

# INSTRUCTION MANUAL FOR MICROWAVE FLOW SWITCH

TYPE  
MWFS-SW-02C

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※An operator should read carefully this instruction manual and conduct correct handling.

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## Safety Precautions

- Be sure to thoroughly read the instruction manual before using the products.
- Keep the instruction manual in a safe, convenient location for future reference.
- All or part of the contents described in this manual may be changed without any notice.
- Due to our constant striving for further improvement of products, parts or products that differ from those described in this manual may be substituted.



### **WARNING** (Failure to observe this WARNING may cause a fatal or serious injury.)

- Be sure to confirm that any peripheral equipment does not move before installation work. In addition, observe safety requirements for installation work where high-place work is expected.
- Be sure to turn off the power source before wiring, mounting and transportation work. (Failure to observe this WARNING may result in an electric shock/ injury or equipment damage due to short-circuit.)
- Carry out wiring work correctly with reference to a proper drawing.
- Never disassemble the equipment. (Failure to observe this WARNING may result in an electric shock.)
- Do not open the cover under an explosive environmental condition when power is entered. (Failure to observe this WARNING may result in an injury or equipment damage.)
- Do not place or store the equipment in any hostile environmental place where it will be subjected to direct sunlight, rain, water droplet, hazardous gas/water, etc..



### **CAUTION** (Failure to observe this CAUTION may cause a moderate injury or equipment damage.)

- Do not use the equipment for any purpose other than the original purpose of use.
- Be sure to confirm the specification of equipment and use the equipment within the range of specification. (Mounting conditions such as temperature, power source, frequency, etc.)
- Make sure a correct wiring before applying power source.
- Do not have a shock or strong impact to the equipment. (Failure to observe this CAUTION may result in equipment damage.)
- Be sure to connect necessary terminals (grounding, etc.).
- Remove all wiring to the equipment before doing electrical welding work near the equipment.
- Do not forcedly bend or pull the lead wire also do not use unnecessarily long wire.
- Tighten the cover, lead outlet, etc. properly so that dust, rainwater, etc. do not enter inside the equipment.
- Do not use the equipment under a corrosive condition (NH<sub>3</sub>, SO<sub>2</sub>, Cl<sub>2</sub>, etc.).
- Be sure to tighten the cable grand so that outer air does not enter inside the equipment.
- When applying piping connection such as conduit, etc. instead of cable grand, apply putty or equivalents on the cable entry so that outer air does not enter inside the equipment.



### **IMPORTANT** (indicates notes or information to help customers.)

#### Limitations of Warranty:

- Warranty period shall be one year from the date of delivery (ex-factory).
- Any damage of any other products that have occurred for use of the equipment is not covered by this warranty. Also any loss induced by failure or malfunction of the equipment is not covered by this warranty.
- Failure or malfunction caused by following are not covered by this warranty:
  - a. Modification or repair by a party other than MATSUSHIMA's authorized personnel, or replacement of parts not recommended by MATSUSHIMA.
  - b. Inadequate storage, installation, use, inspection or maintenance that does not comply with specifications.
  - c. Cause for any peripheral equipment or device.
  - d. Accident beyond control and force majeure (fire, earthquake, flood, riots, etc.).

Lack of instructions to MATSUSHIMA for information or safety requirements that can be predicted only by customers' side.

This warranty conditions do not limit customers' legal right.

Price for the equipment does not include any charge for services such as commissioning, supervising, etc..

## 1 . Outline

This Flow Switch is used to detect whether the solid material is flowing or not by utilizing the high-level penetration ability of microwave and the Doppler effect.

When the microwave from the Flow Switch is reflected off the flowing solid material, the frequency of the transmitted wave and that of the reflected wave differ according to the Doppler effect.

If the solid material is not flowing, there is no frequency difference.

To detect whether the solid material is flowing or not, the Flow Switch judges whether there is a frequency difference or not.

Also the microwave is not affected by any foreign matter adhering to the transmitter face of the Flow Switch, vapor, floating dust due to the strong penetration ability.

Therefore the Flow Switch can detect the flow through the insulated pipe.

## 2 . Specification

2- 1.	Type	MWFS-SW-02C
2- 2.	Power supply	AC 90~230V 50/60Hz (Max. 5.5W)
2- 3.	Operating distance	2m (The operating distance shall change according to the grain size, speed, reflectance.)
2- 4.	Frequency	Approx. 24GHz
2- 5.	Sending output	7mW typ.
2- 6.	Control output	It outputs it with the solid flows. 1-SPDT (AC 250V 3A) 【Operation】 Detection : It turns it on while flowing. ON DELAY : It turns it on with it flows more than set time. OFF DELAY : It turns it off with it doesn't flow more than
2- 7.	Self-diagnosis output	Do the self-diagnosis of the transmission decrease and the power failure of the micro wave and it outputs it. 1-SPDT (AC 250V 3A) 【Operation】 When it is normal : ON (COM-NC) Abnormal circumstances: Decrease and about six seconds of transmitting power or, after it blacks out, it turns it off.
2- 8.	Integration	0.1 ~ 10s (It is possible to adjust it. ON/OFF DELAY)
2- 9.	Permissible temperature	-10 ~ +55°C (Ambient temperature)
2-10.	Permissible pressure	−980kPa ~ +980kPa
2-11.	Material	Housing : ADC Boss : SUS304 Sending side : PTFE
2-12.	Installation method	G1 (Attachment : Lock nut , Packing)
2-13.	Enclosure	IP65
2-14.	Coating color	Munsell 7.5GY6/10
2-15.	Weight	Approx. 2.0kg

### 3. Name of each part

Figure 1 Panel detailed chart

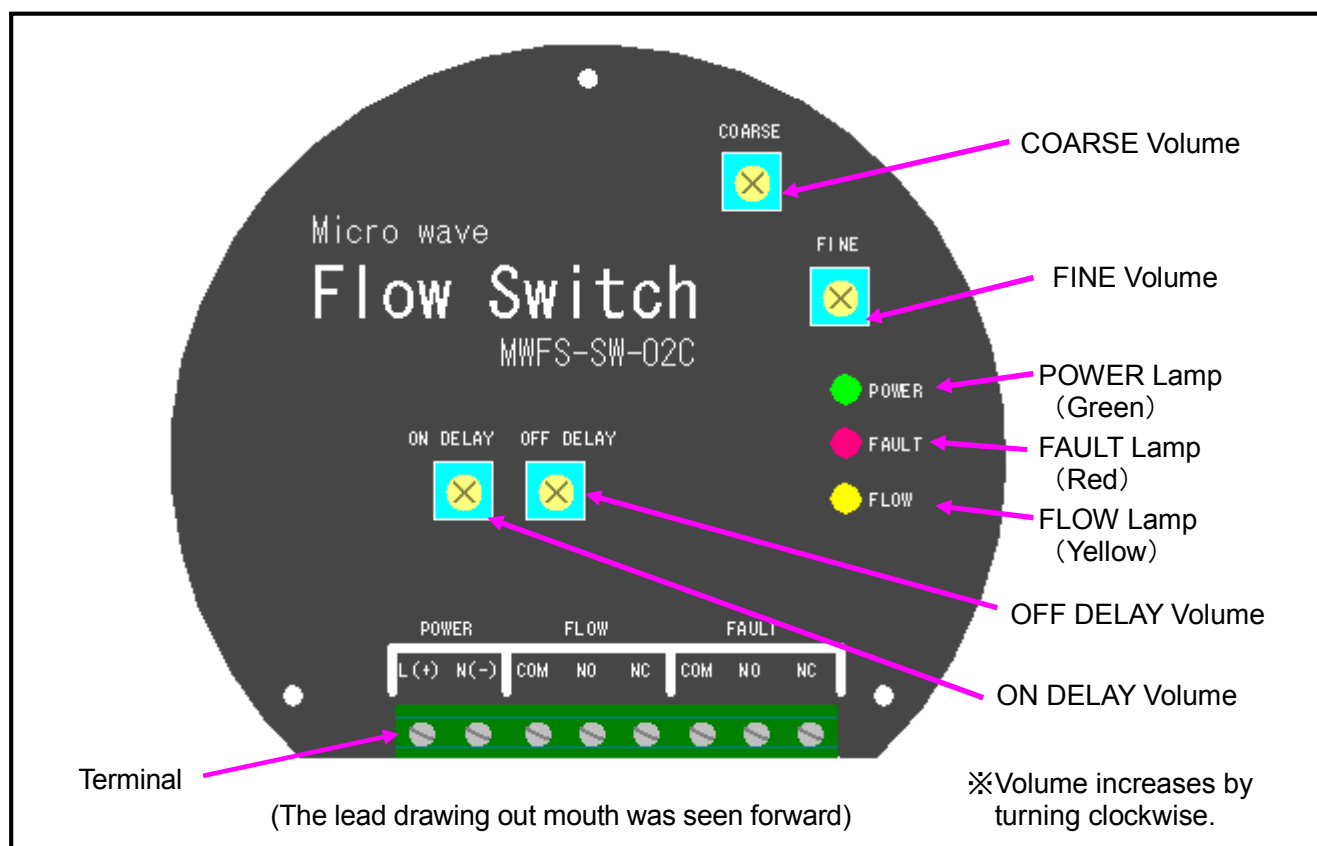


Figure 1 Panel

Table 1.Name and substance

No.	Name	Substance
1	COARSE Volume	It is a volume for the adjustment to match it to the measurement environment. Volume to adjust rough of receiving wave. (0:Fine~10:Coarse)
2	FINE Volume	It is a volume for the adjustment to match it to the measurement environment. Volume to adjust sensitivity of receiving wave. (0:Low~10:High)
3	ON DELAY Volume	Set the time of ON DELAY in the range of 0.1 and 10s. The Flow Switch doesn't output for the set time even when the material is flowing and the detection is being made.
4	OFF DELAY Volume	Set the time of OFF DELAY in the range of 0.1 to 10 sec. The Flow Switch keeps the output detected before the material stops flowing for the set time.
5	POWER Lamp (Green)	Lights up when power-supply voltage is applied.
6	FAULT Lamp (Red)	When transmitting power decreases or sending and the reception module break down, it lights.
7	FLOW Lamp (Yellow)	Lights up when the Flow Switch detects the flow of the object. Continuously lighted while the object is flowing, and turned off when the flow stops.
8	Lead outlet	Cable seize : $\phi 7 \sim \phi 13\text{mm}$
9	Terminal	Figure 2. shows the terminal array.

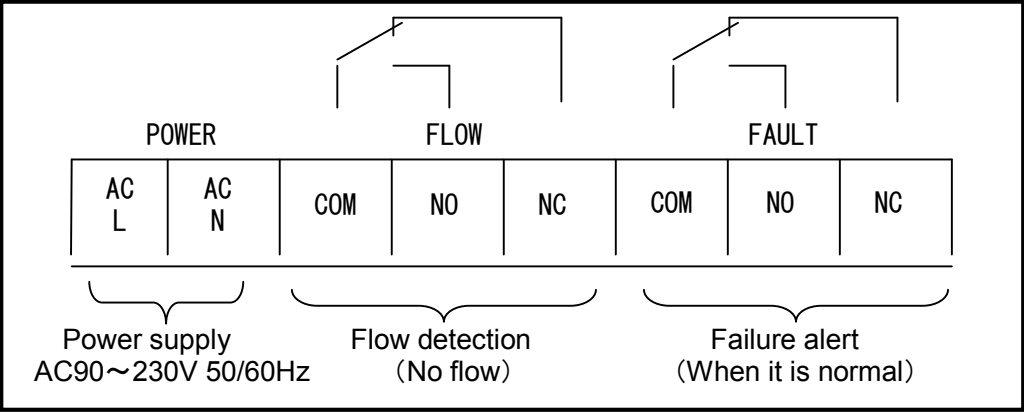


Figure 2. Terminal array

	FLOW Side	FAULT Side
Power OFF		
	○	○
Power ON No flow		
	○	○
Power ON Flow		
	●	○
Power ON Fault		
	○	●

Figure 3. Function chart

#### 4. Environment in erection location (Condition)

- 4-1. Temperature      $-10^{\circ}\text{C} \sim +55^{\circ}\text{C}$   
(It is not possible to use it in the place with the fear of freezing.)
- 4-2. Humidity        90% or less  
(Transmitting part and receiving part is non condensing)
- 4-3. Pressure         $-980\text{kPa} \sim +980\text{kPa}$  ( $-10 \sim +10\text{kgf/cm}^2$ )
- 4-4. Vibration        If resonance occurs because of the vibration resulting from the application structure, the flow switch may malfunction.  
Be sure to install the flow switch in a location free from vibration.

#### 5. Example of installation

Figure 4 and 5 show the details of a typical installation.  
Mount the flow switch with G1 screws.  
The mounting part and the main body can be separated.  
Use a sealant such as liquid gasket to fill the gap between the screw and the packing.  
Use the accessory lock nut to install the flow switch on the pipe.

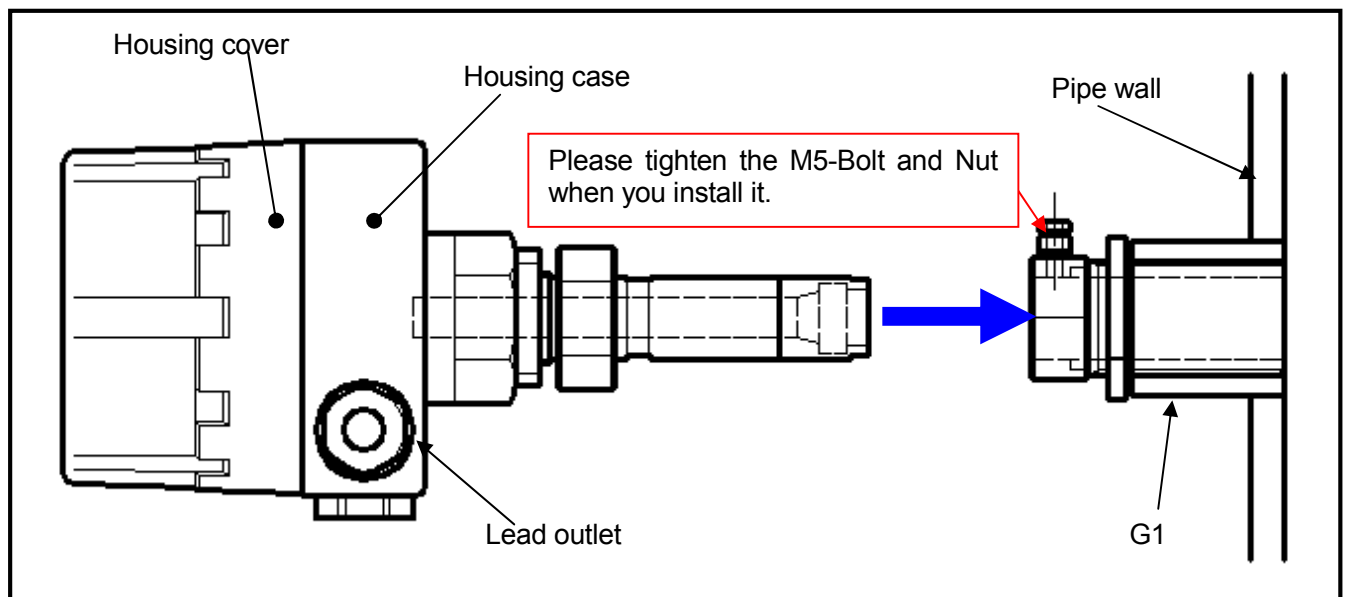


Figure 4. Example of installation

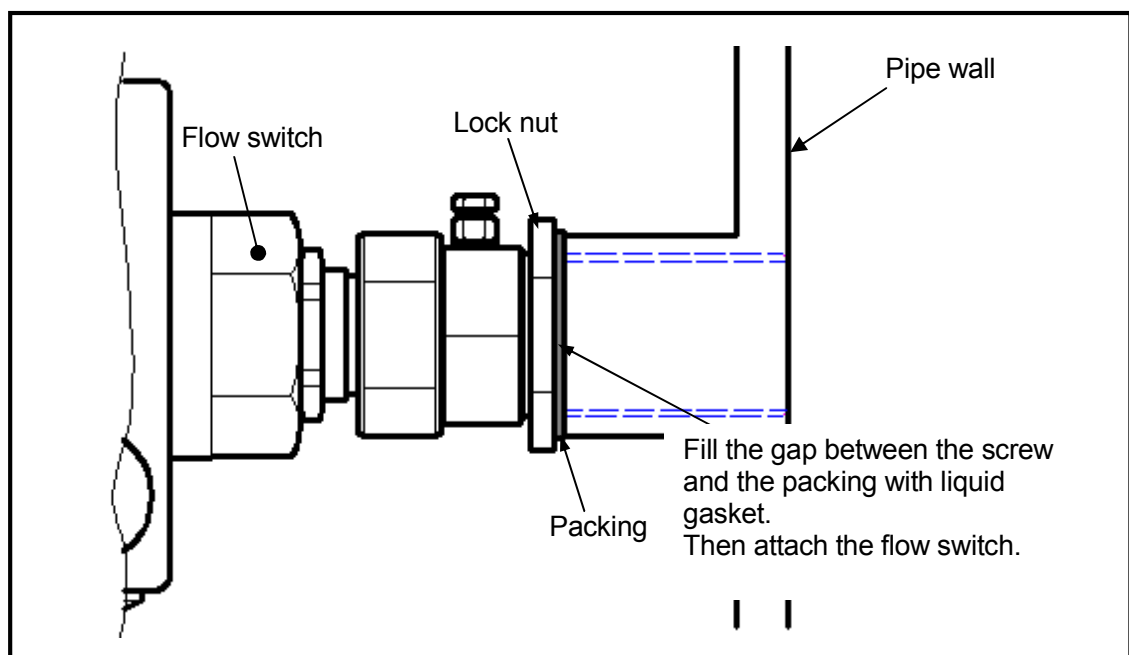


Figure 5. Details of installation

Installation that considers adhesion and piling up

Please install it referring to Figure 6.

Please install the cover board of teflon with a low permittivity or a material ceramic etc. when this installation is difficult and give to me as an installation that penetrates the micro wave.



**Important :** The cover board of physical properties of electroconductive cannot be used.  
Especially, when the measurement thing that contains moisture adheres, it becomes a false detection.

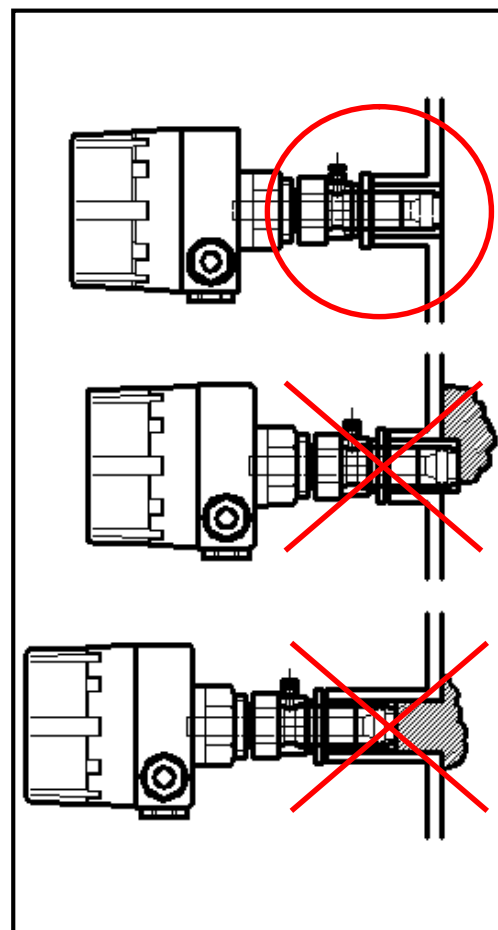


Figure 6. Example of installation

## 6. Wiring

- Use cables of Max.  $1.5\text{mm}^2$  in diameter that are suitable for the operational environment when wiring.

(Size of recommended cable :  $1.25\text{sq}$ )



**Important :** The diameter of the cable for the lead out connector of the terminal box should be between 7 mm to 13 mm.



**Caution :** Please execute it in the state of power supply OFF when you connect wires. There is a possibility that the electric shock, the leak, and the ignition, etc. happen.

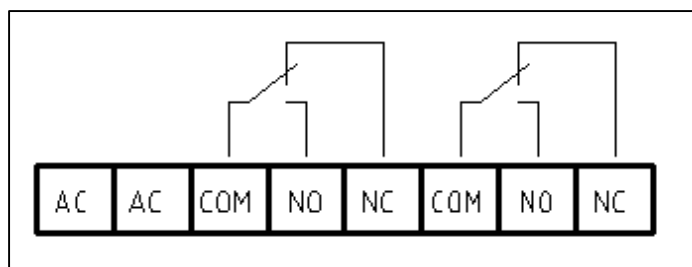


Figure 7. Terminal



**Important :** The state of the point of contact in Figure 7 is in the state of "Power ON , NoFlow".

Power supply OFF or undetection : It becomes excitation between COM-NC.

## 7. Adjustment



**Important :** • When the flow intermittently becomes interrupted.

Please adjust 'ON DELAY' and the 'OFF DELAY' volume to the optimum value.  
(ON/OFF DELAY setting range: 0.1-10s)

『ON DELAY』: The Flow Switch doesn't output for the set time even when the material is flowing and the detection is being made.

『OFF DELAY』: The Flow Switch keeps the output detected before the material stops flowing for the set time.

- 7-1. Please turn on the power supply after confirming wiring after installing Flow Switch.  
The POWER lamp (green) lights when the power supply is turned on.
- 7-2. Turn the ON-DELAY and OFF-DELAY volumes counterclockwise at each minimum value.  
(Volume : Counterclockwise)
- 7-3. Turn the COARSE and the FINE volumes clockwise at each maximum value.  
(Volume : Clockwise)
- 7-4. Check the operation point of the Flow Switch at the ambient noise level.  
Confirm that the FLOW lamp (left, Yellow) lights when no material is flowing.  
Slowly turn the Fine volume counterclockwise and verify where the FLOW lamp turns off.  
At this time, if the FLOW lamp does not turn off even when the FINE volume is turned to the middle position, stop at the middle and turn the COARSE volume counterclockwise until the FLOW lamp turns off.
- 7-5. Check the operation point of the flow switch at the signal level.  
The FLOW lamp lights up when the specified amount of material flows at the specified speed.  
Slowly turn again the COARSE volume counterclockwise while the material is flowing and verify where the FLOW lamp turns off.
- 7-6. Set the COARSE volume to the middle between the flow switch's operation point at the ambient noise level confirmed in 7.4 and that at the signal level confirmed in 7.5.
- 7-7. If the flow is intermittent, use the ON-DELAY volume to set the no-detection and use the OFF-DELAY volume to set the continuous-detection time.

## 8. Maintenance

Maintenance is not needed for the Flow Switch. Confirm the following items in periodical inspections.

### 8-1. Tightness of the bolts for the housing cover.

If these bolts are loose, rainwater or dust can enter from the space between the housing cover and the case, resulting in a malfunction or failure.

### 8-2. Tightness of the lock nuts.

If these lock nuts are loose, the application facility may be affected.

### 8-3. Cleanliness of the transmitting face.

As aforementioned, microwaves have excellent penetration ability.

But on excessive amount of adhered matter may affect normal operations.

So the face must be periodically cleaned.

Note: Please note that the specifications or appearance may be changed without notice due to modification of the Flow Switch.

Note: Matsushima does not take responsibility for any changes or modifications of the Flow Switch made by the user or unauthorized personnel.