

PRODUCT DATA SHEET

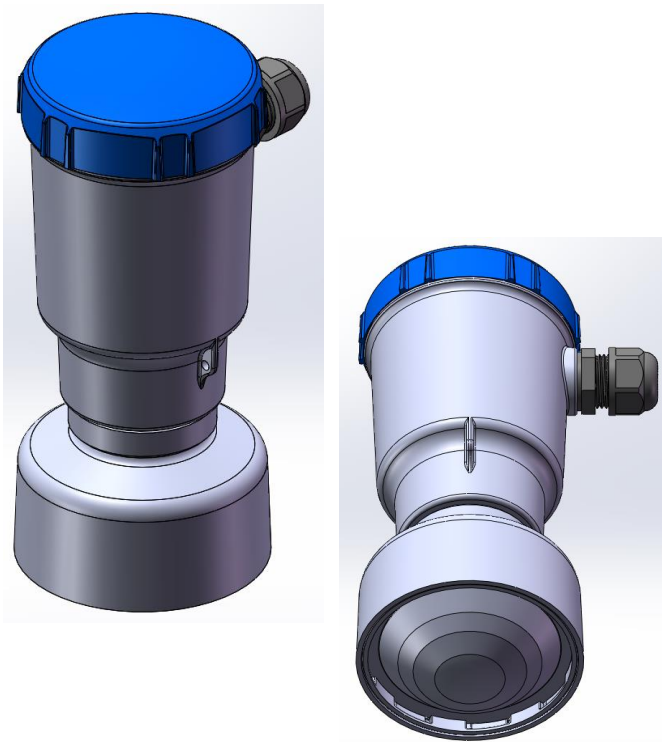
Non-contacting Radar Level Gauge

MW-10/11



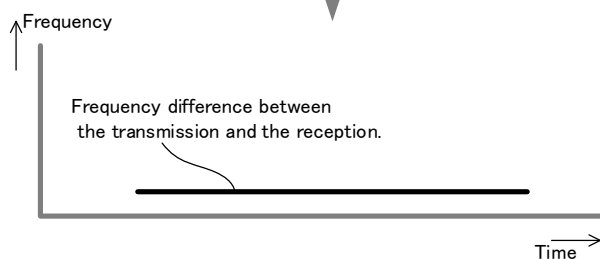
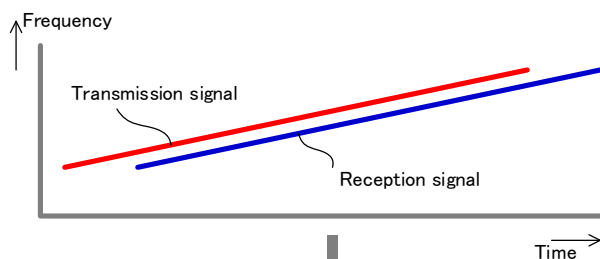
TOKYO
KEIKI

TOKYO KEIKI INC.



1. Advanced performance

- ◆ Non contacting measurement
- ◆ Non mechanical moving parts
- ◆ High reliability, Easy maintenance
- ◆ High sensitivity
- ◆ Density, Pressure and Temperature less affected
- ✓ Loop Power System (2-wire) with 4-20mA with HART protocol (MW-10)
- ✓ 4 wires system with RS-485 (MW-11)
- ✓ Long measurement range
- ✓ Interactive Windows-based setup software
- ✓ Bluetooth communication
- ✓ Wireless commissioning via Android phone



$$d = c \times \frac{\Delta t}{2}$$

d = distance
c = speed of light
 Δt = propagation time



2. Measuring principle

MW-10/11 measures liquid levels by transmitting the FMCW method radar signal towards the liquid surface and receiving the echoes. As the transmission frequency is constantly changing, it is possible to measure the travel time of the radar signal by knowing the frequency difference between the transmission signal frequency and the received signal frequency that is reflected. The speed of the radar signal and the speed of light are equal, therefore knowing the travel time of the radar signal is possible to measure the distance between the gauge and the surface.

Upon reception, microprocessors and intelligent software in the gauge head analyze the echoes and transform them into level output data. The radar signal is virtually less affected by the environment such as temperature or atmospheric pressure. Thus, radar measurement is proven to be the most reliable gauging method in the most applications.

The measuring principle is based on the FMCW method radar technology.

3. Features

Unique Technology

◆ **±2mm High Accuracy**

TOKYO KEIKI's advanced pulse technologies achieve +/-2mm accuracy. (Up to 30m)

◆ **Advanced Echo Processing**

"**Multi-echo Historical-validation**" checks trend continuity to track the echoes from liquid during process operation for smooth measurement. And, "**Auto Noise Table Function**" achieves stable and continuous level measurement on the Reactor tank application.

◆ **Rapid Tracking**

"**Full-range Search Mode**" boosts detection speed and track up to **2.5m/sec level change**.

◆ **Flow & Volume Calculation**

"**Extended calculation mode**" outputs not only Tank Volume, but also **Open Channel Flow Rate** by weir or flume combination.

◆ **Non-contacting commissioning**

Bluetooth communication has been equipped as standard. Android base APP makes non-contacting parameter setting achieve

◆ **Wide Measuring Range**

Up to 100m Max. by 80mm antenna

Stable Measurement

◆ **"Disturbance Noise Elimination"**

Cyclical & Multi-bounce noise echoes are eliminable for stable output. It realizes stable measurement without leap in process tank measurement.

◆ **"Predict Output"**

As the result of echo validation, MW-10/11 can output predicted data reasonably.

◆ **Distance Filter Window**

This window is effective for echo searching, and variable ranging available.

◆ **Double Bounce Handler**

Delayed echo by multi-bounce between liquid surface and tank ceiling will be eliminated.

User-friendly Design

◆ **Easy Configuration**

Graphical HART (MW-10) / RS485 (MW-11) Configuration on Laptop PC
Android base configuration / monitoring APP via Bluetooth communication

4. Applications

MW-10/11 is available to measure both of calm surface liquid such as reservoir basin or hydropower dams and also river level such as flood monitoring.

- Flood alert
- Tidal wave monitoring
- Power plant
- General industry

Also it will be available in Water industrial such as

- River intake gate,
- Process in waterworks,
- Water reservoir,
- Sewage water treatment plant,
- Hydraulic power station,
- River and dam,
- Coolant pit in steel process,
- Discharge outlet for flow metering.

The maintenance is the least required that as no part of the gauge is in physical contact with liquid.

And MW-10/11 has a function to remove unwanted echo.

By using this function, the user can prevent the erroneous recognition of the reflected wave by unwanted echo.

MW-10/11 very well suitable for open area applications such as river level and/or seawater level measurement in the disaster management / prevention market.

5. System

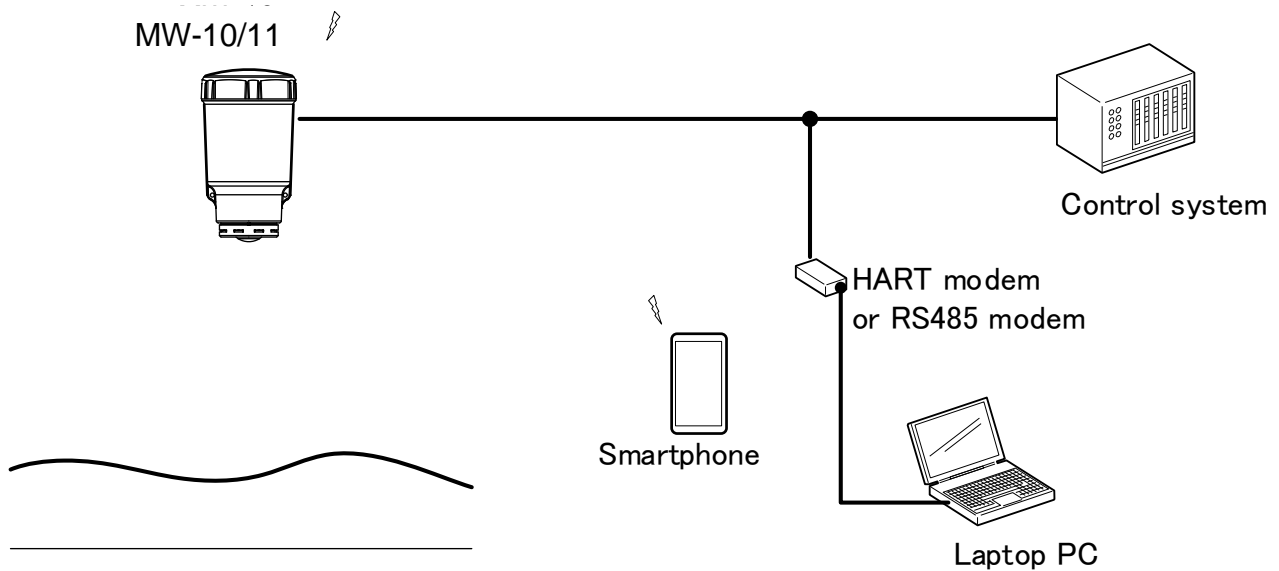
MW-10 uses 2-wire system for 4-20mA current loop with HART protocol which means both signal and power are available on same wiring.

MW-11 uses 4-wire system for RS485 communication by 2-wire power source and two signal line.

It is possible to operate Interactive Windows-based setup software on PC via HART or RS-485.

Also Android base APP via Bluetooth realizes non-contacting commissioning.

Example



6. Measuring

Measuring performance will be decided by products character (dielectric constant), surface conditions and antenna size.

In generally, the liquid, which has higher dielectric constant number such as water, is easily to measure, and calm surface liquid is the same.

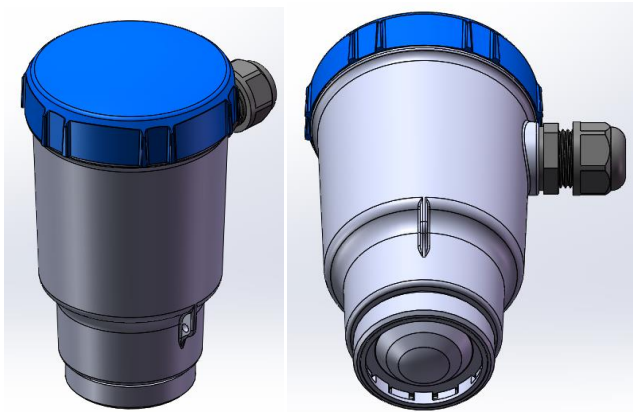
On the contrary, low dielectric constant liquid, turbulence surface or forming surface and dirty antenna conditions are relatively difficult to measure.

Even so if you choose right antenna by measuring range, it is possible to measure in most of case.

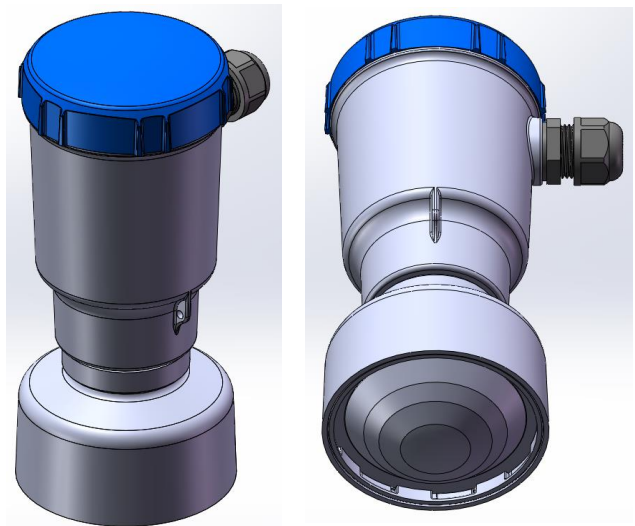
Below table and graphs show suitable antenna, products and range.

Antenna Measuring Distance (reference)

Type	Antenna	Range
MW-1□-NN0-010-4L	40mm	0-10m
MW-1□-NN0-015-4L-S	40mm	0-15m
MW-1□-NN0-030-4L-S	40mm	0-30m
MW-1□-NN0-050-8L-S	80mm	0-50m
MW-1□-NN0-100-8L-S	80mm	0-100m



40mm antenna



80mm antenna

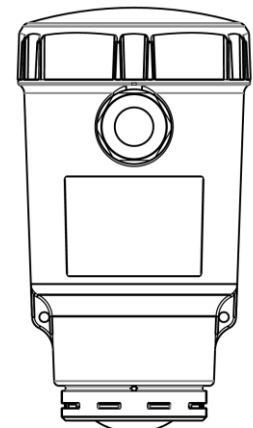
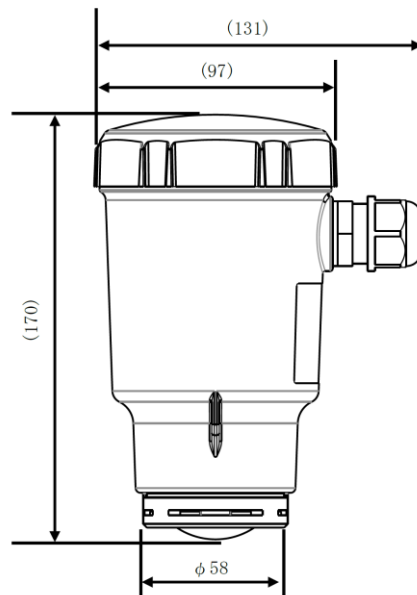
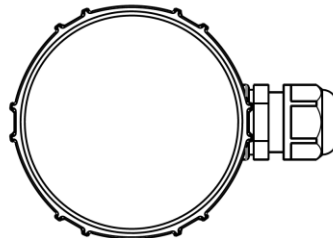
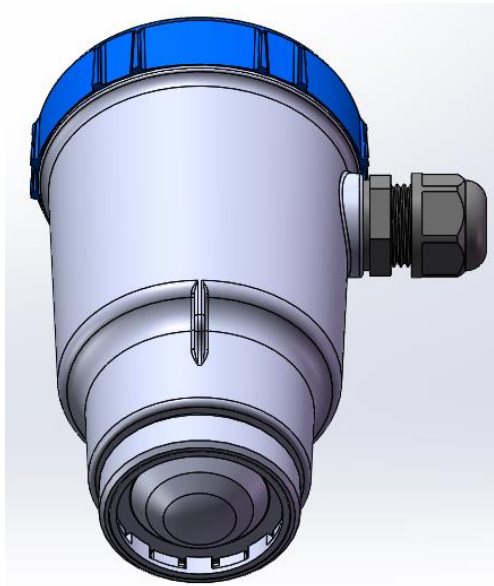
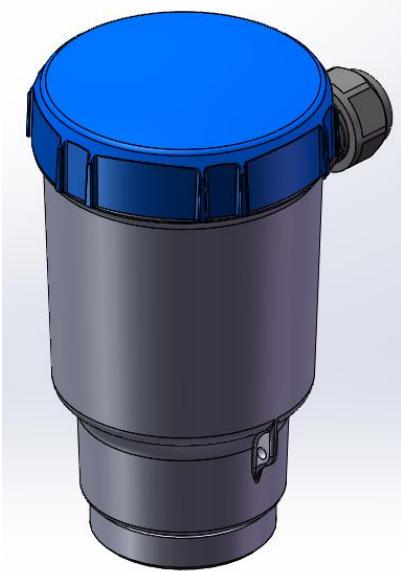
7. Antenna type

7-1. Antenna

2 type of Antennas are available up to 100m level measurement for open area application. The size of antenna are provided 40mm and 80mm.

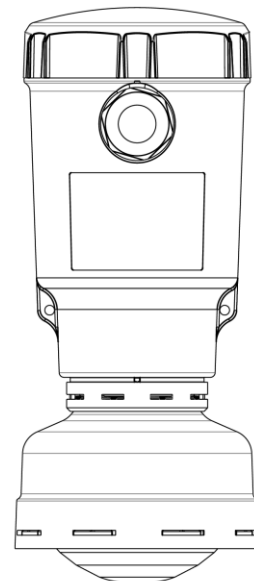
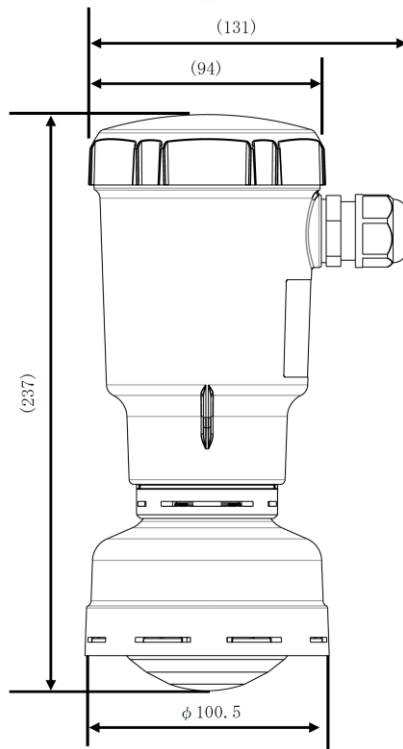
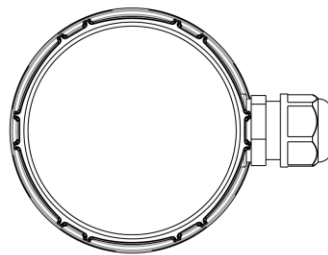
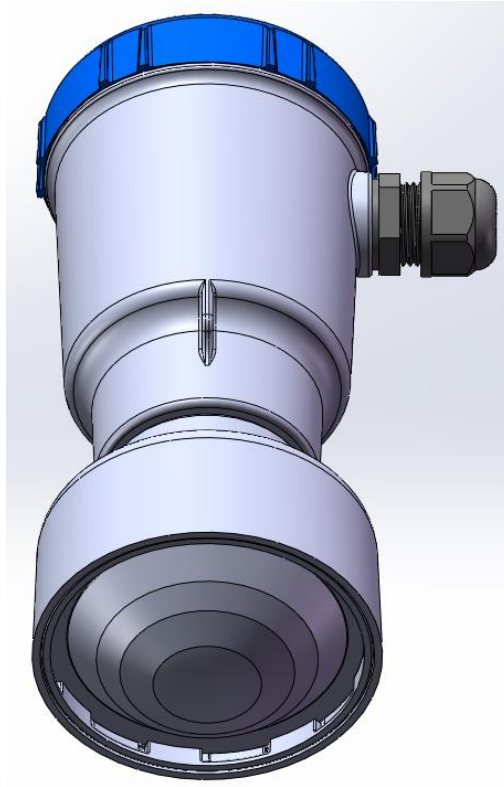
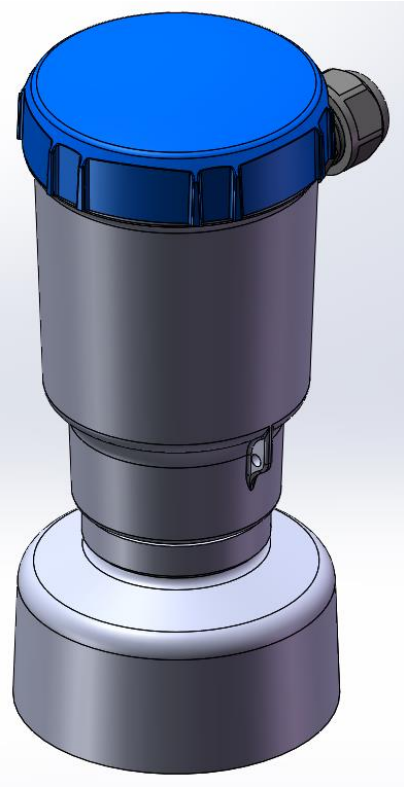
Thanks to MW-10/11 unique plate clamp solution, you can use your existing plate design according to the site conditions.

MW-10/11 with 40mm antenna



1. Hosing / PBT
2. Antenna Lenz / PTFE
3. Cover / PBT
4. Plug or Cable gland 6 Nylon

MW-10/11 with 80mm antenna

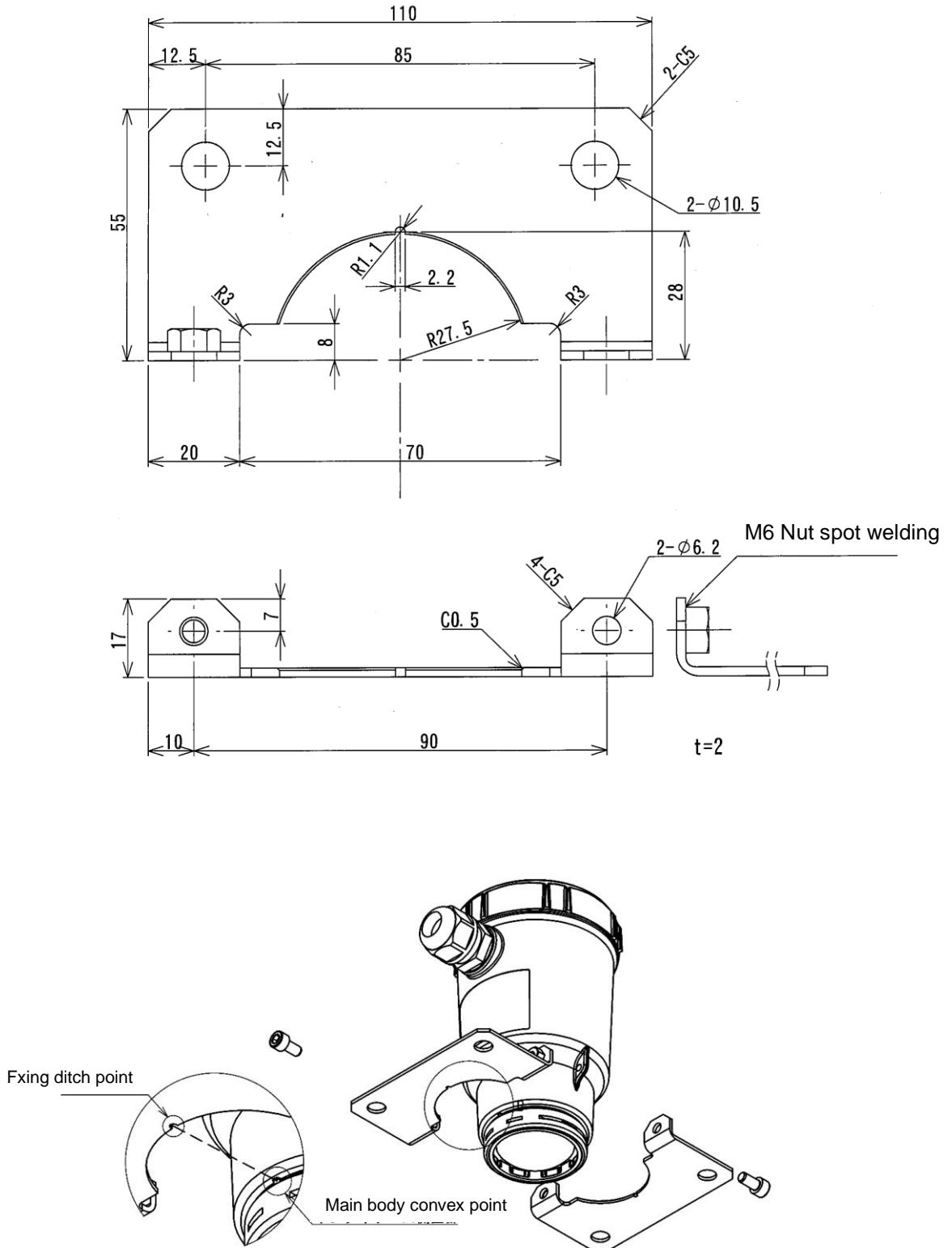


1. Hosing / PBT
2. Antenna Lenz / PTFE
3. Cover / PBT
4. Plug or Cable gland 6 Nylon

7-2. Fitting Flange/Plate for installation

MW-10/11's antennas are designed for easy mounting by plate or flange. In order to apply various standard's flange on the nozzles or plate, following adaptor can be applied which can arranged by local vendors as well.

Required adaptor dimensions



8. Mechanical Installation

MW-10/11 shall be mounted or hanged on the plate easily. To ensure performance you should install gauge properly as bellow.

Antenna should be kept horizontally.

Inside of microwave transmitting area might be clear.

Set the gauge to keep away from constructions as recommended dimension in the measuring ranges.

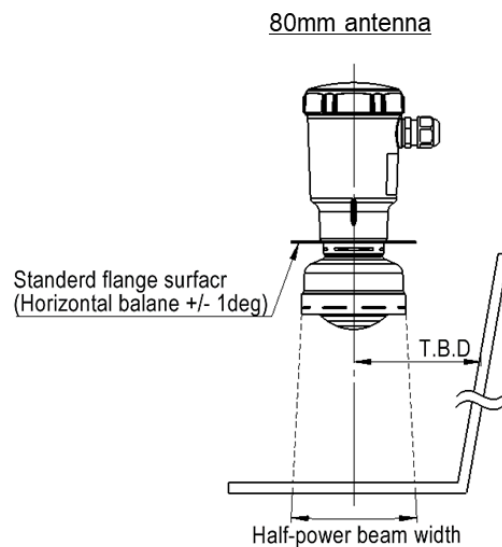
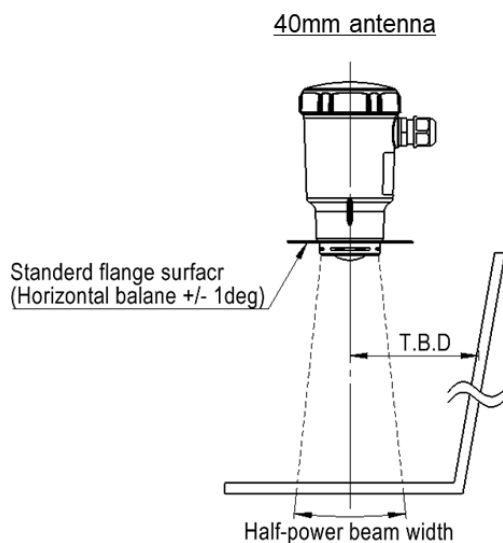
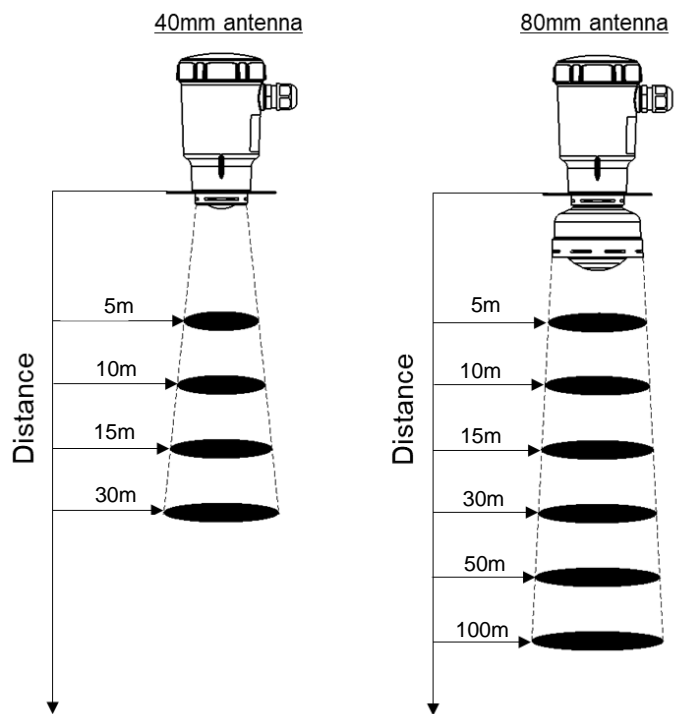
To choose bigger size antenna as you can because big size antenna will be better to gain weak microwave echo in bad conditions.

Size of microwave beam area

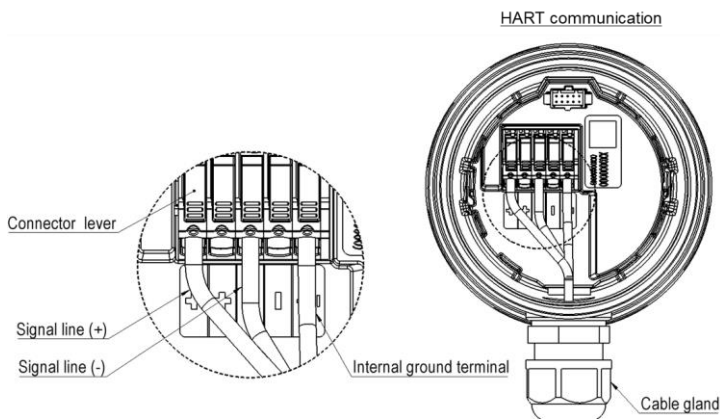
Beam area : Diameter of radiated area

Beam angle: Half-power beam width (degree)

Antenna type	40mm	80mm
Beam angle	6°	3°
Distance (m)	Diameter (m)	
5	0.52	0.26
10	1.05	0.52
15	1.57	0.79
30	3.14	1.57
50	-	2.62
100	-	5.24

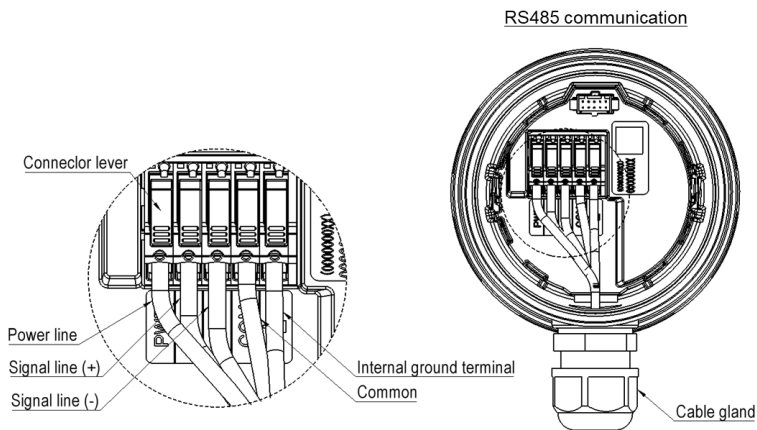


9. Electrical Installation



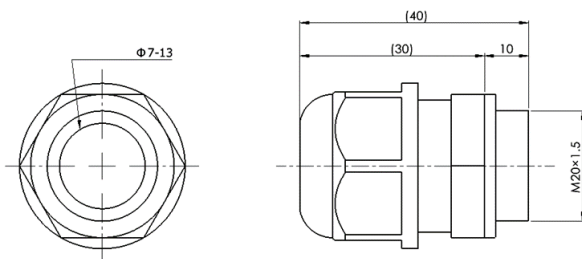
MW-10 via HART I/F model is 2-wire system, which means both signal and power are available on same wiring. The power source voltage is 12~36VDC can be available.

For application twisted and sealed cable is recommended.

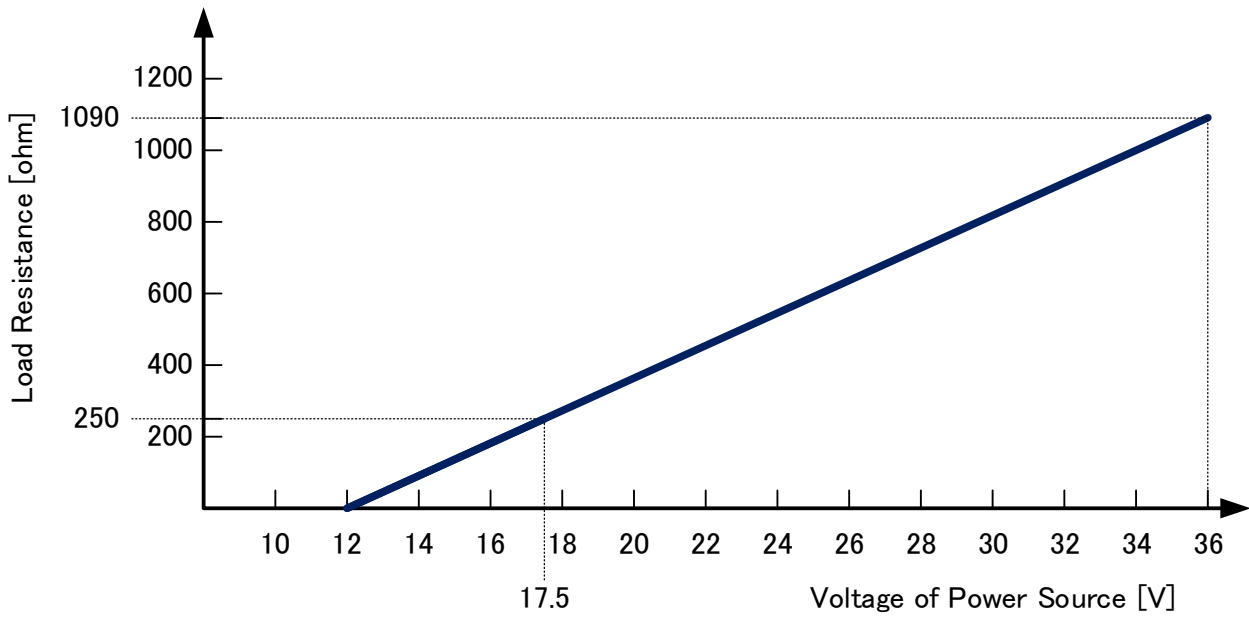


Also MW-11 via RS485 I/F model is provided for digital communication system. This model is using 2-wire Power source and two signal lines, the power source voltage is 10.5~36VDC can be available.

Cable gland



Correlation between Power Voltage and Load Resistance [TBD]



10. Technical Specifications

10-1. General specifications

Measurement principle	Frequency Modulated Continuous Wave (FMCW)	
Medium	Measurement object	Liquid
	Relative permittivity	$\epsilon_r \geq 1.8$
	Process temperature	0°C ~ +50°C
	Process pressure	0MPa ~ +0.3MPa
Max. measuring range	MW-1□-NN0-010-4L	10m
	MW-1□-NN0-015-4L-S	15m
	MW-1□-NN0-030-4L-S	30m
	MW-1□-NN0-050-8L	50m
	MW-1□-NN0-100-8L	100m
	NOTE: <ul style="list-style-type: none"> ▪ Near dead zone is Min.0.12m ▪ It is a consequence in our environment. It may vary depending on the installation environment and the measurement object. 	
Measuring cycle time	Min. 1sec.	
Tracking rate for Level change	Max. 2.5m/sec. (R>3.0m)	
Repeatability	TBD	
Maximum measured error	MW-1□-NN0-010-4L	±2mm
	MW-1□-NN0-015-4L-S	
	MW-1□-NN0-030-4L-S	
	MW-1□-NN0-050-8L	±2mm (-10m) / ±0.04%FS (10m-)
	MW-1□-NN0-100-8L	
NOTE: <ul style="list-style-type: none"> • If the measurement distance is below 1m, the measured error is TBD. • It is a consequence in our environment. It may vary depending on the installation environment and the measurement object. 		
EMC directive	TBD	
Low voltage directive	TBD	
RE directive	TBD	
Open Area directive	TBD	
RoHS10	TBD	

10-2. Transmitter specifications

Microwave	Operating frequency		80GHz		
	Transmitting power		TBD		
Power supply	MW-10 HART model		DC 12 ~ 36V		
	MW-11 RS-485 model		DC 10.5 ~ 36V		
Analog output (MW-10)	Current output		4-20mA, 4mA (HART multidrop mode)		
	Output variable		Level (m or Ft), Distance (m or Ft), Volume (%), Flow rate (%), Signal strength (dB)		
	Resolution		TBD		
	Alarm output		Hold, 3.6mA, 22mA		
	Temperature drift		TBD		
	Response Time		Min. 1s		
Digital output	MW-10	HART specification	HART 7		
		Resolution	1mm		
		Fastest output cycle	Min. 1s		
	MW-11	RS-485	Tokyo Keiki protocol (similar to HART 7)		
	MW-10/11	Bluetooth Low Energy	Bluetooth 5.2		
Max. distance		20m			
Surge immunity	TBD				
Ambient temperature	TBD				
Humidity	TBD				
Storage & transport temperature	TBD				
Vibration resistance (Resonance Point)	1G at 9 ~ 200 Hz				
Wiring port	Standard of screw		M20 x 1.5		
	Plug and cable gland -- attached accessories -- (number of parts)		Cable gland (1)		
	Connection cable outer diameter		Φ7 ~ 13mm		
	Connection cable core		Stranded wire	0.5 ~ 2.5mm ² (AWG20~12)	
			Single wire	0.8 ~ 2.0mm ² (AWG20~12)	
Material	Housing		PBT (Poly Butylene Terephthalate)		
	Cable Gland		Nylon 6		
	Antenna Lenz		PTFE		
Waterproof standard	IEC60529 IP66/67 and IP68				
Dimensions	40mm antenna		W90 x H160		
	80mm antenna		W100 x H210		

10-3. Weights

Weight	MW-1□-NN0-010-4L	Approx. 0.5kg
	MW-1□-NN0-015-4L-S	Approx. 0.5kg
	MW-1□-NN0-030-4L-S	Approx. 0.5kg
	MW-1□-NN0-050-8L	Approx. 0.7kg
	MW-1□-NN0-100-8L	Approx. 0.7kg

11. Required parameters for Inquiry

AA. Site Information

1) Site Name : _____

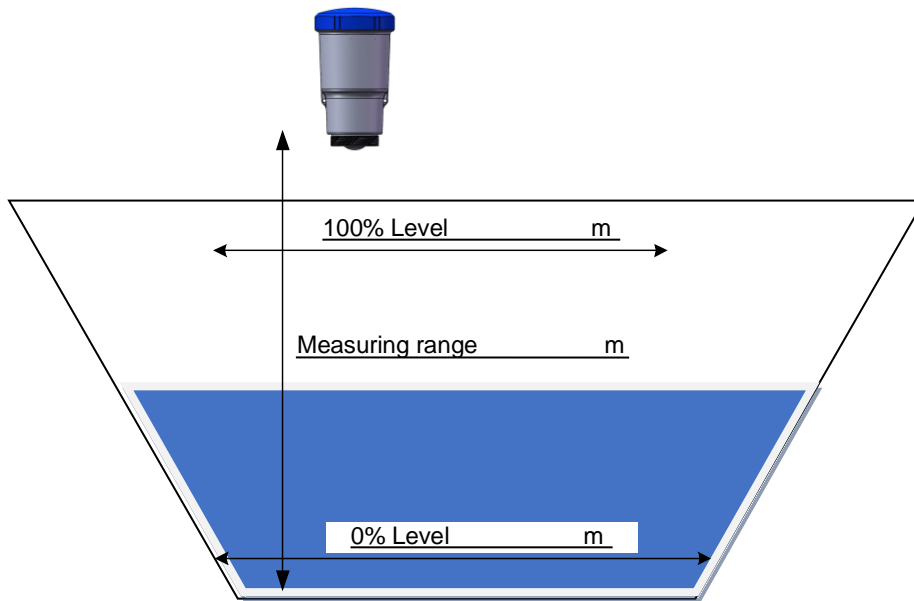
2) Site Quantity : _____ tank(s)

3) Site Dimension : If possible, send us DWG of site. _____

Site Dimension : _____

Site Range : _____ m

0% Position : LV _____ m (=4mA) 100% Position : LV _____ m (=20mA)



BB. Liquid Information

1) Liquid Name : _____ (main component)

2) Dielectric Constant : $\epsilon r =$ _____ (if possible)

3) Temperature : _____ C deg. ~ _____ C deg.

4) Pressure : _____ MPa ~ _____ MPa

5) Surface Condition : Calm / Foamy / Turbulent _____

CC. Extra Information

1) Purpose of Measurement: _____

2) Existing Level instruments : (if any) _____

3) Any other problems at Level : _____

12. Product Code

M	W	-1	N	-VV	W	-XXX	-YY	-S			
									S		Apply for 15m and 30m model only
									4L	Antenna	40mm Lenz Antenna (~10/15/30m)
									8L		80mm Lenz Antenna (~50/100m)
									010	Measuring Range	~10m
									015		~15m
									030		~30m
									050		~50m
									100		~100m
									0	Regulation	Overseas
									1		CE Marking (EN302729)
									NN		Non-Ex model
									0	Output	4-20mA HART
									1		RS485
									1	Destination	Overseas
									W	Frequency	W band
									M	Principle	MicrowaveLevelGauge

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