

Tube-11 Vibrating Rod Level switch



Vibrating level switch

Vibrating level switch is based on a cantilever beam vibrating principle. A cylindrical rod or a fork is used as a vibration probe. Piezoelectric devices are utilized to drive and detect the vibration. With state-of-the-art techniques, the specifications of our vibrating level switch and its reliability reach to an advanced level in the field. When the vibrating probe comes in contact with the material under measure, the vibration amplitude and the frequency of the probe will substantially decrease, so does the output of the detecting piezoelectric device. The amount of decrease is analyzed by an intelligent circuit which outputs a switching signal as a result. Depending on the chemical and physical properties of the measured medium, a series of vibrating level switches can be chosen from.

Jiwei has been granted three invention patents and two utility patents on its vibrating level switches so far. One more invention patent is under checking and verification. Compared with the similar products in the market, our vibrating level switches have following advantages:

- Broader range of the medium density, can be used for the medium with extreme low density (as low as 0.008g/cm³).
- Excellent adaptability, particularly suits for the medium with unstable humidity and dielectric constant.
- Larger redundancy for medium buildup thanks to the precisely pre-adjusted resonance, highly reliable for the medium with higher viscosity and adhesiveness.
- High reliability because of higher quality chips purchasing, detail oriented design, and strict production flow and quality control.
- An industry-leading product for high process temperature applications, excellent performance under temperature up to 250 °C , or ultra-high temperature up to 400 °C with water/air cooling.
 - Smaller probe, particularly suitable for pipelines.
 - Vibrating probe is made of strong corrosion resistant materials, such as 316L.
 - Explosion protection certified, including gas/dust Flameproof Enclosure and gas/dust Intrinsic Safety & IP66/ IP67 ingress protection.
 - Strong self-diagnostic function makes it possible to accurately locate the fault.

Our vibrating level switch has four series of product to meet requirements of a variety of applications:

Tube-11 Vibrating Rod Level Switch:

This innovative vibrating rod level switch is designed with double vibration tubes, which is a first made-in-China model. It suits for the majority of level switch applications for granular and powdery bulk solids. The lowest medium density can be as low as 0.02g/cm^3 .

Fork-11 Tuning Fork Level switch:

The area of the fork body has been reasonably increased for higher sensitivity. It is particularly suitable for powder and fine-granule with the density as low as of 0.008g/cm^3 .

Ring-11 Liquid Level Switch:

With only 40mm length of the fork body, it is particularly designed to measure the liquid level in vessels, storage tanks, other process tanks, as well as bypass pipelines. The density of the liquid can be as low as 0.5 g/cm^3 .

Ring-21 Compact Liquid level switch:

It is compact, lightweight, easy to carry and inexpensive. It is mainly aimed for the applications that are cost sensitive and no explosion protection requirement. It is particularly suitable for pipelines or other applications with constricted space.



Tube-11 Vibrating Rod Level switch

Overview

Tube-11 is the first made-in-China Vibrating Rod Level Switch that is designed with double vibration elements, It is suitable for the majority of granular, powdery and fine-grained bulk solids, such as PVC, sodium hydroxide, lime, sand, soil, coal, dust, sugar, grain, bean, etc. The density of the medium can be as low as 0.02g/cm^3 . It is highly reliable and with industry-leading performance and specifications.

Jiwei has been granted two invention patents on Tube-11 vibrating rod level switch (patent number: ZL 201510009538.3 and ZL 201510059187.7) and one utility patent (patent number: ZL 201620679133.0). One more invention patent is under checking and verification (application number: ZL 201610511184.7).



Measuring principle

The probe of Tube-11 vibrating rod level switch is designed with double vibration tubes. The inner vibration tube nests with the outer vibration tube. When the resonant frequency of inner and outer vibrating tubes is finely adjusted to the same value, both the reliability and the sensitivity of the vibrating rod level switch are very high. Therefore the measurable medium density can be as low as 0.02 g/cm^3 . In this product piezoelectric devices are utilized for vibration drive and detection. When the vibrating frequency of the inner and the outer vibrating rod is finely adjusted to the same value, it results in the resonance of both inner and outer vibration tubes. Until the vibrating rod comes in contact with the measured material, the resonant frequency of the outer vibration tube will shift, therefore destroy the resonant condition. The vibration amplitude of the probe will substantially decrease. The output signal from the piezoelectric detection device will also decrease accordingly. An integrated electronic circuit is designed to analyze the amount of decrease and output a switch signal.

Features

- First made-in-China Vibrating Rod Level Switch that is designed with double vibrating tubes.

- High sensitivity thanks to the fine adjustment on the resonant vibrating frequency. It is suitable for the majority of granular bulk solids. The medium density can be as low as 0.02g/cm³.
- An industry leading product that can tolerate high process temperature up to 250 °C , and ultra-high temperature up to 400°C (Water/air cooling).
- Excellent in the medium interface detection and control.
- Larger redundancy to avoid medium buildup and highly reliable for the medium with higher viscosity and adhesiveness.
- Strong self-diagnostic function makes it possible to accurately locate the fault.
- Easy installation and no calibration necessary.
- With gas/dust Flameproof Enclosure and gas/dust Intrinsic Safety certificates & IP66/IP67 ingress protection.
- Strong anti-corrosion probe thanks to the probe material selection, such as 316L and 318 S13.

Typical Applications

Tube-11 Vibrating Rod Level Switch has been successfully used in the point level detection and monitor in the following applications:

- The level switch for the silo with mixture of CaSO₄ and CaSO₃ resulting from semi-dry desulfurizing reaction at a coal power plant.
 - The problem of the medium buildup has been successfully solved due to a larger redundancy.
- The fluctuation of the humidity results in an unstable dielectric constant of the mixture of CaSO₄ and CaSO₃. Our Tube-11 vibrating level switch could provide a reliable measurement in this situation because the measurement is independent of the dielectric constant.
- Level switches for the soot bin inside the desulfurization equipment and the silo in the regeneration tower at a power plant.
 - The temperature of the active coke is up to 180 °C . Our Tube-11 can tolerate process temperature up to 250°C, and ultra-high temperature (Water/air cooling) up to 400°C.
- The level switch for the environment friendly fuel tank in the combustion system at a power plant.
 - The density of sawdust or straw is very low, only at 0.1g /cm³. It is out of measurable range for most of level switches in the market. However, Our Tube-11 successfully provided a reliable result in this situation. Tube-11 can work reliably for the medium density as low as 0.02g/cm³.
- Level switches for the electrostatic precipitator bag, the ash hopper and the conveying pump in

the ash transport system at a power plant.

- The probe is only 150mm long. It significantly reduces the impact area from the filling material and therefore prevents the probe from the possible impact damage.
- The level switch for the coal bunker or powdery coal bunker in the ash collecting device in a coal power plant.
- The level switch for the sintering ash silo at a smelting plant.
- The level switch for monitoring the PVC granule storage silo, and the silo in the packaging line at a chemical plant.
- The level switch for the hopper of a raw material bucket elevator at a cement plant.

Technical data

Applicable medium	Types of the medium	Granular or powdery solids ^①
	Density	> 0.02g/cm ³
Probe data	Vibrating frequency	~360Hz
	Probe length	125mm
	Probe diameter	16mm
Switching Delay	When immersed	0.5s
	When laid bare	1s
Power Supply	Relay output	20~250V AC/20~72V DC
	Two-wire	10~36V DC
	Power consumption	AC: 1-8VA / DC:1.5W
Output	Relay output	DPDT, 5A/253V AC / 24V DC
	Two-wire	8/16mA, Alarm<2.3mA
Working environment	Process pressure	-1~16bar
	Process temperature	Regular: -50℃~150℃
		High temperature: -50℃~250℃
		Ultra high temperature: -50℃~400℃
Ambient temperature	-40℃~80℃	
Storage and transport temperature	-40℃~80℃	
Cooling system data (for Ultra-high temperature only)	Air intake tube	6x4 (Outer Diameter 6mm) PU tube
	Cooling air pressure	0.8MPa
	Min. cooling air flow rate	to be adjusted ^②

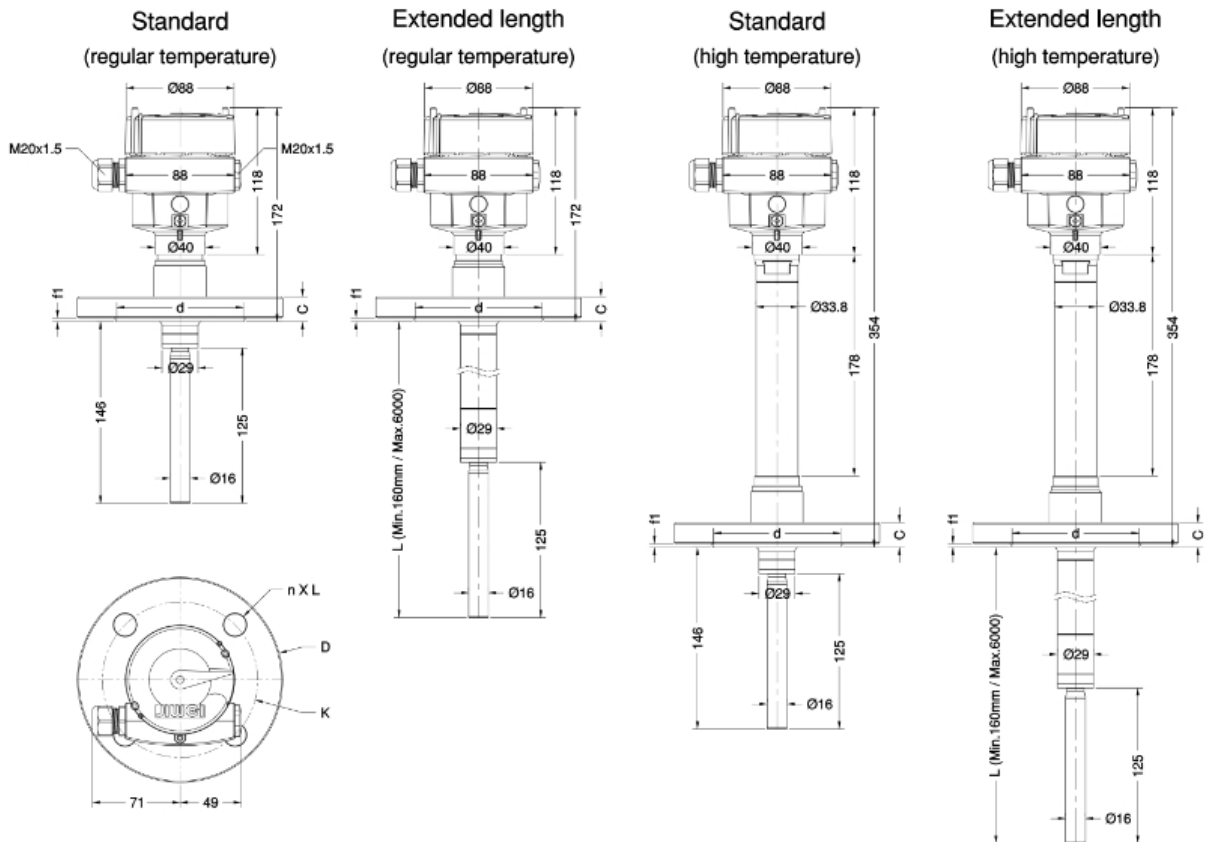
Overvoltage protection	Relay output	Category III, class I
	Two-wire	Category III, class II
Approvals	Protection rating	IP66/IP67
	Explosion-proof types	Flameproof Enclosure: Ex d IIC T6, Ex tD A21 IP66 T80°C
		Intrinsic Safety: Ex ia IIC T6, Ex iaD 20 T6
Materials	External Housing	Aluminum alloy
	Ground terminal	316L
	Process fitting	316L
	Probe	316L、318 S13
	Process seal	Klingersil C-4400

Notes:

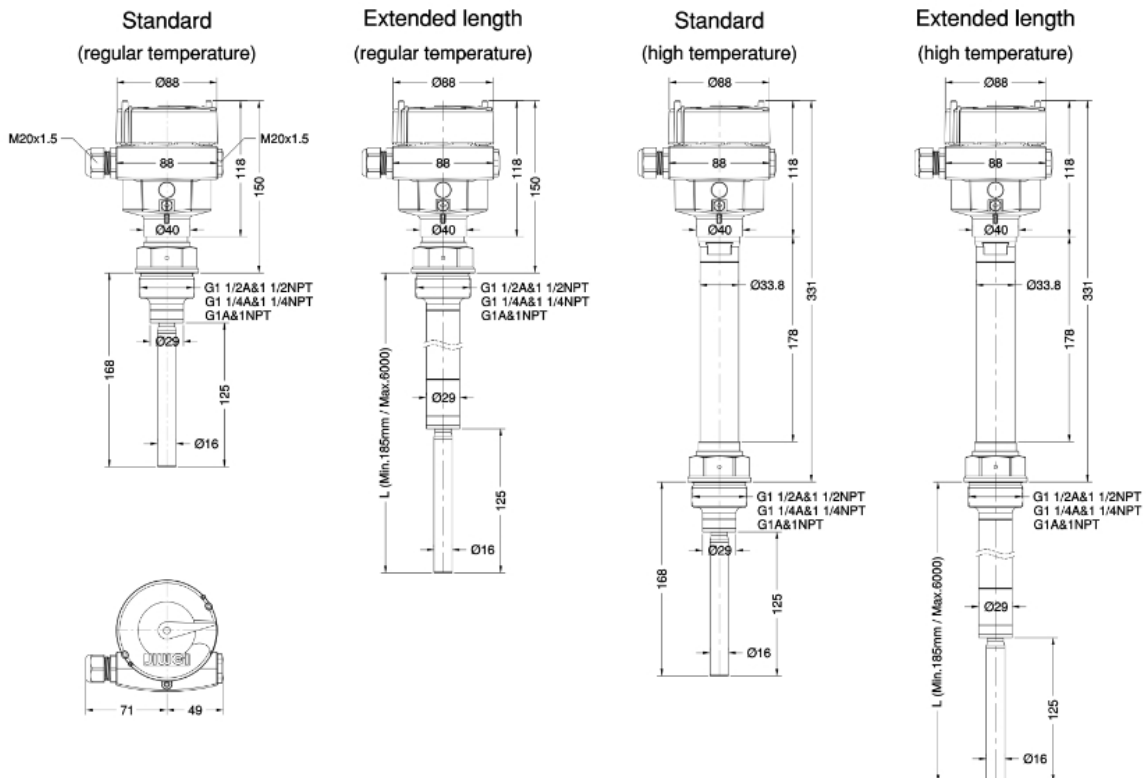
- ① The Maximum applicable particle size is 20mm, If this is the case, the medium density must be lower than 0.05g/cm³.
- ② Cover the exhaust nozzle with the whistle from the instrument accessories and position the whistle such that the whistle's internal wall at its vent side is tightly attached to the external wall of the exhaust nozzle, slowly increase the flow of the cooling air until the whistle blows up. This is when the cooling air is at the expected minimum flow.

Dimensional drawings

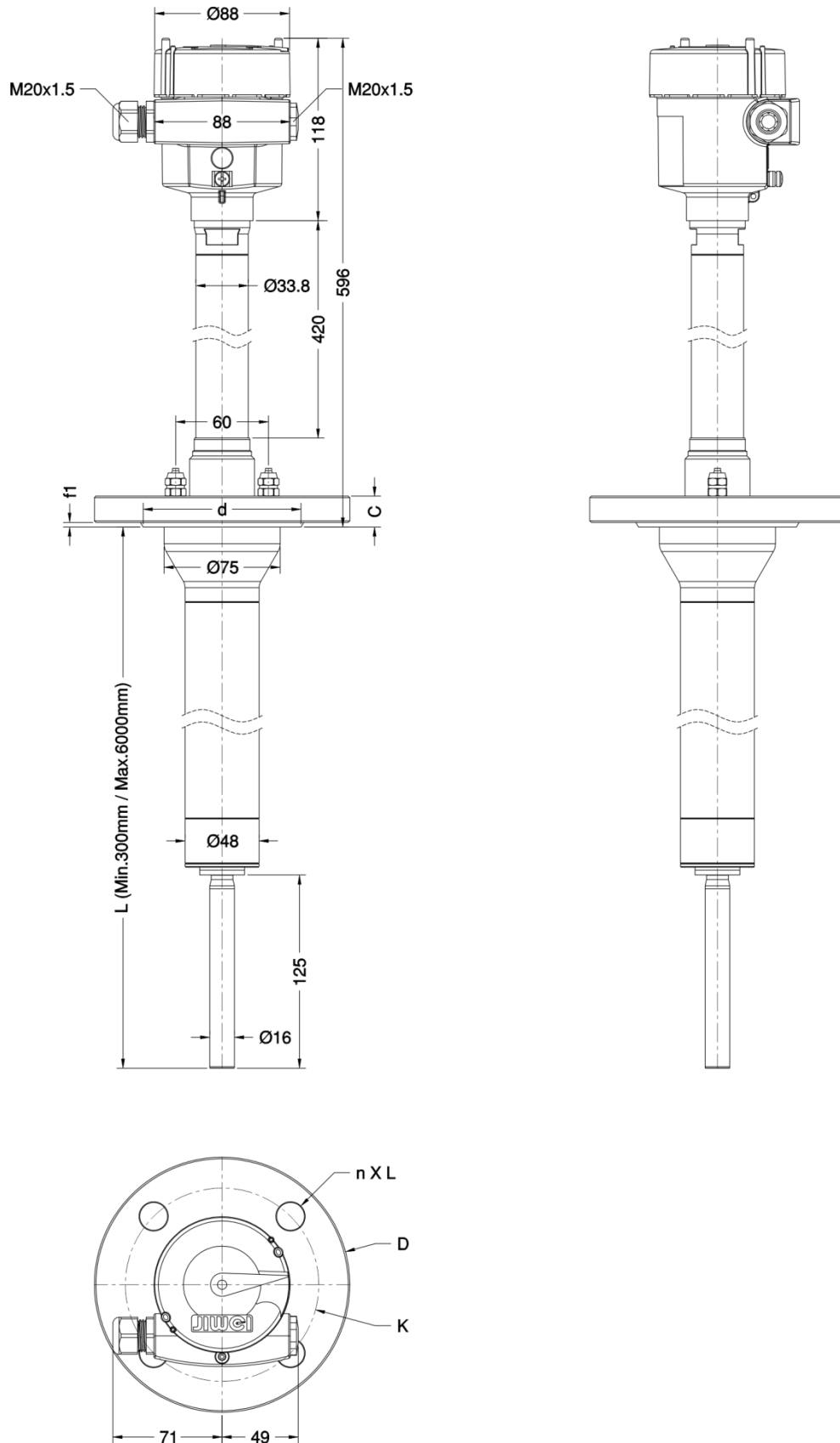
Tube-11 Flange version



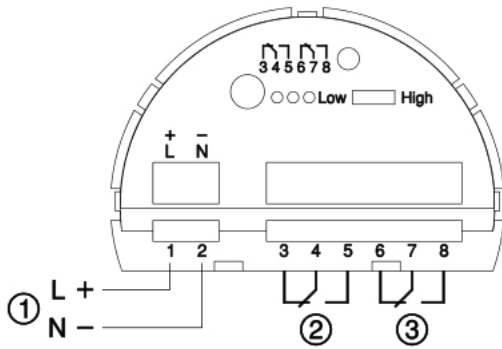
Tube-11 Thread version



Tube-11 Flange version- Ultra High Temperature
DN50/PN40 is the smallest flange available



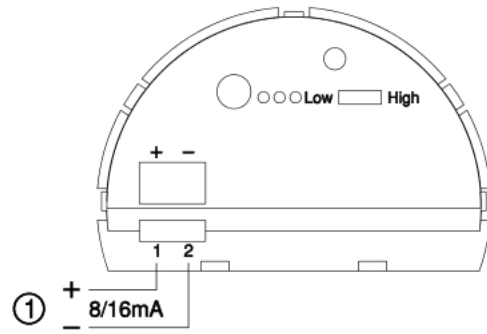
Wiring Plan



Relay output

①: Power Supply terminal

②③: Relay Output, DPDT



Two-wire output

①: Power terminal / output (8/16mA)

Installation diagrams

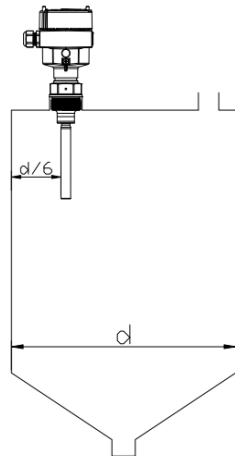


Fig.1

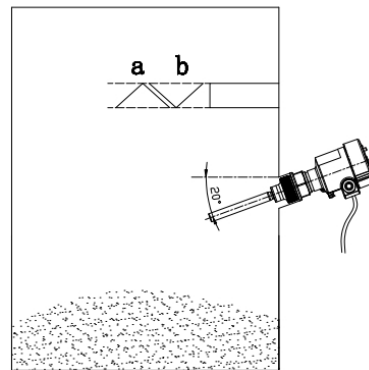


Fig.2

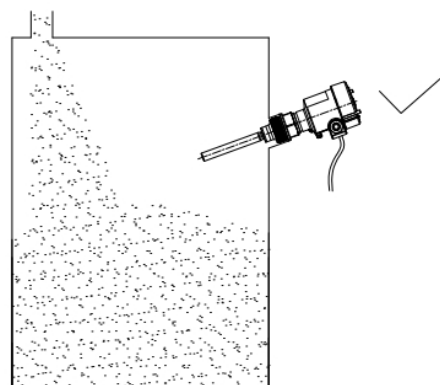


Fig.3

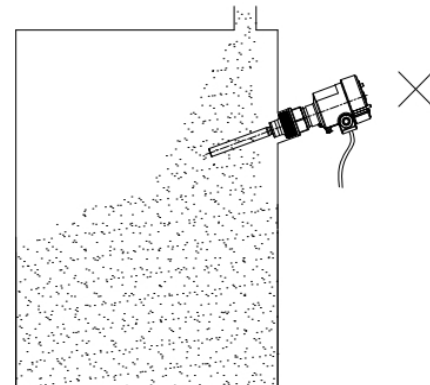


Fig.4

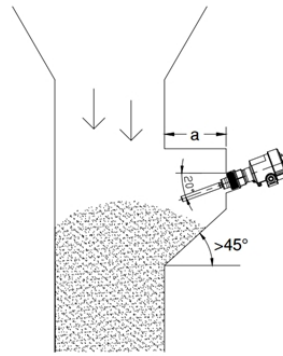


Fig.5

Notes:

- For vertical installation, install the level switch at a distance of $d/6$ from the vessel's wall as shown in Fig.1.
- For horizontal installation, mount the Tube-11 approx. 20° inclined to the bottom of the vessel to avoid the medium buildup as shown in Fig.2. If the medium level moves rapidly up and down or the medium flows rapidly, a protection baffle is needed to ensure TUBE-11 work reliably. Fig.2 shows a protection baffle is installed above the vibrating body. The protection baffle shall be longer than the intrusion depth (horizontally) of the probe to protect the probe from impact damage. Generally the protection baffle can be a convex shape (inverted "V" section) as in Fig.2 (a). But when the medium is coarse and abrasive, the baffle in concave shape (erected "v" section) would be a better choice as in Fig.2 (b). The medium could stack up a bit in the concave area. It will reduce the impact to the baffle and extend the life time of the protection baffle.
- Please avoid installing the instrument near the inlet point so that the vibrating tube does not protrude directly into the filling stream. Fig.3 and Fig.4 give a correct/wrong example respectively. It will prevent the instrument from filling impact damage or generating false signals.
- In the situation where the medium is with higher density and bigger granular size, and the medium fills in vertically, the probe will be impacted by the filling materials. The Tube-11 should be mounted in the recess portion of the container (as in Fig.5) to protect the probe from impact or bending by the filling materials. "a" in Fig.5 should be longer than the probe intrusion length.

Order information

Tube-11	
Approvals	N None explosion hazards. I Gas Intrinsic Safety: Ex ia IIC T6 D Gas Flameproof Enclosure: Ex d IIC T6 M Dust Intrinsic Safety: Ex iaD 20 T6 E Dust Protection Enclosure: Ex tD A21 IP66 T80°C
Process temperature	C -50~150°C H -50~250°C U -50~400°C ①
Process fitting	TG Thread G1 1/2" A TN Thread NPT 1 1/2" TH Thread G1" A TM Thread NPT 1" FA Flange DN50 PN40 ② FB Flange DN80 PN40 FC Flange DN50 PN16 FD Flange DN80 PN16 XX Customized
Power supply&signal output	R Relay (20~70V DC/20~253V AC) DPDT® W Two-wire (10~36V DC) 8/16mA
External Housing/Ingress protection rating	A Aluminum alloy/IP66/IP67 (0.2bar)
Cable entry	M M20×1.5 N 1/2"NPT
Intruding depth	S Standard (168mm) L Lengthened (178mm≤L≤6000mm, upon selection) ④ e.g. if the intruding depth is 300mm, expressed here as L-300

- Notes: ① Only for ultra-high temperature (Water/air cooling) type.
 ② Ultra-high temperature (Water/air cooling) type can only choose flange.
 ③ Gas and dust Intrinsic Safety certificate are not valid for relay output.
 ④ For ultra-high temperature (Water/air cooling) type, the minimum length (L) is 300mm.