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Operating manual

for the flow switches piston, inline structure: FW1-.., FW3. FWJ, RVM, NJ/NJV, MR, MR1K, HD1F/HD2F, HD1K/HD2K,HM1K/ HM2K, HR1MV,HR2K1/HR2VK1,HR2K2/ HR2VK2

Table of contents

1 General safety notes, usage

This operating manual must be locally stored so that it can always be accessed.
All procedures described within this operating manual may only be performed by trained personnel authorised by the operator with corresponding protective gear.

1.1 Safety signs and symbols

Danger signs and symbols are marked as noted below for this operating manual:

	Warning! Symbol warns of ensuing danger, death, grave bodily injury and/or severe material damages due to carelessness.
	Attention! Symbol warns of possible dangers or harmful situations that arise due to not observing damage to the device and/or to the surroundings.
	Note! Symbol refers to procedures that have an indirect influence on operation due to carelessness, or which can trigger an unforeseen reaction.

Table 1

1.2 Safety notes

Read the product information before activating the device. Ensure that the product is indefinitely suitable for the usage in question.
The operator is responsible for the error-free operation of the device. He is obligated to determine and observe adherence to the required work and safety measures of the respectively valid stipulations during the full duration of application.

1.3 Product liability and warranty

This operating manual contains the instructions for assembling and operating the device safely in the stipulated manner. Should any difficulties arise that cannot be solved by using the operating manuals and product information, additional information must be retrieved from the manufacturer. The manufacturer reserves all rights to technical changes and improvements. Usage of this operating manual requires the appropriate qualification of the user. The operating personnel is also subject to the operating manual.

1.4 Standards and guidelines[1]

- DIN EN 60947-5-1
- Low-voltage directive 2014/35/EU
- RoHS - Guideline 2011/65/EU

2 Product description

Oftentimes, with applications, the necessity arises to ensure minimal care, e.g. with lubrication or coolants. With the flow switches pistons / inline structure, a flow volume can be set with which a change of state of the microswitch/reed switch is performed. A safeguard against shortage can thereby be achieved. It is also possible to monitor increasing flow values.[2]

[1] The specified standards and guidelines apply to products with an electrical connection.
[2] If nothing is stated to the contrary, the switching points stated in the product information or during alignment always apply for falling volumetric flow (shortage protection).

Devices with indicator and devices with sensor heads (OMNI, FLEX, LABO)[3] facilitate ascertaining the respective flow rate.

2.1 Active principle

With the device group piston-inline structure a magnet-mounted, spring-supported piston controls the reed switch or microswitch/Hall sensor and/or display measuring stations contact-free.
Deflection of the piston depends on the volumetric flow (spring action against flow resistance). The piston lies concentrically with in- and outlet (in "line").

2.2 Product contents[4]

- Enclosed with the product are an operating manual and the corresponding product information.
- To avoid any transportation damages/spoilage, the devices are equipped with threaded plugs or protective bags.
- When operating the device with valve connector DIN 43650-A, the mating plug is provided with the product contents.

3 Structure of the devices

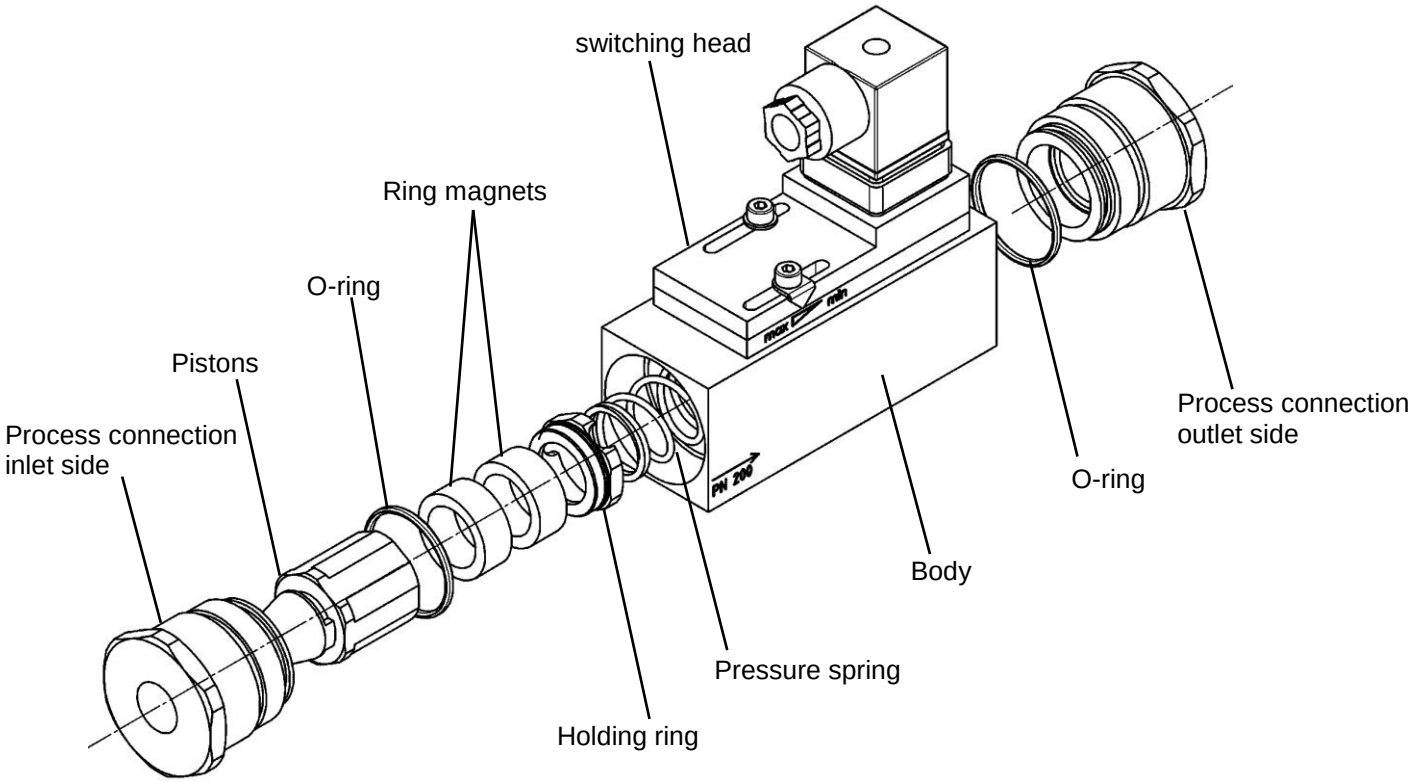

Figure 1: Schematic diagram of the flow switches – piston, inline structure

3.1 Appropriate usage

The flow switch captures the volumetric flow in fluid media and activates the microswitch/reed switch based on the predefined amount. The Hall sensor determines the flow rate by capturing the magnetic field of the piston magnet. The device may only be employed for the medium stated in the product information.
The device is not intended for operation with gaseous media. This product is intended for application in machinery and facilities and for the application of media of the fluid group II as per Guideline 2014/68/EU. The product does not fall under Guideline 2014/68/EU and also receives no CE label in accordance with this guideline. The stated limit values may never be exceeded (the data can be found in the product information).

[3] More information on OMNI, FLEX, LABO can be found in the respective product information.
[4] A deviating schematic can be provided with special devices.

4 Assembly and installation

To ensure flawless usage of our devices, the following points must be observed during assembly and installation:

4.1 Mechanical assembly

- Take the appropriate measures to prevent freezing of the medium. Should the device later be subjected to an ambient temperature <4°C, no operation with pure water may be performed. Frost damage may be caused by water remaining in the device.
- Note the permitted installation positions from the product information.
- The device may never serve as a fixed point.
- The connector flanges/threads must be compatible.
- A filter should be provided for heavily spoiled media.
- In the event of ferritically loaded media we recommend installing our GHM magnetic filter ZV.
- Note that external magnetic fields in the immediate vicinity of the device can influence the functionality of the device. Assembling the device on ferromagnetic materials also changes the switch point/display value.
- The inflow/outflow pathways (before and behind the device) must bear at least[5] 5 x DN for slow-down.
- For devices with flanges, the seal between the flanges must be centred.
- Do not exceed the operating pressure stated in the product information, and do not exceed/undercut the stated temperature range.
- Thermal expansion of the pipework must be balanced out by compensators.

It must also be ensured that

- when soldering/welding the process connections, the device as well as all O-rings are dismantled to avoid damages.
- the device can be aligned horizontally or vertically (see product information). The installation position has an influence on the switching point due to the masses of the mobile components.

The direction of flow is indicated on the device by an arrow. The arrow points in the direction of flow.

4.2 Electrical installation

The device may only be installed by an electrical specialist. The respective national and international regulations on installing electrical facilities of the respective operator country apply.

- The schematic must be the reference for wiring the device.[6]
- When connecting a switch, a load must be serially connected.
- The electrical statements for switches apply to ohmic loads. Capacitive and inductive loads should be operated with a protective circuit (see 4.4).
- Always set the electrical unit to be volt-free before installing the connection cable!

[5] See product information.
[6] The schematic is provided with the device or can be found in the respective product information.

4.3 Electrical connection-panel connector DIN 43650-A

- Loosen the fastening screw pos. 3 (M3x30) and pull socket pos. 2 from connector plug pos. 1 (Fig. 2). Remove the fastening screw.
- Open the inner portion of the socket pos. 2, e.g. with a screwdriver (Fig. 3)
- Loosen the cable screw gland pos. 4 (Fig. 4)
- Lead the connection line through the cable screw gland pos. 9, the pressure ring pos. 8 and the rubber insert pos. 7 into the socket (Fig. 5).
- Connect the connection lead according to the schematic.
- Press the inner portion until it locks in the socket pos. 2. After introducing the fastening bolt, tighten the cable screw gland (Fig. 6).
- Plug socket no. 2 into connector plug pos. 1 and refasten the fastening bolt pos. 3.

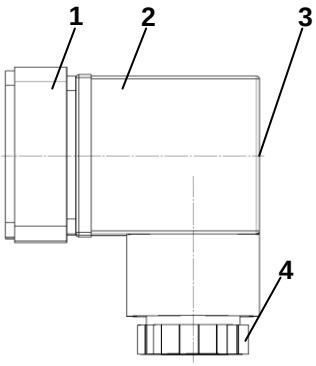

Figure 2

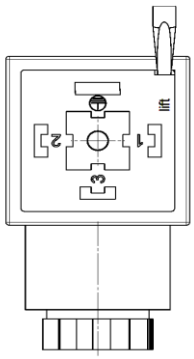
Figure 3

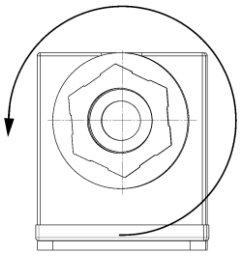
Figure 4

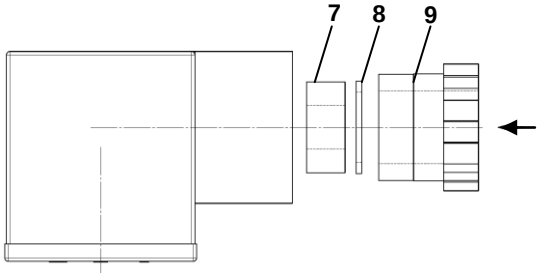

Figure 5

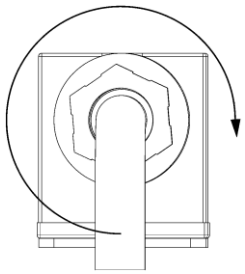
Figure 6

4.4 Electrical connection-PG-/cable screw gland

- Loosen the screwcap pos. 2.
- Lead the connection cable pos. 1 through the screwcap pos. 2, the moulded seal pos. 3 and the intermediate supports pos. 4 (Fig. 7).
- Connect the connection lead to the terminal contacts according to the schematic.
- Fasten the screwcap pos. 2 once more.

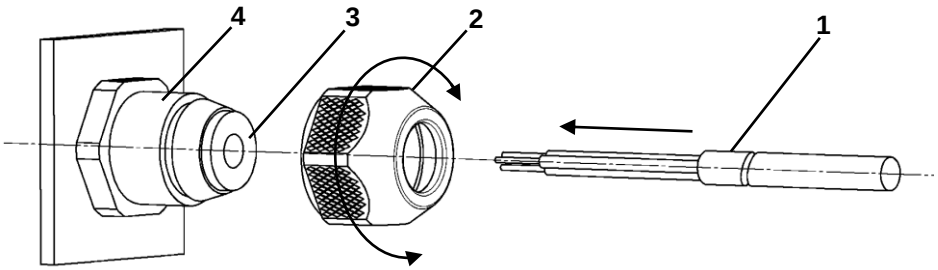

Figure 7: Connection PG-/cable screw gland

4.5 Contact protection measures for devices, especially reed switches

With capacitive and inductive loads or when operating light bulbs, current or voltage peaks may influence the lifespan of the contacts. To achieve a maximal lifespan or to prevent damage to the contacts, a protective circuit should be undertaken in such cases.

Contact protection with inductive load.
With inductive loads a break spark (electric arc) forms when opening the reed switch. There are two common protective circuits for reducing self-inductance:

- For AC voltage, the user protects the reed switch with an R-C element.
- With an inductive load and DC voltage, the reed switch is protected by a catch diode (e.g. 1N4007).

Contact protection with capacitive load.
Capacitive loads primarily arise due to long conduits (>50m). To counteract the loads it is often sufficient to serially switch a resistor. The resistance value should correspond in the voltage value (e.g. 24 V = 24 Ω).
Contact protection for lamp load.
The resistance of a filament is some 10 times smaller in a cold state than in a glowing state. During activation this leads to a 10-fold starting current, if perhaps briefly. To circumvent the problem we recommend LEDs (for instance) instead of light bulbs.

5 Operation elements and functions

5.1 Function/setting

The switching point can be set by adjusting the microswitch/reed switch. Both falling and rising volumetric flows can be monitored/displayed.
To adjust the switching point of the flow switches MR1K, HD1F/HD2F, HR2K1/HR2VK1 (Fig. 8) the internal hex socket screws pos. 1 must be removed. The required switching value can e adjusted via a sideways adjustment of the switching head pos. 2. The min./max. indicator pos. 3 serves for orientation. Refasten the internal hex socket screws pos. 1.
With the device designs HM1K/HM2K, HD1K/HD2K (Fig. 9) the adjustment occurs via a sprocket adjustment. Remove the cap nut pos. 1 (SW 8). The required switching value can be set by turning the adjustment rod pos. 2. Turning anti-clockwise causes a increase in the switching point, turning clockwise causes an decrease in the switching point. The set value can be read on the analog indicator pos. 3.
The function schematic of the lengthwise adjustment of the switching head (Fig. 8) also applies for the devices RVM, MR, HR1MV, FW1-..GP/GM and FW3.
For measuring devices with voltage supply (LABO, FLEX, OMNI) no change in the measuring head occurs.[7]

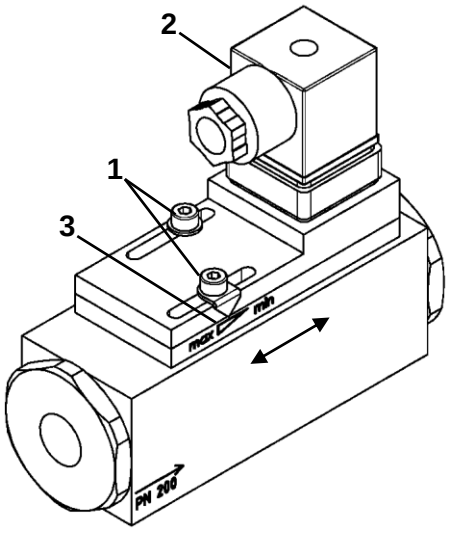

Figure 8: MR1K, HD1F/HD2F, HR2K1/HR2VK1 setting

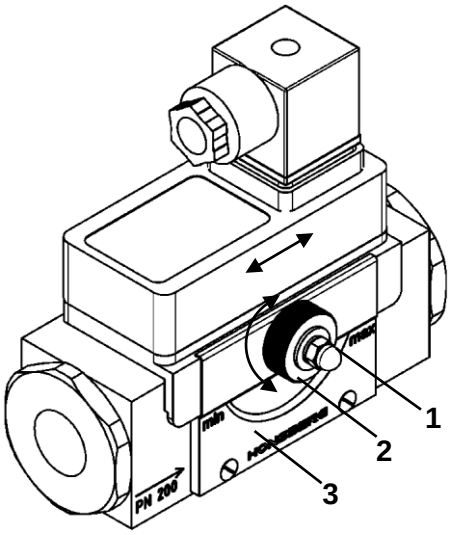

Figure 9: HM1K/HM2K, HD1K/HD2K setting

[7] Notes on programming the measuring heads LABO, FLEX, OMNI can be found in the product information.

6 Activation, operation and maintenance

6.1 Activation

Before activation note the limit values stated in the product information, such as for power, voltage, pressure stage, temperature range or maximum permitted flow.

- If present, the transport lock must be removed.
- When operating with protective covers, remove them immediately before assembly.
- Rinse the pipe system before assembly to remove any spoiling.
- Observe the direction of flow. This is indicated on the device with an arrow and must run parallel to the pipe axis after assembly.
- Properly tighten the device during assembly.
- Note that the switching point/display value can change during fluctuating viscosity.
- Endurance must be assessed with aggressive media.
- A change in medium may result in a faulty indicator and/or a flawed switching point.
- To avoid heavy pressure surges we recommend that you fill and ventilate the system before activation. Pressure surges may not exceed the value of PN/PS.
- The stated switching range is strictly based on decreasing flow (shortage protection). Stop position + hysteresis[8]= switch-on point.
  Assess whether the device turns on. The pumping rate must be sufficient to activate contact.
- With great flow speed and low pressure on the outlet side, cavitation may appear. Cavitation can be recognised from the development of unusual sounds (hissing, rattling). In this case you should increase the pressure on the outlet side or consult GHM-Honsberg.
- The pressure before the flow switch must, during free operation, be over the value of the caused loss of pressure.
- Ensure that both the assembly as well as the electrical connection is conducted properly.
- Observe the re-attachment/repeated maintenance of any present safety installations.

6.2 Operation

Via the indication options J/O/O1/Z/Z1 as well as OMNI, FLEX, LABO (see product information) the alteration in volumetric pressure can be evaluated via an analog/digital indicator during operation. With the optional temperature indicator "A" a change in medium temperature can be read.

6.3 Maintenance

The devices operate with pure medium free of repairs. We recommend applying a filter for unclean medium (see point 8 Accessories).

7 Technical information

The technical information can be found in the product information. This is included with the product or may be downloaded at http://www.ghm-messtechnik.de/en/products/b-sensors-and-instrumentation/b2-flow/piston-inline-design.html#c4423.

[8] Hysteresis: all mechanical devices exhibit a hysteresis (switching point, display difference between increasing and decreasing flow volumes).

8 Accessories[9]

- Filter TYPE ZV
- Filter TYPE ZE
- Manifold VB

9 Device transportation and storage

Storage

- Please observe the storage temperature.[10]
- A desiccant or heating against the formation of condensation is recommended in moist areas.

Transport

- Please observe the transportation temperature.[11]
- Prevent environmental influences such as impacts, blows, dust and vibrations.

10 Return

The legal regulations for protecting the environment and our personnel require that returned devices which have come into contact with toxic and hazardous materials can be treated with no risks to personnel and the environment.
Should you return a device to us for evaluation, repair or disposal we ask that you strictly adhere to the following regulation:

A return form can be downloaded on our homepage at:
http://www.ghm-messtechnik.de/en/downloads/ghm-forms.html.
Acceptance from GHM-Honsberg can only occur if

1. a filled-out form is provided with each return,
2. packing is applied that prevents damage to the device,
3. the device is cleaned so that no dangers are present,
4. the filled-out form and, if necessary (hazardous materials), a safety data sheet of the measurement medium is applied to the outside of the packaging.

11 Disposal

During disposal, a material separation and recycling of the device components as well as the packaging must be observed. The legal stipulations and guidelines valid at this point in time must be adhered to.
The device may not be disposed of in a residual waste bin. Should a disposal of the device take place, send it directly to us with the return form filled out under point 10. We take over the appropriate and professional disposal.

12 Disclaimer

[9] More information on our accessories can be found in the product information.
[10] See product information: ambient temperature
[11] See product information: transportation temperature