



MICROWAVE SENSOR

MWS-ST-3-24V [TRANSMITTER]

MWS-SR-3-24V [RECEIVER]

PAT. PEND.

**LED Indicators Array for
Easy Visual Adjustment.**



200m range

WADECO CO.,LTD.

MICROWAVE SENSOR MWS-ST/SR-3-24V

Due to the sensor's high penetrability, surface contaminants and harsh environments do not affect its operation.

General

The MWS-ST/SR type microwave sensor is a level switch consisting of a transmitter (MWS-ST) and a receiver (MWS-SR) installed face-to-face. The transmitter emits a continuous, low power microwave beam towards the receiver and an output relay is released when the beam is obstructed. The sensor has many applications across all areas of industries where highly reliable, non-contact level detection is required. The sensor is generally used for process control by monitoring the presence/absence of a product, flow/no flow conditions, and point level detection in chutes, bins, and silos. The sensor may also be used as a proximity switch for detection of vehicles, such as dump trucks and rail cars.

Features

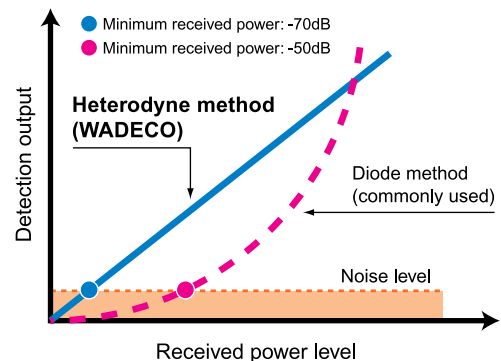
- High penetration**
 Easily penetrates process buildup on antenna, firebrick, refractory etc., thanks to the high penetrability of microwaves.
- Unaffected by adverse environments**
 The sensor is unaffected by surface contaminants, flames, steam, vapor or airborne particles.
- Simple beam alignment**
 Easily initial beam alignment at installation, thanks to the wide beam angle.
- Sensitivity margin indicators**
 The sensitivity margins are indicated on the receiver by LEDs allowing for easy visual adjustment and maintenance of the sensors.
- Lightweight, compact & easy to install**
 The sensor weighs less than 1kg and is housed in a compact aluminum diecast enclosure. Built-in amplifiers allow for no interconnection between the transmitter and receiver.
- Improved anti-vibration**
 All circuits are molded in the enclosure.
- Enclosure rating IP65 equivalent**

Penetrability of microwaves

Harsh environments may result in a buildup of contaminants on the sensing head; however, the sensor is easily able to penetrate such buildup thanks to the high penetrability of microwaves. When microwaves transmitted through air encounter an object, some will be reflected, some absorbed and the rest will pass through the object. The amount of microwaves passing through the object depends on its composition. Generally speaking, microwaves cannot penetrate metals and are reflected; water absorbs the most microwaves.

State-of-the-art Heterodyne Detection Method

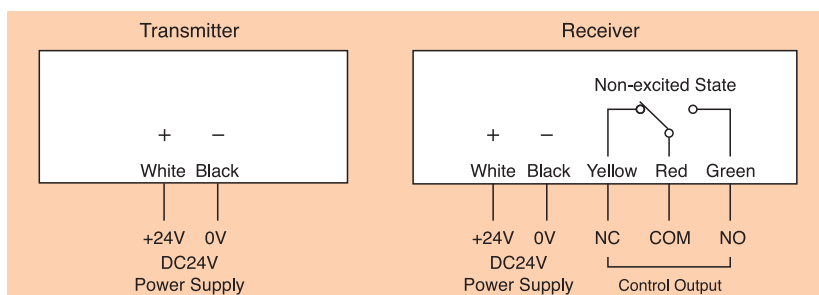
The MWS-ST/SR level switch is the first of its kind to utilize the heterodyne detection method, rather than the now obsolete diode detection method.



The heterodyne detection method gives detection output that is proportional to the received power level (**linear** function), whereas the diode detection method gives detection output that is proportional to the square of the received power level (**quadratic** function).

Therefore the heterodyne method allows detection with a minimum received power that is lower than that of the minimum level required by the diode detection method. This greatly increases the operating range/penetrability without any increase in the power of the transmitted microwave radiation.

Wiring

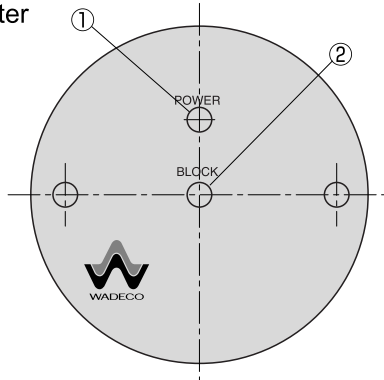


Relay configuration

Wire colors	Yellow & Red	Red & Green
Unpowered state	Closed	Open
Powered state	Non-detecting state	Closed
	Detecting state	Open

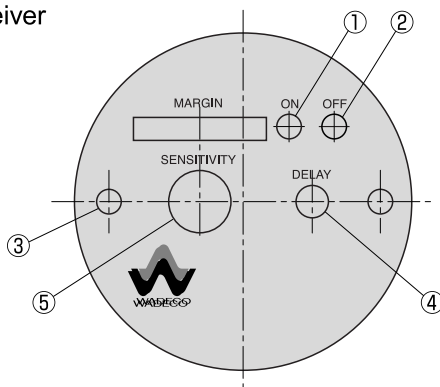
Function of Switches, Indicators and Rheostats

Transmitter



	Part Name	Description
①	Power indicator	Green when power is on
②	Block button	Blocks transmission

Receiver



	Part Name	Description
①	Output indicator	ON (red) : Illuminates on output
②	Output indicator	OFF (green) : Illuminates on no output
③	Sensitivity margin indicator	Indicates sensitivity margin
④	On delay rheostat	0.1 ~ 10sec.
⑤	Sensitivity rheostat	For sensitivity adjustment



Shown with flange (optional)

Sensitivity Adjustment

Before adjusting the sensitivity:

- Ensure that there is a clear line of sight between the transmitter and receiver.

Transmitter MWS-ST-3-24V

- Upon turning on the power supply, the POWER light ① (Green) will come on.

Receiver MWS-SR-3-24V

- Upon turning on the power supply, either the red BLOCK light ① or the green UNBLOCK light ② will come on.

- Set sensitivity rheostat ⑤ to minimum.

- Slowly turn the sensitivity rheostat ⑤ clockwise until the green output indicator ② comes on. This determines the actuation point.

- For applications involving mainly paper and/or where there is little accumulation on the sensing head, increment coarse sensitivity rheostat ⑤ by 1 or 2 levels only.

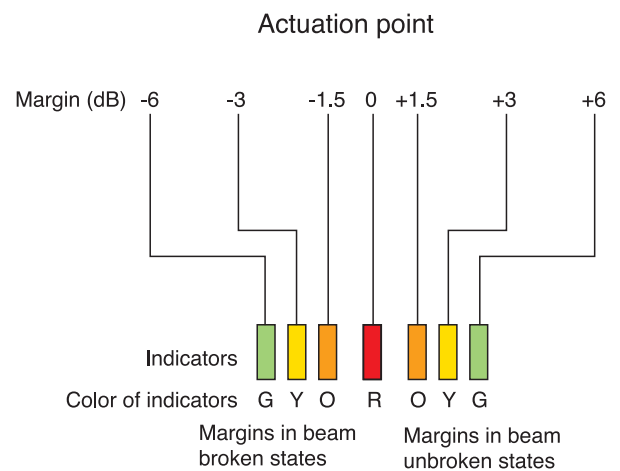
For applications involving materials with a moderately high water content, such as wet garbage, etc, then the rheostat ④ should be incremented by 3-4 steps.

If the object to be detected absorbs microwaves by more than 5 steps.

- The sensitivity margin indicators ③ indicate the sensitivity margins. This allows easy visual adjustment. Using the sensitivity rheostat ⑤, you can visually adjust the sensitivity, so as to have equal margins.

Sensitivity margin indicators

The indicators (Orange, Yellow, Green) indicate the margins between the actuation point and the sensitivity-set-points for both unbroken and broken beam states.



For example, when green indicators for both beam unbroken and beam broken states illuminates, the sensitivity-set-points in both beam unbroken and beam broken states are set with ± 1.5 dB margins (orange indicators light) to the actuation point.

Specifications

	Transmitter	Receiver
Type	MWS-ST-3-24V (Standard, Diecast aluminum) MWS-ST-3-24VS (Optional, SUS304)	MWS-SR-3-24V (Standard, Diecast aluminum) MWS-SR-3-24VS (Optional, SUS304)
Power supply	DC24V ±10%	
Power consumption	1W	2W
*Operating distance	150m	
Frequency and transmission power	GHz, less than 10mW	
Radiation angle	Approx. ±12.5° (angle in half of receiving value)	
Output contact	AC/DC30V, 100mA, 1C noncontact output	
Response time	10msec.	
On delay	0.1 ~ 10sec.	
Condition of output function	Output relay is unexcited when the beam is blocked longer than the delay time.	
Delay time from power on to function	Approx. 50msec.	Approx. 5sec.
Noise tolerance	Square wave noise from noise simulator (rising time : 1 nanosecond, width : 1 microsecond), ±1kV (normal and common modes), with the frequency of the power supply in the 0° ~ 360° phase.	
Operating ambient temperature	-10°C ~ +55°C	
Non-function ambient temperature	-20°C ~ +70°C	
Vibration resistance	10~55Hz, 0.75mm single amplitude in X, Y and Z directions, for 2 hours each.	
Continuous maximum pressure	0.5MPa	
Enclosure rating	IP65 equivalent	
Enclosure construction	Diecast aluminum (Standard) or SUS304 (Optional)	
Color	Metallic silver grey (Standard) or SUS304 (Optional)	
Weight	1.3kg (Diecast aluminum) or 1.7kg (SUS304)	

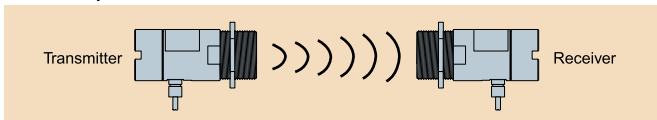
* The operating distance may vary from sensor to sensor and according to installation.

Installation

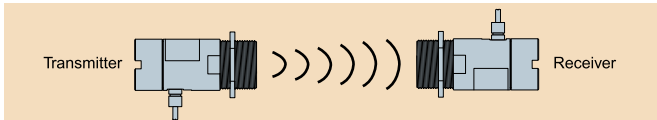
Install the transmitter and receiver face to face as shown below.

Both unit's cable entry should face in the same direction, or be 180° opposite each other.

Cable entry in the same direction.



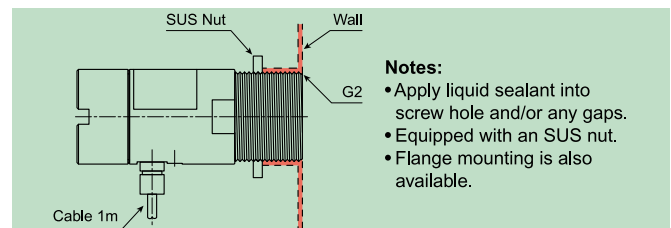
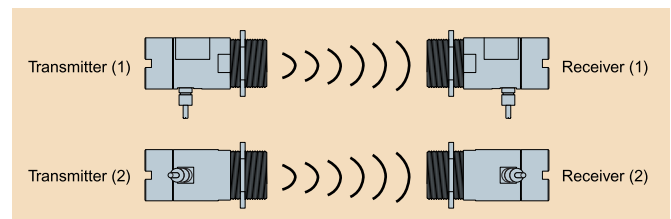
Cable entry 180° opposite each other.



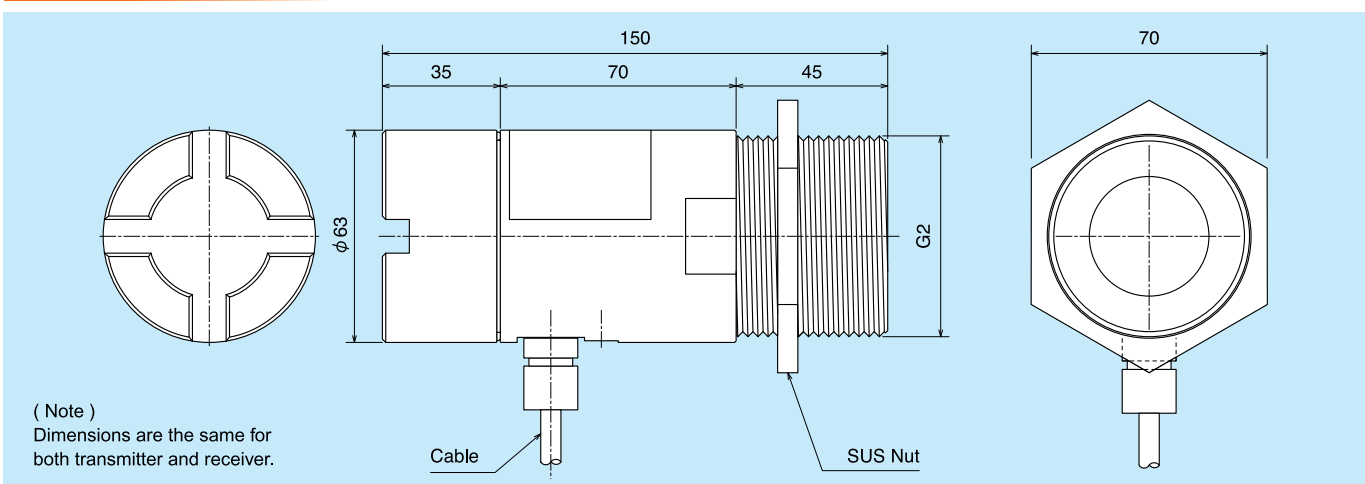
If the units are installed with cable entries at 90° to each other they will not function.



If two transmitter-receiver sets are installed in close proximity, one transmitter-receiver set should be mounted at a 90° angle to the other so that the waves of one unit will not interfere with the other's.



Dimensions



Specifications may be changed without notification.

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