/60Hz Vac/Vdc	
Power Consumption	10VA	
Operating Temp. In Ambient Air	-40°C~60°C	
Operating Temp. In Bin	-40°C~130°C	
Signal Output	Relay, SPDT, 5A/250Vac, PNP/NPN(MOSFET) 400mA/60 Vac/ Vdc	
Min. material density sensed	Solid: density: $\geq 0.07\text{g/cm}^3$ Liquid: density: $\geq 0.7\text{g/cm}^3$ 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.	

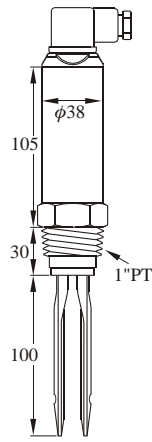
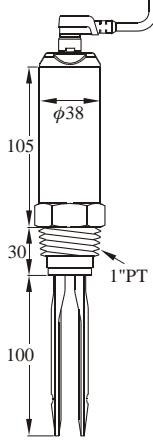
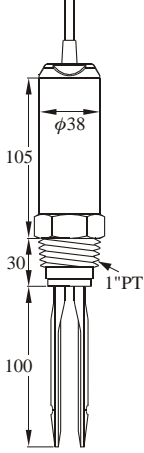
SPECIFICATION

<p>Dimensions (Unit:mm)</p>			
Order No.	SC1400	SC1410	SC1420
Model No.	MV40 【 Standard Type 】	MV41 【 Tuning Fork Extension Type 】	MV42 【 Tuning Fork Ultra Extension Type 】
Level Sensor Housing	Aluminum / IP65		
Probe Construction	SUS 304 / 316		
Mounting	1"PT		
Conduit	1/2"NPT × 2		
Max. Vertical load on rod.	177in.Lbs(20Nm)		
Operating Pressure.	-1~600PSI (40BAR)		
Power Supply	20~250Vac/dc		
Power Consumption	10VA		
Operating Temp. In Ambient Air	-40°C~70°C		
Operating Temp. In Bin	-40°C~130°C		
Signal Output	Relay, SPDT, 2A/250Vac Max.		
Min. material density sensed	Solid: $\geq 0.07\text{g/cm}^3$, Liquid: $\geq 0.7\text{g/cm}^3$		
Time Delay	0.6 Second / Operate; 1~3 Seconds / Reset		
Vibrating Frequency.	350~370HZ		
Selectable Fail-safe	Hi./ Lo.		
Selectable Sensitivity	Hi./ Lo.		

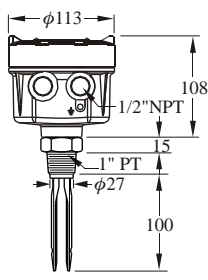
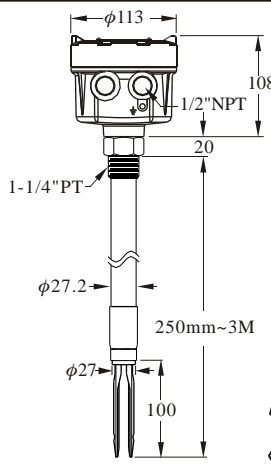
SPECIFICATION

Dimensions (Unit:mm)		
Order No.	SC1540	SC1600
Model No.	MV54 【Corrosion-Proof Type】	MV60 【Sanitary Type】
Level Sensor Housing	Aluminum / IP65	
Probe Construction	SUS 304/316 Coating TEFLON	SUS 304 / 316
Mounting	Flange 1"(min.)	2" Sanitary
Conduit	1/2"NPT × 2	
Max. Vertical load on rod.	177in.Lbs(20Nm)	
Operating Pressure.	-1~600PSI (40BAR)	
Power Supply	20~250Vac/dc	
Power Consumption	10VA	
Operating Temp. In Ambient Air	-40°C~70°C	
Operating Temp. In Bin	-40°C~130°C	
Signal Output	Relay, SPDT, 2A/250Vac Max.	
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.	

SPECIFICATION

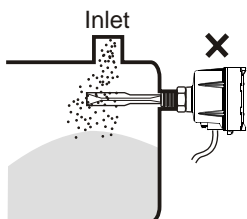
Dimensions (Unit:mm)			
Order No.	SC2400/10 DIN Connector	SC2400/10 ASI Connector	SC2400/10 Cable Wire Type
Supply Voltage & Output	SC240□□:20~250Vac / Vdc 2 wire Contactless electronic switch. SC241□□:12~55 Vdc 3 wire PNP/ NPN Output.		
Fork Length	100mm		
Operating Temp. In Ambient Air	-40~60°C		
Storage Temp.	-40~70°C		
Operating Temp. In Bin	SC24□□□: -40~+100°C SC24□□□T: -40~+150°C		
Operation Humidity	80% RH non-condensed		
Operation Pressure	Maximum 40 Bar		
Min. material density sensed	Solid: density: $\geq 0.07\text{g/cm}^3$ Liquid: density: $\geq 0.7\text{g/cm}^3$ Viscosity: 1~10000 cSt		
Magnetic testing	Output function test performed by putting magnets near the indicated spot		
Status indication	Green light :indicate power supply Red light :indicate operating mode		
Housing material	SUS 304		
Fork Material	316L, 316, 304		
IP Protection	IP65 / IP67		
Mounting	1" PT		
Conduit	Valve plug DIN 43650 / Cable connector / ASI		

SPECIFICATION

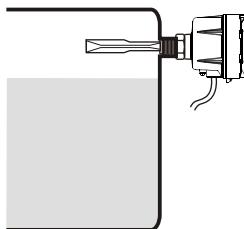
Dimensions (Unit:mm)		
Order No.	SC1740	SC1741
Model No.	MV74 【 Standard Type 】	MV74 【 Tuning Fork Ultra Extension Type 】
Level Sensor Housing	Aluminum / Ex d IIC T3~T6	
Probe Construction	SUS 304 / 316	
Mounting	1"PT	1-1/4"PT
Conduit	1/2"NPT×2	
Max. Vertical load on rod.	177in.Lbs(20Nm)	
Operating Pressure.	-1~600PSI (40BAR)	
Power Supply	20~250Vac/dc	
Power Consumption	10VA	
Operating Temp. In Ambient Air	-40°C~70°C	
Operating Temp. In Bin	-40°C~130°C	
Signal Output	Relay, SPDT, 3A/250Vac Max.	
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.	355~365HZ	
Selectable Fail-safe	Hi./ Lo.	
Selectable Sensitivity	Hi./ Lo.	

INSTALLATION FOR TUNING FORK

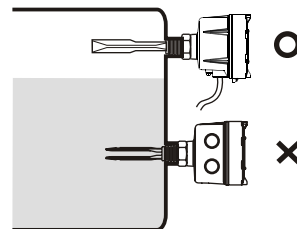
1. Can be applied for high viscosity fluid and power
Do not install near around material inlet.



2. Wiring port faces downward recommended.

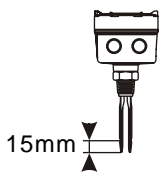


3. Consistence of the wiring port direction and always in downward direction for multi-tuning fork installation.

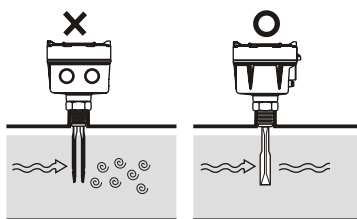


Vertical Installation:

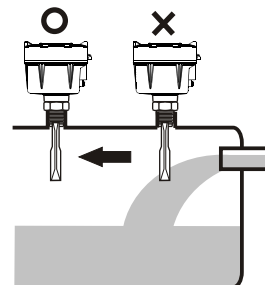
1. Depends on the sensitivity tuning, user should note the switching point is triggered around 15mm from the tip of fork.



3. Consistence of the wiring port direction for multi-tuning fork installation

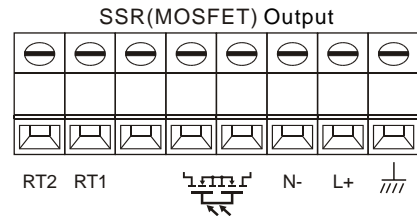
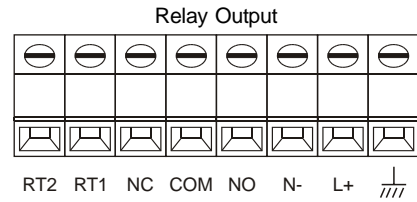
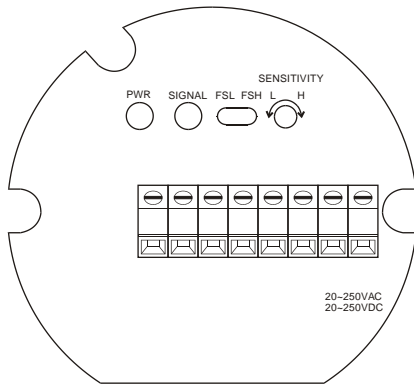


3. Do not install near material inlet.



TERMINAL / SENSITIVITY ADJUSTMENT (SPDT TYPE)

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



Terminal Function

- L+, N-: Power Supply
- NC, COM, No: Relay Output
- RT1, RT2: Remote-Test
- \perp : Ground Connection
- : SSR(MOSFET) Output

Fail-Safe High / Low Protection

FSH (Fail-Safe High) Protection:

Switch to FSH mode.

Normal Status: The signal lamp is on. It means 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 means 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.

Level	FSL		FSH	
Contact Form				
Indication				
Status	Fail	Normal	Normal	Fail

Panel Function

- 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

Sensitivity Adjustment

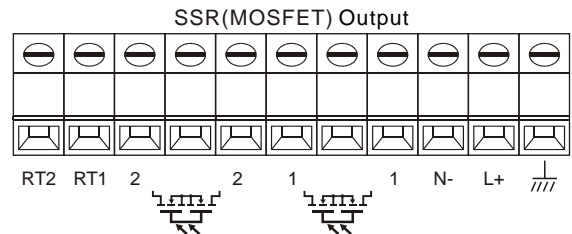
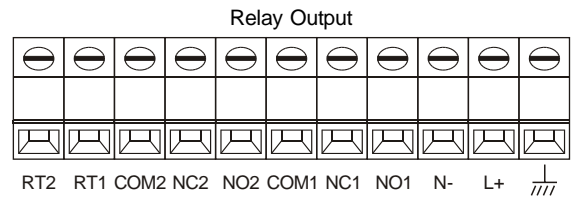
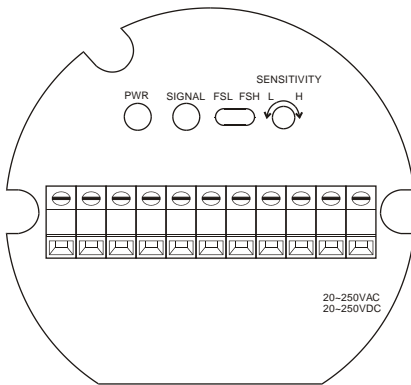
The SENSITIVITY is located on the right side of the panel. The user is able to do the minor adjustment by the screw driver. If it turns to H position clockwise, the sensitivity increases; if it turns to L position anti-clockwise, the sensitivity decreases. The sensitivity is originally set at max. value. The switching point is at 15mm from tip of tuning fork switch.

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. 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 case, it is no need for sensitivity adjustment.

TERMINAL / SENSITIVITY ADJUSTMENT (DPDT TYPE)

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



Terminal Function

- L+, N-: Power Supply
- NC1, COM1, NO1: Relay Output
- NC2, COM2, NO2: Relay Output
- RT1, RT2: Remote-Test
- \perp : Ground Connection
- : 1st SSR(MOSFET) Output
- : 2nd SSR(MOSFET) Output

Fail-Safe High / Low Protection

FSH (Fail-Safe High) Protection:

Switch to FSH mode.

Normal Status: The signal lamp is on. It means 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 means 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.

	FSL		FSH	
Level				
Contact Form	NO COM NC	NO COM NC	NO COM NC	NO COM NC
Indication	○	☀	☀	○
Status	Fail	Normal	Normal	Fail

Panel Function

- 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

Sensitivity Adjustment

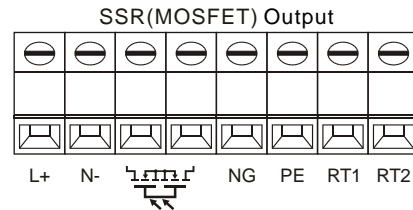
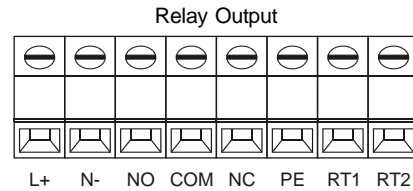
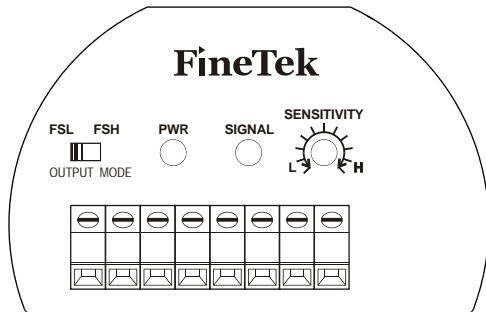
The SENSITIVITY is located on the right side of the panel. The user is able to do the minor adjustment by the screw driver. If it turns to H position clockwise, the sensitivity increases; if it turns to L position anti-clockwise, the sensitivity decreases. The sensitivity is originally set at max. value. The switching point is at 15mm from tip of tuning fork switch.

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. 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 case, it is no need for sensitivity adjustment.

TERMINAL / SENSITIVITY ADJUSTMENT (MULTI-FUNCTION TYPE)

SC3400X, SC3410X, SC3420X, SC3450X



Terminal Function

- L+, N-: Power Supply
- NC, COM, No: Relay Output
- RT1, RT2: Remote-Test
- \perp : Ground Connection
- : SSR(MOSFET) Output

Fail-Safe High / Low Protection

FSH (Fail-Safe High) Protection:

Switch to FSH mode.

Normal Status: The signal lamp is on. It means 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 means 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.

Level	FSL		FSH	
Contact Form				
Indication				
Status	Fail	Normal	Normal	Fail

Panel Function

- 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

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. 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 tip of tuning fork switch.

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. 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 case, it is no need for sensitivity adjustment.

WIRING DIAGRAM DETAILS

SC240X (Two wires) wiring

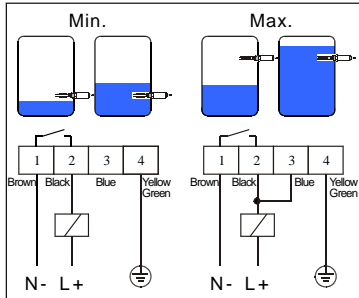
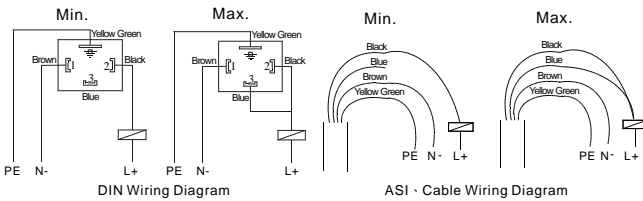


Figure 1 Two wires wiring



Wiring

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

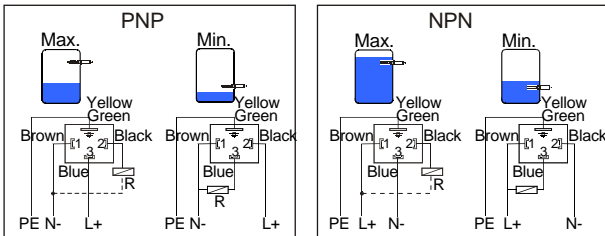
Low (Min.) Mode:

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

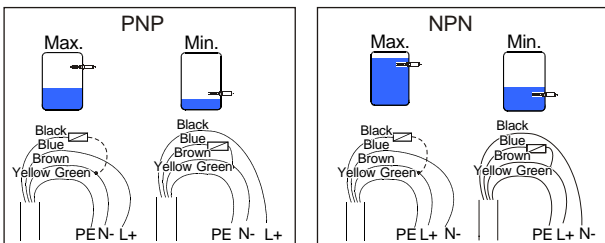
High (Max.) mode:

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.

SC240X (Two wires) wiring



DIN Wiring Diagram



ASI Cable Wiring Diagram

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.

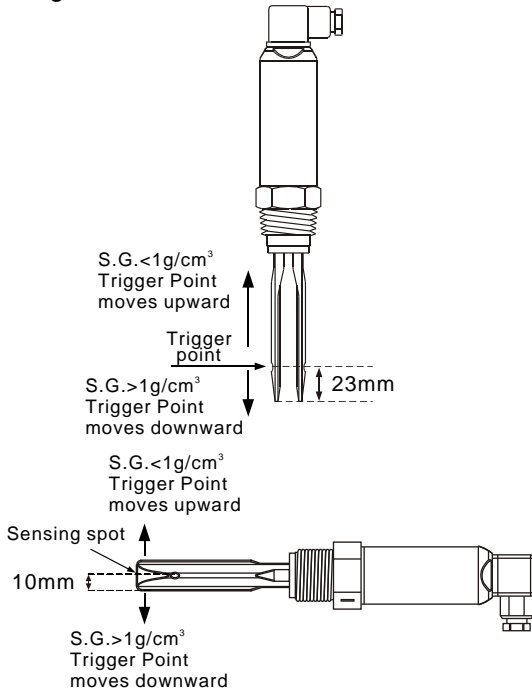
Low(Min.)Mode:

Pin 1 (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.

TUNING AND INDICATION DETAILS

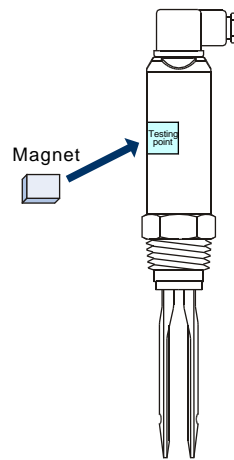
Fork Trigger Point

SC2409 fork trigger point is shown as Figure 3 below. The testing medium is water (S.G.=1 g/cm³), and its trigger point is about 23mm from the fork tip. If testing medium with S.G. (specific gravity) lower than 1g/cm³ (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 has installed and power tested, magnetic switch can be performed accordingly. Output status will switch from status of NO. to NC. or NC to NO. and red LED would indicate the vibration status by on / off. When magnet is pulled away from the housing, red LED would return as default while fork continues to vibrate. By this verification, user can confirm the wiring and function are correct or not.



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.

	Min. Mode		Max. Mode	
Level				
Contactless electronic switch				
Red LED				

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.

	Min. Mode		Max. Mode	
Level				
PNP/ NPN Output				
Red LED				

ORDER INFORMATION

SC () ()

ORDER NO.

- 3400: Multi-Function Tuning Fork Standard Type
- 3410: Multi-Function Tuning Fork Extension Type
- 3420: Multi-Function Tuning Fork Ultra Extension Type
- 3440: Multi-Function Tuning Fork Corrosion Proof Type
- 3450: Multi-Function Tuning Fork Sanitary Type
- 1400: MV40 Tuning Fork Standard Type
- 1410: MV41 Tuning Fork Extension Type
- 1420: MV42 Tuning Fork Ultra Extension Type
- 1540: MV54 Tuning Fork Corrosion Proof Type
- 1600: MV60 Tuning Fork Sanitary Type
- 1740: MV74 Explosion Proof Tuning Fork Standard Type
- 1741: MV74 Explosion Proof Tuning Fork Ultra Extension Type

POWER & OUTPUT MODULE

20~250Vac/ Vdc, 50/60Hz R: Relay O/P (Green terminal)-EuroType
N: Transistor PNP/NPN-EuroType

MATERIAL

0: SUS304 6: SUS316 P: PTFE

CONNECTION

Dimension	Specification
D---1"(25A)	M---5kg/cm ² Y---PN 25
3---1-1/4"(32A)	N---10kg/cm ² Z---PN 40
E---1-1/2"(40A)	O---150 Lbs S---others
F---2"(50A)	P---300 Lbs 9---Sanitary
G---2-1/2"(65A)	Q---PT
H---3"(80A)	R---PF(G)
I---4"(100A)	T---BSP
J---5"(125A)	U---NPT
K---6"(150A)	W---PN 10
S---others	X---PN 16

LENGTH (L) (UNIT: cm)

0500: below 500mm

1000: 501~1000mm

1500: 1001~1500mm

⋮

※ 500mm per Unit

※ Use English letter as first code for probe length over 10m.
A150 represents 15m, A200 represents 20m

BEFORE YOU ORDER

1. Please affirm the voltage.
2. Please affirm the mounting positions.
3. Please affirm the material specific gravity (S.G.) value.
4. Please affirm whether any bridge block or vibrating motor are attached onto the silo wall.

Tolerance of the total product length is 65mm

Characteristics, specifications and dimensions are subject to change without notice.

Please contact your nearest distributing office for further information.

ORDER INFORMATION

SC 24 0 (T) -

POWER SUPPLY & OUTPUT

0: 20~250Vac / Vdc 2 wire Contactless electronic switch.
 1: 12~55 Vdc 3 wire PNP/ NPN Output.

MATERIAL

0: SUS304 6: SUS316 L: SUS316L

MODEL

0: Standard

(High temp. 150BC)

ELECTRICAL CONNECTION

A: ASI C: CABLE D: Valve plug DIN43650

CONNECTION

Dimension	Specification
D---1"(25A)	M---5kg/cm ² Y---PN 25
E---1-1/2"(40A)	N---10kg/cm ² Z---PN 40
F---2"(50A)	O---150 Lbs S---Special
G---2-1/2"(65A)	P---300 Lbs
H---3"(80A)	Q---PT
I---4"(100A)	R---PF(G)
J---5"(125A)	T---BSP
K---6"(150A)	U---NPT
S---Special	W---PN 10
	X---PN 16