

REMOTE AMPLIFIER VERSION

Presence & Absence Detection

**MRS-MRR-MRA**

Microwave Pulse Switch

**Solid/Liquid Level**

10.525 GHz Sender Receiver

**FUNCTION**

Point level switching for presence or absence of most solid and liquid materials. Environmentally and personally safe replacement for nuclear switches. Not restricted by OSHA or FCC regulations. Caution sign posting not required.

**TYPICAL USES**

- Flow/no flow
- Plugged chute detection
- Low level measurement
- High level measurement
- Product on conveyor detection
- Rail/truck load out position detection
- Anti-collision crane detection
- Blocked feeder pipes for pneumatic and dense phase filling, air slides etc.
- Replacement of tilt switches

**PRIMARY AREAS OF APPLICATION**

Any application where microwave energy is aborted 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 fields.

Safe  
Alternative  
to Nuclear  
Switches

Replaces  
Tilt  
Switches

## PRINCIPLE OF OPERATION

The Hawk Microwave Pulse Sender-Receiver Remote System is comprised of three electrically isolated units:- the sender unit, three receiver units and amplifier 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. While the line-of-sight is interrupted by a sufficiency 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 it's 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.

## FEATURES

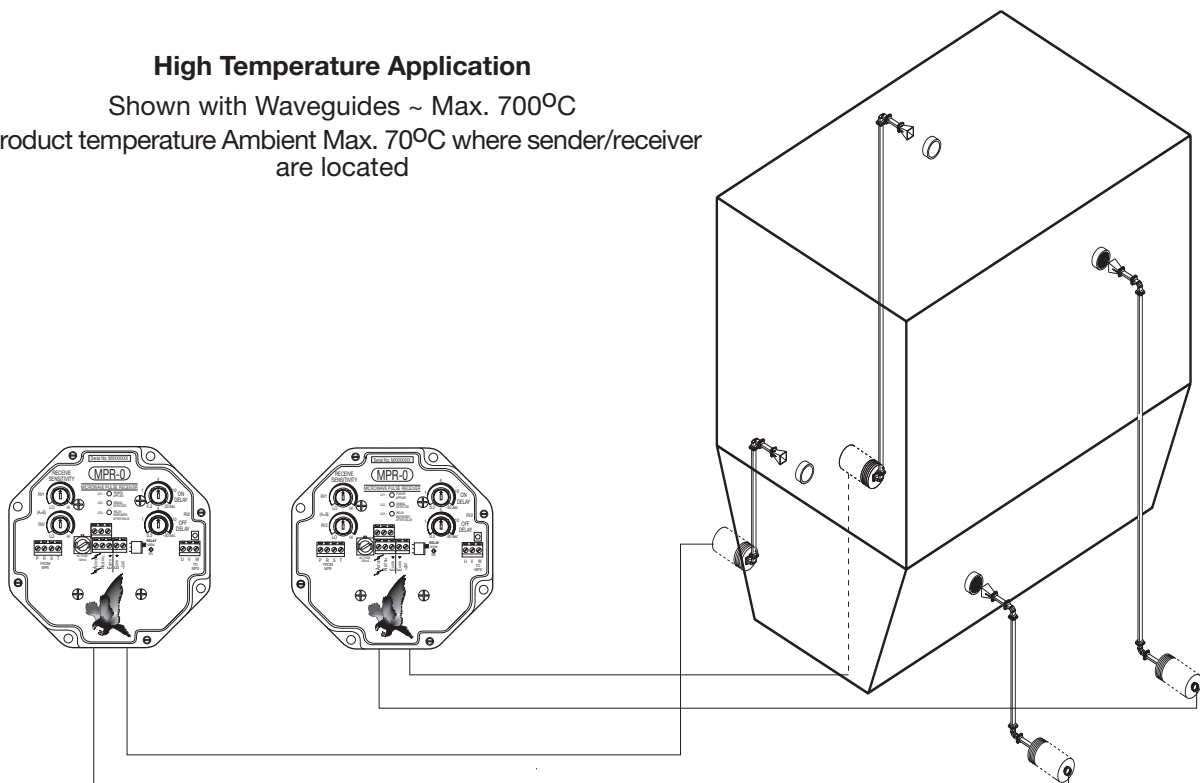
- Remote Amplifier: maximum cable separation 50 m
- Maximum long range capability: 100 m plus
- No site licensing required
- No interconnection between sender and receiver
- Low cost installation and cabling
- Versatile power supply: 240 VAC (115 VAC also available), 24 VDC (standard)
- Excellent adjustment stability for maximum repeatability
- Super bright LED annunciation for power, microwave signal established, and relay condition
- Meets Class 2 Div. 1, E, F, & G specifications (D.I.P)
- Water tight, dust tight, chemically resistant NEMA 4X enclosure (IP67)
- Alignment test probes
- Shock mounted construction
- Sealed switch selectable failsafe relay
- Pre-drilled for convenient access for conduit entry
- Wide beam pattern for ease of alignment
- Analog voltage output for alignment
- Single turn thumbwheel adjustment potentiometers
- Push-to-test circuit on amplifier
- 100m sec. to 30 sec. time delays ( on and off delays)
- Multiple mounting options (NPT, remote flange, pipe brackets)
- Flush mounted ceramic and firebrick window options
- Robust (high vibration resistance)
- U.H.M.W. (polyethylene) wear plate (standard)
- High temperature remote mounting with waveguides (contact factory)

\*See specifications (Range)

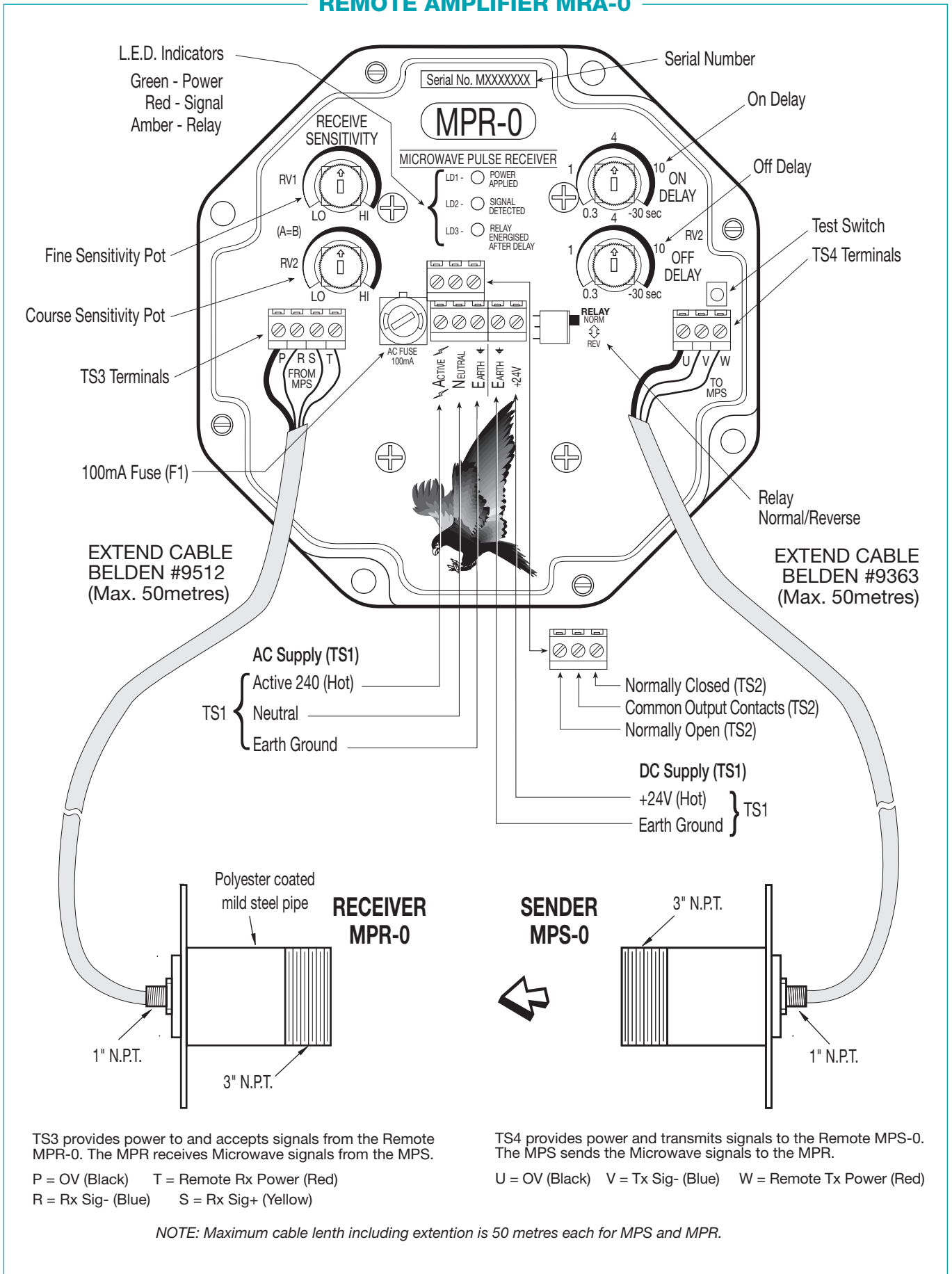
## SPECIALTY APPLICATION

### High Temperature Application

Shown with Waveguides ~ Max. 700°C  
 Product temperature Ambient Max. 70°C where sender/receiver are located

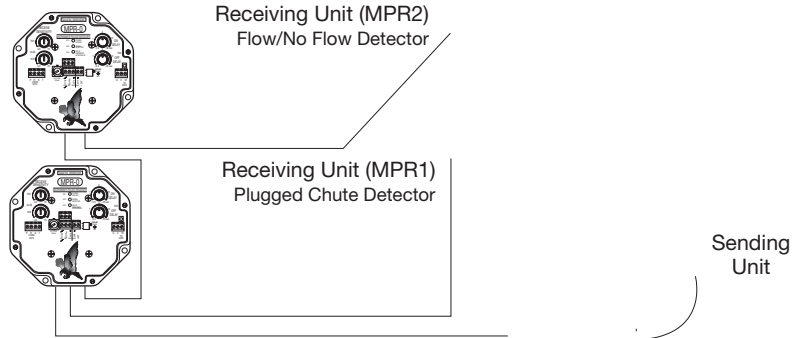


## REMOTE AMPLIFIER MRA-0



**STANDARD MODEL APPLICATION**

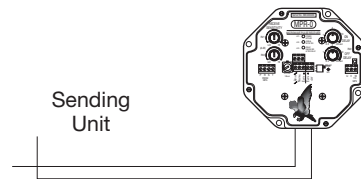
**Feeder Pipe coal/ore**  
Flow/No Flow  
Blocked Chute



**Blocked Chute Detector**

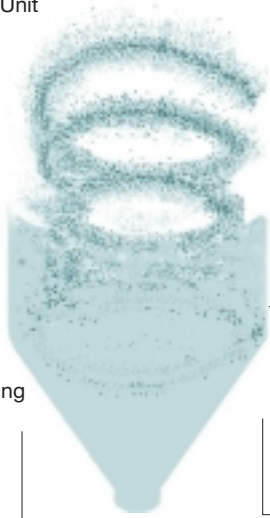
Note: Ensure Sender/Receiver are behind Infeed stream.

Receiving Unit

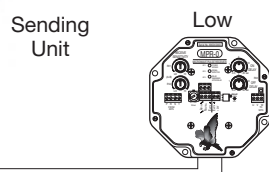
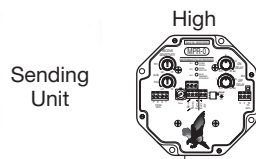


**Solid Level ~ Cyclone Bin**  
High/low Level

Receiving Unit



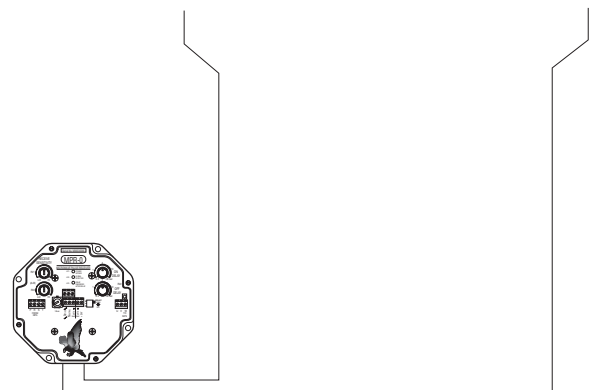
Receiving Unit



**Solid/Liquid Level Non Metal Tank**

Receiving Unit

Sending Unit



## SPECIFICATIONS

### Input Voltage:

240Vac nominal, 200-270Vac acceptable, 50-60 Hz  
 115Vac nominal, 100-130Vac acceptable, 50-60 Hz  
 AC supply line fuse: 100mA, 250Vac  
 Amplifier unit includes terminals for 240Vdc supply power.

### Power Consumption:

MRA <5VA Remote Amplifier

### Power Density:

Rated from emitter (MRS) to receiver (MRR) at approximately 20 $\mu$ W/cm<sup>2</sup>. No interconnection wiring between emitter and receiver. Complies with FCC Title Rules Part 15. Caution sign posting not required.

### Transmitted Signal:

Frequency: 10.525 GHz, 25 MHz  
 Average Power Density: 20 $\mu$ W/cm<sup>2</sup> typical  
 Linearly Polarised Field  
 Beam angle (3dB) approximately 30° (conservative)

### Range:

Maximum range under ideal conditions:  
     >105m (340 ft.)  
 Expected maximum practical range:  
     100m (340 ft.)  
 Minimum range under ideal conditions:  
     10cm (4 inches)  
 Expected maximum practical range:  
     20cm (8 inches)

*Note: Minimum ranges are dependent on application conductivity.*

### L.E.D. Indicators:

MPA: power on (green)  
       signal detect (red)  
       relay state (amber)

### Mounting:

1. 3" male NPT thread or four 6mm (.25 in.) blind bolt 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.

### Adjustments:

MRA: Test switch - momentary push-button  
 Single turn coarse and single turn fine adjustment potentiometers for set point.  
 Relay time delays adjustable from 100ms to 30 seconds via two independent on/signal make and off/signal break potentiometers with automatic reset.

### 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:

MRS & MRR: -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:

MRS: 1 x 10mm (3/8" NPT)  
 MRR: 2 x 10mm (3/8" NPT)  
 MRA: 3 x 10mm (3/8" NPT)

### Relay Contact Output:

MRA: SPDT - 10amps @ 250Vac resistive  
           10amps @ 125Vac resistive

*Option: solid state relay 1A @ 250Vac/Vdc*

### Enclosure:

NEMA 4X. IP67/IP66  
 SAA LISTED  
 Meets Class 2, Div 1, Group E, F & G (DIP-Dust Ignition Proof) classification. FM Approval Pending

### Sealing:

MRA: NEMA 4X (IP67)  
 MRR/MRS: NEMA 4X (IP68)

### Shipping Weights:

MRS: 10lbs. (4.5kg)  
 MRR: 10lbs. (4.5kg)  
 MRA: 3lbs. (1.4kg)

### Documentation:

One Installation/Operation manual supplied per system. Certified drawings/reproductions sepia available for extra charge.

## PART NUMBERS / ACCESSORIES

### MICROWAVE PULSE SENDER/RECEIVER

(Sample).....RMS-240-00\*

**MODEL**

**Remote Electronics Version**

- RMS** - Remote Microwave Switch System
- MRA** - Microwave Remote Amplifier
- MRS** - Microwave Remote Sender
- MRR** - Microwave Remote Receiver

**Integral Electronics Version**

- IMS** - Integral Microwave Switch System
- MPS** - Microwave Pulse Sender
- MPR** - Microwave Pulse Receiver

**INPUTS**

**240 VAC**

**220 VAC**

**115 VAC**

**000 Remote (Sender/Receiver Only)**

*Note: 24 VDC standard on all units*

**FACING MATERIAL & PROCESS CONNECTION**

- 0** - UHMW Polyethylene-3" MNPT
- 1** - PTFE Teflon-3" MNPT
- 2** - Waveguide Flange

**OUTPUTS**

- X** - None
- 0** - Standard Relay
- 6** - Solid State Relay (Encapsulated)

*\*Mounting accessories ordered separately. Include number and description when ordering.*

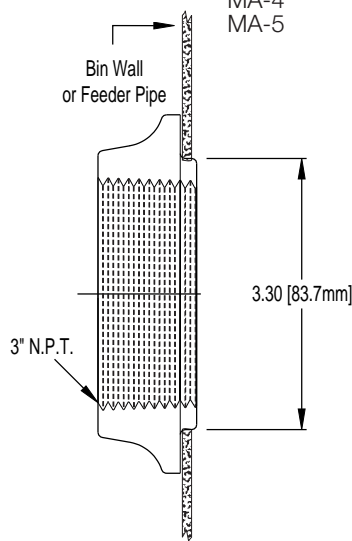
### MOUNTING ACCESSORIES

Number	Description
<b>MA-1</b>	2" NPT Glass Window pair
<b>MA-2</b>	4" Glass Window pair
<b>MA-3</b>	3" UHMW Window pair
<b>MA-4</b>	4" UHMW Window pair
<b>MA-5</b>	6" UHMW Window pair
<b>MA-6</b>	3" PTFE Window pair
<b>MA-7</b>	4" PTFE Window pair
<b>MA-8</b>	6" PTFE Window pair
<b>MA-9</b>	9"x 4.5" Firebrick pair
<b>MA-10</b>	6"x 4" Ceramic pair
<b>MA-11</b>	Isolation Shock Mounts (pack of 4)
<b>MA-12</b>	Adjustable Mount-UHMW pair
<b>MA-13</b>	Adjustable Mount-PTFE pair
<b>MA-14</b>	Remote Waveguide Assembly
<b>MA-15</b>	Flange Pipe Mounting

#### Standard Weldment

Included with MRR/MRS System

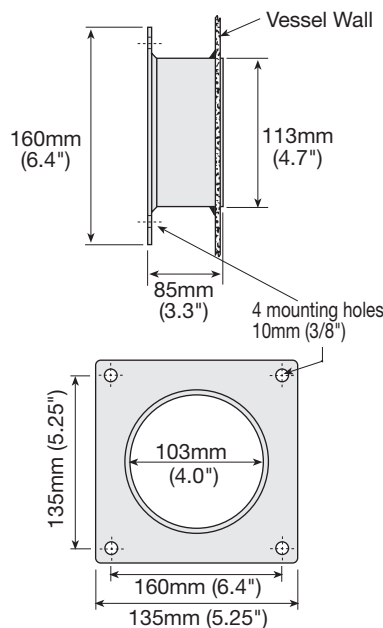
Part Number: MA-3  
MA-4  
MA-5



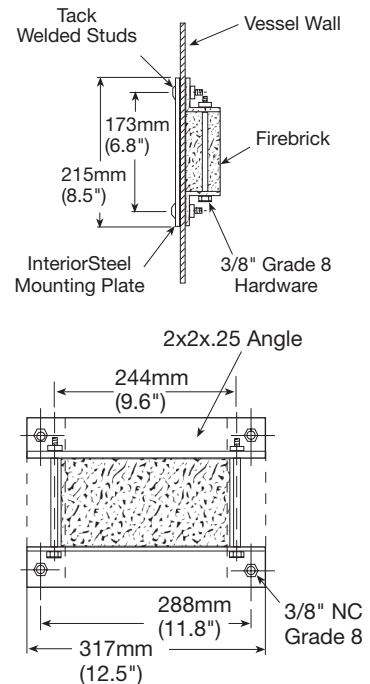
4 or 6" weldment should be used for impact resistance with microwave mounted behind it.

#### Standard Flanged Pipe Mount

Part Number: MA-15



#### Firebrick Frame Assembly



**Hawk Measurement Systems**  
15-17 Maurice Court  
Nunawading 3131 Victoria Australia

Telephone: 61 3 9873 4750

Facsimile: 61 3 9873 4538

E-mail Address: [hawksales@hawk.com.au](mailto:hawksales@hawk.com.au)

Represented by: