

Operating Manual

Flow switch

GB English manual

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1 Device Description and Intended Use

JLSO flow switches are designed for minimum or maximum monitoring of liquid flows. The operational safety of the supplied equipment is only guaranteed if it is operated according to its intended use (flow monitoring of liquids). The specified limit values (see the chapter entitled "Technical Data") should never be exceeded.

It is your responsibility to select a technology which is suitable for your specific application, to install it correctly, to carry out tests and to maintain all the components.

Various device versions are manufactured. The respective type plate displays the version of each device.

1.1 Flow switch version VH...X

Flow switches for application in potentially explosive areas have an "X" at the end of the article number (see the type plate). They have been subjected to an ignition hazard assessment according to DIN EN 13463-1: 2002 and do not have potential sources of ignition. They are, therefore, not subject to directive 94/9/EC.

The switching unit is a simple electrical device for connection to a certified intrinsically safe circuit according to DIN EN 50020: 2003. The effective internal inductances and capacities are negligibly small.

The flow switch version VH...X is designed for application in explosive atmospheres. The ignition energy of the explosive atmosphere should not be below 60µJ.

Please observe the following separation of zones:

The construction of the flow switch VH...X allows a potentially explosive atmosphere (zone 0) to exist permanently, over a longer period or frequently within the pipework in which the paddle is located.

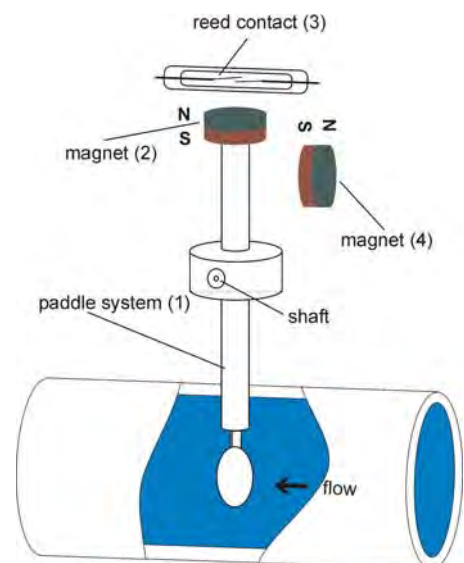
In normal operation, there should only be an occasional potentially explosive atmosphere (zone 1) outside the pipework where the flow switch connection is located. A manufacturer's declaration is available.

1.2 Functional principle

The flow switch consists of a paddle system (1) which has a permanent magnet (2) located at its upper end. A reed contact (3) is positioned outside the flow above this magnet. A second, magnet (4) with opposite polarity is used to create a reset force.

The paddle system is moved once it comes into contact with the flow which is to be monitored. The magnet (2) changes its position in relation to the reed contact (3). The contact opens/closes depending on the contact type (see chapter 5).

As soon as the flow is interrupted, the paddle returns to its original position and the reed contact opens/closes depending on the contact type (see chapter 5).



2 Safety Instructions

Always read these operating instructions carefully prior to installing the new product. Always adhere to the instructions contained herein, especially the safety instructions, otherwise there is a potential risk of personal injury and damage to instruments and plants.

Even though JLSO provides assistance through personal consultation or the respective literature, it is the responsibility of the customers to determine the suitability of the product for the specific application.

The flow switches are state-of-the-art devices. This concerns switching point accuracy, functioning and safe operation of the device.

However, professional and safety conscious conduct of the operator is required to ensure safe operation.

2.1 Qualified personnel

- The personnel entrusted with installing, operating and maintaining the flow switches have to be suitably qualified; the required knowledge can be gained via training courses or appropriate on-the-job instruction. The personnel have to be familiar with the contents of these instructions, which have to be available to them at all times.
- The electrical connection should only be carried out by a fully qualified electrician.
- All work has to be carried out in accordance with existing national regulations on accident prevention and safety at work and with any internal regulations of the operator, even if they are not specified in these instructions.

2.2 Special safety instructions

- The operational safety of the supplied equipment is only guaranteed if it is operated according to its intended use. The specified limit values (see the chapter entitled "Technical Data") should never be exceeded.
- To avoid damages to the flow switch and the monitored system, only use JLSO flow switches for minimum or maximum monitoring of the flow of liquids.
- Always follow and adhere to the flow switch installation instructions.
- Never operate the flow switch in systems which have a greater flow rate than the specified max. flow rate (see the chapter entitled "Technical Data", details of the max. flow rate). Otherwise it will cause irreparable damage to the flow switch.
- Prior to flow switch installation, ensure that all the materials of the flow switch are chemically and mechanically-resistant to the medium which is to be monitored and to all external factors.
- Ensure that the medium is free from magnetic particles.
- Suitable measures should be taken to prevent the medium from freezing.
If the flow switch is to be used in ambient temperatures of $<4^{\circ}\text{C}$, do not carry out any operation beforehand with pure water, e.g. a test run. Residual water in the flow switch can result in frost damage.
- No greases, oils etc. should be used during the installation of the VK... devices due to the material resistance.
- Ensure that the max. specified operating pressure is not exceeded.
- Never remove a flow switch or its upper parts from a pipe system under pressure.
- If the medium which is to be monitored is very hot, the flow switches or their connection fittings will also become very hot. In this case, neither touch the flow switch nor place any heat-sensitive objects in its vicinity.
- Protect the flow switch against external magnetic fields in the immediate vicinity, since these can impair device functioning.
- The technical data of special versions (customised versions) can deviate from the details in these instructions. Please observe the details on the type plate.

- **Caution: Danger of death due to high voltages!**
Always de-energize the system before connecting the connector cable.
- It is prohibited to remove or make type plates or any other information attached to the equipment indecipherable, otherwise all warranties and the responsibility of the manufacturer no longer apply.

2.3 Additional information for flow switch version VH...X

- The flow switch should only come into contact with media with a minimum ignition temperature of >135 °C and ignition energy of >60μJ.
- When installing and before starting-up, it is to be guaranteed that the mechanical process connections are technically tight.
- Always consider the impermeability of the screwing elements for the zone allocation. Depending on the operating conditions, it may be necessary to regularly check the impermeability of the screwing elements.

CAUTION: Ensure that the maximum electrical contact load specified on the type plate is never exceeded; otherwise the reed contact integrated in the switching unit will be damaged.
The switching capacity is reduced with inductive loads. Details of the protective circuit can be requested from the manufacturer.

3 Material Specifications of Wetted Components

Type	VH...M.1..1..1 VH...M.1..1..C	VH...M.1..1..1X	VH...M.3..3..3	VH...M.3..3..3X	VH...M.P..1..1 VH...M.P..1..C	VK...M.P..P..1 VK...M.P..P..C VK...M.P..P..K
Upper part	2.0401	2.0401	1.4571	1.4571	2. 0401	PPO (NORYL GFN3)
Paddle system	2.0401	2.0401	1.4571	1.4571	PPO (NORYL GFN3)	PPO (NORYL GFN3)
Round head rivet	2.0321	2.0321	1.4303	1.4303	-----	-----
Bushings	PPO (NORYL GFN3)	1.4571	PVDF	1.4571	PPO (NORYL GFN3)	PPO (NORYL GFN3)
Axle	1.4571	1.4571	1.4571	1.4571	1.4571	1.4571 / PPO
Pipe section*	2.0402 (VH...1) copper (VH...C)	2.0402	1.4571	1.4571	2.0402 (VH...1) copper (VH...C)	2.0402 (VK...1) copper (VK...C) PVC (VK...K)
Threaded nipple**	2.0402	2.0402	1.4571	1.4571	2.0402	1.4571
Screw-in insert***	2.0401	2.0401	1.4571	1.4571	2.0401	1.4571
Seal	NBR	NBR	NBR	NBR	NBR	NBR
V seal	-----	-----	-----	-----	EPDM	EPDM / PPO
Magnet	Hard ferrite	Hard ferrite	Hard ferrite	Hard ferrite	Hard ferrite	Hard ferrite

* only for flow switch with pipe section

** only for flow switch for direct installation, soldering or welding connection

*** only for flow switch for direct installation, screw connection

4 Flow Switch Installation

4.1 Mechanical installation

4.1.1 General installation instructions

- ⇒ When choosing the installation site, ensure that the specified limit values (see “Technical data”) are not exceeded.
- ⇒ Select suitable measures to prevent the medium from freezing.
If the flow switch is to be used in ambient temperatures of $<4^{\circ}\text{C}$, do not carry out any operation beforehand with pure water, e.g. a test run. Residual water in the flow switch can result in frost damage.
- ⇒ Firstly, clean the pipe system in which the flow switch is to be installed and remove any magnetic particles, e.g. welding residue.
- ⇒ The straight in- and outlet pipe (in front of and behind the flow switch) has to be at least $5 \times \text{DN}$.
- ⇒ The nominal installation position of the flow switch is an “upright standing position” in horizontal pipework.
- ⇒ The switches should only be installed in a vertical position, deviation max. 45° (Fig. 1).
- ⇒ Please contact the manufacturer if other installation positions are desired.
- ⇒ Please make sure that there are no external magnetic fields in the immediate vicinity of the flow switch, since these can impair device functioning (Fig. 2).
- ⇒ There is an arrow on the flow switch. Ensure that this arrow is parallel with the pipe shaft and is facing in the direction of flow during installation (Fig. 2).
- ⇒ The brass and stainless steel union nuts $\frac{3}{4}$ “BSP (version VH...) have a tightening torque of 25...30 Nm.
- ⇒ The plastic union nuts (version VK...) have a tightening torque of 7...8 Nm.

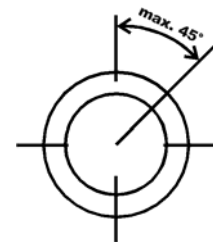


Fig. 1

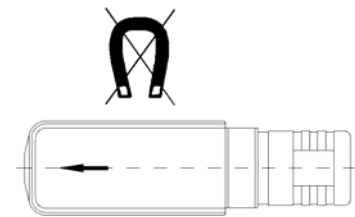


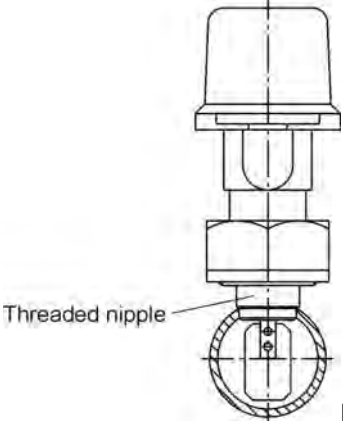
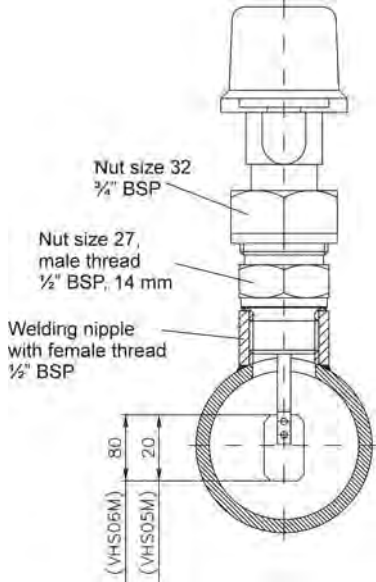
Fig. 2

Additional information for flow switch version VH...X

- ⇒ Please observe the specified limit values when choosing the installation site (see “Technical Data”).
- ⇒ When installing and before starting-up, it is to be guaranteed that the mechanical process connections are technically tight.
- ⇒ Always consider the impermeability of the screwing elements for the zone allocation. Depending on the operating conditions, it may be necessary to regularly check the impermeability of the screwing elements.

4.1.2 Flow switch for direct installation

- ⇒ During flow switch installation, ensure that the paddle does not touch the wall of the pipe.
- ⇒ Prior to soldering (brass) or welding (stainless steel) the threaded nipple of the flow switch V...01M..., always disassemble the flow switch and the O ring to prevent overheating.
- ⇒ Carry out installation of your device type as described in the table below.

Flow switch type	Installation type and instructions
<p>V..01M...</p>  <p>Threaded nipple</p> <p>Fig. 3</p>	<p>Installation with the help of brass (soldering) threaded nipples or stainless steel (welding) threaded nipples including O ring.</p>
<p>V..05M... V..06M... up to DN 50 V..07M... up to DN 50</p>  <p>Nut size 32 3/4" BSP</p> <p>Nut size 27, male thread 1/2" BSP, 14 mm</p> <p>Welding nipple with female thread 1/2" BSP</p> <p>80 (VHS06M)</p> <p>20 (VHS05M)</p> <p>Fig. 4</p> <p>V..06M... from DN 50 V..07M... from DN 50</p>	<p>Installation in sockets with a 1/2" BSP female thread</p> <p>Caution: Please observe the installation height dimensions</p> <p>Installation in sockets with a 1/2" BSP female thread, should only installed vertically in horizontal pipes.</p> <p>Caution: Always observe the installation height dimensions</p>

4.1.3 Flow switch with pipe section

- ⇒ Install the flow switch pipe section just like a valve in the existing pipe.
- ⇒ Sealing of the brass or stainless steel pipe sections has to be carried out with either thread sealants (Teflon tape, surface coating, etc.) or via sealing rings on the face of the tube section.
- ⇒ Flow switches optionally equipped with a copper tube section (Fig. 5) have to be soldered to the pipe. The flow switch (upper part) and the O ring have to be disassembled from the tube section when soldering to prevent overheating.
- ⇒ With version ...MKU seal the PVC tube section (Fig. 6) in the pipe using suitable adhesive joints.

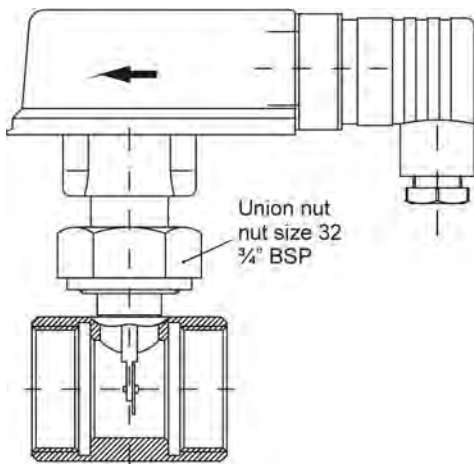


Fig. 5

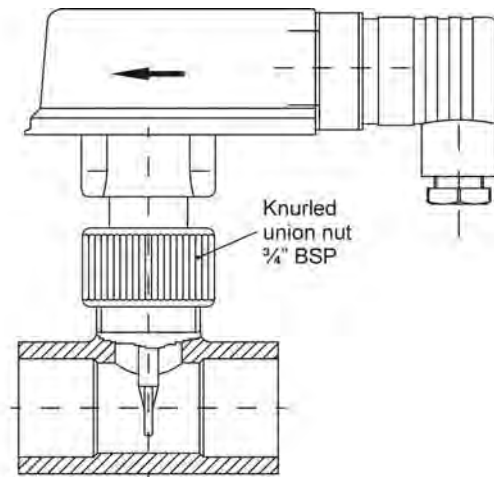


Fig. 6

4.2 Electrical connection

4.2.1 General electrical connection information

- ⇒ **Caution:** Danger of death due to high voltages!
Always de-energize the system before connecting the wires of the mains cable.
- ⇒ **CAUTION:** Ensure that the maximum electrical contact load specified on the type plate is never exceeded; otherwise the reed contact integrated in the switching unit will be damaged.
The switching capacity is reduced with inductive loads. Details on the protective circuit can be requested from the manufacturer.

Additional information for flow switch version VH...X

- ⇒ The flow switch version VH...X can be connected as a simple electrical device to a certified intrinsically safe circuit.
- ⇒ The flow switch version VH...X is equipped with either an elbow plug connector EN 175301-803-A or a permanent connecting cable.
- ⇒ To prevent electrostatic charging the devices have to be connected to the equipotential bonding via the elbow plug connector or the fixed connecting cable.

4.2.2 Elbow plug connector EN 175301-803-A

- ⇒ Loosen the central screw (pos. 6) M3x35 and disconnect the junction box EN 175301-803-A (pos. 2) from the connector (pos. 1) (Fig. 7).
- ⇒ Use a screwdriver or similar tool to press out the core (pos. 8) of the junction box (Fig. 8).
- ⇒ Loosen the screw connection PG 9 (pos. 5, Fig. 9).
- ⇒ Feed the connecting cable into the junction box via the screw connection (pos. 5), the clamping ring (pos. 10) and the rubber insert (pos. 9) and subsequently connect the wires as displayed in the connection diagram (see Fig. 11).
- ⇒ Press the core (pos. 8) until it locks into position in the junction box (pos. 2).
- ⇒ Tighten the cable gland PG 9 (pos. 5).
- ⇒ Place the junction box (pos. 2) on the connector (pos. 1) and retighten the central screw (pos. 6).

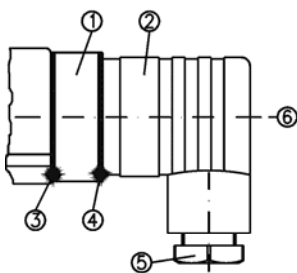


Fig. 7

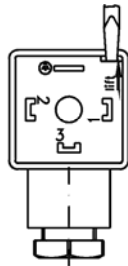


Fig. 8

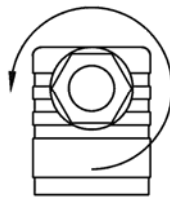


Fig. 9

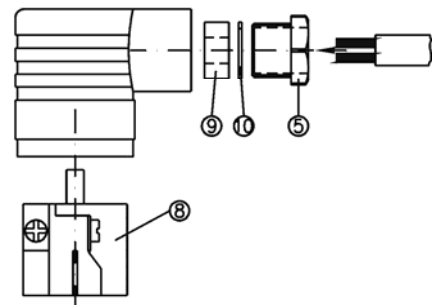


Fig. 10

- ⇒ To guarantee the protection class IP 65 according to EN 60529, the applied connecting cable has to have a sheathing diameter of between 4.5 and 7 mm.
- ⇒ Furthermore, ensure that all the connector seals (pos. 3, 4 and 9) have been correctly inserted.

Flow switch version VHS.../VKS...

Flow switch version VHS...X

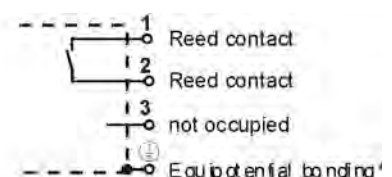
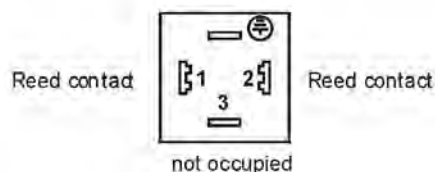
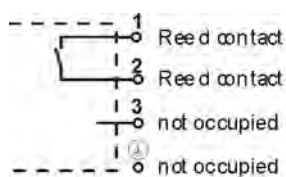


Fig. 11

*To prevent electrostatic charging the VHS...X devices have to be connected to the equipotential bonding via the elbow plug connector.

4.2.3 Sensor plug M12x1 (4-pole)

⇒ Only use suitable coupling sockets M12x1 for the connection. These are supplied as accessories with either a directly moulded cable or for self-assembly.

Pin assignment of the coupler connector

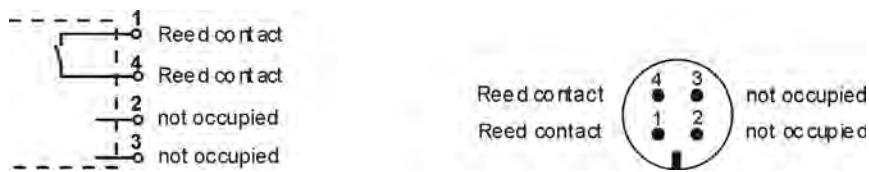


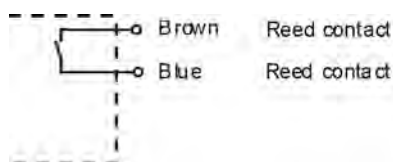
Fig. 12

4.2.4 Fixed connecting cable

⇒ Connect the connecting cable according to the connection diagram (see Fig. 13 or Fig. 14):

Standard contact

Flow switch version VH3.../VK3...



Flow switch version VH3...X

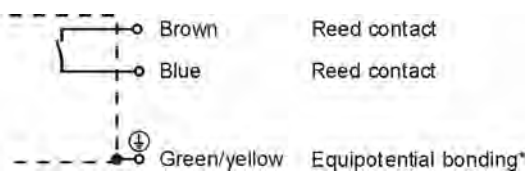


Fig. 13

*To prevent electrostatic charging the VH3...X devices have to be connected to the equipotential bonding via the fixed connecting cable.

Change-over contact (only flow switch version VH3...)

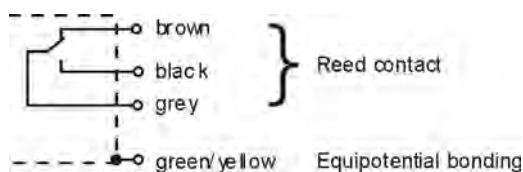


Fig. 14

5 Adjusting the Switching Unit

5.1 Contact type

5.1.1 Standard contact

The switching unit of the control switch enables 2 contact types:

1. Make contact (normally open): "RED" arrow on the switching unit
2. Break contact (normally closed): "WHITE" or "BLUE" arrow on the switching unit

The following table explains the two contact types:

Contact type	Setting	Flow rate:	Electric contact
Make contact	RED arrow	increasing	closing
		decreasing	opening
Break contact	WHITE or BLUE arrow	increasing	opening
		decreasing	closing

If not otherwise agreed with the customer, the switching unit is factory set as a make contact, i.e. the reed contact opens if the set switching point is exceeded.

5.1.2 Change-over contact (only for VH3...)

For flow switches with a change-over contact a fine adjustment can only be carried out within the red arrow. The contact switches after reaching the set switching point.

5.2 Flow switch version VH...X

The flow switch version VH...X is supplied ex works with a fixed switching point. Adjustment of the switching point for flow switch version VH...X is not permitted.

5.3 Flow switch version VHS... , VKS... and VK3...

- ⇒ In order to adjust the switching unit, open the cover of the switching head (Fig. 15)
(not required for VK3...)

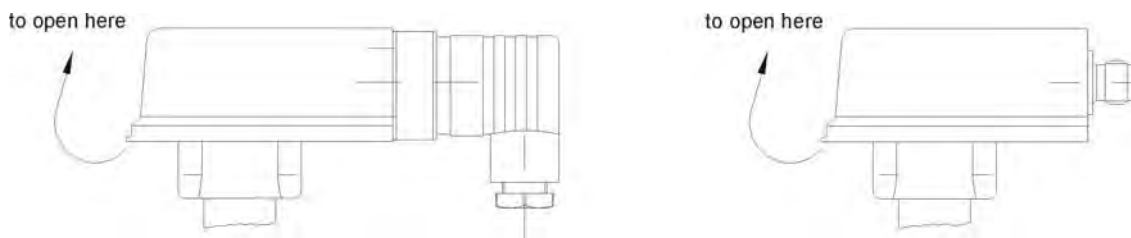


Fig.15

- ⇒ Subsequently loosen the locking screw (2.5 hexagon socket screw for the brass and stainless steel version or recessed head screw for the plastic version) and position the switching unit until the red or white arrow are visible at the entry of the switching contact guide for a desired make contact (Fig. 16) or break contact (Fig. 17) respectively.
- ⇒ The fine adjustment of the switching point can be carried out on the basis of the arrow length:
Movement towards the arrow head: Switching point is set to lower flow rate.
Movement towards the arrow tail: Switching point is set to higher flow rate.
- ⇒ Carefully retighten the locking screw.
- ⇒ We recommend you to use lacquer/threadlocker to secure the locking screw of the switching unit after carrying out individual adjustments.
- ⇒ Close the cover until it locks into place (not required for VK3...).

Adjustment of the switching unit is not required if a desired ex works switching point setting has been agreed with the customer.

make contact (red arrow)

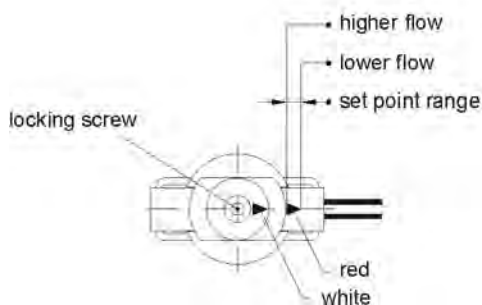


Fig. 16

break contact (white arrow)

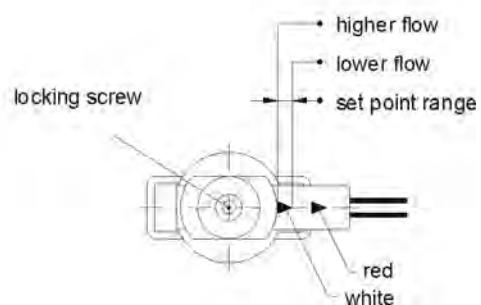


Fig. 17

5 Adjusting the Switching Unit

5.1 Contact type

5.1.1 Standard contact

The switching unit of the control switch enables 2 contact types:

1. Make contact (normally open): "RED" arrow on the switching unit
2. Break contact (normally closed): "WHITE" or "BLUE" arrow on the switching unit

The following table explains the two contact types:

Contact type	Setting	Flow rate:	Electric contact
Make contact	RED arrow	increasing	closing
		decreasing	opening
Break contact	WHITE or BLUE arrow	increasing	opening
		decreasing	closing

If not otherwise agreed with the customer, the switching unit is factory set as a make contact, i.e. the reed contact opens if the set switching point is exceeded.

5.1.2 Change-over contact (only for VH3...)

For flow switches with a change-over contact a fine adjustment can only be carried out within the red arrow. The contact switches after reaching the set switching point.

5.2 Flow switch version VH...X

The flow switch version VH...X is supplied ex works with a fixed switching point. Adjustment of the switching point for flow switch version VH...X is not permitted.

8 Technical Data *

8.1 Technical data flow switch version VH... and VK...

Series	VHS...	VH3... make/ break contact	VH3... change- over contact	VKS...	VK3...	VKS...K	VK3...K
Nominal pressure	PN 25**			PN 10**	PN 10**	PN 10	PN 10
Max. medium temperature (the medium should never freeze)	110 °C			100 °C		20 °C (PN 10); 60 °C (PN 2.5)	
Ambient temperature (do not store at <4 °C)	80 °C, 100 °C (optional)				70 °C	60 °C	
Max. switching current	1 A		0.2 A	1 A			
Max. switching voltage	230 VAC, 48 VDC		30 VAC/DC	230 VAC, 48 VDC			
Max. switching capacity	26 VA, 20 W		3 VA, 3 W	26 VA, 20 W			
Protection class	II		I	II			
Degree of protection	IP 65						
Max. permanent temperature load of the cable	—	105 °C	80 °C	—	70 °C 105 °C (optional)	—	70 °C 105 °C (optional)
Connecting cable length	—	1.5 m		—	1.5 m	—	1.5 m
Cable cross-shaped section	—	0.75 mm²	0.5 mm²	—	0.5 mm²	—	0.5 mm²
Tolerance of the switching point ranges	±15 %						

*The technical data of special versions (customised versions) can deviate from the details in these instructions. Please observe the details on the type plate.

**Reduced pressure level for devices with copper pipe section. Please observe the details on the type plate!

8.2 Technical data flow switch version VH...X

Series	VHS...X	VH3...X
Nominal pressure	PN 25	
Max. medium temperature (the medium should never freeze)	100 °C	
Ambient temperature (do not store at <4 °C)	70 °C	
Max. switching current	1 A	
Max. switching voltage	230 VAC, 48 VDC	
Max. switching capacity	26 VA, 20 W	
Protection class	II	I
Degree of protection	IP 65	
Max. permanent temperature of the cable	—	70 °C
Connecting cable length	—	1.5 m
Cable cross-shaped section	—	0.5 mm ²
Tolerance of the switching point ranges	±15 %	

Applies for flow switch version VH...X

The ignition energy of the explosive atmosphere should not be below 60µJ. The effective internal inductances and capacities are negligibly small.

8.3 Maximum flow rate of the flow switch*

Flow switch with pipe section

The maximum specifications relate to water as the medium and a continuous flow rate.

Brass/Stainless steel pipe section			PVC pipe section
	VH...	VK...	VK...
Nominal width	Max. flow rate [l/min]		Max. flow rate [l/min]
DN 8	45	14	--
DN 10	60	20	--
DN 15	67	30	50
DN 15 (external thread)	60	20	--
DN 20	180	80	100
DN 25	195	130	100
DN 32	240	180	150
DN 40	400	300	200 (260)**
DN 50	400	350	260 (350)**

** The values in brackets apply to shortened paddles

Flow switch for direct installation

Series VH... / VK...		VH...	VK...
	Nominal width	Max flow rate [m³/h]	Max flow rate [m³/h]
V...05M... (mounting length 51 mm)	DN 50	30	25
	DN 80	80	65
	DN 100	150	100
	DN 150	200	170
V...06M... (mounting length 111 mm)	DN 100	100	40
	DN 150	150	95
	DN 200	200	160
V..01M... with soldered/welded nipple (mounting length 24 mm)	DN 50	30	--
	DN 80	100	--
	DN 100	150	--
	DN 150	200	--

* The max. permissible flow rate can deviate from the specified limit values for customised versions.

9 Approvals

The flow switches have been type-tested by TÜV Rheinland, mark of conformity R 9611016 dated 28.08.1996 (not valid for version with sensor plug M12x1 and for VH...X).



Reference no. 0507081, section "Switches - Flow Control – 1718"