

Ring-11 Liquid Level Switch



Overview

Ring-11 Liquid Level Switch is a highly reliable instrument for liquid level detection and control. The fork length is only 40mm which makes Ring-11 applicable not only for vessels, process tanks and storage tanks, but also particularly for pipelines or other applications with constricted space. Based on the fork resonant principle, when a fork vibrates in harmonic resonance comes in contact with a measured liquid, its vibration frequency will greatly decrease. The fork's harmonic resonant frequency has been precisely pre-adjusted to achieve high sensitivity, which enables the sensor to detect fluids with density as low as 0.5g/cm^3 . Hastelloy C-22 is available for a better corrosion-resistant performance. Jiwei Ring-11 Liquid Level Switch is an optimum solution for virtually all applications in acids (such as HCL, H_2SO_4 , H_2SO_3), alkali liquids, syrup, medical liquids, and industrial wastewater, etc. Particularly, for the point level detection in pressured liquefied gas, LNG and complex applications where liquids are easy to foaming, bubbling or with high viscosity and under vibration disturbance environments. The special setting of gas-tight leadthrough makes Ring-11 effectively prevent accidental leakage from high-pressure strong corrosive liquids.

Ring-11 has qualified with SIL2 / SIL3 Certificates, CCC, EAC, CE Certificates, as well as certified for both Intrinsic Safety and Flameproof Enclosure explosion protection.

Currently, Jiwei has been granted an invention patent (ZL201510735568.2) and a utility model patent (ZL201520009337.9) on Ring-11 Liquid Level Switch.



Operating principle

Piezoelectric devices are utilized to achieve vibration drive and detection. Once resonant vibration fork comes into contact with application medium, vibration frequency of forks substantially decreases, and the output signal from piezoelectric detection device decreases accordingly. Then an integrated circuit is designed to analyze the signal from piezoelectric device and output a switch signal as a result.

Benefits

- With only 40mm fork length, specially designed for pipelines and confined spaces.
- High sensitivity due to the precisely pre-adjusted harmonic resonant frequency of the fork, the lowest detectable medium density is as low as $0.5\text{g}/\text{cm}^3$.
- With strong anti-interference function, not influenced by foam, bubbles, viscosity, oscillation and other liquid characteristics.
- Hastelloy C-22 material is optional and can withstand fluid corrosion and erosion in high temperature applications, leading the technology in China.
- Industry-leading performance for high temperature applications. Process temperature can reach up to 400°C .
- Four optional outputs available: relay, two-wire, NAMUR and transistor.
- SIL2 / SIL3 Certificates are qualified in accordance with the IEC 61508 international standards. The Certificates for Intrinsically-Safety and Explosion-Proof allow the operation in hazardous areas.
- With CCC, EAC, CE certificates, meets European safety and environmental standards.

Application

- Liquefied natural gas and LNG with the density of $0.56\text{g}/\text{cm}^3$ in transport pipelines.
- Pipelines in pump protection system.
- Herbicides and fungicides in insecticide Factory.

Technical specifications

Applicable liquid	Density	≥0.5g/cm ³
	Viscosity	0.1 ~ 10000mPa.s ^①
	Flow velocity	Max. 6m/s
Probe data	Surface finish	Ra<0.5μm ^②
	Vibration frequency	~ 1200Hz
	Fork length	40mm
Accuracy	Measurement error	±1mm
	Delay	2mm
	Repeatability	0.1mm
Switching delay	When immersed	0.5s
	When laid bare	1s
Power supply ^③	Relay	20 ~ 253V AC/20 ~ 72V DC
	Two-wire	10 ~ 36V DC
	NAMUR	8.2V DC
	Transistor	10~40V DC
	Max. power consumption	8VA(AC); 1.5W(DC)
Output	Relay	5A/253V AC/24V DC
	Two-wire	8mA/16mA, Alarm<2.3mA
	NAMUR	≤1mA or ≥2.1mA, Fault ≤1mA
	Transistor	NPN/PNP
Installation conditions ^④	Process pressure	-1 ~ 64bar
	Process temperature	Regular temperature: -50 ~ 150°C
		High temperature: -50 ~ 280°C
		Ultra-high temperature: -50 ~ 400°C ^⑤
	Ambient temperature	-40 ~ 70°C
	Storage and transport temperature	-40 ~ 80°C



Overvoltage protection	Relay	Category III, class I
	Two-wire	Category III, class II
Certificates and approvals	SIL Qualification⑥	SIL2 (HFT=0) / SIL3 (HFT=1)
	Explosion-Proof	Intrinsic Safety: Ex ia IIC T1...T6 Ga
		Flameproof Enclosure: Ex db IIC T6...T1 Gb
		Gas/Dust Explosion-proof: Ex db IIC T6...T1 Gb + Ex tb IIIC T440°C ...T80°C Db
	CE	LVD and EMC Certificates
	Ingress Protection	IP66/IP67
Materials	Housing	Aluminum alloy, stainless steel
	Ground terminal	316L
	Thread connection	316L
	Flange connection	316L, 316L coated Enamel, ECTFE, PFA
	Fork	316L, 316L coated Enamel, ECTFE, PFA
	Process seal	Klingersil C-4400

Note: ① Assume the medium density equals to 1.

② Applicable: for Hygienic Ring-11 only.

③ The voltage of explosion-proof models can be executed according to the technical requirements on the Explosion-proof Certificate.

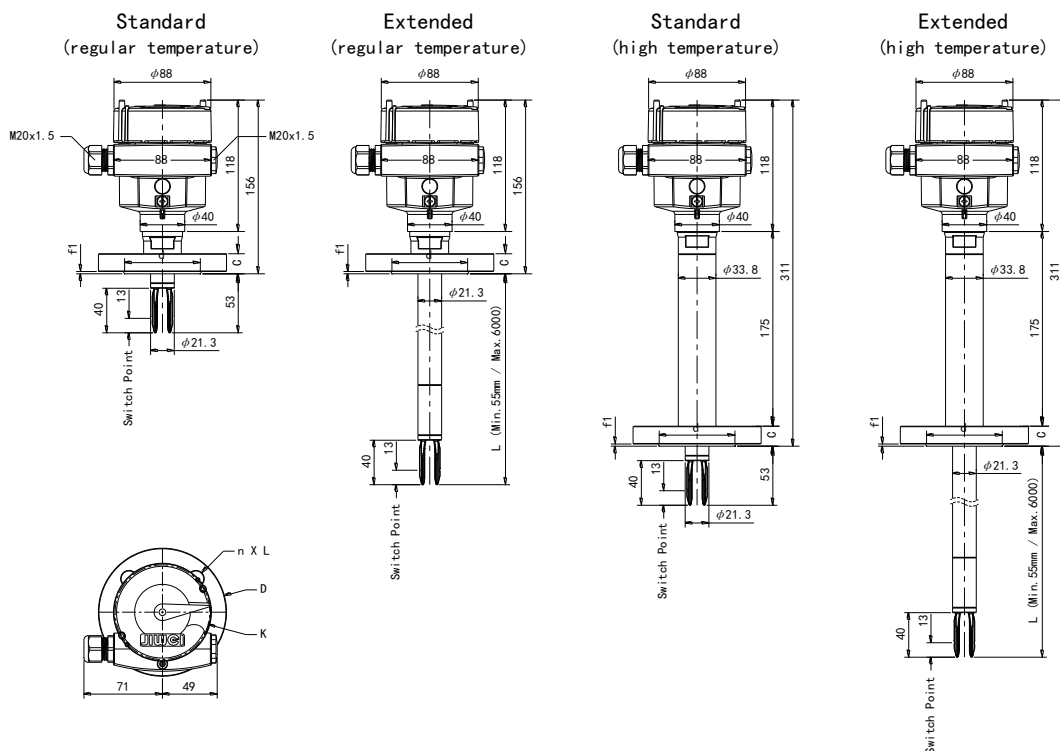
④ The relationship between the process temperature, medium temperature and ambient temperature of explosion-proof models can be executed according to the technical requirements on the Explosion-proof Certificate.

⑤ Cover the exhaust port with the whistle, keeping the whistle's outlet side close against the port wall. Gradually increase the cooling gas flow until the whistle emits a sound—this indicates the minimum required flow rate.

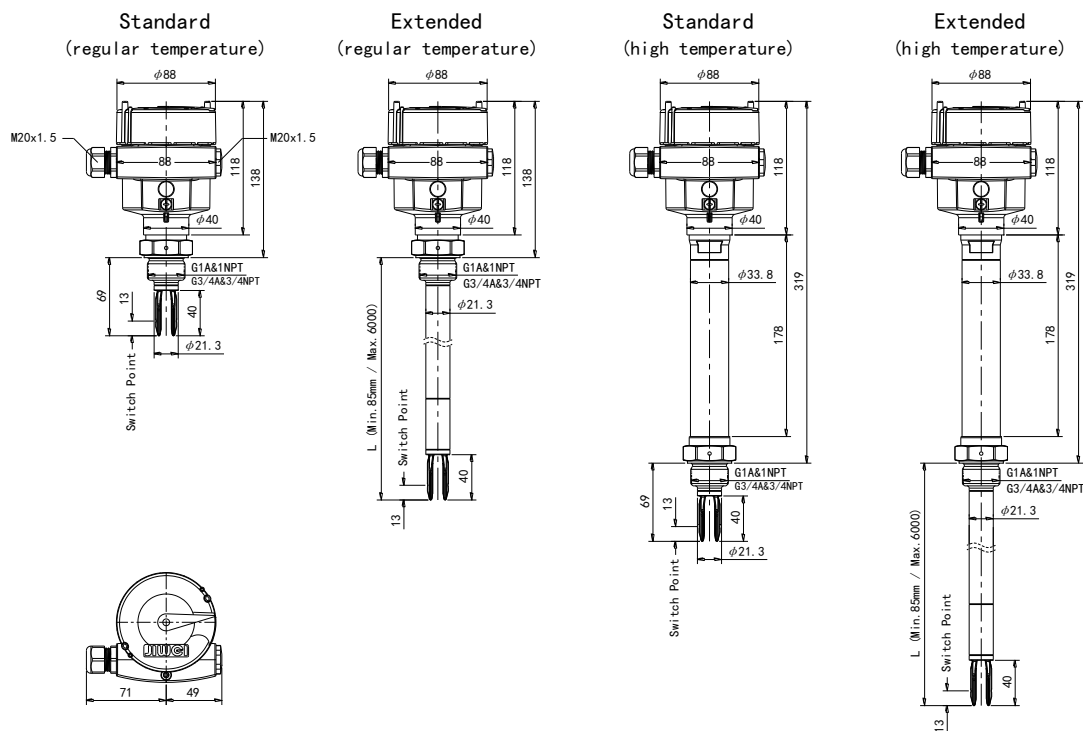
⑥ Comply with international standard IEC61508 (national standard GB/T20438).

Dimensional drawings

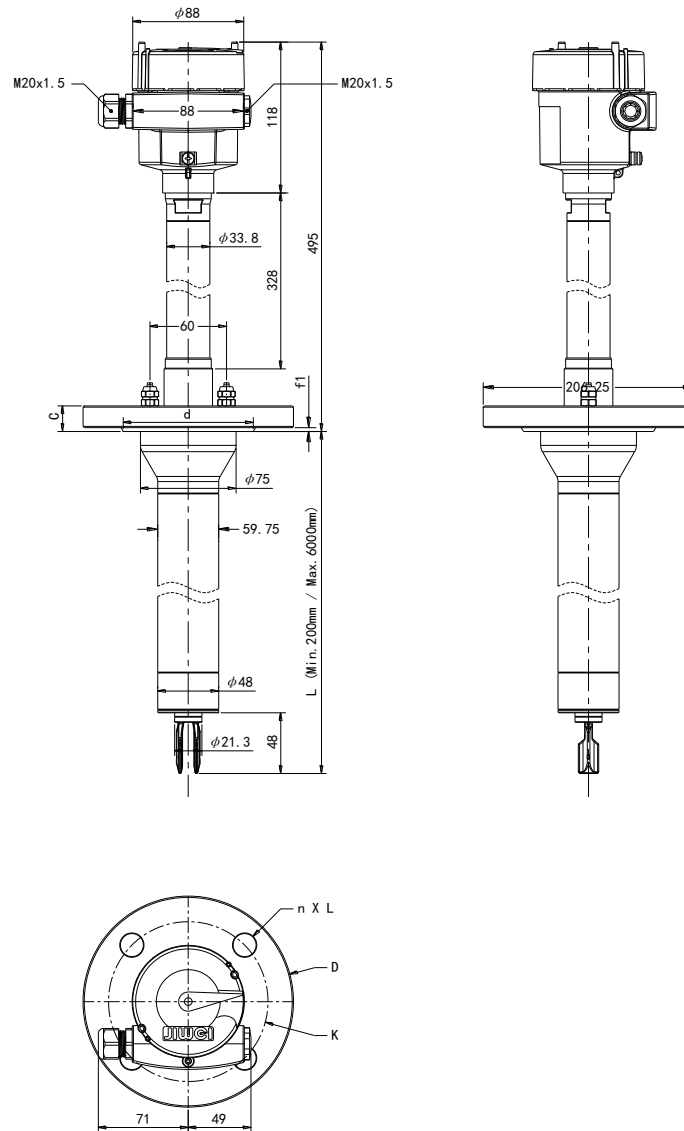
Ring-11 Flange Version



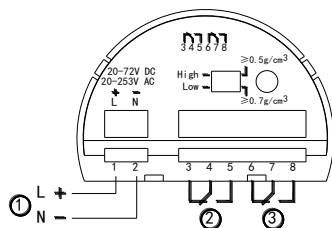
Ring-11 Threaded Version



Ring-11 Ultra-high temp

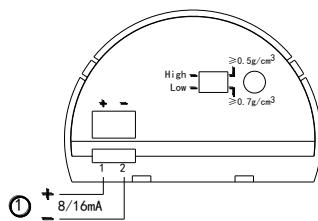


Circuit diagrams



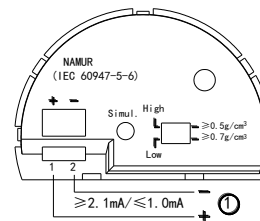
Relay output

- ①: Power terminal
 ②③: Relay signal output, DPDT



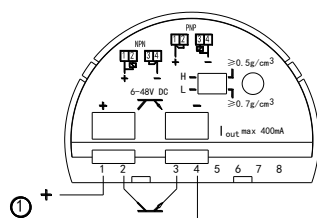
Two-wire output

- ①: Power terminal,
 8/16 mA signal output



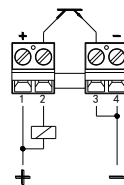
NAMUR output

- ①: Power terminal,
 ≥2.1mA/≤1.0mA signal output

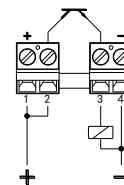


Transistor (NPN/PNP) output

- ①: Power terminal



NPN mode



PNP mode

Configuration

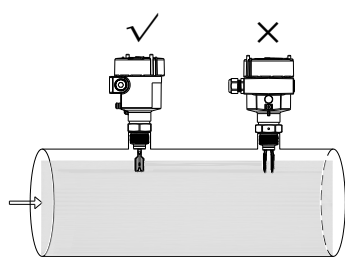


Fig.1

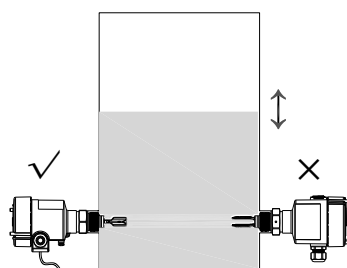


Fig.2

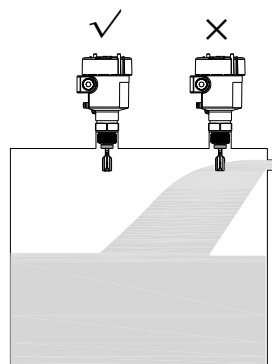


Fig.3

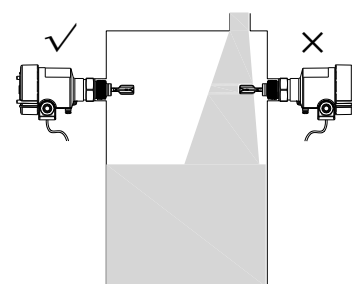


Fig.4

Note:

- Surface of fork tines should be parallel to the movement direction of fluids, as showing in Fig.1 and Fig.2.
- To prevent the instrument from filling impact damage or generating false signals, avoid installing instrument near inlet and outlet, as showing in Fig.3 and Fig.4.

Selection and ordering

Ring-11								
Approvals^①	N Non-explosion-proof I Intrinsic Safety (Ex ia IIC T1...T6 Ga) D Flameproof Enclosure (Ex db IIC T6...T1 Gb) F Gas/Dust Explosion-proof (Ex db IIC T6...T1 Gb + Ex tb IIIC T440°C...T80°C Db)							
	SIL Functional Safety Assessment available for all approvals							
Process temperature^②	C -50~150°C H -50~280°C? A -50~150°C (with gas-tight leadthrough) B -50~280°C (with gas-tight leadthrough) U -50~400°C ^③							
Process fitting^④	TC Thread G¾" A TD Thread ¾" NPT TH Thread G1" A TM Thread 1" NPT FA Flange DN25 PN40/316L ^⑤ FB Flange DN50 PN40/316L FC Flange DN25 PN40/ECTFE coating FD Flange DN50 PN40/ECTFE coating FE Flange DN25 PN40/PFA coating FF Flange DN50 PN40/PFA coating FG Flange DN25 PN40/Enamel coating FH Flange DN50 PN40/Enamel coating CB Clamp 1", Ra<0.8µm XX Customized							
Signal output^⑥	R Relay (DPDT) 20~72V DC/20~253V AC ^⑦ W Two-wire (8/16mA) 10~36V DC N NAMUR (≤1mA/≥ 2.1mA, 8.2V DC) T Transistor (NPN/PNP) 10~40V DC							
Housing material/ Protection rating	A Aluminum alloy /IP66/IP67 S Stainless steel /IP66/IP67							
Cable entry	M M20×1.5 N 1/2 NPT							
Intrusion depth	S Standard (69mm) L Lengthened (80mm≤L≤6000mm, upon selection e.g. if the intrusion depth is 300mm, expressed as L-300) ^⑧							

Note:

- ① SIL Functional Safety Assessment available for all approvals.
- ② The relationship between the process temperature, medium temperature and ambient temperature of explosion-proof models can be executed according to the technical requirements on the Explosion-proof Certificate.
- ③ Applicable only to the ultra-high temperature model (with water cooling).
- ④ The ultra-high temperature model (water-cooled) is only available with flange connection.
- ⑤ For HG/T 20592 standard, the specifications of Flange DN50PN10~PN40 are consistent.
- ⑥ The voltage of explosion-proof models can be executed according to the technical requirements on the Explosion-proof Certificate.
- ⑦ This option cannot be co selected with item I of approvals.
- ⑧ For the ultra-high temperature model (water-cooled), the minimum insertion depth L is 200 mm.