

ZNC-FRC Explosion-Proof Thermal Mass High-Temperature Flow Switch





I. Product Purpose

The FRC Explosion-Proof Flow Switch can be widely used for flow detection, alarm, and control in flammable and explosive environments such as petroleum, chemical, power, metallurgy, and other industries.

II. Features:

- No mechanical moving parts, corrosion-resistant, stable and reliable, long service life, and requires no special maintenance for long-term operation.
- The probe and signal processing circuit are integrated for easy installation and use.
- The circuit includes a temperature compensation circuit, minimizing the error caused by the medium and environmental temperature on the fluid flow rate.
- The newly selected circuit ensures a low current draw of $\leq 100\text{mA}$ at $\text{DC}24\text{V}\pm 15\%$, with minimal heat generation, and the use of surface-mount components increases reliability.
- The housing is designed with Exd II CT6 explosion-proof protection, suitable for factories containing explosive gases or vapors of group II A, B, C in Zone 1 or Zone 2 hazardous areas.

III. Specifications:

- **Power Supply:** $\text{DC}24\text{V}\pm 15\%$ / 100mA
- **Medium Temperature:** $-45\sim 300^{\circ}\text{C}$
- **Relative Humidity:** $5\%\sim 95\%$
- **Nominal Pressure:** $0\sim 3\text{ MPa}$
- **Liquid Flow Speed:** $2\sim 300\text{ cm/s}$
- **Protection Level:** IP66
- **Explosion-Proof Rating:** Exd II CT6
- **Explosion-Proof Certificate No.:** CCRI 20.1044
- **Contact Capacity:** $\text{AC}220\text{V}$ / 1A , $\text{DC}24\text{V}$ / 2.5A
- **Warm-up Time:** ≤ 3 minutes
- **Cable Specification:** RVV $4\times 1.0\text{mm}^2$, outer diameter: $9\text{mm}\pm 0.5\text{mm}$
- **Mounting Method:** Threaded connection

IV. Operating Principle

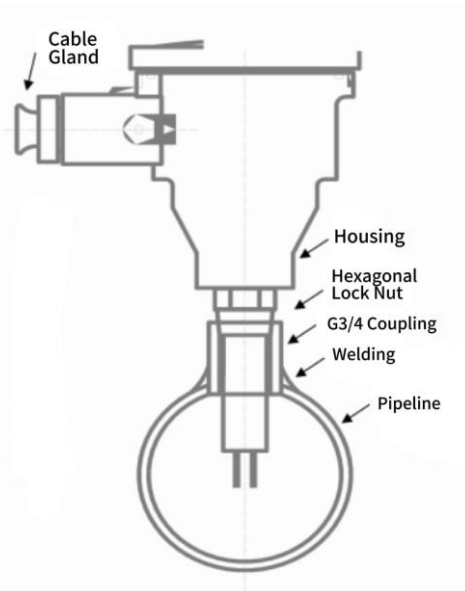
The thermal mass flow switch operates based on the **L.V. King heat transfer principle**. The front end of the flow sensor has two probes in contact with the medium. One probe measures the medium temperature, while the other is both heated and temperature-sensitive.

- **No flow:** Maximum temperature difference between the two probes.
- **With flow:** The temperature difference decreases as flow increases.
- The difference is directly related to fluid velocity and its thermal conductivity and humidity.
- When the flow rate crosses a preset threshold (either above or below), the relay is triggered to output a switch signal (on/off).

V. Structure & Installation

The FRC Thermal Mass Flow Switch integrates both sensor and electronic circuits into an explosion-proof structure (see Figure, shown). Main components include:

- Flow sensor
- Anti-corrosion probe
- Thermal insulation material
- Mounting hardware
- Explosion-proof aluminum housing

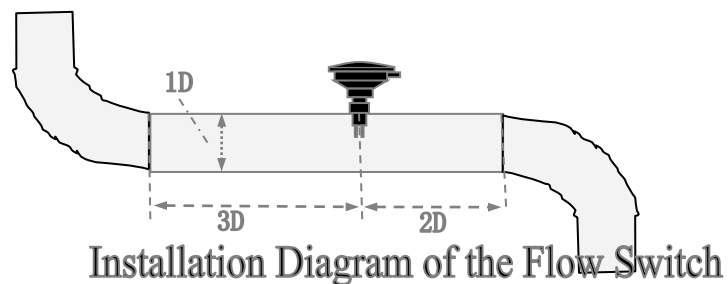


Installation Method:

1. Choose a **horizontal section** of the high-temperature pipeline, with a **straight pipe length $\geq 50\text{cm}$** .
2. Open a **30mm diameter hole** in the upper part of the pipe section.
3. Weld the provided short connection pipe (included with the product) to the hole.
4. Insert the flow switch, seal it properly, and fasten it securely to the connection pipe.
5. **Important:** Apply insulation to the high-temperature pipeline near the flow switch to reduce heat transfer to the device housing.

VI. Wiring Instructions

Refer to **Wiring Diagram – Figure** for connection layout:



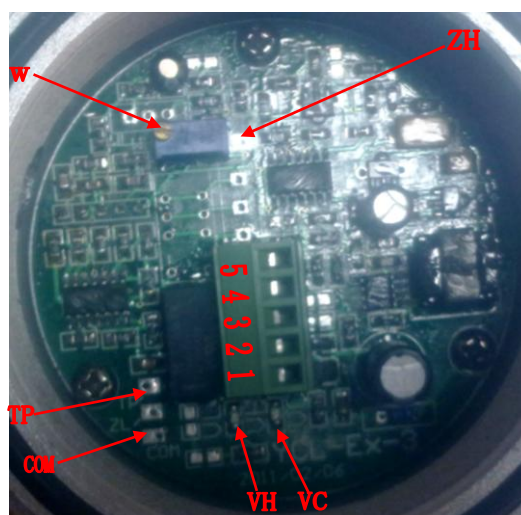
- **Terminal 1:** DC24V (+)
- **Terminal 2:** 0V (Ground)
- **Terminal 3:** Normally Closed Contact (NC)
- **Terminal 4:** Common Terminal (COM)
- **Terminal 5:** Normally Open Contact (NO)

VC: Power Indicator Light

VH: Limit Alarm Indicator Light

Wiring Procedure:

First, feed the cable through the **explosion-proof cable gland** into the housing. Unplug the terminal block and connect each wire to its corresponding terminal according to the output type. After completing the wiring, insert the terminal block back into the socket and tighten the cable gland to ensure proper sealing.



VII. Instrument Commissioning

After powering the device with **24V DC**, wait approximately **3 minutes** before starting the commissioning process.

- **COM**: Common test point
- **TP**: Test point for flow-velocity-correlated voltage
- **W**: Threshold adjustment potentiometer
- **ZH**: Voltage test point for W potentiometer setting
- **VC**: Power status indicator
- **VH**: Relay activation status indicator

Reference Curve (Figure 4):

The TP voltage vs. fluid velocity curve is plotted under conditions of **air humidity at 28%** and **ambient temperature of 20°C**. It can serve as a reference when adjusting the potentiometer.

How to Set Relay Activation Threshold (with digital multimeter):

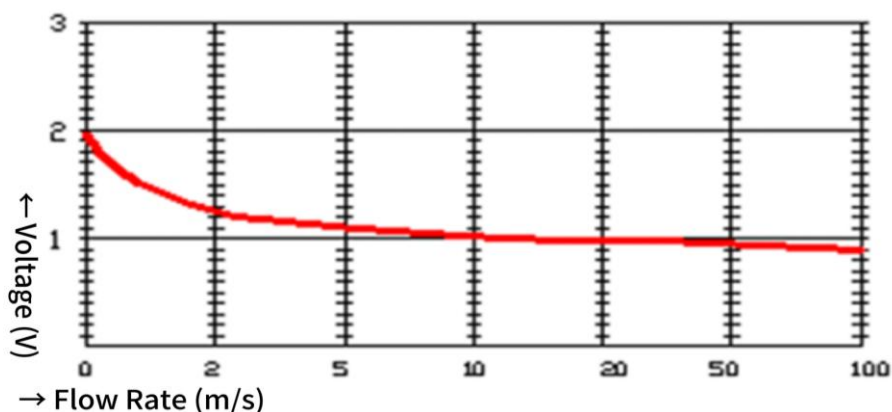
Calculate the average of the TP voltage when there is **no flow** and when there is **flow**:

$(TP_voltage_with_flow + TP_voltage_without_flow) \div 2 = \text{Relay Threshold Voltage (ZH)}$

Adjust potentiometer **W** accordingly until ZH voltage is reached.

VIII. Precautions

- **Explosion-proof Rating**: Exd II CT6
- When connecting the device to pipeline, use a wrench on the **stainless steel hexagonal section only**. Do **not** apply force to the aluminum housing.
- After commissioning, **securely tighten the upper cover** and **lock the cover with the locking screw**.



Flow Switch Characteristic Curve: TP Voltage vs. Water Velocity