4 CHANNEL DELUXE TYPE MICROWAVE SENSOR

MWS-ST-2 [TRANSMITTER]
MWS-SR-2 [RECEIVER]

PAT. PEND

300% Increased Range!
Multi Channel type with Received Power Level Indicators.

100m/325ft range with Ø27mm/1in antenna

WIRE AUTOMATIC DEVICE CO., LTD.
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 wide application across all areas of industry where highly reliable, non-contact level detection is required. The sensor is generally used for process control by monitoring presence/absence of 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 increased operating range.

• Unaffected by adverse environments
  The sensor is unaffected by surface contaminants, flames, steam, vapor or airborne particles.

• Simple beam alignment
  Easy initial beam alignment at installation, due to the wide beam angle.

• Selectable detection mode
  Either broken beam (BLOCK) or unbroken beam (UNBLOCK) detection method may be selected.

• No set-to-set interference
  Four channels are available, selectable by rotary switch. This permits the use of multiple sets in close proximity to each other.

• Power level & sensitivity indicators
  The received power level and the sensitivity-set-point are indicated on the receiver by a bank of 15 LEDs, allowing for easy visual adjustment and maintenance of the sensor.

• Analog output (optional)
  The received power level may be output as a 4~20mA analog signal.

• Inspection window (optional)
  The received power level and the sensitivity-set-point are easily seen, without removing the sensor’s cover.

• Small sensing head (Ø27mm/1in)
  Approximately 100m/325ft range with Ø27mm/1in antenna.

• Enclosure rating IP65/NEMA4 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

<table>
<thead>
<tr>
<th>Transmitter</th>
<th>Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5 6 7 8</td>
</tr>
</tbody>
</table>

*Phase of power supply must be the same for both transmitter and receiver.
### Function of Switches, Indicators and Rheostats

#### Transmitter
- **Part Name**: Power indicator
  - **Description**: Green when power is on
- **Part Name**: Channel selector
  - **Description**: CH1~4 or CH0
- **Part Name**: Block button
  - **Description**: Blocks transmission
- **Part Name**: Terminals

#### Receiver
- **Part Name**: Mode selection switch
  - **Description**: BLOCK: Outputs on broken beam, UNBLOCK: Outputs on unbroken beam
- **Part Name**: Sensitivity rheostat
  - **Description**: For sensitivity adjustment
- **Part Name**: 15 LED indicator array
  - **Description**: Received power level: indicated by one of 15 LEDs, Sensitivity set-point: indicated by one of 15 LEDs
- **Part Name**: Output indicator
  - **Description**: ON (red): Illuminates on output
- **Part Name**: Output indicator
  - **Description**: OFF (green): Illuminates on no output
- **Part Name**: On delay rheostat
  - **Description**: 0.1~10 sec.
- **Part Name**: Channel selector
  - **Description**: CH1~4 or CH0
- **Part Name**: Terminals

### Sensitivity Adjustment

#### Before adjusting the sensitivity:
- Ensure that there is a clear line of sight between the transmitter and receiver.
- Set the CHANNEL selector on both the transmitter and receiver to 0 (single channel mode) if you are installing one transmitter/receiver set only. If you are installing more than one transmitter/receiver set in close proximity, then select channel 1, 2, 3 or 4 (multi channel mode) to prevent set-to-set interference.
- The phase of the power supply must be the same for both the transmitter(s) and the receiver(s).

#### Transmitter MWS-ST-2
- Apply power to the unit. The green POWER indicator will illuminate.

#### Receiver MWS-SR-2
- Apply power to the unit. Either the red ON or the green OFF indicator will illuminate.
- Set the mode selection switch to BLOCK. Turn sensitivity rheostat fully counter clockwise (minimum).
- Turn the delay time rheostat fully counter clockwise (minimum).
- The red output indicator ON will illuminate.
- The sensitivity is adjusted visually using the 15 LED indicator array.
  - The received power level and sensitivity-set-point are indicated on the receiver by a bank of 15 LEDs. Turn the sensitivity rheostat clockwise until the sensitivity-set-point is located halfway between the received power level in the BEAM UNOBSSTRUCTED and the BEAM OBOBSTRUCTED states.

### Selecting the channel

- **Single channel mode (CH0)**
  - In the case where multiple units are NOT installed in close proximity and a faster response time is desirable, the CHANNEL selector on both the transmitter and receiver should be set to 0. Selecting CH0 will disable the multi channel function.

- **Multi channel mode (CH1~4)**
  - In the case where multiple sets of sensors are installed in close proximity to each other, multi channel mode should be used. The sensor comes standard with four channels (CH1~4). The CHANNEL selector on both the transmitter and its corresponding receiver must be set to the same channel. Each pair of transmitters and receivers should be set to a different channel; if more than 4 channels are required consult WADECO or its representative.

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*Flanges are optional.*
Specifications

<table>
<thead>
<tr>
<th>Transmitter</th>
<th>Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>MWS-51-2</td>
</tr>
<tr>
<td>Power supply</td>
<td>AC100<del>150V or AC200</del>240V ±10%, 50/60Hz</td>
</tr>
<tr>
<td>Power consumption</td>
<td>2VA</td>
</tr>
<tr>
<td>Operating distance</td>
<td>80m/262ft or less</td>
</tr>
<tr>
<td>Frequency and transmission power</td>
<td>Approx. 240Hz, less than 10mW</td>
</tr>
<tr>
<td>Compliance</td>
<td>FCC Title 15 and IEC/EN60947 exposure specification section 1910.97</td>
</tr>
<tr>
<td>Number of channels</td>
<td>Single channel mode (CH1), Multi channel mode (CH1-4)</td>
</tr>
<tr>
<td>Received power level indication</td>
<td>Indicated by 1 of 15 LEDs</td>
</tr>
<tr>
<td>Sensitivity-setpoint indication</td>
<td>Indicated by 1 of 15 LEDs</td>
</tr>
<tr>
<td>Radiation angle</td>
<td>Approx. ±20° (angle in half of receiving value)</td>
</tr>
<tr>
<td>Output contact</td>
<td>1C relay contacts AC250V, 2A (cosφ=1), relay is unexcited during output state</td>
</tr>
<tr>
<td>Response time</td>
<td>10mssec (in single channel mode), 25mssec (in multi channel mode)</td>
</tr>
<tr>
<td>On delay</td>
<td>0.1 ~ 10sec</td>
</tr>
<tr>
<td>Analog output (optional)</td>
<td>4mA ~ 20mA, load resistance 250Ω max.</td>
</tr>
<tr>
<td>Delay time from power on to function</td>
<td>Approx. 50msec</td>
</tr>
<tr>
<td>Noise tolerance</td>
<td>Square wave noise from noise simulator (rising time: 1 nanosecond, width: 1 microsecond), ±1.5KV (normal and common modes), with the frequency of the power supply in the 0° ~ 360° phase</td>
</tr>
<tr>
<td>Operating ambient temperature</td>
<td>-10°C ~ +55°C</td>
</tr>
<tr>
<td>Non-function ambient temperature</td>
<td>-20°C ~ +70°C</td>
</tr>
<tr>
<td>Continuous maximum pressure</td>
<td>0.5MPa</td>
</tr>
<tr>
<td>Enclosure rating</td>
<td>IP65/NE3MA equivalent</td>
</tr>
<tr>
<td>Enclosure construction</td>
<td>Diecast aluminum</td>
</tr>
<tr>
<td>Color</td>
<td>Metallic silver grey</td>
</tr>
<tr>
<td>Weight</td>
<td>1kg</td>
</tr>
</tbody>
</table>

* 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.
  - Transmitter
  - Receiver

- Cable entry 180° opposite each other.
  - Transmitter
  - Receiver

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, different channels should be selected or 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.

Cable entry

Dimensions

- Dimensions are the same for both transmitter and receiver.

For Additional Information Contact:
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