计为自动化

Fork-11 Tuning Fork Level Switch

SHENZHEN JIWEI AUTOMATIONS LTD.

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/cm$^{3)}$.
- 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℃, or ultra-high temperature up to 400℃ 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/cm3.

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.





Fork-11 Tuning Fork Level Switch

Overview

Fork-11 Tuning Fork Level Switch is specially designed for powdery and fine-grained bulk solids, such as sands, fine raw materials in chemical industry, flours, salts etc. The lowest measurable medium density can be as low as 0.008g/cm3. It makes the Fork-11 the best level switch for ultra-low density mediums. Fork-11 has very high reliability. It has been applied extensively.

Measuring principle

Fork-11 tuning fork level switch probe is based on a tuning fork harmonic resonance. It utilizes piezoelectric devices to drive the fork to vibrate and detect the changes of the vibration. The fork vibrates in the resonant frequency when it does not contact with the medium. Once the fork comes in contact with the medium, the vibration amplitude of the fork will decrease substantially. The output from the detecting piezoelectric device will decrease accordingly. An integrated circuit is designed to analyze the amount of decrease and output a switch signal. By reasonably increasing the area of the fork body and precisely adjusting the harmonic resonance, our Fork-11 tuning fork level switch offers a very high sensitivity. Therefore, the lowest measurable density can be as low as 0.008g/cm^3.

Features

- High sensitivity thanks to the reasonably increased the sectional area of the fork body and precisely adjusted the fork resonant frequency. The lowest measurable density can be 0.008g/cm^3.
- Particularly suits for level measurement of powdery, fine-grained bulk solids, can effectively avoid material buildup.
- Industry-leading performance for high temperature working environment, can tolerate the process temperature up to 250℃.
- Strong self-diagnostic function helps to accurately locate the fault.
- Easy to install and free of maintenance.
- Gas and dust pressurized enclosure and intrinsic safety certified.

- Made of strong corrosion resistant material 316L.

Typical Applications

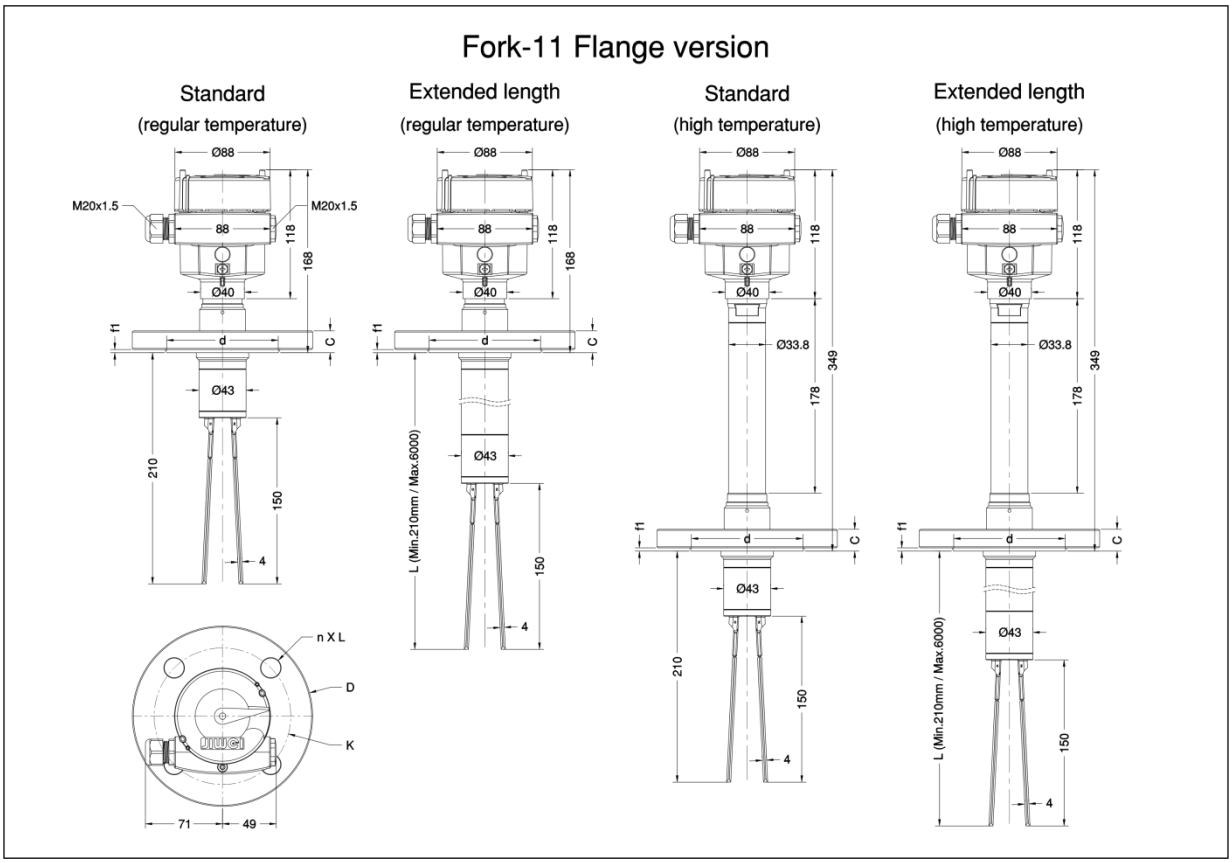
- High reliable level measurement for low density foam beads in the silo of a foam molding machine and a plastic forming machine.
  - By increasing the area of fork body and precisely adjusting the fork resonance, the lowest measurable density can be as low as 0.008 g/cm^3. It provides highly reliable level measurement solution for non-conductive mediums with ultra-low density.
- Level measurement in the hopper of a cement packaging line.
  - With thin fork body and larger separation distance between the two fork bodies, Fork-11, is particularly suitable for powdery mediums level measurement. It can effectively avoid bridge agglomeration and provide reliable level measurement.
- Level measurement in silo for a variety of fine-granular and powdery raw materials.

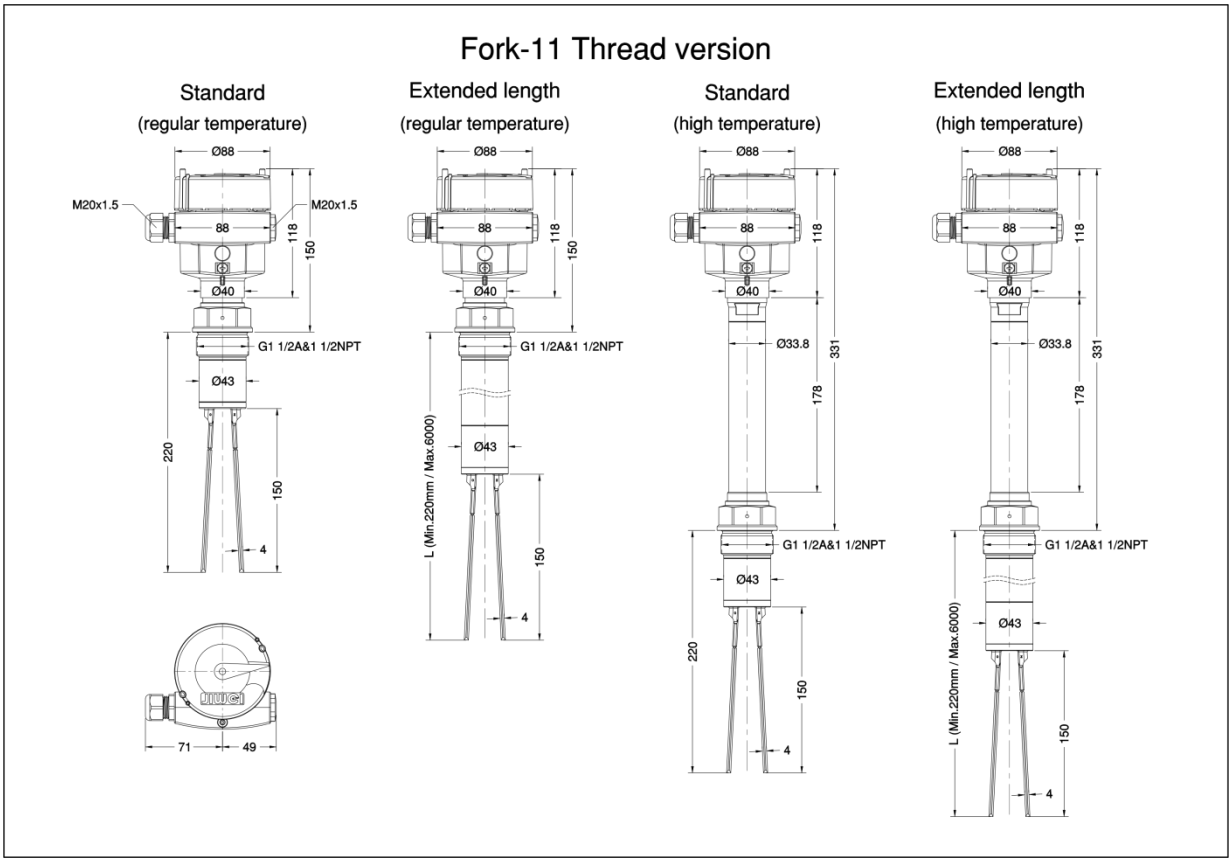
Technical data

Applicable medium	Types of the Medium	powders or granular solids
	Density	＞0.008g/cm^3
	Medium size	Max. 10mm
Fork data	Vibrating frequency	～140Hz
	Fork length	150mm
Switching Delay	When immersed	0.5s
	When laid bare	1s
Power supply	Relay output	20～250VAC/20～72VDC
	Two-wire	10～36VDC
	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	-1～25bar
	Process temperature	Regular: -50℃～150℃ High temperature: -50℃～250℃
	Ambient temperature	-40℃～80℃
	Storage and transport temperature	-40℃～80℃
Overvoltage protections	Relay output	Category III, class I
	Two-wire	Category III, class II

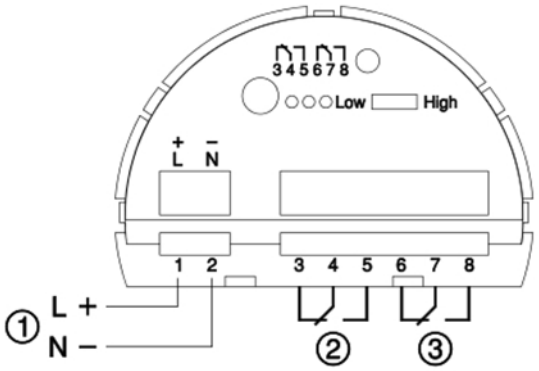
Approvals	Protection rating	IP66/IP67
	Explosion-proof types	Flameproof Enclosure: Ex d IIC T6, Intrinsic Safety: Ex ia IIC T6
Materials	External Housing	Aluminum Alloy
	Ground terminal	316L
	Process fitting	316L
	Fork body	316L
	Process seal	Klingersil C-4400

Dimensional drawings





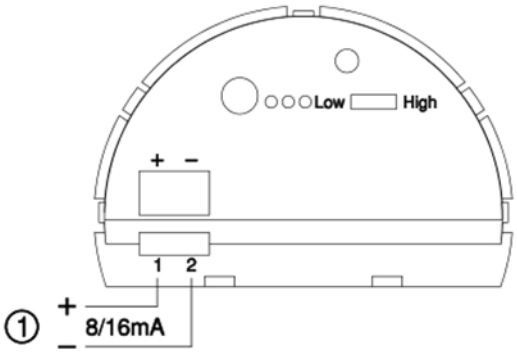
Wiring Plan



Relay output (DPDT)

①：Power terminal

②③：Relay output (DPDT)



Two-wire

①：Power terminal /output (8/16mA)

Installation diagrams

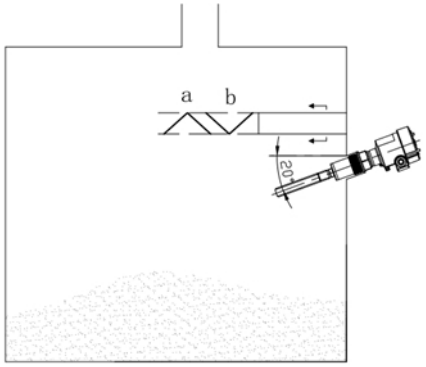


Fig.1

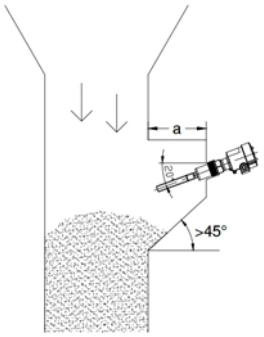


Fig.2

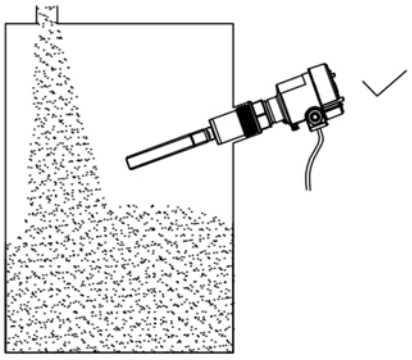


Fig.3

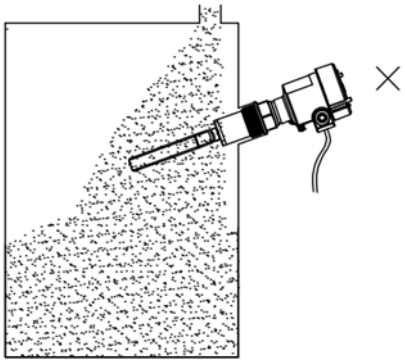


Fig.4

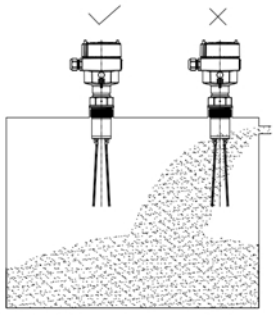


Fig.5

Notes:

- For horizontal installation, mount the Fork-11 approx.20°inclined to the vessel's bottom to avoid medium buildup as shown in Fig.1. If the medium level goes up and down rapidly (the medium fills in/flow out rapidly) or the medium flows rapidly, a protection baffle is needed to ensure the Fork-11 work reliably. Fig.1 shows a protection baffle is installed above the vibrating body. The protection baffle shall be longer than the intrusion depth (horizontal) 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.1 (a). If the medium is coarse and abrasive, the baffle in concave shape (erected “v” section) would be a better choice. 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, as shown in Fig.1 (b).

- For horizontal installation, if the measured medium is with higher density and bigger granular size, and the medium fills in vertically, it can impact the probe. The Fork-11 should be mounted in a recess portion of the container (Fig.2) to protect the probe from the impact damage or being bent by the filling material and ensure the instrument working properly. In Fig.2, “a” must be longer than the probe intrusion length.
- For horizontal installation, the surface of the fork wing should be parallel to the movement direction of the measured material as in Fig.3.
- Please avoid installing the instrument near the inlet point so that the probe does not protrude directly into the filling stream. It will prevent the instrument from impact damage by the filling material and generating false signals. Fig.3 and Fig.4 are schemes to show the correct and wrong installation position respectively for horizontal installation. Fig.5 is a scheme to show correct and wrong installation position for vertical installation.

Order information

Fork-11 [ ] [ ] [ ] [ ] [ ] [ ] [ ]

Approvals
- N None explosion hazards
- I Intrinsic Safety: Ex ia IIC T6
- D Flameproof Enclosure: Ex d IIC T6

Process temperature
- C -50～150℃
- H -50～250℃

Process fitting
- TG Thread G1 1/2"A
- TN Thread NPT 1½"
- FA Flange DN50 PN40
- 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 ①
- 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 (220mm)
- L Lengthened (240mm≤L≤6000mm, upon selection)

e.g. if the intruding depth is 300mm, expressed here as L-300

Notes: ①.Intrinsic Safety explosion proof certificate is not valid for this option.