



# Thermal Dispersion & Paddle Type Flow Switch

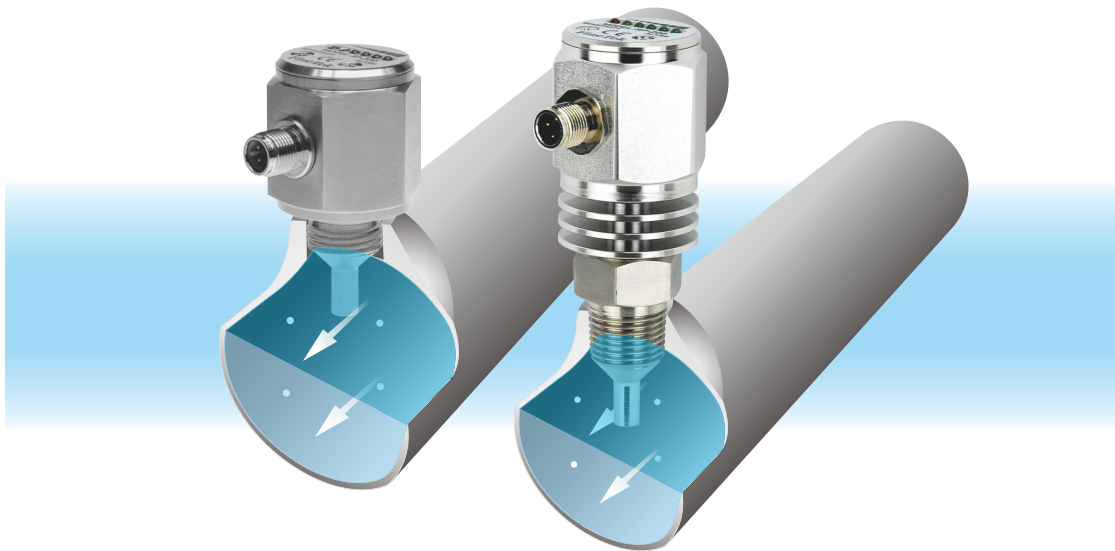


# PRODUCT INTRODUCTION

## OPERATING PRINCIPLE

Thermal dispersion flow switches measure the velocity of a liquid inside a pipe or channel. The switch's probe contains two key components – a heating sensor and temperature sensor. The heating sensor is positioned closest to the flowing liquid and provides a consistent heat. The temperature sensor measures the temperature emitted from the heating sensor.

When liquid is flowing, there is a temperature difference between the two sensors. The temperature difference has a proportional to the flow velocity (fast flowing liquids will result in greater heat differences and vice versa). Since the device contains no moving parts, has no wear and tear and maintains a long lifespan.



## FEATURES

- High sensitivity and accuracy.
- Suitable for corrosive and hazardous conditions.
- Able to be calibrated for liquids with different densities and impurities.
- Suitable for complex locations with easy installation.
- Customized probe lengths available.
- Three different output signals options.

## APPLICATION

Petrochemicals, Hydroelectric plants, Shipyard, HVAC Systems, Steel Industry Food and Beverage, Pharmaceutical, Optics and Semiconductor Industry, Cooling pipes flow control  
Any pipes carrying liquid where flow measurement is needed.

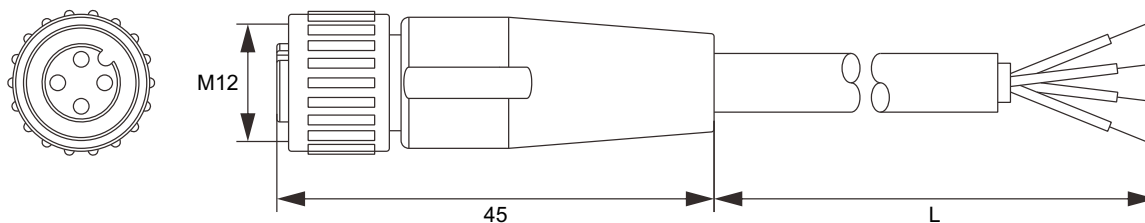
# PRODUCT SPECIFICATIONS

<b>Drawings</b>			
<b>Model</b>	<b>SP200 Compact model</b>	<b>SP201 Extension model</b>	<b>SP202 High temp. model</b>
<b>Measuring range</b>	Water: 1~150 cm/s Oil: 3~300 cm/s	Water: 1~150 cm/s Oil: 3~300 cm/s	Water: 1~150 cm/s Oil: 3~300 cm/s
<b>Switching point</b>	Flow velocity ≤ 50 cm/s @ 25°C, Water		
<b>Ambient temp.</b>	-20 ~ 80°C	-20 ~ 80°C	-20 ~ 80°C
<b>Process temp.</b>	-20 ~ 80°C	-20 ~ 80°C	-20 ~ 120°C
<b>Alarm output</b>	Open Collector : NPN / PNP (<400mA) Relay : 1A/30Vdc, 0.3A/125Vac (NO or NC)		
<b>Operating pressure</b>	100 bar (max.)	100 bar (max.)	100 bar (max.)
<b>Led indication</b>	Flow velocity below set point- Red LED on, Open Flow velocity equals set point- Yellow LED on, Close Flow velocity above set point- 4 Green LED to indicate flow speed, Close		
<b>Housing</b>	SUS304 / 316 / 316L		
<b>Wetted part</b>	SUS304 / 316 / 316L		
<b>Protection level</b>	IP67		
<b>Warm-up time</b>	Approx.15 Sec	Approx.15 Sec	Approx.15 Sec
<b>Connection thread</b>	G1/2, G1/4, NPT1/2	G1/2, NPT1/2	G1/2, G1/4, NPT1/2
<b>Operating voltage</b>	19 ~ 30Vdc		
<b>Power consumption</b>	50mA (max.)		
<b>Electric connection</b>	M12-4Pin Connector		
<b>Accessory</b>	Gasket		

<p><b>Drawings</b></p>			
<p><b>Model</b></p>	<p><b>SP210 Stainless steel model</b></p>	<p><b>SP170-(1/2) Explosion proof model</b></p>	<p><b>SP171-(1/2) Explosion-proof extension model</b></p>
<p><b>Measuring range</b></p>	<p>Water: 1~150 cm/s Oil: 3~300 cm/s</p>		
<p><b>Switching point</b></p>	<p>Flow velocity ≤ 50cm/s @25°C, Water</p>		
<p><b>Ambient temp.</b></p>	<p>-20 ~ 80°C</p>	<p>-20 ~ 60°C</p>	
<p><b>Process temp.</b></p>	<p>-20 ~ 80°C</p>		
<p><b>Alarm output</b></p>	<p>Relay: 5A/250Vac</p>	<p>Relay: 3A/250Vac</p>	
<p><b>Operating pressure</b></p>	<p>100 bar (max.)</p>		
<p><b>Led indication</b></p>	<p>Flow velocity below set point- Red LED on, Open Flow velocity equals set point- Yellow LED on, Close Flow velocity above set point- 4 Green LED to indicate flow speed, Close</p>		
<p><b>Housing</b></p>	<p>SUS304</p>		
<p><b>Wetted part</b></p>	<p>SUS304 / 316 / 316L</p>		
<p><b>Protection level</b></p>	<p>IP67</p>		
<p><b>Warm-up time</b></p>	<p>Approx.15 Sec</p>		
<p><b>Connection thread</b></p>	<p>G1/2, NPT1/2</p>		
<p><b>Operating voltage</b></p>	<p>19 ~ 30Vdc</p>		
<p><b>Power consumption</b></p>	<p>60mA (max.)</p>		
<p><b>Electric connection</b></p>	<p>5-wire Relay Output Power- red Grounding- black COM- white NC- yellow NO- blue</p>		
<p><b>Accessory</b></p>	<p>Gasket</p>	<p>_____</p>	<p>_____</p>

## OPTIONAL ACCESSORIES

### M12 ELECTRICAL CABLE CONNECTOR



### STANDARD SPECIFICATIONS

Order Code	Cable length	Voltage rating	Current rating	Working temp.	Protection grade
PC312-2101422M01	2m	Max. 250Vac	Max. 3A	-25~80°C	IP67
PC312-2101425M01	5m				
PC312-2101421001	10m				

# INSTALLATION

## INSTALLATION

1. Use the water-proof gasket provided
2. The distance "a" should be 4 times larger than the switches' screw diameter. (Fig. 1)
3. The pipe is bubble free for proper functioning. (Fig. 2)
4. For not-completely-filled pipes, install from the bottom. The liquid level needs to be higher than the probe height. (Fig. 3)
4. Must secure the mounting is firmly locked to avoid the danger of liquid leakage from the pipe. To ensure the optimal sensitivity and response time, it should be installed in the direction as shown in Figure 4
5. Installing a filter upstream can decrease liquid impurities which can reduce wear and tear on the switch.

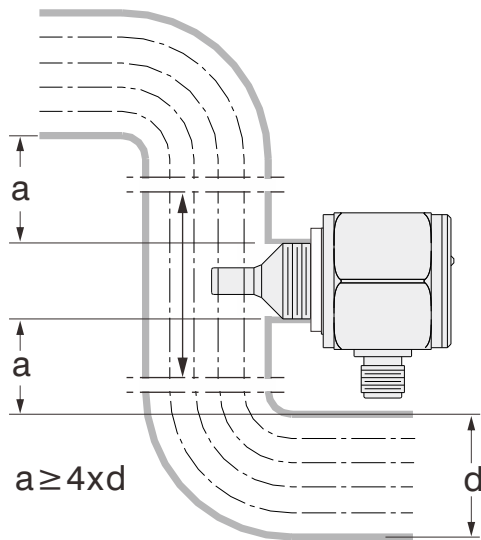


Fig. 1

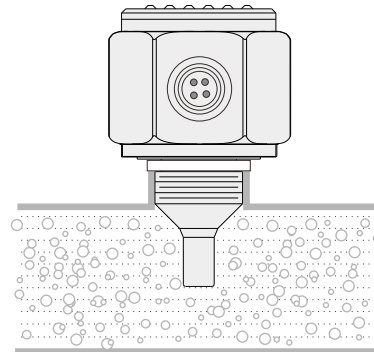


Fig. 2

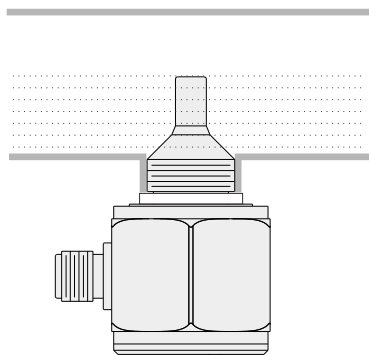
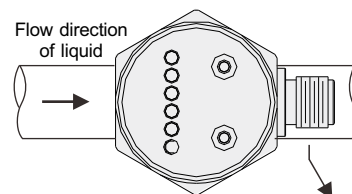


Fig. 3



The M12 socket needs to be in parallel direction as pipeline and in the side after flow passed the probe

Fig. 4



## WIRING AND CONNECTIONS

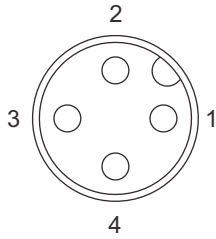


Fig. 5  
Wire terminal diagram  
(NPN, PNP and 1A relay output type)

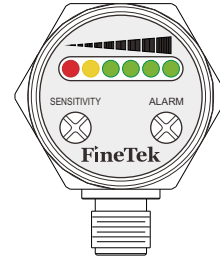


Fig. 6

## WIRING

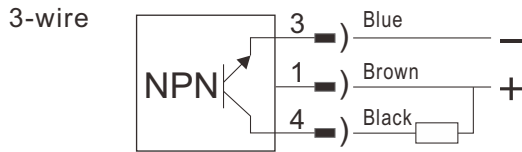


Fig. 7, NPN output type wiring

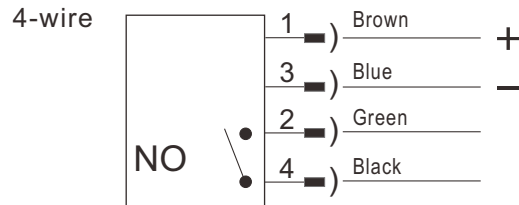


Fig. 10, Relay output type wiring (NO)

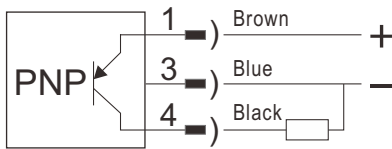


Fig. 8, PNP output type wiring

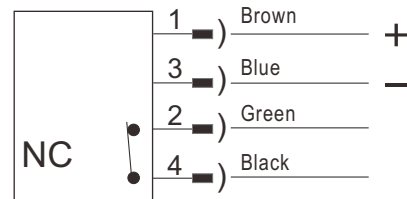


Fig. 11, Relay output type wiring (NC)

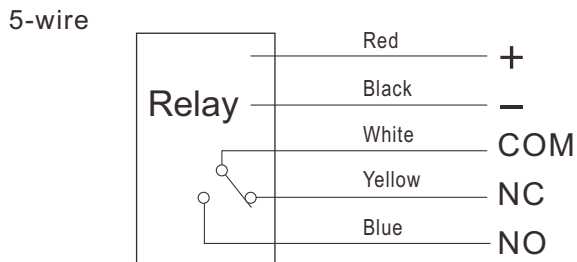
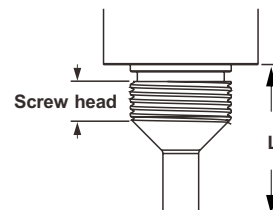


Fig. 9, Relay output type wiring

## SCREW TABLE

Screw	Standard			
	PF,BSP		PT,NPT	
	Screw head	L	Screw head	L
1/4"	8.5mm	25mm	10mm	25mm
1/2"	10.5mm	31mm	19mm	40mm
1"	16mm	36mm	20mm	40mm

Screw	Extension			
	PF,BSP		PT,NPT	
	Screw head	Screw head	Screw head	Screw head
1/2"	11.5mm	16mm	16mm	20mm
1"	16mm		20mm	







# ORDER INFORMATION

SPX1 ⑤⑥⑦⑧⑨⑩⑪⑫⑬⑭⑮⑯⑰⑱⑲⑳㉑㉒

⑤ ⑥ **Model**  
 00: Standard  
 02: Hi-temperature

⑦ ⑧ **Certification**  
 00: None  
 7C: NEPSI-Exd  
 B0: DNV

⑨ **Construction**  
 A: Compact type  
 B: Extension type  
 C: Stainless steel type  
 D: Stainless steel extension type

**Connection**

⑩ ⑪ Thread item AA: JIS AB: ISO AC: ANSI	⑫ ⑬ A4: 3/8" A2: 1/4" A5: 1/2" A7: 3/4" A8: 1"	⑭ ⑮ 01: PT male 03: PF male 05: BSP male 07: NPT male 13: GAS male
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⑯ ⑰ **Material**  
 MA: SUS 304  
 MB: SUS 316  
 MC: SUS 316L

⑱ **Output signal**  
 A: NPN  
 B: PNP  
 C: Relay 1A/30Vdc, 0.3A/125Vac(NO)  
 D: Relay 1A/30Vdc, 0.3A/125Vac(NC)  
 E: SPDT 3A/5A, 250Vac(Only stainless steel type )

⑲ ⑳ ㉑ ㉒ **Length**

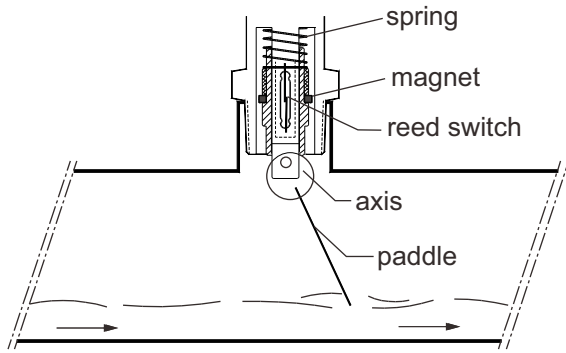
Code	Description
0031~0200	0031(PF), 0040(NPT/PT)mm, Max.0200
0070~0200	0070~0200mm

# PADDLE TYPE FLOW SWITCH

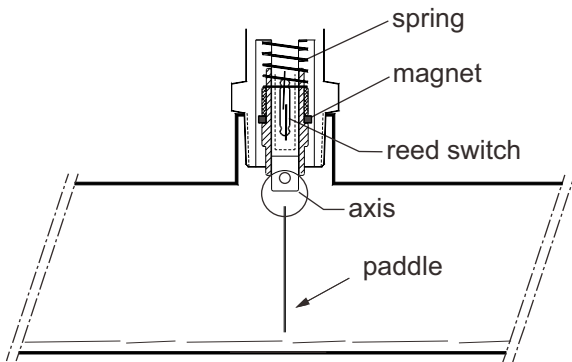
## PRINCIPLE

Flow switch can detect liquid movement in pipes. When the liquid is static or nonexistent, the spring is fully extended pulling the magnet downward and opening the switch.

As flow occurs and the paddle is thrust forward 20°~30° (or more) the paddle will push the magnet upward and actuate the switch (closing the circuit) The length of paddle can be adjusted to the pipe's diameter.



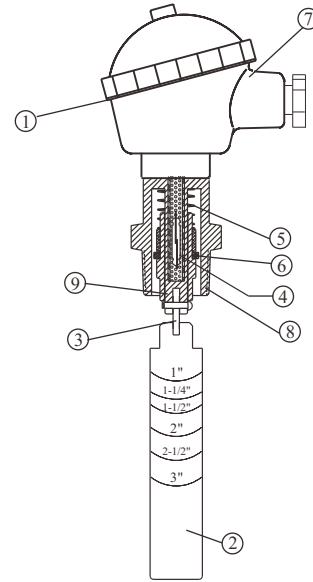
Switch on in case of liquid flowing in pipes



Switch off in case of no moving liquid in pipes

## SECTIONAL DRAWINGS

1. O-Ring
2. Paddle
3. Axis
4. Reed switch
5. Spring
6. Magnet
7. Housing
8. Screw
9. Center rod



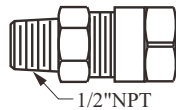


# PRODUCT SPECIFICATIONS

NEPSI Ex d IIC T4~T6 Gb

Drawings			
Model	SF1710		SF1800
	Explosion-Proof type	Enhance type	Standard type
Housing material	Stainless steel, IP65	Aluminum Alloy, Ex d	Aluminum Alloy, IP65
Process temp.	-30 ~ 130°C	-30 ~ 150°C	-30 ~ 150°C
Wetted material	SUS304		
Operation pressure	Max.355 PSIG		
Pressure drop allowance	3 PSIG		
Set point tolerance	±25%		
Repeatability tolerance	±5%		
Contact capacity	1A,40W 230Vac / 30Vdc SPDT	1A,60W 220Vac / 200Vdc SPDT	
Certification	NEPSI Ex d IIC T4~T6 Gb	N/A	

\* Optional part



## FLOW CONTROL RANGE TABLE

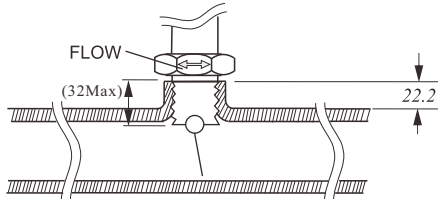
Paddle Length Flow Volume Gallon / Min.	1"		1-1/2"		2"		2-1/2"		3"	
	Act.	De-Act.	Act.	De-Act.	Act.	De-Act.	Act.	De-Act.	Act.	De-Act.
1"	4.7	3.9	10.9	8.3	19.9	16.1				
1-1/4"			7.7	6.1	16.5	12.3	31.3	22.8		
1-1/2"			5.7	4.5	13.4	9.5	25.2	18.5		
2"					8.4	6.3	15.1	12.8	29.7	21.9
2-1/2"							13.9	10	20.4	15.4
3"									17.1	12.8

※1 Gallon=3.7854 Litter

### INSTALLATION

1. The paddle length is dependent on the lowest paddle point to actuate the switch. Cut the paddle at appropriate pipe size mark or wherever desired. The minimum is 1".
2. The paddle must be at a right angle to the direction of flow
3. The FLOW mark on the screw must be parallel to the pipe.
4. Before installing the unit to a tee pipe, apply thread seal tape to the screw and then tighten.

- Not recommended for 1" or smaller NPT plastic pipes.



### CAUTION

1. The pressure and temperature ranges as shown in the catalog, must not be exceeded and also take the abrupt pressure and temperature into considerations.
2. Large sudden changes in liquid temperature and density (specific gravity) changes will influence the flow switch accuracy
3. Although highly rigid and durable, shock and vibration should be minimized.
4. Excessive fluid debris might inhibit paddle operation. Occasionally remove switch and clean off any debris.
5. Sealing electrical connections and the connection will reduce moisture damage.

# MODEL NUMBER / ORDER CODE COMPARISON TABLE / ORDER INFORMATION

Model Number	Order Code
SF1800	SFX10000-A1EAAA801
SF1710	SFX10000-A1LAAA801
	SFX1007C-A1NAAA801

SFX1 0 0 <sup>07</sup> <sup>08</sup>   -A 1 <sup>11</sup> <sup>12</sup> <sup>13</sup> <sup>14</sup> <sup>15</sup> <sup>16</sup> <sup>17</sup> <sup>18</sup> <sup>19</sup> <sup>20</sup>

**<sup>07</sup> <sup>08</sup> Certification**

00: None  
7C: NEPSI-Ex d

**<sup>11</sup> Housing**

Code	Description
E	Aluminum, IP 65, Only code for "00" on certification column.
L	Aluminum, Ex d, Only code for "00" on certification column.
N	Stainless steel, 1/2"NPT, Only code for "7C" on certification column.

**Connection**

<sup>12</sup> <sup>13</sup>	<sup>14</sup> <sup>15</sup>	<sup>16</sup> <sup>17</sup>
Thread	A8: 1"	01: PT male 07: NPT male
AA: JIS AC: ANSI		

**<sup>18</sup> <sup>19</sup> Material**

MA: SUS 304  
MB: SUS 316

**<sup>20</sup> Paddle length**

X: Standard

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