Microwave Pulse Switch

Integral Version
Solid/Liquid Level
10.525GHz Sender/Receiver

Principle of Operation
The Hawk Microwave Pulse Sender-Receiver is comprised of two electrically isolated units:- the sender unit and the receiver unit. The Sender-Receiver units are mounted facing each other. For best performance it is essential that they be mounted securely and correctly aligned.

The sender emits a burst of microwave energy toward the receiver, which is designed around a tuned microwave detector. This burst of energy is transmitted approximately 200 times each second. If the line-of-sight between the sender and receiver is interrupted by a sufficiently reflective or absorbent material, the energy will not reach the receiver, and therefore the receiver will not detect the transmission.

The receiver is designed to switch a relay when it’s detector changes state. Time delays between detector change and relay switching is set via two single turn potentiometers; there is a potentiometer for the make (signal detected) delay and another for the break (signal interrupted) delay. In each case the relay will switch only after the detector state has been maintained (since its change) for the respective time: any further change of state during a time-out period will override the previous change.

The sensitivity of the detector is adjusted by a potentiometer. By this adjustment, compensation can be made for partially reflective or partially absorbing materials. Similarly, it can be adjusted so that it will change state when only a fraction of the beam is blocked. There are two sensitivity adjustment potentiometers, one for a coarse adjustment and the other for a fine adjustment.

The relay can be set to either energize or de-energize when the beam is broken. This mode is set via a two-position slide switch in the receiver unit.

In the Amplifier unit there are three LED lamps; one indicates that power is applied, another indicates that a valid signal is detected, and the other indicates that the relay is energized. In the sender unit the only lamp is the one indicating that power is applied.

Certification
ATEX, SAA/IECEEx, CE, (CSA, FM pending)

Primary Areas of Applications
Any application where microwave energy is absorbed by the material being monitored, including replacement of traditional contact switching devices used in mining, sand and gravel quarries, cement plants, pulp paper, plastic, rubber, coal fired power plants, steel mills, aluminium smelters, food, pharmaceuticals and other manufacturing

Features:
- Flow/no flow.
- Plugged/blocked chute detection.
- Low level measurement (bins, crushers etc).
- High level measurement (bins, crushers etc).
- Product on conveyor detection.
- Super bright LCD annunciation for power, microwave signal established and relay condition
- Maximum long range capability: 105m (340ft)
- No site licensing required
- No interconnection between sender and receiver
- Low cost installation and cabling
- Full failsafe capability
- Excellent adjustment stability for maximum repeatability
- Rail/truck load out position detection.
- Anti-collision crane detection.
- Blocked feeder pipes for pneumatic and dencphase filling, air slides etc.
- Replacement of tilt switches.
Flow/No Flow and Plugged Chute Switch

MPR1 = Plugged Chute Indicator
MPR2 = Flow/No Flow Indicator

Solid Level - Cyclone Bin
High/low Level

Solid/Liquid Level
Non Metal Tank
MICROWAVE INTEGRAL PULSE SENDER/RECEIVER (MPS/MPR) - Overall Dimensions

160mm (6.3")
135mm (5.25")
160mm (6.3")
130mm (5.15")
310mm (12.2")

4 X Ø22.0 holes thru equi spaced on 241 P.C.D.

MICROWAVE INTEGRAL PULSE SENDER/RECEIVER (MPS/MPR) - Mounting Plate

160mm (6.3")
12.7mm (0.5") Thru
Typ 4 Pics

79mm (3.11") Thru
On 132mm (5.232") B.C.
12mm (.472")

6mm (.236") Thru
On 132mm (5.232") B.C.
12mm (.472")

9mm (354") Thru
On 190.5mm (7.5") B.C.

ACCESSORIES

3" Weldment Window

3" UHMW Polyethylene/Ceramic Window

3" Teflon/Ceramics Window
GSM or CDMA Network

- Typically up to 31 transmitters or switches per string.
- Maximum 250 transmitters or switches.
- Using GSM/CDMA network, transmitters and switches can be monitored, calibrated remotely.
- Alarm status, diagnostics can be monitored.
- Support from factory engineering for customer application problems.
- Specifications for all other communication systems, e.g., HART, Profibus, Modbus etc. check instruction manual.

Communication Network Overview

Modbus and Profibus

Sultan Acoustic Wave Transmitter
- Silo, bin levels, coal, plastic powder, woodchip, sawdust, cement, clinker, iron ore, lime etc.

Orca Sonar Interface
- Thickener, CCD

Orca Sonar Interface
- Clarifier

Sultan Master/Slave Positioning System
- Stockpiles, Stackers, Reclaimers

Sultan Acoustic Wave Transmitter
- Slurries

Sultan Acoustic Wave Transmitter
- Floatation Cells

Sultan Smart Transducer
- Farm Tanks, Grain Terminals

Sultan Acoustic Wave Switch
- Blocked Chute Detection

GSM or CDMA Network

- Laptop or PC Communications or PLC / DCS with MODBUS RTU Port
- Goshawk Software for inventory monitoring on PC

(Limited Modbus query rate for switches only)
**MPS - SENDER**

- **L.E.D. Indicators**
  - Green - Power
  - Red - Signal
  - Amber - Relay
- **Gnd**
- **100mA Fuse (F1)**
- **Test Switch (SW1)**
- **Serial Number**
- **100mA Fuse (F1)**
- **AC Supply (TS1)**
  - Active 240 (Hot)
  - Neutral
  - Earth Ground
- **DC Supply (TS2)**
  - +24V
  - -30 sec
  - 0.3
  - RV1
  - RV2

**MPR - RECEIVER**

- **L.E.D. Indicators**
  - Green - Power
  - Red - Signal
  - Amber - Relay
- **Gnd**
- **100mA Fuse (F1)**
- **Serial Number**
- **Relay**
  - Normal/Reverse
- **Sensitivity Lo/Hi Switch**
- **EMI Indicator**
- **Course Sensitivity Pot**
- **TP5 Positive**
- **TP6 Gnd**
- **AC Supply (TS1)**
  - Active 240 (Hot)
  - Neutral
  - Earth Ground
- **DC Supply (TS1)**
  - +24V (Hot)
  - Earth Ground
  - Not Used
- **Common Output Contacts (TS2)**
  - Normally Closed (TS2)
  - Normally Open (TS2)
- **Serial Number**
- **TS1**
<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMS</td>
<td>Integral Microwave System with Sender and receiver without 3” Weldemnt</td>
</tr>
<tr>
<td>MPS</td>
<td>Integral Microwave Sender without 3” Weldemnt</td>
</tr>
<tr>
<td>MPR</td>
<td>Integral Microwave Receiver without 3” Weldemnt</td>
</tr>
<tr>
<td>MPR3</td>
<td>Integral Microwave Receiver with Signal Recognition Stability</td>
</tr>
<tr>
<td>MSEQ</td>
<td>Microwave Sequencer Unit</td>
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<table>
<thead>
<tr>
<th>Power Supply</th>
<th>Voltage</th>
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<tbody>
<tr>
<td>240</td>
<td>240 Vac Volt</td>
</tr>
<tr>
<td>220</td>
<td>220 Vac Volt</td>
</tr>
<tr>
<td>115</td>
<td>115 Vac Volt</td>
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<table>
<thead>
<tr>
<th>Outputs</th>
<th>Description</th>
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<tbody>
<tr>
<td>0</td>
<td>Standard relay Output</td>
</tr>
<tr>
<td>6</td>
<td>Solid State Relay Output</td>
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<table>
<thead>
<tr>
<th>Facing Material</th>
<th>Description</th>
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<tbody>
<tr>
<td>0</td>
<td>UHMW Polyethylene</td>
</tr>
<tr>
<td>1</td>
<td>PTFE Teflon for complete set pair</td>
</tr>
<tr>
<td>2</td>
<td>PTFE Teflon for sender or receiver, each</td>
</tr>
<tr>
<td>W1</td>
<td>Wave guide connector for set pair</td>
</tr>
<tr>
<td>W2</td>
<td>Wave guide connector for sender or receiver, each</td>
</tr>
<tr>
<td>Z</td>
<td>Special request</td>
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<table>
<thead>
<tr>
<th>ATEX Approvals</th>
<th>Description</th>
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<tbody>
<tr>
<td>X</td>
<td>not required</td>
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<tr>
<td>A22</td>
<td>ATEX Zone 22</td>
</tr>
<tr>
<td>A22</td>
<td>ATEX Zone 22 for a complete set</td>
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</table>

IMS 240 0 0 X
# Part Numbering

## Mounting Accessories

<table>
<thead>
<tr>
<th>MA</th>
<th>Part Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3” Weldment, each</td>
</tr>
<tr>
<td>1</td>
<td>2” Glass window each</td>
</tr>
<tr>
<td>2</td>
<td>3” UHMW Windows &amp; Weldment each</td>
</tr>
<tr>
<td>3</td>
<td>4” UHMW Windows &amp; Weldment each</td>
</tr>
<tr>
<td>4</td>
<td>6” UHMW Windows &amp; Weldment each</td>
</tr>
<tr>
<td>5</td>
<td>3” PTFE Windows &amp; Weldment each</td>
</tr>
<tr>
<td>6</td>
<td>4” PTFE Windows &amp; Weldment each</td>
</tr>
<tr>
<td>7</td>
<td>6” PTFE Windows &amp; Weldment each</td>
</tr>
<tr>
<td>8</td>
<td>9’ x 4,5” Fire brick each</td>
</tr>
<tr>
<td>9</td>
<td>6” x 4” ceramic brick each</td>
</tr>
<tr>
<td>10</td>
<td>Shock insulation mounts pack of 4</td>
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<tr>
<td>11</td>
<td>Adjustable mounting UHMW windows each</td>
</tr>
<tr>
<td>12</td>
<td>Adjustable mounting PTFE windows each</td>
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<tr>
<td>13</td>
<td>Remote wave guide Assembly</td>
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<tr>
<td>14</td>
<td>Mounting Flange pipe</td>
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<tr>
<td>15</td>
<td>3” Ceramic window &amp; weldment each</td>
</tr>
<tr>
<td>16</td>
<td>4” Ceramic window &amp; 4” weldment each</td>
</tr>
<tr>
<td>17</td>
<td>4” Microwave Weldment only each</td>
</tr>
<tr>
<td>18</td>
<td>3” Stainless steel Weldment only for UHMW each</td>
</tr>
<tr>
<td>19</td>
<td>4” UHMW Windows only each</td>
</tr>
<tr>
<td>20</td>
<td>3” UHMW Windows only each</td>
</tr>
<tr>
<td>21</td>
<td>4” Stainless steel Weldment only for UHMW each</td>
</tr>
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</table>

## Full Part Number

**Electronics + Mounting Accessories**

\[
\text{RMS 240 0 0 X 10} + \text{ MA 0}
\]
Input Voltage
240Vac nominal, 200-270Vac acceptable, 50-60 Hz
115Vac nominal, 100-130Vac acceptable, 50-60 Hz
AC supply line fuse: 100mA, 250Vac
Both MPS and MPR units includes terminals for 24Vdc supply power.

Power Consumption
MPS < 2VA
MPR < 3VA

Power Density
Rated from emitter (MPS) to reciever (MPR) at approximately 20μW/cm². No interconnection wiring between emitted and receive. Complies with FCC Title Rules Part 15. Caution sign posting not required

Transmitted Signal
Frequency: 10.525GHz, 25mHz
Average Power Density: 20μW/cm² typical
Linearly Polarised Field
Beam angle (3db) approximately 30° (10GHz) conservative

Range
Maximum range under ideal conditions: 105m (340ft)
Expected maximum practical range: 65m (215ft)
Minimum range under ideal conditions: 10cm (4”)
Expected minimum practical range: 20cm (8”)
Note: Minimum ranges are dependent on application conductivity

L.E.D. Indicators:
MPS: Power on (green)
MPR: Power on (green)
Signal detect (red)
Relay state (amber)

Mounting
1. 3” male NPT thread or four 6mm (.25inch) blind bold holes in flange
   a) 3” weldments supplied for standard integral mounting
   b) Flange is used for remote mount in high vibration applications - isolation shock mounts are available.
2. 4” Weldments with PTFE (teflon) and UHMW windows
3. Ceramic window assemblies.

4. Firebrick window assemblies available on custom basis.
5. 2” NPT sight glass window.
6. Waveguides - custom assemblies available for high temperature and limited access applications.
7. Flanged pipe mount.

Fail-Safe
Switch selectable - presence or absence of material
High level fail-safe position: relay is activated when material is present.
Low level fail safe position: relay is activated when no material is present.

Temperature
MPS & MPR -30°C to +65°C (-20°F to +150°F)
Note: For higher temperature applications, remote mounting with windows is necessary. Custom waveguide assemblies can also be provided.
UHMW Window: Consult factory for manufacturer’s specifications.
Firebrick Assemblies: Consult factory for manufacturer’s specifications.

Cabling Entry
MPS: 1 x 10mm (3/8” NPT)
MPR: 2 x 10mm (3/8” NPT)

Relay Contact Output
MPR: SPDT 5amps @ 250Vac resistive
5amps @ 125Vac resistive

Enclosure
VALOX
SAA Listed
Meets Class 2, Div 1, Group E, F & G (DIP-Dust Ignition Proof) classification. FM Approval Pending.
Windows: UHMW (ultra high molecular weight) polyethylene standard PTFE (teflon) available (see part numbering)

Sealing
IP67 NEMA 4X

Shipping Weights
MPS: 4.5kg (10lbs)
MPR: 4.5kg (10lbs)

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