

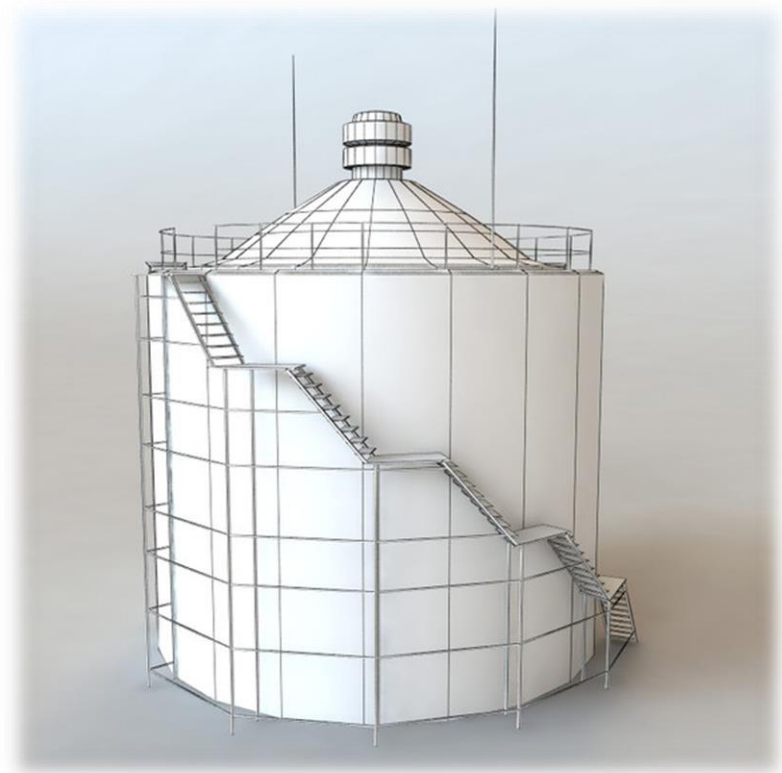
## General Specifications

### TJGL700 Series Guided Wave Radar

TJGL 701  
TJGL 702  
TJGL 703  
TJGL 704

Guided wave radar is a gauge based on time stroke principle, the radar wave is running at speed of light, the running time can be converted to material level signal through electric components.

The sensor emit high frequency impulse and transmit along the cable, when impulse meets the material surface, it reflects back and is received by receiver inside the gauge, and converts the distance signal to material level signal.



## Technical Index

<b>Working frequency</b>	<b>100MHZ-1.8GHZ</b>	
<b>Measuring range</b>	Cable Type	Rod / co-axial type
	0-30m	0-6m
<b>Repeatability</b>	±3mm	
<b>Resolution</b>	1 mm	
<b>Sampling</b>	wave echo sampling 55 times/s	
<b>Response Speed</b>	>0.2S (depends on concrete application status)	
<b>Output</b>	4-20mA	
<b>Precision</b>	<0.1%	
<b>Communication Interface</b>	HART Communication Protocol	
<b>Process Connection</b>	G1-1/2, Flange 2",3", 4", 6"	
<b>Process Pressure</b>	-1-40bar	
<b>Power Supply</b>	24VDC (±10%)	
<b>Ripple Voltage</b>	1Vpp	
<b>Power Consumption</b>	Max. 22.5mA	
<b>Environment Conditions</b>	-40℃...+70℃ / -40℃...+2 5 0℃ / -40℃...+4 0 0℃	
<b>Shell Safety Grade</b>	IP68	
<b>Anti-explosion Grade</b>	EXiaIICT6	
<b>2-wire</b>	One two-core shield cable is used for instrument power supply and signal output	
<b>Cable Entry</b>	two M20×1.5(cable diameter 5--9mm)	

### **Input**

The reflected impulse signal is transmitted along the cable to the circuit of the gauge; the microwave processor processes this signal, and recognizes the wave echo of the microwave impulse from the material surface. The correct wave echo signal is recognized by the intelligent software, the distance from the material surface  $D$  is proportional to the time stroke of the impulse  $T$ :

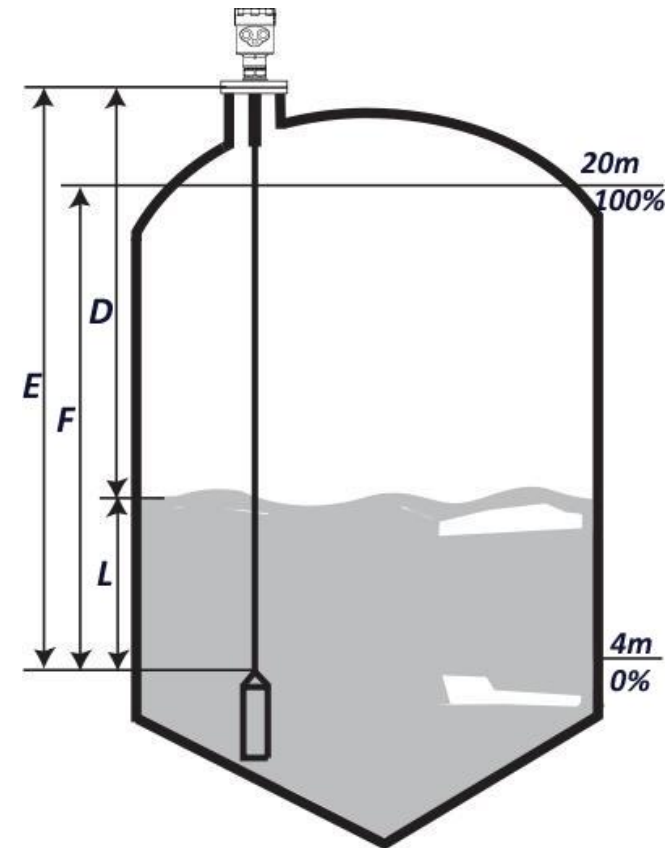
$$D = C \times T / 2$$

Among them,  $C$  is the velocity of light.

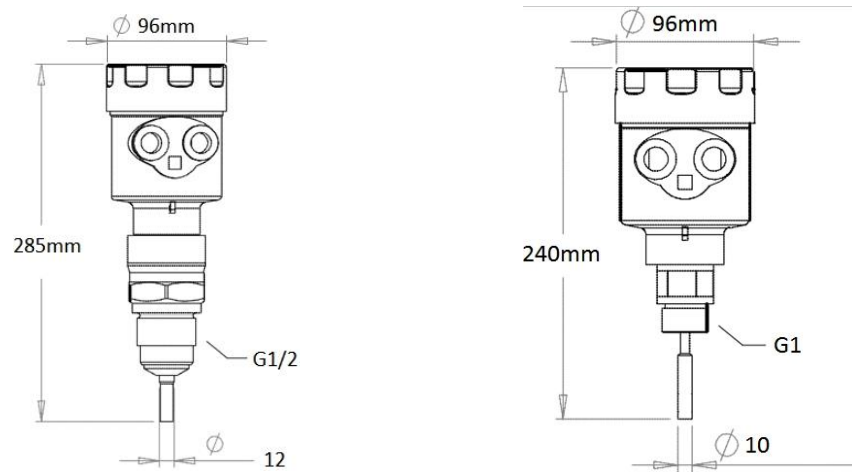
As the distance of the empty tank  $E$  is known, so  $L$  is:  $L = E - D$

### **Output**

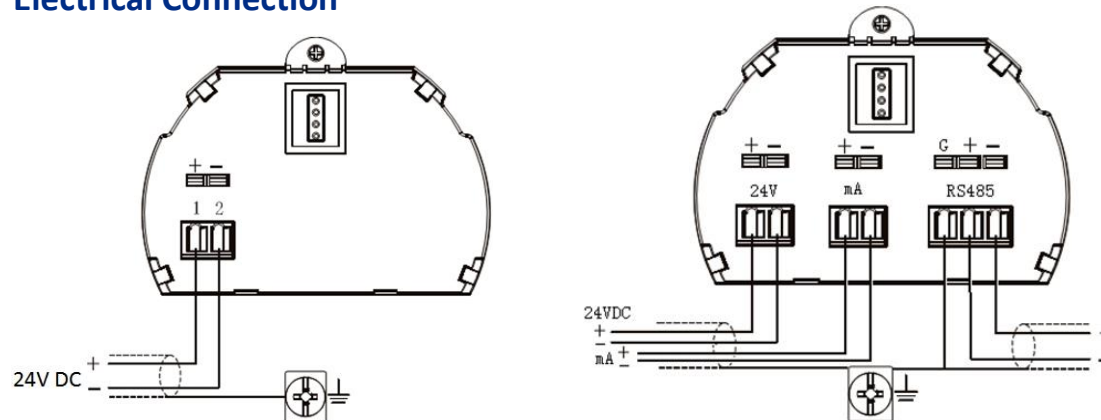
By inputting empty tank height  $E$  (=zero point), full tank height  $F$  (=full measuring range) and some application parameters are set, the application parameters will automatically make the gauge adapted to the measuring environment, it corresponds 4-20mA output.







## Outline Structure



## Electrical Connection



## TJGL Spec.

TJGL 700 series Guided wave radar level gauge				
Types	TJGL701	TJGL702	TJGL703	TJGL704
Application	Liquid, solid granules	Liquid, solid granules	Liquid	Liquid of Low relative
Measuring range	30 meters	6 meters	6 meters	6m
Process	Screw, Flange	Screw, Flange	Screw, Flange	Flange
Process	-40-250 Deg. C	-40-250 Deg. C	-40-250 Deg. C	-40-250 Deg. C
Process pressure	-1.0-40bar	-1.0-40bar	-1.0-40bar	-1.0-20bar
Precision	±10mm	±10mm	±10mm	±15mm
Frequency range	100MHZ-1.8GHZ	100MHZ-1.8GHZ	100MHZ-1.8GHZ	100MHZ-1.8GHZ
Anti-explosion/safety	EXiaIICT6/IP68	EXiaIICT6/IP68	EXiaIICT6/IP68	EXiaIICT6/IP67
Signal output	4...20mA/HART(two phases)	4...20mA/HART(two phases)	4...20mA/HART(two phases)	4...20mA/HART(two phases) RS485 (4 phases)

## Measuring Range Description

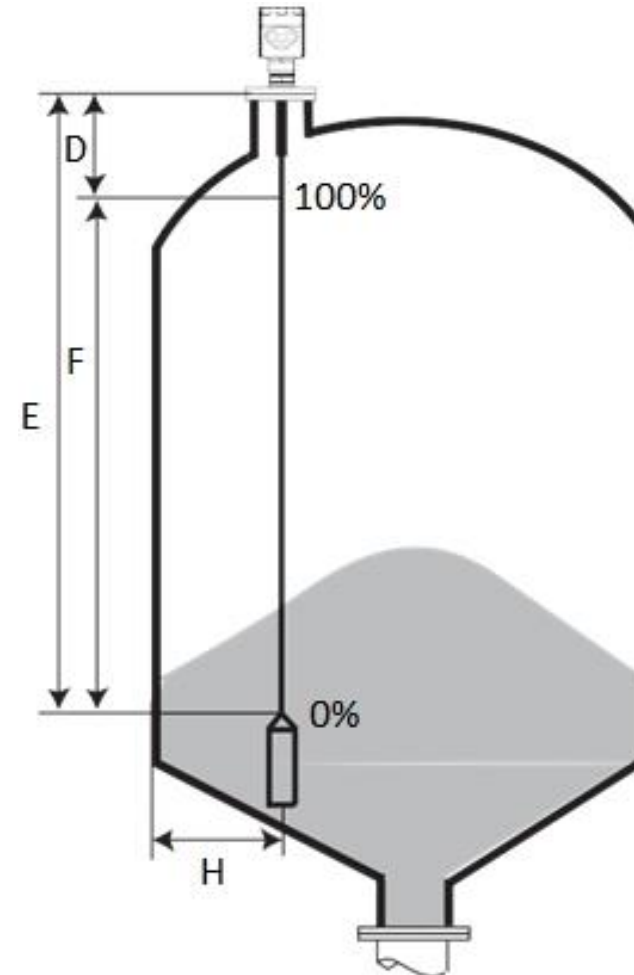
H----measuring range

L----distance of empty tank

B----blind area at the top

E----Minimum Distance between the Sensor and Tank Wall.

- The blind area at the top refers to the minimum distance between material max.level and the measuring reference point.
- The blind area at the bottom refers to the distance near the very bottom area of the cable that cannot be measured precisely.
- The distance between the blind area at the top and the blind area at the bottom is the effective measuring distance.



## Installation guide

The following installation guide is suitable for the measuring of solid granules and liquids by using cable and rod type sensors. Coaxial tube sensor is only suitable for liquid materials.

### Installation positions

Better keep away from material inlet and outlet.

For metal and plastic tanks, make sure it does not touch the wall within the whole measuring range.

If it is metal tank, do not install the material level gauge at the center of the tank

Suggest installing at the point of  $\frac{1}{4}$  of the material silo diameter.

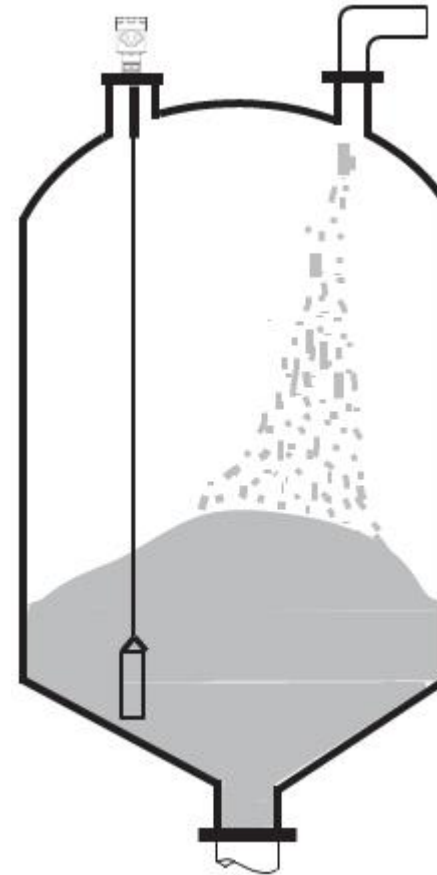
The Min. cable or rod sensors' distance from the tank wall is not less than 30 cm.

The distance of the bottom of the sensor to the bottom of the tank is about 30mm.

The Min. distance of the sensor to the obstacle in the tank is not less than 200mm.

If the tank bottom is tapered, the sensor can be installed in the center of the tank top, in this case, it is possible to measure deep to the tank bottom.

Reliable measurement of the material level inside the tank can be secured.



The illustration at the right is the installation of rod type radar; it is mainly used for the measuring of the level of liquids.

**Characteristics:**

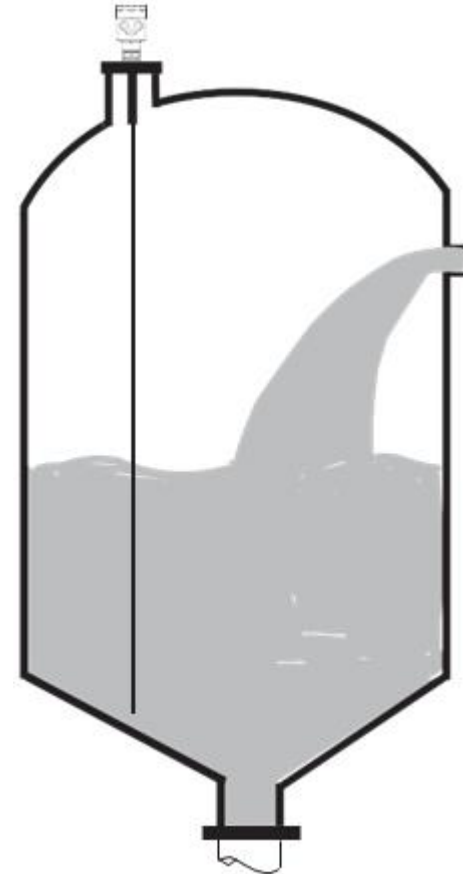
It is possible to measure any medium with the constant bigger or equal to 1.4.

It is usually used to measure material with viscosity  $\leq 500\text{cst}$ , and usually medium adherence does not occur.

The Max. measuring range of the rod type radar is 6 meters.

It has strong inhibition ability for steam and foams; the measuring process has no influence by these factors.

For liquid materials with relatively small medium electric constant, we can use double-rod sensor measuring method, to secure good and precise measurement.





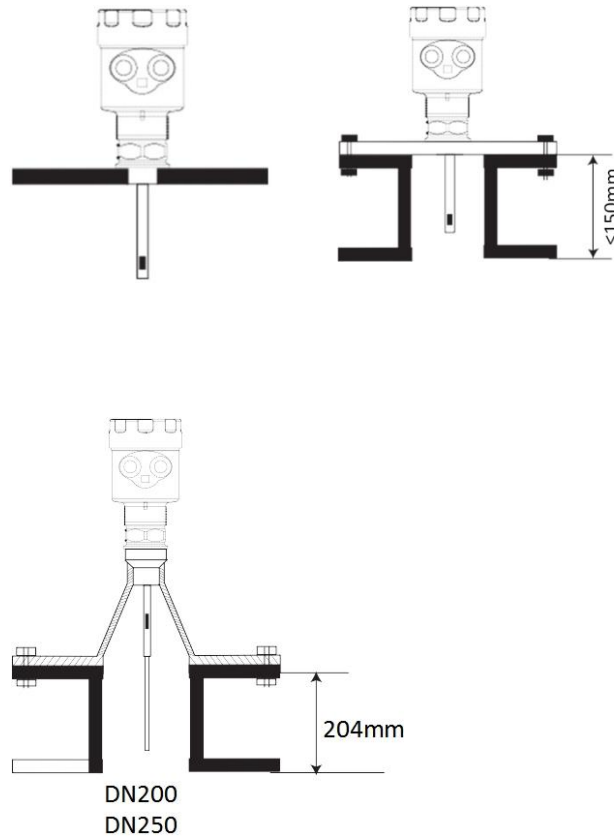
## Installation method

### Reasonable installation can secure long term reliable and precise measurement

The gauge can be connected with screw threads, the screw length thread length shall not be more than 150mm, it is also possible to install on the short tube. The ideal short tube diameter is less than 150mm, the height is less than 150mm, if it is installed on a relatively long short tube, the bottom must have fixing cable or use centering bracket to avoid the contact of the cable to the end of the short tube.

### 6'or 8'installation inside the short tube

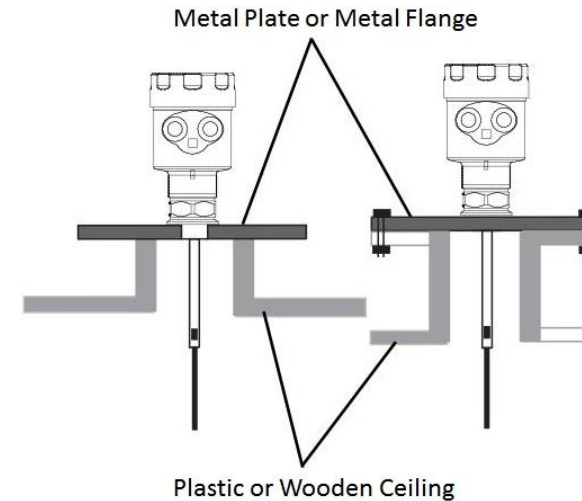
When gauge needs an installation of a short tube with a diameter of more than 200mm, the inner wall of the short tube will have wave echo, under the condition that the medium electric constant is low, and it may cause measuring error. So, for the short tube with diameter of 200mm or 250mm, it needs to use a special flange with horn interface. Try to avoid installing on a short tube with diameter bigger than 250mm.



## Installation on plastic tanks

### Attention

No matter cable type or rod type, if you want to keep normal working condition of the gauge, the process connection surface must be metal. When the gauge has been installed on the plastic tank, and if the tank top is also plastic or other non-conductive materials, the gauge then needs a metal flange, if screw connection is applied, it needs a piece of metal plate.



## The pulling-down force received from the cable

During material feeding and discharging, the medium will cause pulling-down force to the cable; the capacity of the pulling-down force depends on following factors:

- Cable length
- Density of the material
- Tank diameter
- Cable diameter

## Installation guide for liquid measurement

The following installation guide is suitable for rod type and cable type sensors; tube type sensor measurement has no relation with the installation method.

### Installation position

The distance from the tank wall is suggested to be  $1/6 - 1/4$  of the tank diameter (at least 300mm, for concrete tank, at least 400mm).

Do not install at the center of the metal tank.

Do not install at the material discharge mouth.

When selecting sensor length, secure that the distance from the sensor bottom to the tank bottom is about more than 30mm.

Pay attention to the medium temperature

### Obstacles inside the tank

Secure the distance from sensor to the obstacle is at least 200mm during installation.

### Removal of the interference

Inhibition of interfering wave echo: the software can realize the inhibition of interfering wave echo, so as to get ideal measuring effect.

Side tube and guided wave tube (only suitable for liquids), for viscosity less than 500cst, we can use side tube, guided wave tube, or tube sensor to avoid interference.

## Standard installation for liquid materials

For mediums with viscosity of  $\leq 500\text{cst}$  and with no medium adherence, the tube sensor is the best solution, its characteristics are as following:

- Excellent reliability

- Can be used for any medium with medium electric constant of more than or equal to 1.4, the measurement and medium conductivity are unrelated.

- The obstacles inside the tank and the size of the short tube have no influence to the measurement.

- It can bear higher horizontal pressure than rod type sensors.

- For high viscosity mediums, we suggest to use rod type sensors.

## Gauge installation on horizontal and vertical tanks

The Max. Length of tube type and rod type sensors can be 6 meters, for the measurement of the tank with a distance of more than 6 meters; we can use 8mm cable sensors.

The installation and fixing methods are the same as that for solid powder measurement.

There is no limit for the distance from the tank wall, whenever sensor's contact to the tank wall is avoided.

If there are too many obstacles inside the tank or obstacles are too close to the sensor rod, please use tube sensor.

## Measurement for corrosive mediums

For measurement of corrosive mediums, we can use rod type sensor with a plastic bushing for measurement.

## Debugging

ACCU-WAVE-44-04-2 can be debugged by following three methods:

Debug module JEPM through display

Debug software JESOF

Through HART portable programmer

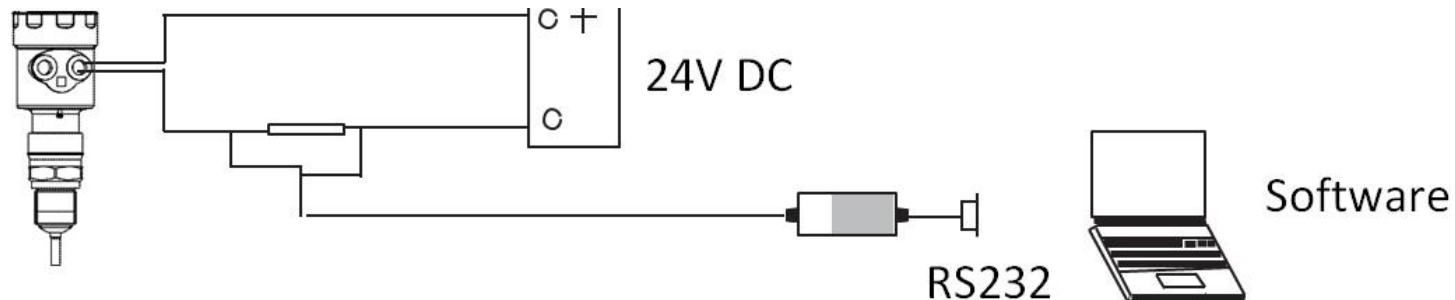
### (JEPM) Jobsite programmable module

JEPM programmer is composed of 6 keys and 1 LCD; it can display debugging menu and parameter setup. Its function is equivalent to an analyzing process gauge.

### Software debugging through JESOF

The radar sensors can be debugged through software.

By using JESOF software for debugging, you need an instrument CONNECTCAT driver.



When we use software for debugging, we need to connect 24VDC power supply to the radar instrument, at the same time, in front of the HART adapter connection, we need to add a 250Ω resistance. If it is a one-piece HART resistance (internal resistance 250Ω) power supply instrument, we do not need external resistance, at this time, HART adapter can be parallel-connected with 4...20mA wire.

## Measuring distance

The following table lists the relations between different types of measured mediums and measuring distance

Mediums Grouping	DK (ε)	Solid Granules	Liquids	Measuring Range
1	1.4...1.6		• Condensation Gas, such as N2, CO2	3m (only refers to coaxial rod type probe)
2	1.6...1.9	• plastic with granules • limestone, special cement • sugar	• liquefied gas, such as propane • Solvent • Fern 12/freon • Palm oil	25m
3	1.9...2.5	• Ordinary Cement, Plaster	• Mineral oil, Fuel	30m
4	2.5...4	• Corn, seeds • Stone • Sand	• Benzene, Atyrene, Toluene • Furan • Naphthalene	30m
5	4...7	• Wet stones, minerals • Salt	• Chlorobenzene, Chloroform • Cellulose Spray • Isocyanuric Hydrochloride, Amine	30m
6	>7	• Metal powder • Carbon black • Coal and charcoal	• Water Containing liquid • Alcohol • Liquid ammonia	30m

## Order Guide

TJGL700 Series					
Model		Probe type	Length	Material	
TJGL 701		8mm cable-type probe	30000mm	stainless steel	
TJGL 702		10mm bar-type probe	60000mm	stainless steel	
TJGL 703		double-bar type probe	60000mm	stainless steel (Flange Installation)	
Code	Description				
P	Normal Type Non-Ex Proof, 4-20mA via HART PROTOCOL				
I	Intrinsic Safety, EXia II C T6, 4-20mA via HART PROTOCOL				
D	Intrinsic Safety with Flameproof, Exd ia II C T6, 4-20mA via HART PROTOCOL				
	Code	Integrated process connection/Material			
	A	G1A Screw Thread	PN16	316L stainless steel	
	B	G1-1/2A Screw Thread	PN16	316L stainless steel	
	C	1 NPT Screw Thread	PN16	316L stainless steel	
	D	1-1/2NPT Screw Thread	PN16	316L stainless steel	
		Code	Flange Spec.		
		0	Non Flange Required		
		C	Flange DN50	PN16C	316L stainless steel
		D	Flange DN80	PN16C	316L stainless steel
		E	Flange DN100	PN16C	316L stainless steel
		F	Flange DN150	PN16C	316L stainless steel
		Y	As Required		
		Code	Process Temperature (°C)		

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			P	Common seal, -20...+150°C				
			G	High temperature seal-40...+250°C, with Heat Sink				
			H	High temperature seal-40...+400°C, with Heat Sink				
				Code	Enclosure / Protection Grade/ Antenna Protection Grade			
				L	Aluminum / IP68			
				S	Plastic / IP66			
					Code	Electric Connection		
					M	M20*1.5		
					N	1/2NPT		
						Code	Programmer On-site LCD Display	
						B	Required	
						X	Not Required	
						Code	Cable Length (mm)	
						X	As Required	
I	D	C	G	L	N	B	5000	The Whole Spec.



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