



FMCW Radar Level Transmitter



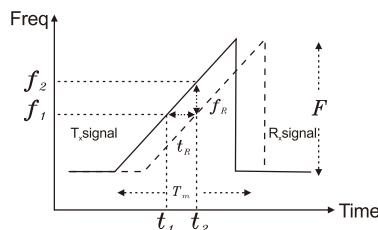
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PRODUCT INTRODUCTION

FMCW Radar level transmitter is a non contact measuring device, which is suitable for high temp., high pressure, and corrosive applications. It is easy to install and free of maintenance, especially for the high accuracy requirement environment.

PRINCIPLE

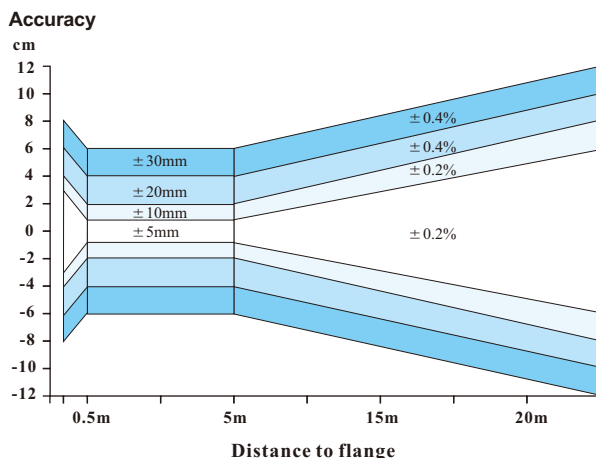
FMCW radar adopts a high frequency signal, which is emitted via an antenna and swipes frequency increment by 0.5GHz during the measurement, reflected by the target surface and received at a time delay. The frequency difference, which is calculated from the transmitting frequency and the received frequency, which is directly proportional to the measured distance (or material surface). The frequency difference then is processed by Fast Fourier Transformation (FFT) to identify the signal in Intermedium Frequency (IF). This FMCW radar is innate with signal / noise enhancement and filtering of echo-back via Phase-Lock Loop (PLL) circuit that is the best solution for complex environment and high accuracy measurement.



Design formula

$$\text{Slop} = \frac{F}{T_m} = \frac{f_R}{t_R} = \frac{f_R}{\frac{2R}{c}} \quad t_R = \frac{2R}{c}$$
$$R = \frac{F \times c \times T_m}{2F}$$

JFR-100 LINEARITY DIAGRAM



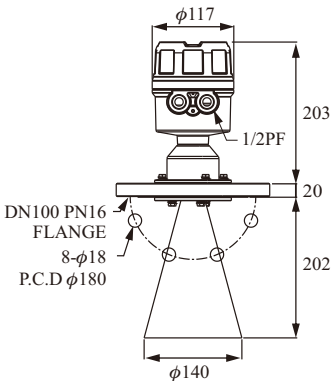
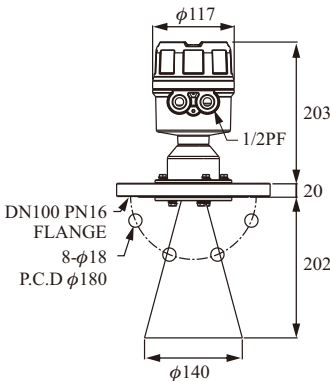
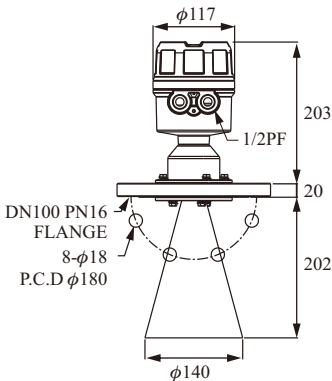
FEATURES

- Non contact measuring
- Corrosive and toxic liquid, hydrocarbons, slurries
- Not affected by specific gravity, pressure, temperature, viscosity, foam, and dust
- 5 digits LCM display
- Indicate signal wave inside the silo.
- Selection of Different Measurement unit(m, cm, mm, inch, ft, %, mA)
- Measuring distance and actual level.
- Language selection of traditional Chinese, simplified Chinese, English.
- 4-20mA/ 4 lead wires
- Modbus RS-485 to enhance isolation and easy for remote control.
- CE standards for isolation(EFT 2000V, B class or better)
- Suitable for mid-range signal
- 4mA, 20mA output
- Set functions to the continuous measuring device via FAS software.
- Isolated circuit design.

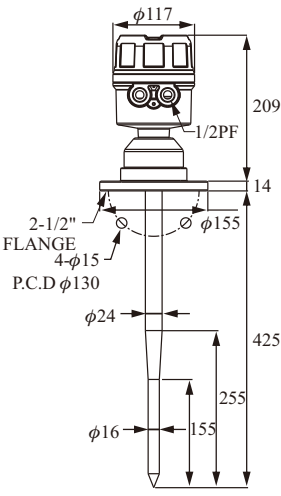
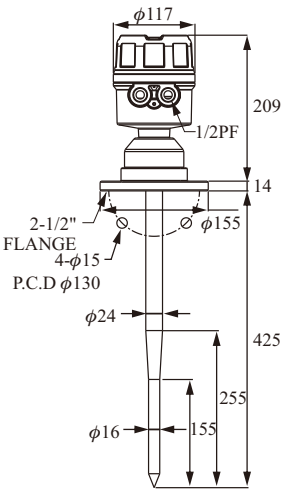
TEST STANDARDS

- High voltage : IEC60947-2
- Isolated resistance : IEC60092-504
- Power supply change : IEC60092-504
- Power supply failure : IEC60092-504
- Electrical burst testing : IEC61000-4-4
- Voltage DIPS : IEC61000-4-11
- Humidity : IEC60068-2-30
- High/Low temperature test : IEC60068-2-1&2
- Protection rating IP65 : IEC60529

SPECIFICATION

Dimensions (Unit:mm)				
	DN100 PN16 FLANGE 8-φ18 P.C.D φ180	DN100 PN16 FLANGE 8-φ18 P.C.D φ180	DN100 PN16 FLANGE 8-φ18 P.C.D φ180	
	Model	JFR-100-□-□□□A	JFR-100-□-□□□B	JFR-100-□-□□□C
	Measuring range	20m(max.30m)	20m(max.30m)	20m(max.30m)
Accuracy	± 5mm (1m~5m)	± 10mm (1m~5m)	± 20mm (1m~5m)	
Repeatability	± 2.5mm	± 5mm	± 10mm	
Digital comm.	RS485(Isolated)	RS485(Isolated)	RS485(Isolated)	
Ambient temp.	-20~70°C	-20~70°C	-20~70°C	
Operating temp.	-20~200°C	-20~200°C	-20~200°C	
Operating pressure	0~40 bar	0~40 bar	0~40 bar	
Frequency	X Band	X Band	X Band	
Analog output	4~20mA/ 4 Wire	4~20mA/ 4 Wire	4~20mA/ 4 Wire	
Power consumption	100mA/ 24Vdc	100mA/ 24Vdc	100mA/ 24Vdc	
Protection rating	IP65	IP65	IP65	
Min. dielectric constant	2.5	2.5	2.5	
Power supply	24Vdc ± 10%	24Vdc ± 10%	24Vdc ± 10%	
Local display	5 digits LCM display	5 digits LCM display	5 digits LCM display	
Housing material	Aluminum	Aluminum	Aluminum	
Antenna type	Horn	Horn	Horn	
Antenna material	SUS 304/ 316/ PTFE Coating	SUS 304/ 316/ PTFE Coating	SUS 304/ 316/ PTFE Coating	
Sampling rate	1sec.	1sec.	1sec.	
Blind distance	0.5m	0.5m	0.5m	

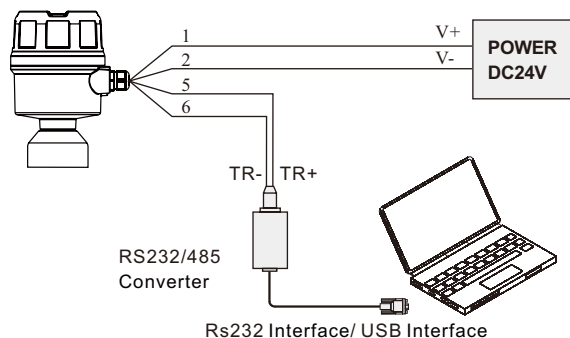
SPECIFICATION

Dimensions (Unit:mm)		
Model	JFR-110-□-□□□C	JFR-110-□-□□□D
Measuring range	10m	10m
Accuracy	± 20mm (1m~5m)	± 30mm (1m~5m)
Repeatability	± 10mm	± 15mm
Digital comm.	RS485(Isolated)	RS485(Isolated)
Ambient temp.	-20~70°C	-20~70°C
Operating temp.	-20~150°C	-20~150°C
Operating pressure	0~16 bar	0~16 bar
Frequency	X Band	X Band
Analog output	4~20mA/ 4 Wire	4~20mA/ 4 Wire
Power consumption	100mA/ 24Vdc	100mA/ 24Vdc
Protection rating	IP65	IP65
Min. dielectric constant	4	4
Power supply	24Vdc ± 10%	24Vdc ± 10%
Local display	5 digits LCM display	5 digits LCM display
Housing material	Aluminum	Aluminum
Antenna type	Wave Stick	Wave Stick
Antenna material	PTFE	PTFE
Sampling rate	1sec.	1sec.
Blind distance	0.6m	0.6m

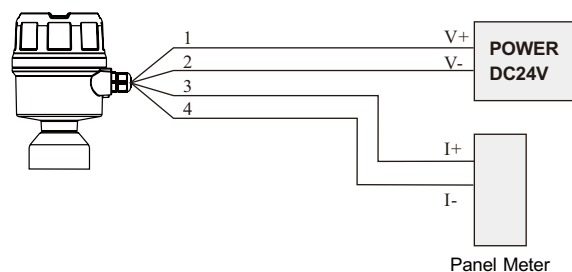
WIRING/CALIBRATION

WIRING INFORMATION

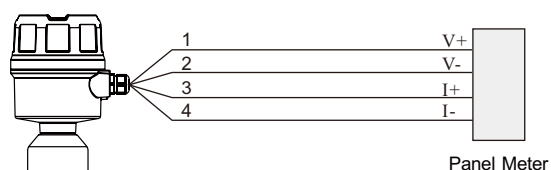
RS485 wiring



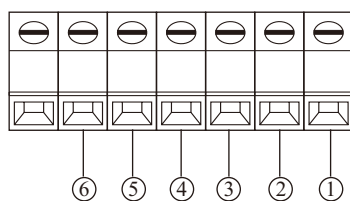
JFR Series and Indicator(External Power)



JFR Series and Indicator(Powered by panel meter)



WIRING DIAGRAM



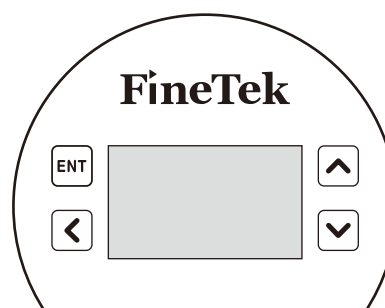
- ① Power Supply: V+
- ② Power Supply: V-
- ③ Analog Output: I+ (4~20mA)
- ④ Analog Output: I- (4~20mA)
- ⑤ Communication: TR+ (Rs485)
- ⑥ Communication: TR- (RS485)

CALIBRATION

Two ways to calibrate the JFR Series:

1. With display/adjustment module
2. By PC based FAS software

Adjustment module is an adjustment tool with 4 buttons to click on. It also has a transparent window to allow display reading.



5 digits LCM display

[ENT] Button

- Enter Edit status
- Confirm Edit
- Confirm parameter modification

[<] Button

- Select Edit
- Select parameter
- Parameter

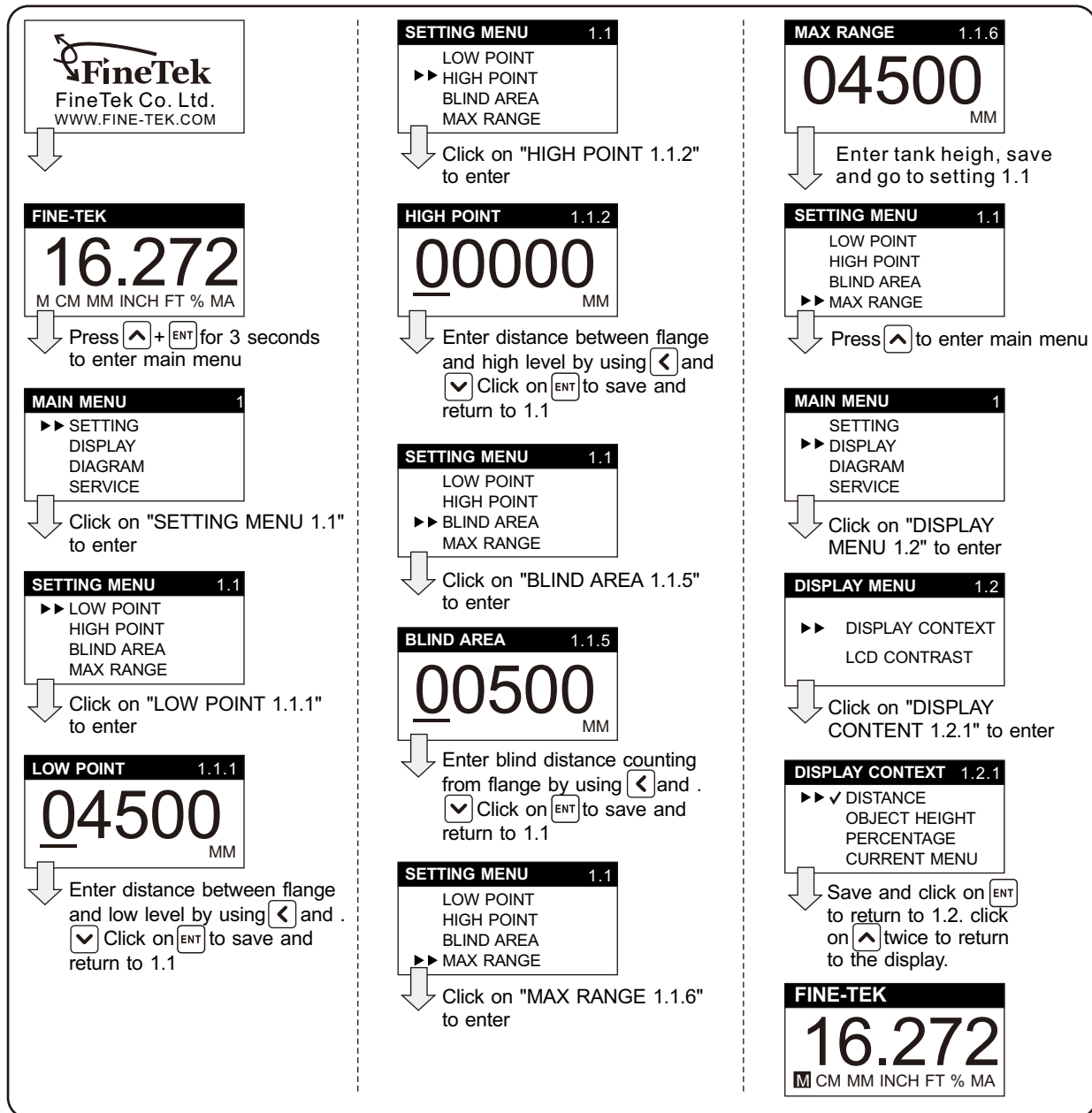
[^] Button

- Return
- Cancel

[v] Button

- Increase
- Select

QUICK SETUP

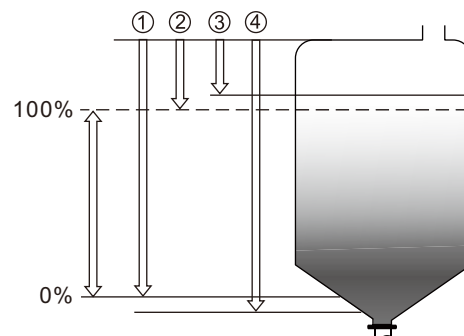


DIAGRAM

Measurement bench-mark starts at contact surface of connection.

- ① Low level calibration (menu 1.1.1)
- ② High level calibration (menu 1.1.2)
- ③ Blind Distance (menu 1.1.5)
- ④ Measuring Distance Setup (menu 1.1.6)

Note: Be aware of blind distance when measuring material high level.(Shown in ③)



SOFTWARE SETUP CALIBRATION

Software Setup Calibration(FAS)

FAS calibration software can be utilized with JFR Series via RS485/RS232 to allow tank data reading and setup from PC.

Parameter Description

Low Point: Low point(4mA), measuring range from flange to low level.

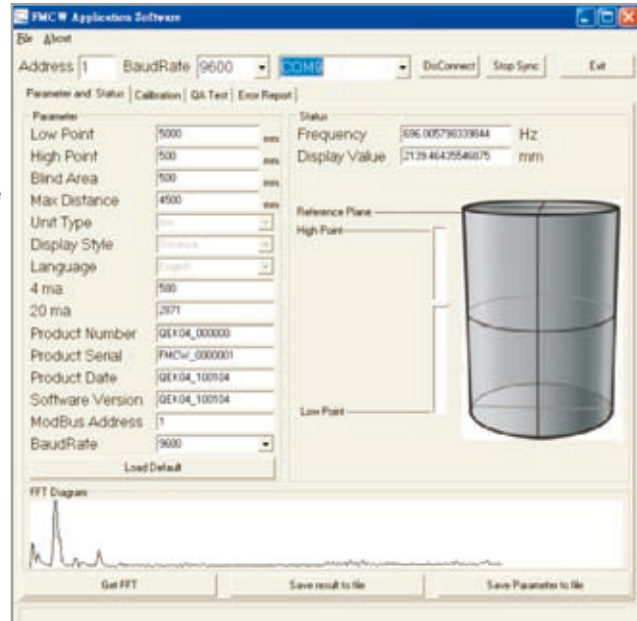
High Point: High point(20mA), measuring range from flange to high level.

Blind Area: Blind distance, distance starts from flange surface.

Max. Distance: Measuring range between low point and high point.

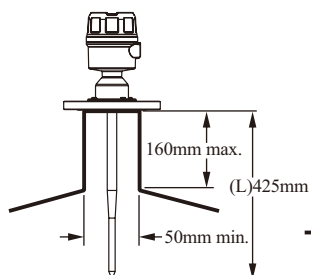
FAS Operation Instruction

1. Turn on FAS software
2. Go to Address, then choose 9600, COM5 from baudrate
3. Click on Connect.
4. Press "Stop Sync" to change parameter.
5. Press "GetFFT" to read wave reflection diagram.
Press "Stop Sync" to change preset parameter.

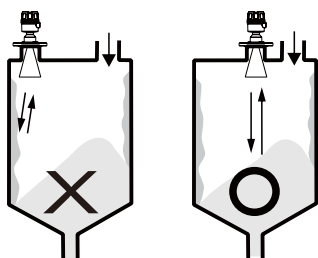


INSTALLATION

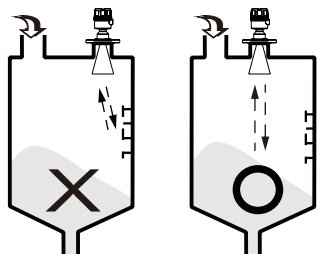
If the JFR-110 is installed on a neck, refer to the limitation on the length and the diameter as below.



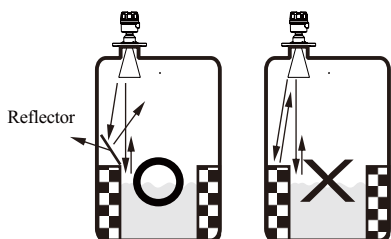
Device has to be installed away from the tank wall to avoid disturbance caused by reflection.



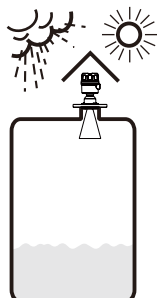
Device has to be installed away from the tank wall to avoid incorrect reflection.



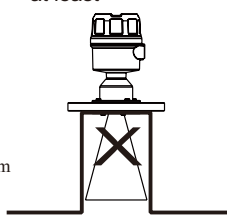
A reflector is recommended to be installed when there is disturbing obstacle to avoid false reflection.



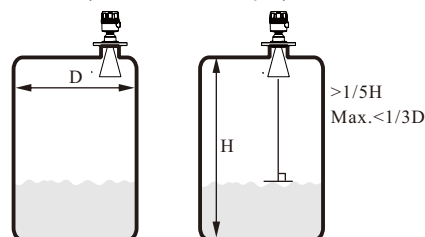
Sun/rain block is recommended for outdoor application.



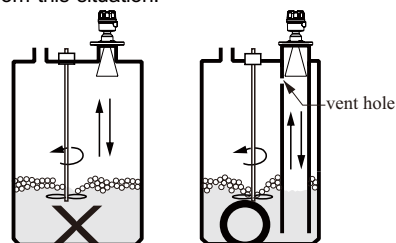
The horn of the JFR-100 can not hide in the neck. The horn has to expose itself to the tank by 0.39" at least



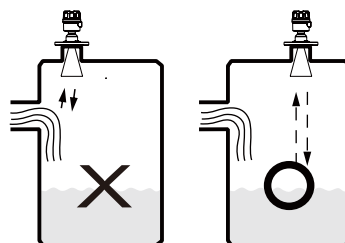
The axis direction of FMCW should be parallel with the wall, or be in orthogonal with the surface. For Install, the distance from the wall should $>1/3 D$, and the height from the surface $>1/5 H$ (Measurement Depth) is recommended.



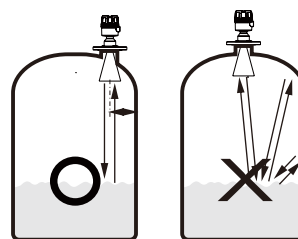
The turbulent or stirring will make the bubble and vortex that might interface with the measurement, it is recommended to install wave shield tube with vent hole. To avoid from this situation.



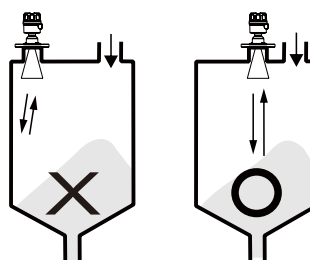
Device is to be installed away from material inlet to avoid disturbance caused by material or other obstacles.



Please avoid center installation for arched top tanks for possible multiple reflection.



The best installation position for cone shape tank with flat top is at the center spot for full measuring range.



ORDERING INFORMATION

JFR-1 - - 0 - 0 - **R** 0 1

Type

- 0: Horn Antenna Type3
(Length 202mm, opening 140mm) Standard
- 1: Horn Antenna Type2
(Length 126mm, opening 100mm)
- 2: Horn Antenna Type1
(Length 89mm, opening 80mm)
- 3: Rod Antenna
(Length 425mm) Standard
- 4: Rod Antenna
(Length 525~825mm) Lengthened

Material

- 0: SUS304---Horn Antenna
- 6: SUS316---Horn Antenna
- E: PTFE-----Horn Antenna or Wave Rod Antenna
with PTEE coating
- F: PTFE-----Rod Antenna

Accuracy

- A: ± 5mm B: ± 10mm
- C: ± 20mm D: ± 30mm

Connection

Size for flange or screw		Pressure range or other	
G: 2-1/2"(65A)	I: 4"(100A)	M: 5kg/cm ² JIS	W: PN10 (10Bar)
H: 3" (80A)	J: 5"(125A)	N: 10kg/cm ² JIS	X: PN16 (16Bar)
	K: 6"(150A)	O: 150Lbs ANSI	Y: PN25 (25Bar)
	S: Others	P: 300Lbs ANSI	Z: PN40 (40Bar)
			S: Others

Horn Antenna Type3--- 4"(Min.)(In case of applying in protective tube,
the minimum flange size is 6")

Wave Rod Antenna --- 2-1/2"(Min.)

Flange Material

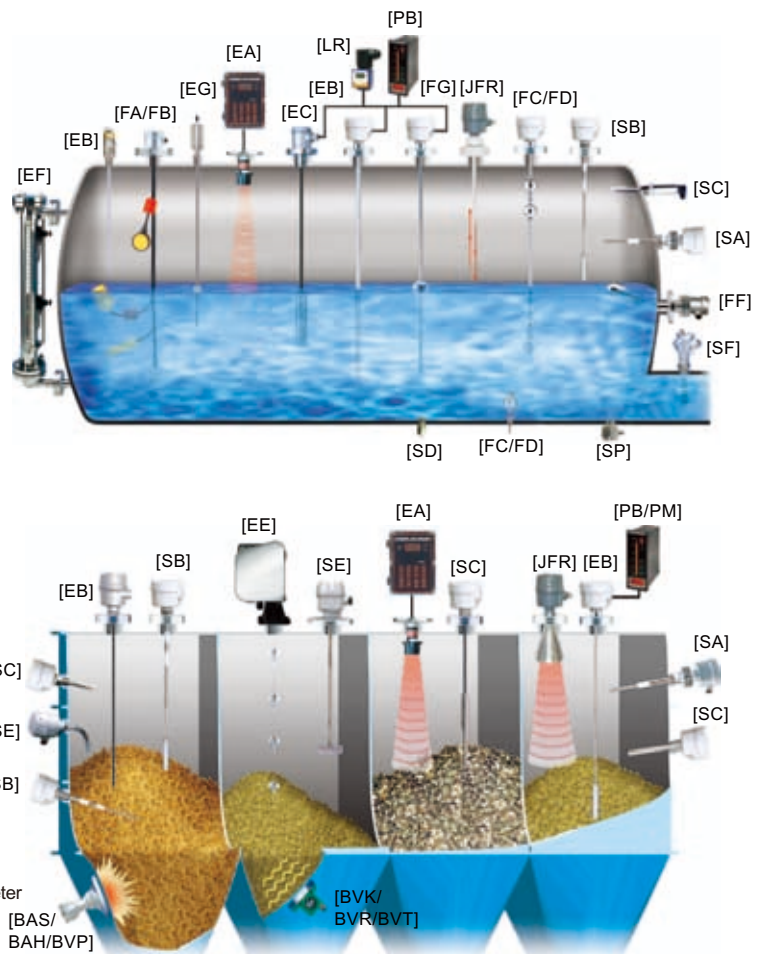
- Meral 0: SUS304 5: SS41 zinc coating 6: SUS316
- Plastic P: PP E: PTFE

Housing

- R: Aluminum(IP65)

EXAMPLES-OF-TANK-MOUNTING

- [FC/FD] Mini Float/Magnetic Float Level Switch
- [FG] Magnetic Float Level Transmitter
- [FF] Side Mounting Float Switch
- [FA/FB] Cable Float Level Switch
- [SP] Thermal Dispersion Flow Switch
- [SF] Paddle Flow Switch
- [SD] Optical Level Switch
- [SE] Rotary Paddle Level Switch
- [SA] Capacitance Level Switch
- [EC] Pressure Level Transmitter
- [LR] Loop Power Indicator
- [SC] Vibrating Probe Level Switch
- [SC] Tuning Fork Level Switch
- [EB] RF-Capacitance Level Transmitter
- [SB] RF-Capacitance / Admittance Level Switch
- [EG] Magnetostrictive Level Transmitter
- [EF] By-Pass Level Transmitter
- [MEF] Mini By-Pass Level Transmitter
- [EA] Ultrasonic Level Transmitter
- [JFR] FMCW Radar Level Transmitter
- [EE] Electromechanical Level Measuring System
- [ED] Speed Monitor
- [SRT/SRS] Conveyor Belt Misalignment Switch & Safety Cable Pull Switch
- [PB/PM] Microprocessor Based Bargraphic Display Scaling Meter
- [BRD/AE] Valve and Controller for Dust Collector System
- [BAS/BAH/BVP] Air Hammer
- [BVK/BVR/BVT] Pneumatic Vibrator



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