

PRODUCT DATA SHEET

Microwave Level Gauge

MRG-10



TOKYO
KEIKI

TOKYO KEIKI INC.

Microwave Level Gauge MRG-10

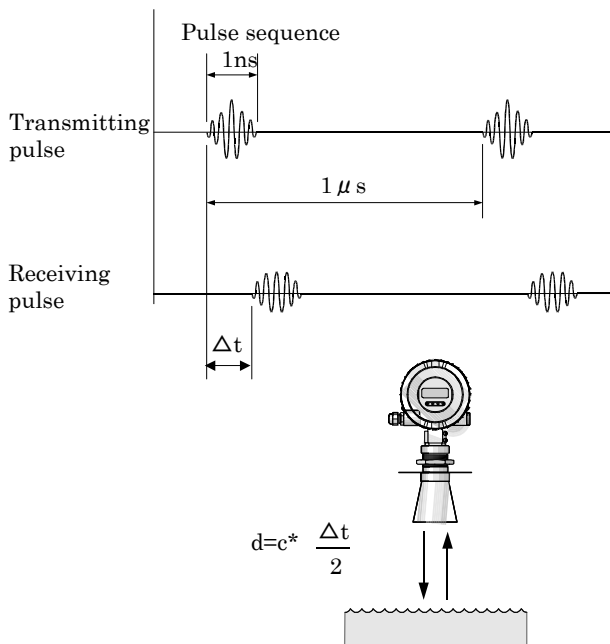


1. Advanced performance

The measuring principle is based on Time Flight impulse Radar technology that uses very short pulses.

- Non contact measuring
- Non mechanical moving parts
- High reliability, Easy maintenance
- High sensitivity
- Density, Pressure and Temperature independent

- Loop Power System (2-wire)
- 4-20mA output and HART output integrated
- Wide antenna range
- Interactive Windows-based setup software
- Built-in display/ keyboard



2. Features

1) Principle

Time Flight Impulse Radar Technology

2) Wide Measuring Range

Up to 20m Max.

3) Variety of Antennas

- 4inch Cone Antenna / 6inch Cone Antenna
- 8inch Cone Antenna
- PFA Rod Antenna (Long/Short inactive)

4) Easy Configuration

- Menu driven 4-keys input
- Graphical HART Configuration

3. Measuring principle

MRG-10 measures liquid levels by transmitting low energy radar pulses towards the liquid surface and receiving the radar echoes. The travel time for the radar pulse is proportional to 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 pulse is virtually unaffected by the tank content and atmosphere, temperature or pressure. Thus, radar measurement is proven to be the most reliable gauging method in most applications. Furthermore, maintenance requirements are in fact zero that as no part of the gauge is in physical contact with liquid.

All this makes MRG-10 very well suited for storage and buffer tanks in the chemical and water industry.

4. Applications

MRG-10 is appropriate for calm surface liquid. If you intend to use MRG-10 to measuring turbulence surface liquid, you had better to use still pipe in order to keep calm surface.

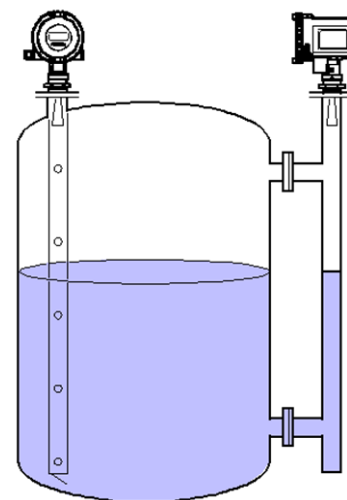
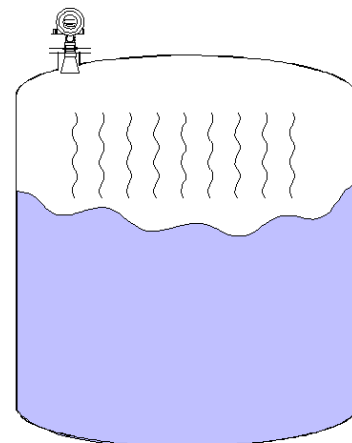
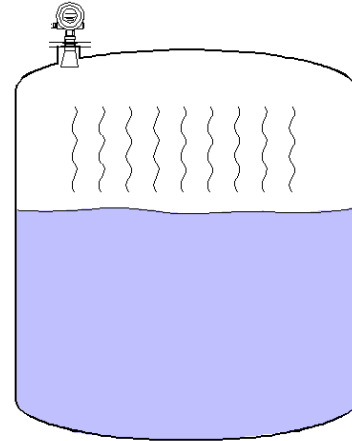
MRG-10 is appropriate for storage tanks or buffer tanks that they have relatively calm surface.

- Chemical and petroleum
- Pharmacy
- Food and beverage

Also it will be available in

- Water industrial such as river intake gate,
- Water supply,
- Sewage water treatment plant
- Hydraulic power station.

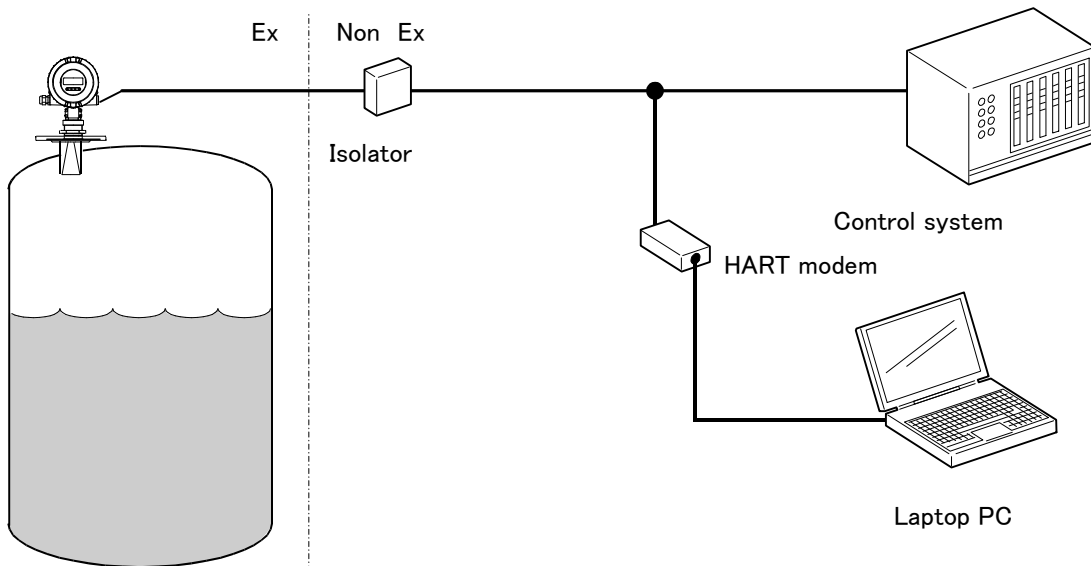
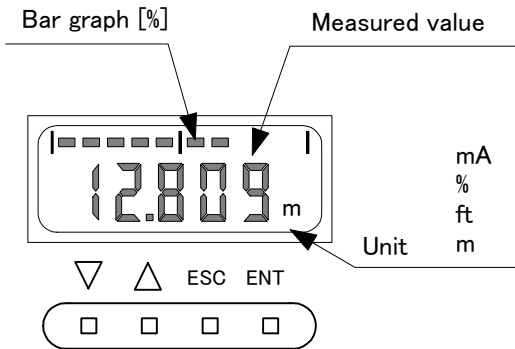
If you intend to use MRG-10 to measuring turbulence surface liquid, you had better to use still pipe in order to keep calm surface. Refer right figure.



5. System

MRG-10 uses 2-wire system, which means both signal and power are available on same wiring. MRG-10 is certified as intrinsically safety instrument, then if you intend to use it in hazard area, intrinsically safety isolator should be used.

All of data is displayed by 5-digit LCD display on main body and changed items by 4 configuration buttons easily. Also it is possible to operate Interactive Windows-based setup software on PC.



6. Measuring

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

In generally, the liquid, which has high 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, it is possible to measure in most of case.

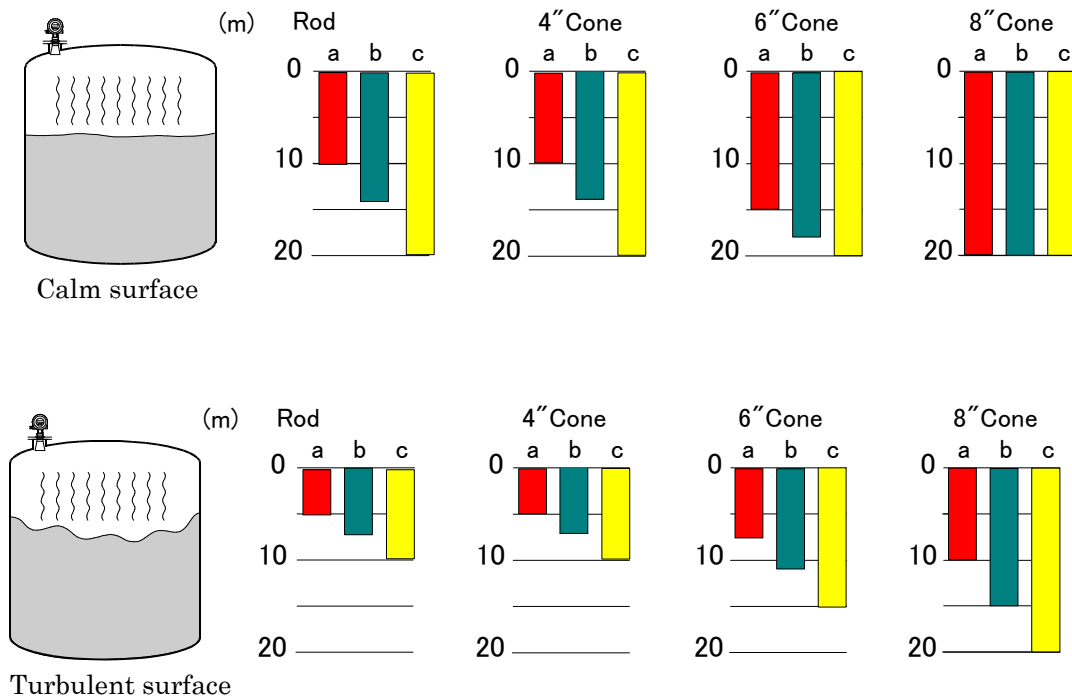
Below table and graphs show suitable antenna, products and range.

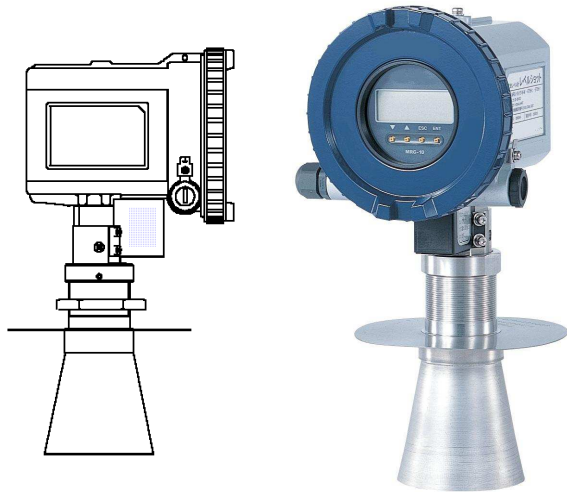
Type	Antenna	Targeting
MRG-10A-5T0H	4",6",8" Cone	Tank application
MRG-10A-5T0R-S	Rod antenna short	Low tank nozzle
MRG-10A-5T0R-L	Rod antenna long	High tank nozzle

Almost all of liquid may be classified as below 3 types.

- a: Oil, Hydraulic carbon, Mainly petroleum industry ($\epsilon r=1.9\sim 4.0$)
- b: Alcohol, Acid ($\epsilon r=4.0\sim 10$)
- c: Water base liquid ($\epsilon r > 10$)

Antenna Measuring Distance (reference)





7. Antenna type

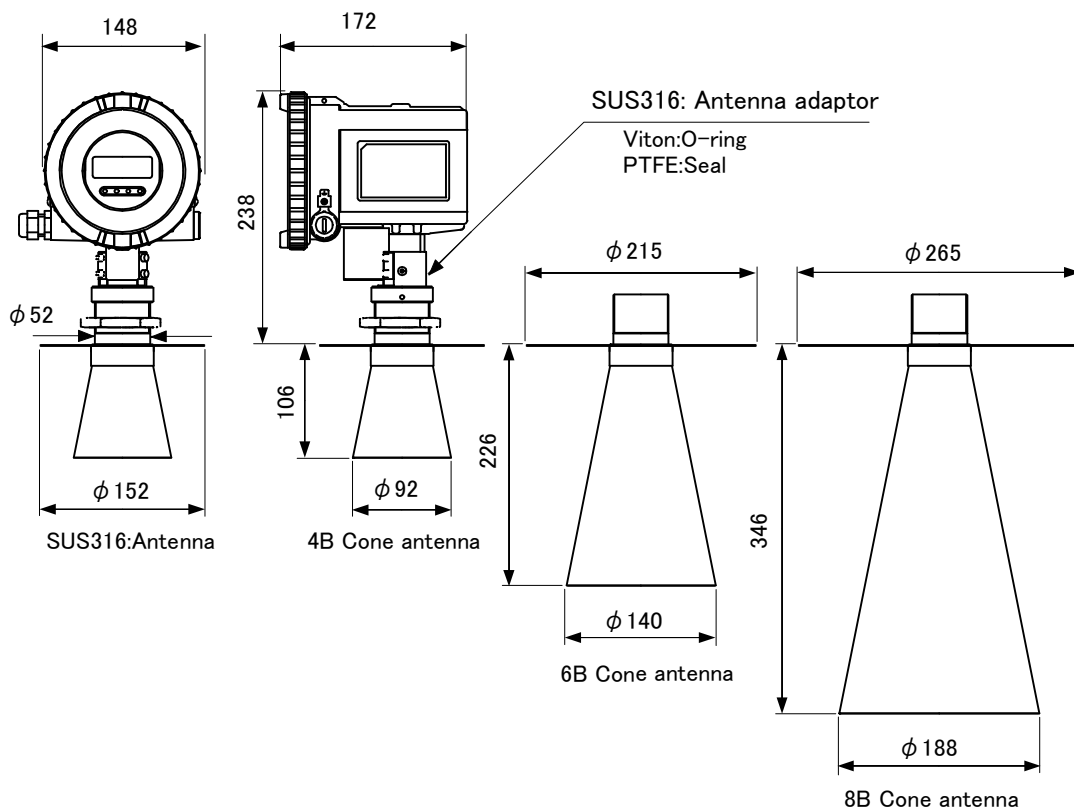
Antenna is only a part, which is exposed in tank inside, and you should choose proper antenna that suits to your demand.

7-1. Cone antenna

Cone antenna is available for both original tank or vessel and pipe installation.

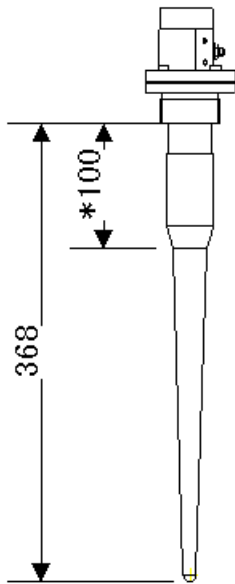
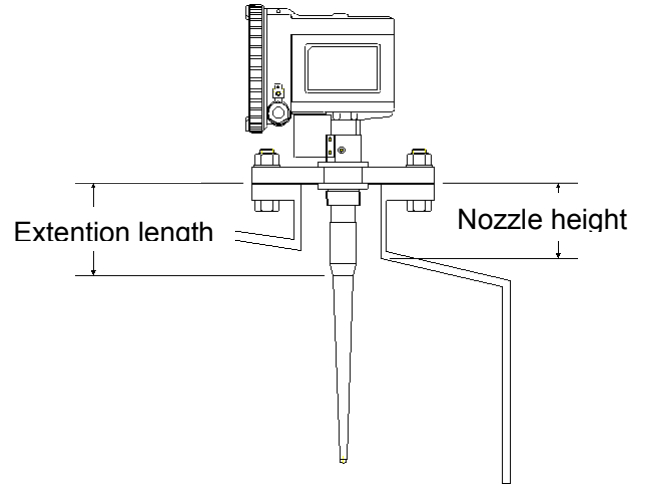
The size of antenna are extending from 4 inch to 8 inch, and the only materials which is exposed in tank inside are consisted of SUS-316L and PTFE sealing and O rings.

Thanks to MRG-10 unique flange clamp solution, you can use your existing flange as process connection.

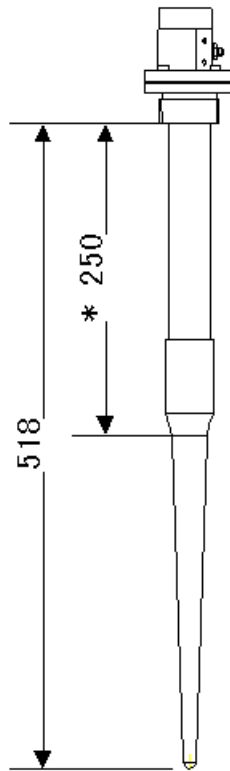


7-2. Rod antenna

The Rod antenna is made of Teflon (PFA) and stainless steel, which makes it easy to clean and resistant to aggressive chemicals and conditions. It has inactive length of 100mm and 250mm to ensure that measurements are unaffected by the mounting nozzle or thick flower.



*Extension

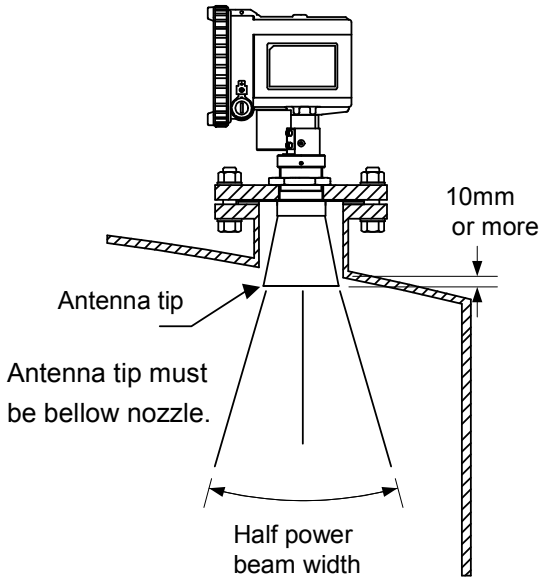


8. Mechanical Installation

MRG-10 shall be mounted on tank nozzle or pipe easily. To ensure performance you should install gauge properly as bellow.

Antenna should be kept horizontally. Inside of microwave transmitting area might be clear.

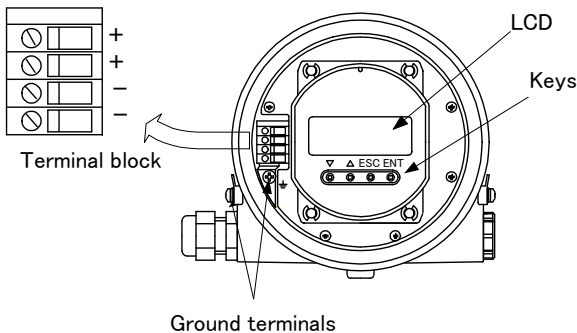
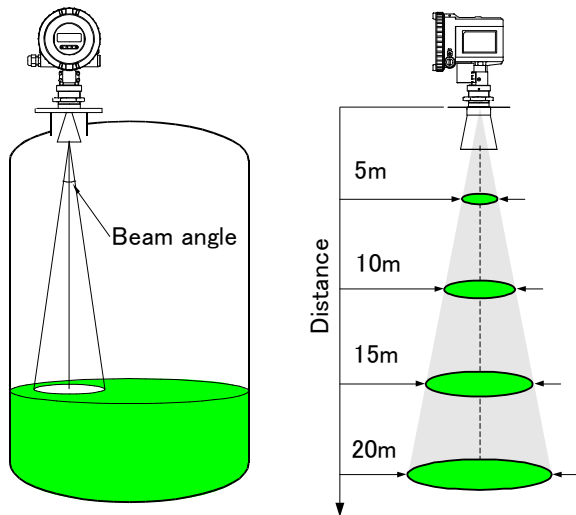
Set the gauge to keep away from tank wall as recommended dimension in the measuring ranges. To choose bigger size antenna as you can because big size antenna will be better to gain weak microwave echo in bad conditions.



Size of microwave transmitting area

* (-3dB down angle)

Distance (m)	Diameter (m)			
Antenna type	4B Cone	6B Cone	8B Cone	Rod
Beam angle	34°	22°	17°	30°
5	2.9	1.9	1.5	2.7
10	5.8	3.8	3.0	5.4
15	8.8	5.7	4.4	8.0
20	11.7	7.6	5.9	10.7



9. Electrical Installation

MRG-10 is 2-wire system, which means both signal and power are available on same wiring. The power source voltage is 16-36VDC in non-hazardous area, and 16-28VDC in hazardous area might be available. For application twisted and sealed cable is recommended.

MRG-10 is certified as intrinsically safety instrument. Then if you intend to use it in hazardous area, you should use with intrinsically safety isolator. In that case electrical parameters are 28VDC, 93mA and 0.65W as maximum.

Also, if you want to know more detail conditions, please refer installation guidance.

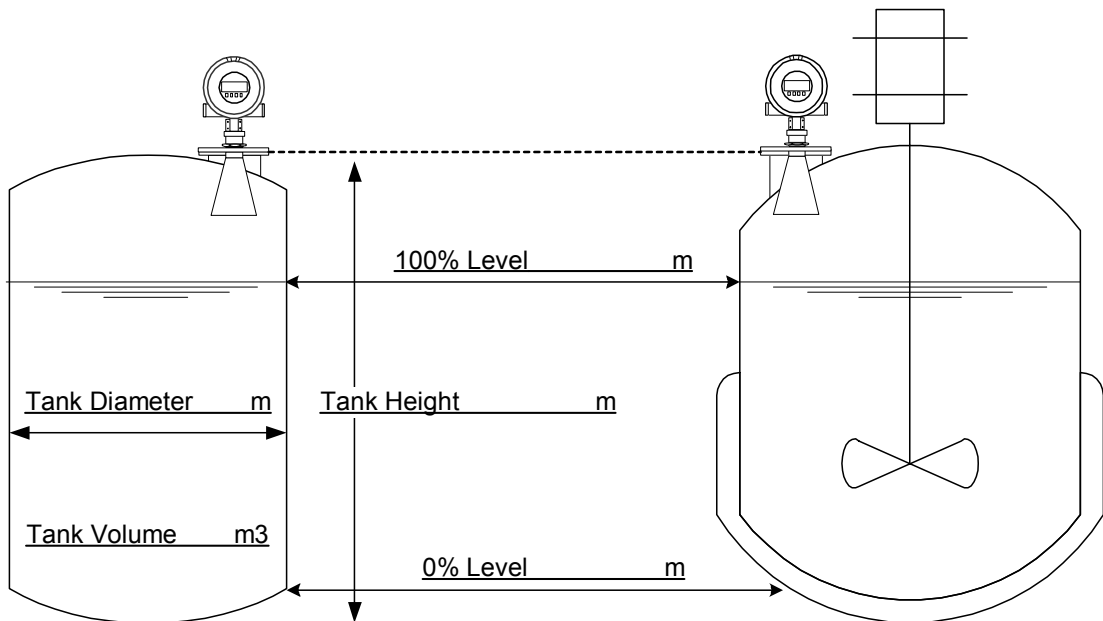
SPECIFICATIONS

1.General	
Measuring principle	Time Flight impulse Radar technology
Operating frequency	5.8 GHz
Half power beam angle	Rod antenna: 30deg., Cone antenna 4": 34deg., 6": 22deg., 8": 17deg.
Microwave output power	Max 1 μ W
Reference conditions	Free space reflection from metal surface, ambient temperature 25°C, atmospheric pressure
2.Display / Configuration	
Local display	5 digit LCD display with 4 configuration buttons. Level, Ullage, Volume, Current or Amplitude output
HART hand held communicator	Rosemount Communicator RS275, just display not for configuration
PC Remote configuration	Windows base setup and configuration software
3.Electrical	
Power supply	Loop powered 16-36 VDC (16-30VDC in Ex applications)
Output	Analog DC4-20mA +HART
Output variable	Level, Ullage in m or ft. Volume in %, Amplitude in dB.
Signal on alarm	Hold, Low(3.9mA), High(22mA)
Cable entry	2-M20×1.5(Applicable Cable diameter : 6.5-9.0mm)
4.Mechanical	
Antenna	Rod antenna, Cone antenna 4", 6", 8"
Antenna material exposed to tank	Rod antenna: PFA and SUS(316L,ext.version) Cone antenna: 4", 6", 8" SUS(316L), PTFE, Viton
Antenna dimension	See page 5 and 6
Housing / Enclosure	Casting Aluminum
Flange	On request or customer supply
Mass	3.3--4.3Kg, depend on antenna size
Height above flange	230 mm
5.Environment Condition	
Max. pressure	10 bar. (145 psi)
Ambient temperature	-20 °C to 70 °C (-4° F to 158° F), LCD Display -20°C to 70°C
Storage temperature	-40 °C to 80 °C (-40° F to 176° F)
Tank inside temperature	-20 °C to 150 °C (-4° F to 302° F)
Ingress protection	IP65
Vibration resistance	IEC 68-2-6/1G
Ex. Approval	ATEX II 1/2GD Ex ia IIC T4 (for Cone antenna) ATEX II 2G EX ia IIC T4 (for Rod antenna) (Ui=28V / Ii=93mA / Pi=650mW / Li=0H / Ci=0F / Group II C)
6.Measuring Performance	
Instrument accuracy	+/- 10mm
Repeatability	+/- 1mm
Update interval	1 Second
Measuring range	Depend on Antenna type and products nature, see diagram at page 4

Required parameters for Inquiry

AA. Tank Information

- 1) Tank Name : _____
- 2) Tank Q'ty : _____ tank(s)
- 3) Tank Dimension : If possible, send us DWG of tank.
 Tank Shape : Spherical, Cylindrical, Horizontal, Other (_____)
 Tank Volume : _____ m³ or _____ L
 Tank Height : _____ m Tank Diameter : _____ m
 0% Position : LV _____ m (=4mA) 100% Position : LV _____ m (=20mA)
- 4) Agitator Type : _____
- 5) Inner Obstruction : Heater coil / Baffles / Pipes / or others (_____)
- 6) Mounting Flange Rating : _____



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) Corrosive Requirement : SUS316L / PFA/PTFE only
- 6) Surface Condition : Calm / Foamy / Turbulent

CC. Extra Information

- 1) Purpose of process : _____
- 2) Existing Level instruments: (if any) _____
- 3) Any other problems at Level : _____

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