

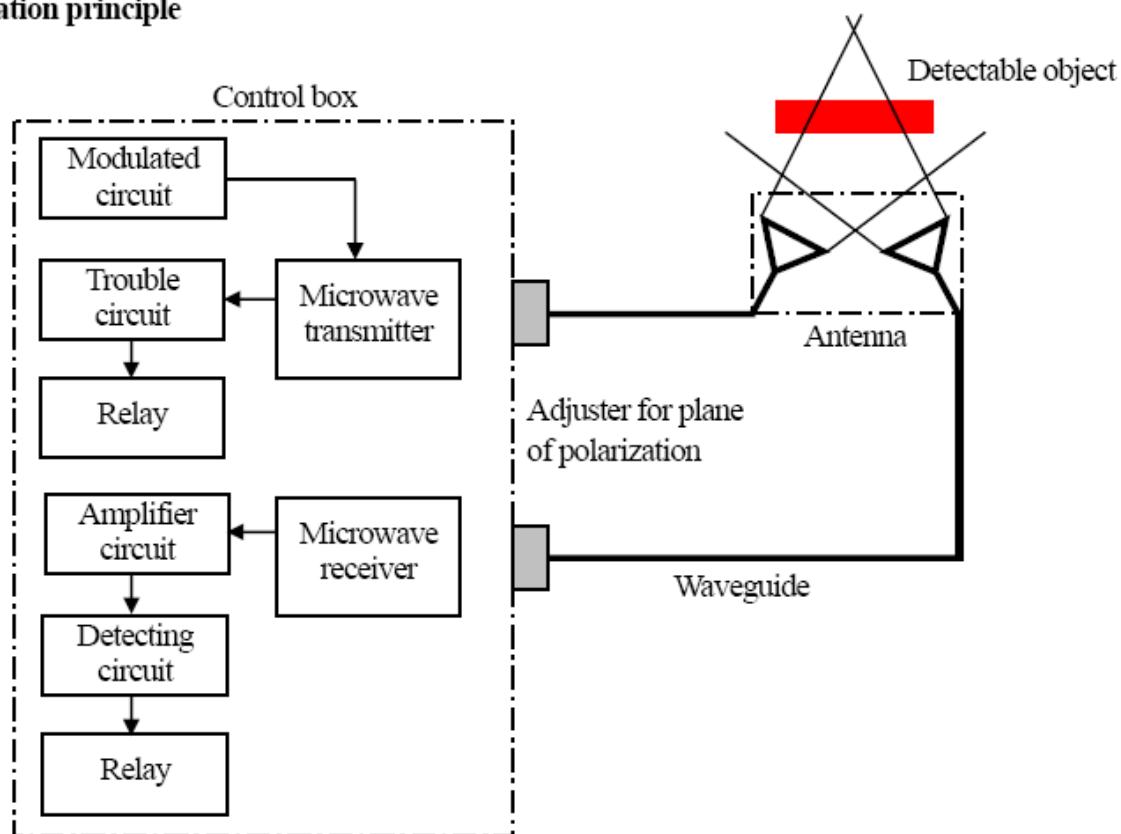
## 1. General

- \* This unit is a non-contact detection switch with microwave which had been developed for iron and steel making industry and is a suitable for detection of metal under sever condition with normal to extreme high(red heat) temperature.
- \* Microwave from transmission antenna is reflected by detectable objects and detection signal is executed by incidence to reception antenna.
- \* This unit consists of an antenna(detecting part), control box(transmitter, receiver and amplifier) and waveguide which is connected to both sections.
- \* Microwave is a kind of electromagnetic wave and generally electromagnetic wave with 1 to 30GHz is called microwave. This device is using microwave with 10.525GHz.

## 2. Feature

- \* No influence by disturbance light  
There is no influence by sun light or illumination because it is using microwave.
- \* Withstanding steam, dust or smoke  
Microwave is a higher permeability than light and permeates without attenuation even opaque object which can't permeate light, steam or smoke.
- \* Withstanding heat  
This unit can be used for detection of high temperature objects without water or air-cooling because electronic circuit which is very sensitive to heat is isolated from antenna section as detection part.
- \* High linearity  
Microwave provides high linearity because character is similar to light.

## 3. Operation principle



\* Operation principle of waveguide type Micro Master is as follows:-

\* Microwave is generated by modulated signal from modulated circuit through microwave transmitter.

- \* Microwave which was generated by microwave transmitter is radiated from transmission antenna through waveguide.
- \* In case that there are any detectable objects in detection area which consists of installation angle between transmission and reception antenna, installation dimension and antenna directional angle, microwave from transmission antenna is incident to reception antenna by reflecting detection objects.
- \* Microwave which is incident from reception antenna is reached to microwave receiver through waveguide. The signal from microwave receiver is executed as contact signal through amplifier circuit and detection circuit.
- \* In case that microwave transmitter was broken, contact signal is executed through trouble circuit.
- \* Adjuster for plane of polarization

Microwave can't communicate if microwave transmitter can't be coincided with electric/magnetic field direction of receiver. Cross section for microwave transmitter and input/output waveguide of receiver can distinguish electric and magnetic field direction because of rectangle but cross section of propagation waveguide is round and it may make a gap to electric and magnetic field direction in accordance with piping route and so electric and magnetic field direction are coincided with adjuster for plane of polarization.



Cross section of waveguide for transmitter and receiver



Cross section of propagation waveguide



Electric field direction



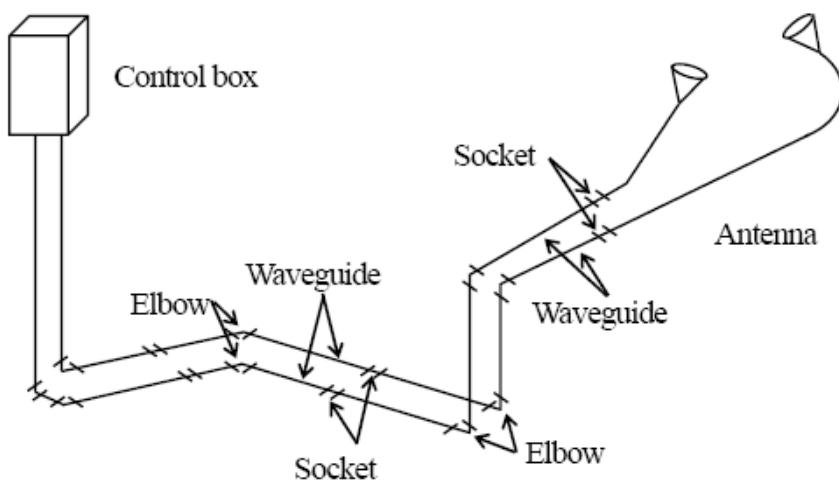
Magnetic field direction

#### 4. Structure and model No.

Waveguide type micro master consists of the following part.

- (1) Control box : MBX-301CA-NA
- (2) Antenna : MAR-201 or MAR-251
- (3) Waveguide : MWG-20
- (4) Joint : Socket MSJ-20, Elbow MBJ-20
- (5) Support stand for waveguide

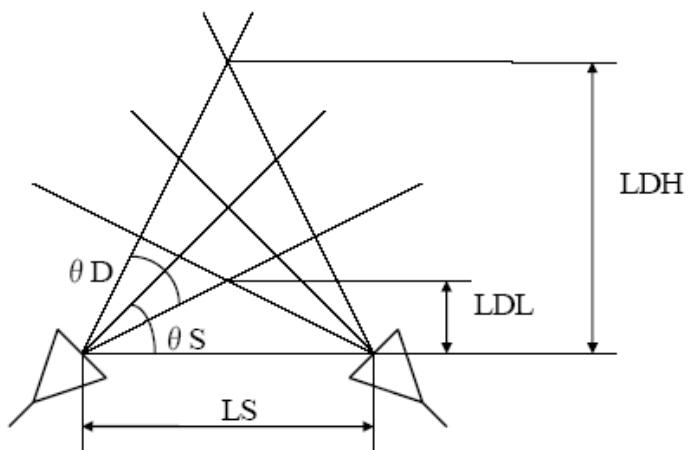
} Specify necessary quantities in accordance with piping route.



## 5. Specifications

Radio wave	A2N 10.525GHz(Model No. in accordance with Japanese radio wave regulation)	
Power source	115VAC(97 to 130VAC)	
Current consumption	4.5VA or less	
Control output	1C relay 250VAC 3A COS $\phi$ =1, 30VDC 5A Photo-coupler open-collector V <sub>ce</sub> $\leq$ 75V, I <sub>c</sub> $\leq$ 100mA	
Trouble output	1C relay 250VAC 3A COS $\phi$ =1, 30VDC 5A	
Min. detectable objects	Steel material with 50mm $\times$ 50mm, reflecting surface(In case that detecting object is in the center of detecting area and reflecting surface is flat.)	
Distance between antenna surface and passing line	300mm(Between the center of antenna face and passing line)	
Response time	Operating time	Returning time
	Relay 10msec or less	20msec to 10sec(Adjustable)
	Photo-coupler 3msec or less	10msec to 10sec(Adjustable)
Sensitivity adjuster	5 steps per 5dB(3.16 times)	
Hysteresis	1mm to 30mm Adjustable(2 to 10dB)	
LED lamps	Power lamp	Green Light up when Power-ON
	Operation lamp	Red Lights up when detecting
	Trouble lamp	Red Lights up when transmission trouble
	Receiving level lamp	Red 5 points Lights up in accordance with receiving level
Ambient temperature	Control box	-10 to +60 degrees C
	Waveguide, joint	-20 to +600 degrees C
	Antenna	-20 to +600 degrees C
Ambient humidity	45 to 95%RH(Not icing)	
Insulation resistance	20Mohm or more(Between power/output relay and case)	
Withstand voltage	1500VAC/min(Between power/output relay and case)	
Noise resistance	Pulse with 100nsec and 1500V by noise simulator	
Vibration resistance	10 to 55Hz and double amplitude 1.5mm	
Impact resistance	490m/S <sup>2</sup> (Approx. 50G) or more	
Protective structure	IP64	
Materials	Control box	AC2B
	Waveguide	SUS304
	Joint	BC-6
	Antenna	SPCC, BC-6, Vycor glass
External connection	M4 screw terminal	
Weight	Control box	Approx.10Kg
	Waveguide	Approx. 1Kg
	Joint	Approx. 150g
	Antenna	MAR-201 : Approx. 11Kg, MAR-251 : Approx. 12Kg,
Painted color	Control box	Munsell 7.5BG6/1.5
Air blow in waveguide (When using antenna with air-purge)	Quality	Industrial clean air
	Quantity	20lit/min
	Pressure	10Kg/cm <sup>2</sup>
Antenna specifications	Antenna interval LS	MAR-201, MAR-251 : 250mm
	Setting angle	MAR-201, MAR-251 : 65 degrees
	Directional angle $\theta$ D	25 degrees

## Detecting area



$$LDH = LS / 2 \tan(\theta S - \theta D/2)$$

$$LDL = LS / 2 \tan(\theta S - \theta D/2)$$

MAR-201, MAR-251 LDH approx. 560mm

LDL approx. 160mm