TYPE APPROVED PRODUCT
DNV
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艾克设备工程有限公司
ARK Equipment & Engineering Co.,Ltd.
艾克空调通风设备（昆山）有限公司
ARK HVAC & REF (Kunshan) Co.,Ltd.



防爆流量开关
使用说明

ARK Ex-proof Flow Switch Manual

适用于LNG 甲醇 氨气双壁管
Suitbale for LNG, Methanol, and NH_3 Double-wall pipe

TEL:+86(21)60718386
ADDRESS: No.971,Room 2709,
Dong Fang Road,Shanghai

ARK-FS-01 流量开关 使用操作说明书

ARK-FS-01 Flow Switch operating manual

一. 概述 Brief

ARK-FS-01流量开关，前端安装一个流量传感器，与介质接触部分有两个探针。一个测量介质温度，另一个测温并被加热，当没有介质流动时两个探针的温差最大，有介质流动时两个探针温差变小，温差的大小只与介质的流速有关，流速越大温差越小，流速越小温差越大，不流动时温差最大，同时与介质自身的导热性温度有关，当流速低于或上与某一设定值时，继电器接通或者断开，输出开关量信号。

ARK-FS-01 flow switch: a flow sensor is installed at the front end, with two probes in contact with the medium. One probe measures the medium temperature; the other probes the temperature and is heated. When there is no medium flow, the temperature difference between the two probes is at its maximum; when medium flow is present, the temperature difference between the two probes decreases, the magnitude of this temperature difference depends solely on the medium's flow rate: the higher the flow rate, the smaller the temperature difference; the lower the flow rate, the larger the temperature difference. The maximum temperature difference occurs when there is no flow. It is also related to the medium's own thermal conductivity and temperature. When the flow rate falls below or exceeds a preset value, the relay closes or opens, thereby outputting a digital signal.

备注：使用该仪器时，严禁带电开盖及操作。

Note: When using this instrument, it is prohibited to open the lid or operate it while it is energized.

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二. 产品特点 *Product Character*

✓ 无机械可动部件，耐腐蚀，稳定可靠，寿命长，长期运行无须特殊维护；

No moving mechanical parts; corrosion-resistant; stable and reliable; long service life; requires no special maintenance during long-term operation;

✓ 探测探头与信号处理电路一体设计，安装使用极为方便；

The detection probe and signal-processing circuit are integrated into a single design, making installation and operation extremely convenient;

✓ 内置温度补偿电路，介质及环境温度对流体的流速所造成的误差减到最小；

Equipped with a built-in temperature compensation circuit that minimizes errors caused by the flow rate of the fluid relative to the ambient medium and ambient temperature;

三、技术参数 *Technical Parameter*

电源 Power：24V±20%DC	环境温度 Environment temp.：-20℃~80℃
相对湿度 Relative humidity：5%～95%	大气压力 Atmospheric pressure：86～106KPa
介质温度 Medium temp.：-20℃~80℃	公称压力 Nominal pressure：≤10MPa
防爆等级 anti-hazard level：Exd ⅡCT6	设置范围 Setting range：气体：0.5～20m/s
防护等级 Protection level：IP67	电气接口 Electrical interface：M20*1.5

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四、安装 Installation

4.1 流量开关与介质管道的连接形式为G1/2”螺纹（也可根据用户要求另行提供其他螺纹连接）。

The connection between the flow switch and the medium pipeline is via G1/2" thread (other thread connections may also be provided upon request by the user).

4.2 为了避免由于气穴产生的错误信号请不要将流量开关装在弯管或者装在管道头附近（最小距离>2 倍管径）。

To avoid erroneous signals caused by cavitation, do not install the flow switch in a bend or near the pipe end (minimum distance> 2 pipe diameters).

4.3 如果流量开关必须水平安装，并且管道中可能存在沉淀物。流量开关应该安装在管道的侧面。

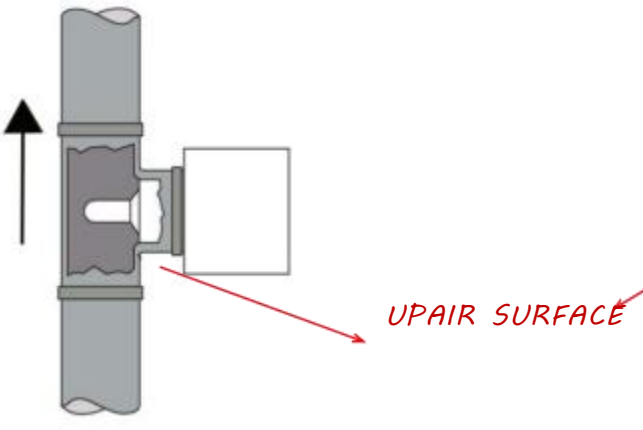
If the flow switch must be installed horizontally and deposits may be present in the pipeline, the flow switch should be installed on the side of the pipeline.

4.4 安装时一定要保证探头部分进入管内约2/3处。

When installing, ensure that the probe extends at least 2/3 of pipe.

4.5在安装时告知船厂使用紫铜垫片调整流量开关方向，**使得流量开关的迎风面标志“●”正对流体来液方向。**

During installation, instruct the shipyard to use a copper gasket to adjust the direction of the flow switch so that the flow switch's airward-side marking faces “●” the incoming medium flow direction.



The flow switch shall be installed on a pipeline with upward flow.



The red-marked area must face the flow direction directly as the upair surface.

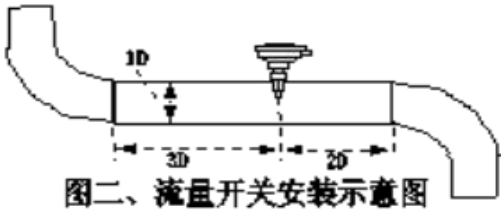
警示:安装时，不要用力旋转流量开关的中间部位，请用合适的工具旋六方处进行安装，否则将会损坏流量开关。

Warning: During installation, do not forcefully rotate the middle section of the flow switch; instead, use an appropriate tool to turn the hexagonal interface for installation; otherwise, the flow switch may be damaged.

4.5 流量开关安装 Flow switch installation

a) 流量开关可安装在与管线垂直的任意位置上而不考虑管线的走向，但要保证传感器上游直管长度至少为3D,下游侧的直管段长度至少为2D。（D：为流量开关探测管线的公称直径）

The flow switch may be installed at any position perpendicular to the pipeline, regardless of the pipeline's orientation; however, it must be ensured that the straight pipe length upstream of the sensor is at least 3D and that the straight pipe length on the downstream side is at least 2D. (D: nominal diameter of the flow switch's sensing pipe).



图二、流量开关安装示意图

b)流量开关安装在缩管、扩管、阀门管线时，也要保证传感器上游直管长度至少为3D,下游侧的直管段长度至少为 2D。

When installing a flow switch in a reducer, expander, or valve pipeline, ensure that the straight-pipe length upstream of the sensor is at least 3D and that the straight-pipe length downstream is at least 2D.

c)在≥DN150 的管线上安装时，固定短接G20 的长度可选取2～3cm，一端焊接在管线上，另一端固定流量开关。在≤DN150 的管线上安装时，固定短接G20 的长度要加长，使流量开关的传感器尽可能位于管线的中心。

When installed on pipelines with a nominal diameter of ≥DN150, the length of the fixed G20 adapter may be selected as 2 - 3 cm; one end is welded to the pipeline, while the other end is secured to the flow switch. When installed on pipelines with a nominal diameter of ≤DN150, the length

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of the fixed G20 adapter should be increased so that the flow switch sensor is positioned as close as possible to the center of the pipeline.

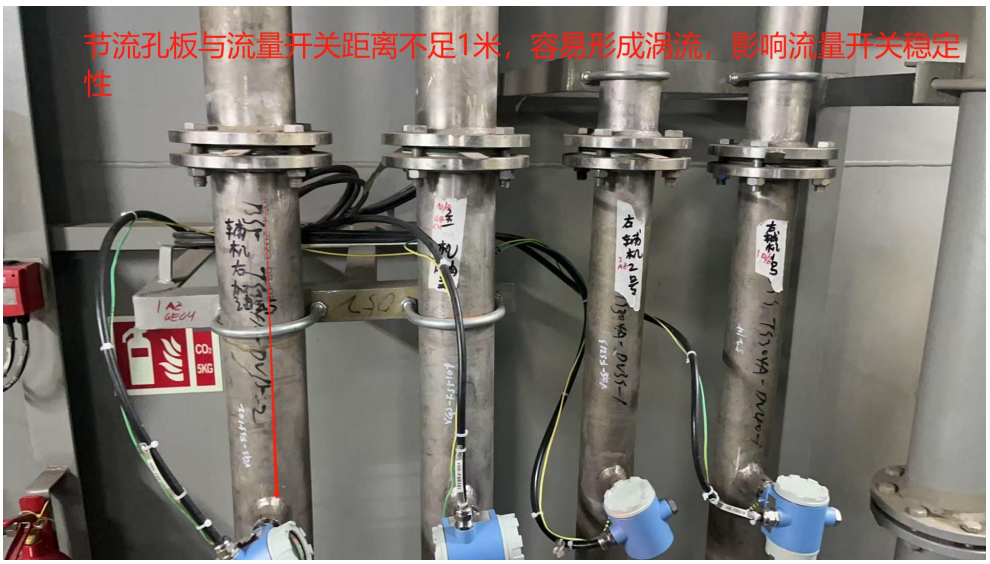
4.6 本开关采 54 线制接法，其中24V+接电源正,VO接电源负,NO 是常开接点输出,NC 是常闭接点输出。 COM 是公共端。



This switch uses a 54-wire configuration: 24V+ to the positive power, VO to negative power, NO is the normally open contact output, NC is the normally closed contact output, and COM is the common terminal.

4.7 如果管路使用了节流孔板，则流量开关的安装位置应至少离开孔板1000mm以上，避开紊流区。

If an orifice is used in the pipelines, the flow switch should be installed at a distance of more than 1000 mm from the orifice to avoid the turbulent flow zone.



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五、流量开关调试 Setting

5.1 该开关有两个开关量输出触点，一个为常开点，一个为常闭点。用户可以根据需求选择常开或者常闭。

This switch have 2 switch on/off contacts, one is normal open and the other is normal off. The user could select which one should be used.

5.2 指示灯 Indicator light

红 LED 为流量未触发指示灯；绿 LED 为流量触发指示灯；电位器旋钮为流量控制设定旋钮；黄LED为流量接近触点。

The red LED serves as the indicator for the flow-rate switching set point switch off; the green LED serves as the flow-rate indicator for the low-rate switching set point switch on; the knob is adjust setpoint. Yellow light is closed to the setpoint。



正确地安装流量开关，使介质以设定的流量流速流动，然后调节电位器，直至绿色 LED 恰好亮起。此后，当流量流速降至该值以下时将触发报警。若要将开关点设定得低于当前流量流速，请调节电位器，使更多绿色 LED 亮起。

Install the flow switch properly, allow the medium to flow at the monitored flow rate ,and adjust the potentiometer untill the green LED just lights up. Afterwards, an alarm will be output when the flow rate drops below this value. To set the switch point lower than the current flow rate,adjust the potentiometer to light up more green LEDs.

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5.3 工作点设定 *Work point Setting*

①将管道中介质流量调至需要控制的值，使绿灯变亮即可，待流量稳定 1—2分钟；

Set the pipeline medium flow rate to the desired control value; the green light will illuminate once this is achieved, and wait until the flow rate has stabilized for 1-2 minutes.

②如果流量指示灯为亮，可将旋钮逆时针旋转至灭，再顺时针慢慢旋转至刚刚亮.此时当调小介质流量绿灯熄灭.如果流量指示灯为灭，可将旋钮顺时针旋转至亮，再逆时针慢慢旋转至刚刚灭.此时调大介质流量绿灯亮。

If the flow indicator is lit, rotate the knob counter-clockwise until it goes out, then slowly rotate it clockwise until it just begins to light up again. At this point, when the medium flow is reduced, the green light will turn off. If the flow indicator is off, rotate the knob clockwise until it lights up, then slowly rotate it counter-clockwise until it just goes out again. At this point, when the medium flow is increased, the green light will illuminate.

③流量开关在介质流量设定时亮灭状态的改变的延迟时间为:1-15 秒.控制点的设定视介质流动的风速变化需要多次耐心的调节。

The delay time for the on/off state of the flow switch to change when the medium flow rate is set is 1-15 seconds. The setpoint of the control point requires multiple patient adjustments depending on changes in the air velocity of the medium flow.

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5.4 调试注意事项 *Commissioning Notes*

① 进风口之间距离过近，尤其是大风量的进风口和小风量进风口的距离过近。

The distances between air inlets are too close, particularly when the distance between high-airflow inlets and low-airflow inlets is excessive.



② 测试时，需要测试风速，应当在流量开关处使用手持管道插入式风速仪测量风速，并且要注意测试口的密封，在吸风口处使用风扇式风速仪测试风速并不准确，不能作为风速测量依据。

During testing, flowing speed needs to be measured, a handheld duct-type anemometer should be used at the flow switch to measure the air speed; attention should also be paid to ensuring the sealing of the test port. Using a fan-type anemometer at the air intake to measure air speed is inaccurate and should not be used as the basis for air-speed measurement.



③ 尽量全开风机出口阀，**只在出口阀全开时通过开风机和关风机测试流量开关，不要在截阀时调整流量开关。**

Fully open the fan outlet valve; use the fan-on and fan-off positions to test the flow switch only when the outlet valve is fully open, and do not adjust the flow switch while the throttle valve is partially closed.

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④ 正常测试流程：由于管路过长，启动风机3~5分钟以后再开始调整流量开关，先把固定螺丝拧下来，使用小螺丝刀旋转调整旋钮至绿灯亮，稳定10分钟以上，停风机并计时，如果流量开关在30秒左右切换为红灯，等待10分钟后再启动风机，同时计时，5~10秒红灯切换为黄灯和绿灯。

Standard testing procedure: Because the piping is relatively long, wait 3 - 5 minutes after starting the fan before beginning to adjust the flow switch; first unscrew the fixed screw, then use a small screwdriver to rotate the adjustment knob until the green light illuminates. After the system has stabilized for at least 10 minutes, turn off the fan and start timing. If the flow switch switches to the red light after approximately 30 seconds, wait another 10 minutes before restarting the fan and start timing again; after 5 - 10 seconds, the red light will switch to yellow and then to green.

小风量管路不具备使用压力式传感器的条件。对于大风量的管路，测量其流量开关处风压为-450pa，对于小风量的管路，测量其流量开关处风压为0。上述工况属于正常。

Small-airflow pipelines do not meet the requirements for using pressure measure sensors. For pipelines with high airflow, the air pressure at the flow switch is measured at-450 Pa; for ducts with low airflow, the air pressure at the flow switch is measured at 0 Pa. Above situation is normal.



大风量管路压力
High-flow pipeline pressure



小风量管路压力
Low-airflow pipeline pressure

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ADDRESS: No.971,Room 2709,
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六、故障处理 Fault treatment

1. 流量开关常见的故障现象包括流量开关无法启动或无响应、误报或误触发、不能准确测量流速或流量、 以及流量开关存在漏水、或密封问题。

Common faults in flow switches include failure to start or lack of response, false alarms or false triggering, inability to accurately measure flow velocity or flow rate, and leakage or sealing issues in the flow switch.

1.1 **无法启动或无响应**可能是由于电源未正常供电、开关接线不正确、开关被堵塞或损坏、控制电路或继电器故障等原因导致的。解决方法包括检查电源供应、确保开关接线正确、清洁或更换开关、 以及修复或更换故障部件。

Failure to start or lack of response may be caused by factors such as an improperly supplied power source, incorrect switch wiring, a blocked or damaged switch, or a fault in the control circuit or relay. Solutions include checking the power supply, ensuring that the switch is wired correctly, cleaning or replacing the switch, and repairing or replacing faulty components.

1.2 **不能准确测量流速或流量**可能是因为开关位置和安装不正确、传感器不干净、或者需要校准。解决方法包括确保水流充分接触到开关、清洁传感器表面、以及根据需要进行调整或重新校准。

Inaccurate measurement of flow velocity or flow rate may be caused by incorrect switch positioning or installation, a dirty sensor, or the need for calibration. Solutions include ensuring that the water flow has adequate contact with the switch, cleaning the sensor surface, and making adjustments or recalibrating the device as necessary.

1.3 **存在漏水或密封问题**可能是由于密封件和连接部分损坏、管道和阀门损坏或松动导致。解决方法包括检查并修复或更换故障部件、增加额外的密封措施。

Leakage or sealing issues may result from damage to seals and connection components, or from damage or looseness in pipes and valves. Remedies include inspecting and repairing or replacing faulty components, implementing additional sealing.

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1.4 **压力低，流量小，信号不切换。**在负压情况下或者压力极低的情况下，流量达不到产品启动要求时，会造成开关不亮绿灯，如果把产品灵敏度调得太高，可能会造成绿灯不灭，或者绿灯绿灯来回切换。

Low pressure and low flow result in no signal switching. When operating under negative pressure or at extremely low pressure, if the flow fails to meet the product's startup requirements, the switch's green indicator will not illuminate; if the product sensitivity is set too high, the green indicator may remain lit continuously or switch back and forth between on and off states.

工作在低风速管路是影响流量开关性能的主要问题：对于设计风速较大的管路，流量开关运行情况较好；对于设计风速较小的管路（小于1m/s），流量开关的工作状况非常容易受外界因素干扰，**建议对该处的管路进行缩径，从而增加流速**，优化流量开关的使用状况。

For pipelines with higher air speeds, the flow switch operated effectively; for pipelines with lower air speeds (less than 1 m/s), the operating condition of the flow switch is highly susceptible to interference from external factors; ***recommended that the pipeline at this location be reduced in diameter to increase the flow velocity*** *and optimize the performance of the flow switch.*

1.5 **流量报警点偏移。**调试开关的时候尽量要保证流量比较稳定的时候来设定报警值。流量开关的安装位置也会对开关报警值会有影响。请查看本说明安装位置章节。

Offset of the flow alarm point. When commissioning the flow switch, ensure that the alarm setpoint is configured while the flow rate is as stable as possible. The installation location of the flow switch also affects its alarm setpoint. Please refer the installation site introduction.

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ADDRESS: No.971,Room 2709,
Dong Fang Road,Shanghai

流量开关使用及保养建议

Operation and Maintenance Procedures

流量开关是一种常见的流量控制装置，其作用是根据流量的大小来控制液体或气体的流动。通过对流量开关的正确使用和保养，可以达到提高设备稳定性、提高生产效率、延长设备寿命的目的。

A flow switch is a common flow-control device that regulates the flow of liquid or gas according to the magnitude of the flow rate. Proper use and maintenance of the flow switch can improve equipment stability, enhance production efficiency, and extend equipment service life.

操作规程 Operation Specification

1. 安装位置 *Installation Site*

在安装流量开关时，应选择合适的位置，避免在高温、腐蚀等特殊环境下使用，同时应尽量避免安装在缺乏通风、易产生震动等环境中。

When installing the flow switch, select an appropriate location and avoid using it in special environments characterized by high temperatures, corrosion, or other adverse conditions; additionally, installation in areas lacking adequate ventilation or prone to vibration should be avoided whenever possible.

2. 连接方式 *Connection Method*

在连接流量开关时，应按照说明书中的连线方式进行连接，保证电气连接良好，避免出现短路或者其他电气故障;同时还需密封连接处避免液体或气体泄漏。

When connecting the flow switch, follow the wiring instructions provided in the manual to ensure a proper electrical connection and prevent short circuits or other electrical faults; additionally, seal the connection points to prevent leakage of liquids or gases.

3. 操作注意事项 *Operating Precautions*

在正常使用流量开关时，应注意以下几点:

①不得超过流量开关的额定流量范围， 以免损坏设备;

②不得在流量开关工作过程中频繁开关， 以免造成过度损坏;

When using the flow switch under normal operating conditions, please note the following:

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① *Do not exceed the rated flow range of the flow switch to avoid damaging the equipment;*

② *Do not frequently switch the flow switch on and off while it is in operation, as this may cause excessive damage;*

4. 保养规程 *Maintenance*

①对于流量开关的保养工作，需要注意以下几点:

长时间运行会导致流量开关表面积累尘，影响散热或者其他机械效应。所以在日常保养时需要对流量开关进行清洗，除去积尘， 以保证机器的正常运转。

②定期检查连接方式及电气连接是否正常

在使用流量开关时，需要定期检查连接方式及电气是否正常，避免出现电气故障的情况。同时还需要关注气流及液流的通畅与否， 以保障液体或气体的正常通道。

① *When maintaining the flow switch, the following points should be observed: prolonged operation can cause dust to accumulate on the surface of the flow switch, impairing heat dissipation or causing other mechanical effects. Therefore, during routine maintenance, the flow switch should be cleaned to remove accumulated dust and ensure the normal operation of the equipment.*

② *Regularly inspect whether the connection methods and electrical connections are functioning properly. When using the flow switch, the connection methods and electrical system should be checked periodically to prevent electrical faults. At the same time, attention should be paid to whether the airflow and liquid flow are unobstructed, thereby ensuring that the liquid or gas has a clear passage.*

The end

Email: tom.li@arkee.com.cn

16/11/2026