bürkert
FLUID CONTROL SYSTEMS

Type 8041

Insertion electromagnetic flowmeter
Magnetisch-induktives Durchfluss-Messgerät, Insertion
Débitmètre électromagnétique à insertion

Operating Instructions

Bedienungsanleitung
Manuel d'utilisation

MAN 1000211865 EN Version: EStatus: RL (released | freigegeben) printed: 21.06.2023

Operating Instructions 2306/05_EU-ML 00559777 / Original_EN

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1. ABOUT THESE OPERATING INSTRUCTIONS

The Operating Instructions describe the entire life cycle of the device. Please keep these Operating Instructions in a safe place, accessible to all users and any new owners.

The Operating Instructions contains important safety information.

Failure to comply with these instructions can lead to hazardous situations. Pay attention in particular to the chapters "3. Basic safety information" and "2. Intended use".

- Whatever the version of the device, the Operating Instructions must be read and understood.
- When the symbol  is marked inside or outside the device, carefully read the Operating Instructions.

1.1. Symbols used

DANGER

Warns against an imminent danger.

- Failure to observe this warning results in death or in serious injury.

WARNING

Warns against a potentially dangerous situation.

- Failure to observe this warning can result in serious injury or even death.

CAUTION

Warns against a possible risk.

- Failure to observe this warning can result in substantial or minor injuries.

NOTICE

Warns against material damage.

 indicates additional information, advice or important recommendations.

 refers to information contained in these Operating Instructions or in other documents.

- Indicates an instruction to be carried out to avoid a danger, a warning or a possible risk.

→ Indicates a procedure to be carried out.

✔ Indicates the result of a specific instruction.

1.2. Definition of the word "device"

The word "device" used within these Operating Instructions refers to the flowmeter type 8041.

2. INTENDED USE

Use of the device that does not comply with the instructions could present risks to people, nearby installations and the environment.

The 8041 flowmeter is intended exclusively to measure the flow rate in liquids.

- Use this device in compliance with the characteristics and commissioning and use conditions specified in the contractual documents and in the Operating Instructions.
- Never use the flowmeter type 8041 for security applications.
- Protect this device against electromagnetic interference, ultraviolet rays and, when installed outdoors, the effects of climatic conditions.
- Protect this device against electromagnetic interference, ultraviolet rays and, when installed outdoors, the effects of climatic conditions.
- Only operate a device in perfect working order.
- Requirements for the safe and proper operation of the device are proper transport, storage and installation, as well as careful operation and maintenance.
- Only use the device as intended.

3. BASIC SAFETY INFORMATION

This safety information does not take into account any contingencies or occurrences that may arise during installation, use and maintenance of the device.

The operating company is responsible for the respect of the local safety regulations including staff safety.

Risk of injury due to high pressure in the installation.

- Stop the circulation of fluid, cut off the pressure and drain the pipe before loosening the process connections.

Risk of injury due to electrical voltage.

- If a 18...36 V DC powered version is installed either in a wet environment or outdoors, all the electrical voltages must be of max. 35 V DC.
- Shut down the electrical power source of all the conductors and isolate it before carrying out work on the system.
- Observe all applicable accident protection and safety regulations for electrical equipment.

Risk of injury due to high fluid temperatures.

- Use safety gloves to handle the device.
- Stop the circulation of fluid and drain the pipe before loosening the process connections.

Risk of injury due to the nature of the fluid.

- Respect the prevailing regulations on accident prevention and safety relating to the use of aggressive fluids.

Various dangerous situations

To avoid injury take care:

- to prevent any unintentional power supply switch-on.
- to ensure that installation and maintenance work are carried out by qualified, authorised personnel in possession of the appropriate tools.
- to guarantee a defined or controlled restarting of the process, after a power supply interruption.
- not to use the device for the measurement of gas flow rates.
- not to use the device in explosive atmospheres.
- not to use the device in an environment incompatible with the materials it is made of.
- not to subject the device to mechanical loads.
- not to make any modifications to the device.
- to use the device only if in perfect working order and in compliance with the instructions provided in these Operating Instructions.
- to observe the general technical rules when installing and using the device.

NOTICE

The device may be damaged by the fluid in contact with.

- Systematically check the chemical compatibility of the component materials of the device and the fluids likely to come into contact with it (for example: alcohols, strong or concentrated acids, aldehydes, alkaline compounds, esters, aliphatic compounds, ketones, halogenated aromatics or hydrocarbons, oxidants and chlorinated agents).

NOTICE

Elements / Components sensitive to electrostatic discharges

- This device contains electronic components sensitive to electrostatic discharges. They may be damaged if they are touched by an electrostatically charged person or object. In the worst case scenario, these components are instantly destroyed or go out of order as soon as they are activated.
- To minimise or even avoid all damage due to an electrostatic discharge, take all the precautions described in the EN 61340-5-1 norm.
- Also ensure that you do not touch any of the live electrical components.

4. GENERAL INFORMATION

4.1. Manufacturer's address and international contacts

To contact the manufacturer of the device, use following address:

Bürkert SAS

Rue du Giessen

BP 21

F-67220 TRIEMBACH-AU-VAL

You may also contact your local Bürkert sales office.

The addresses of our international sales offices are available on the internet at: country.burkert.com.

4.2. Warranty conditions

The condition governing the legal warranty is the conforming use of the device in observance of the operating conditions specified in these Operating Instructions.

4.3. Information on the Internet

You can find the Operating Instructions and technical data sheets regarding the type 8041 at: country.burkert.com.

5. DESCRIPTION

5.1. Area of application

The device is used to measure the flow of neutral or slightly aggressive fluids with a conductivity of more than 20 µS/cm in DN06 to DN400 pipes.

5.2. General description

5.2.1. Construction

The device comprises an electronic module and a PVDF or stainless steel measurement sensor.

The flow sensor comprises two electrodes and a magnetic system.

The connection of the device to the process is made depending on the version, either by a G2" nut or a clamp.

Electrical connection is made via two cable glands on a 6-pin terminal block.

The device requires an 18...36 V DC power supply and has:

- a frequency output,
- a relay output,
- a 4...20 mA current output.

5.2.2. Operating principle

The magnetic system in the flow sensor generates a magnetic field in the fluid, perpendicular to the flow direction, see Fig. 1. The electrodes on the flow sensor ensure electrical contact with the fluid. When the fluid flows over them, a voltage is measured between the two electrodes. This voltage is proportional to the fluid velocity.

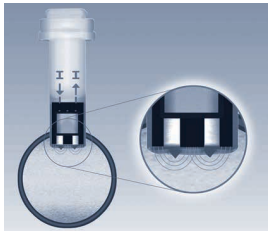
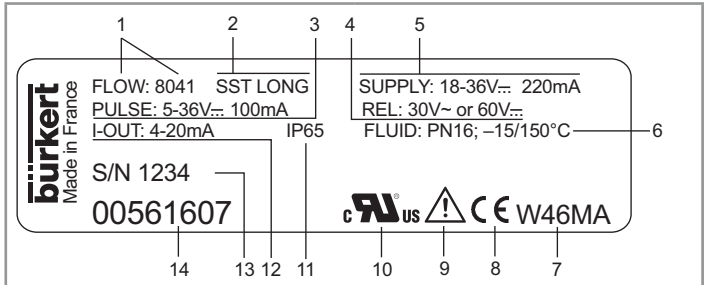


Fig. 1: Operating principle of the flow sensor

5.3. Description of the rating plate



1. Measured value and type of the device
2. Specification of the flow sensor
3. Specification of the pulse output
4. Specification of the relay output
5. Power supply / Max. consumption
6. Fluid nominal pressure and fluid temperature range
7. Manufacturing code
8. Conformity marking
9. Warning: Before using the device, take into account the technical specifications described in the Operating Instructions
10. Certification
11. Protection class of the device
12. Specification of the current output
13. Serial number
14. Article number

Fig. 2: Rating plate of the device (example)

5.4. Symbols on the device

Symbol	Description
	Direct current
	Alternating current
	Earth terminal
	Protective conductor terminal

6. TECHNICAL DATA

6.1. Conditions of use

Ambient temperature	–10...+60 °C
Air humidity	< 80 %, non condensated
Height above see level	max. 2000 m
Operating conditions	Continuous
Equipment mobility	Fixed
Use	Indoor and outdoor (Protect the device against electro-magnetic interference, ultraviolet rays and, when installed outdoors, against the effects of climatic conditions)
Installation category	Category I according to UL/EN 61010-1
Degree of pollution	Degree 2 according to UL/EN 61010-1
Protection class according to IEC / EN 60529	IP65 [1], with cable connected and cable gland tightened and cover screwed on to the electronic module

[1] not evaluated by UL

6.2. Standards and directives

The device complies with the relevant EU harmonisation legislation. In addition, the device also complies with the requirements of the laws of the United Kingdom.

The harmonised standards that have been applied for the conformity assessment procedure are listed in the current version of the EU Declaration of Conformity/UK Declaration of Conformity.

6.2.1. Conformity to the Pressure Equipment Directive

→ Make sure the device materials are compatible with the fluid.

→ Make sure the pipe DN is adapted for the device.

The device conforms to Article 4, Paragraph 1 of the Pressure Equipment Directive 2014/68/EU under the following conditions:

- Device used on a pipe (PS = maximum admissible pressure in bar; DN = nominal diameter of the pipe in mm)

Type of fluid	Conditions
Fluid group 1, Article 4, Paragraph 1.c.i	DN ≤ 25
Fluid group 2, Article 4, Paragraph 1.c.i	DN ≤ 32 or PSxDN ≤ 1000
Fluid group 1, Article 4, Paragraph 1.c.ii	DN ≤ 25 or PSxDN ≤ 2000
Fluid group 2, Article 4, Paragraph 1.c.ii	DN ≤ 200 or PS ≤ 10 or PSxDN ≤ 5000

6.2.2. UL-Certification

The devices with variable key PU01 or PU02 are UL-certified products and comply also with the following standards:

- UL 61010-1
- CAN/CSA-C22.2 n°61010-1

Identification on the device	Certification	Variable key
c US	UL recognized	PU01
c UL US LISTED Measuring Equipment EXXXXXX	UL listed	PU02

6.3. Mechanical data

Table 1: Wetted parts

Part	Material
Holder of the flow sensor	PVDF or stainless steel 1.4404 / 316L
Electrodes	Stainless steel 1.4404 / 316L
Clamp (only clamp version)	Stainless steel 1.4404 / 316L
Earthing ring (only if flow sensor holder in PVDF)	Stainless steel 1.4404 / 316L
Holder of the electrodes (only if flow sensor holder in stainless steel)	PEEK
Seal of the flow sensor (version with G2" nut)	FKM (FDA approved)

Table 2: Parts not in contact with the fluid

Part	Material
Housing, cover, nut • holder of the flow sensor in stainless steel • holder of the flow sensor in PVDF	 • PPA, glass fiber reinforced • PC, glass fiber reinforced
Screws of the cover	Stainless steel
Cable gland	PA
Seal of the cover	EPDM
Seal of the cable gland	Neoprene

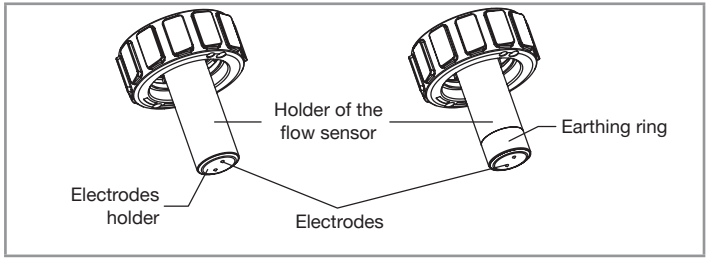


Fig. 3: Parts of the flow sensor holder in stainless steel (left) or in PVDF (right), devices with a G2" nut

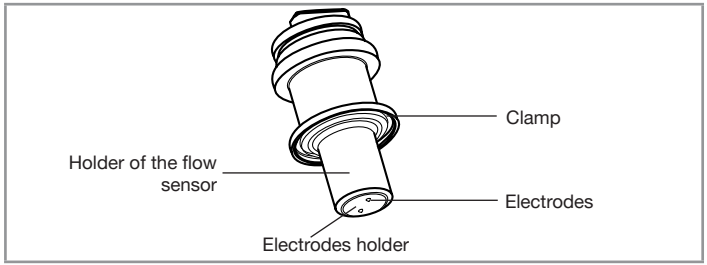


Fig. 4: Parts of the flow sensor in stainless steel with a clamp connection

6.4. Dimensions of device

→ Please refer to the technical data sheets regarding the type 8041 avalaible at: country.burkert.com.

6.5. Fluid data

Fluid conductivity	> 20 µS/cm
Fluid viscosity	< 1000 mPa.s
Fluid temperature	The fluid temperature may be restricted by the fluid pressure and the material of the S020 fitting used (see Fig. 5 and Fig. 6)
• with holder of the flow sensor in stainless steel	• –15...+150 °C
• with holder of the flow sensor in PVDF	• 0...+80 °C
Fluid pressure	The fluid pressure may be restricted by the fluid temperature, the material of the S020 fitting used and the DN of the S020 fitting used (see Fig. 5 and Fig. 6).
• with holder of the flow sensor in stainless steel	• PN10 [1] with a fitting in plastic, PN16 [1] with a fitting in metal
• with holder of the flow sensor in PVDF	• PN10 [1]

Flow rate measurement	
• Measuring range	• 0.2...10 m/s [2]
• Linearity	• ±0.5 % of the full scale (10 m/s)
• Repeatability	• ±0.25 % of the measured value [2]
• Measurement deviation	
- with standard K-factor	- ±3.5 % of the measured value [2]
- with Teach-in	- ±0.5 % of the measured value (at the value of the teach-in flow rate) [2]

[1] not evaluated by UL

[2] Determined in the following reference conditions: fluid = water, water and ambiant temperatures = 20 °C, upstream and downstream distances respected, appropriate pipe dimensions

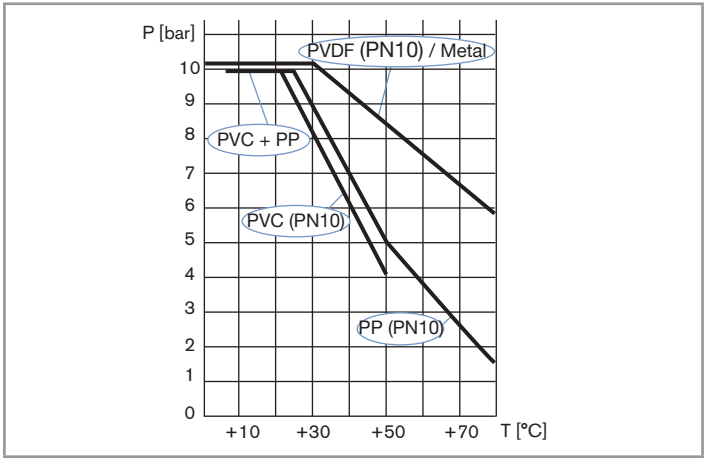


Fig. 5: Fluid pressure-temperature dependency of the 8041 with a flow sensor holder in PVDF, inserted into an S020 fitting in metal, PVDF, PVC or PP

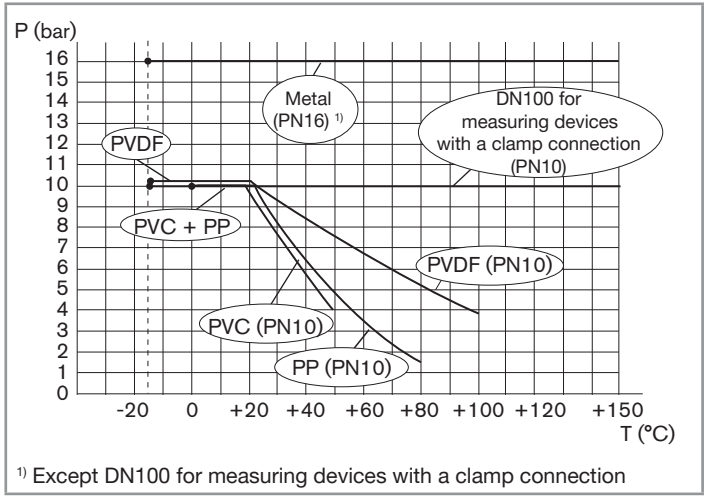


Fig. 6: Fluid pressure-temperature dependency of the 8041 with a flow sensor holder in stainless steel, inserted into an S020 fitting in metal, PVDF, PVC or PP

6.6. Electrical data

Operating voltage	• 18...36 V DC, • filtered and regulated • oscillation rate: ±5 % • Connection to main supply: permanent (through external SELV and through LPS power supply)
Specifications of the power source (not supplied)	• Limited power source according to IEC 62368-1, Appendix Q • or limited energy circuit according to IEC 61010-1, Paragraph 9.4 • SELV/PELV with UL-approved overcurrent protection designed according to IEC 61010-1, Table 18 (e.g. Block PM-0124-020-0)
Current consumption	• 220 mA (at 18 V DC)
Current output	
• Type of output	• 4...20 mA, sinking or sourcing wiring
• Accuracy	• ± 1 % (0.16 mA)
• Refresh time	• 100 ms
• Max. loop impedance	• 1100 Ω at 36 V DC, 330 Ω at 18 V DC
Frequency output	
• Frequency	• 0...240 Hz
• Duty cycle	• 50 % ± 1 %
• Max current	• 100 mA max.
• Protected against short-circuits and polarity reversal	• yes
Relay output	To use the relay outputs in a wet location, observe the following DANGER safety instruction. • Normally open or normally closed, depending on the wiring • max. 30 V AC and 42 V peak / 2 A or 60 V DC / 1 A max.
Alarme	
• Full scale exceeded	• 22 mA and 256 Hz
• Error signal	• 22 mA and 0 Hz

DANGER

Danger due to the operation of the relay outputs of a UL device in a wet location.

▸ If a UL device is used in a wet location:

- energize the relay outputs with an alternating voltage of max. 16 Vrms and 22.6 Vpeak.
- or energize the relay outputs with a direct voltage of max. 35 V DC.

6.7. Electrical connections data

Type of connection	Through 2 M20x1.5 cable glands
▸ Cable type	▸ shielded
▸ Cross section	▸ 0.5...1.5 mm²
▸ Diameter of each cable:	
- if only one cable is used per cable gland	- 6...12 mm
- if two cables are used per cable gland	- 4 mm, with the supplied multi-way seal

6.8. K-factors

The S020 fitting with weld end connections is available in two versions: a version for the measuring devices with a G2" nut and a version for the measuring devices with a clamp connection.

▸ Use the K-factor of the fitting used.

The device measures the flow velocity (in m/s) of the fluid and converts it into a current (in mA) and a frequency rating (in Hz).

The current I or the frequency f are proportional to the flow rate Q (l/s), the proportionality factor is called the "K-factor":

$$f = K_1 * Q$$

$$I = K_2 * Q + 4$$

with K_1 and K_2 in pulse/litre

The following formulae are used to calculate the K1 and K2 factors needed to convert the current or frequency into a flow rate:

Full scale	K-factor K_1	K-factor K_2
10 m/s	$K_1 = \frac{100}{K_{fitting}}$	$K_2 = \frac{20}{3*K_{fitting}}$
5 m/s	$K_1 = \frac{200}{K_{fitting}}$	$K_2 = \frac{40}{3*K_{fitting}}$
2 m/s	$K_1 = \frac{500}{K_{fitting}}$	$K_2 = \frac{100}{3*K_{fitting}}$

where $K_{fitting}$ = K-factor of the S020 fitting used

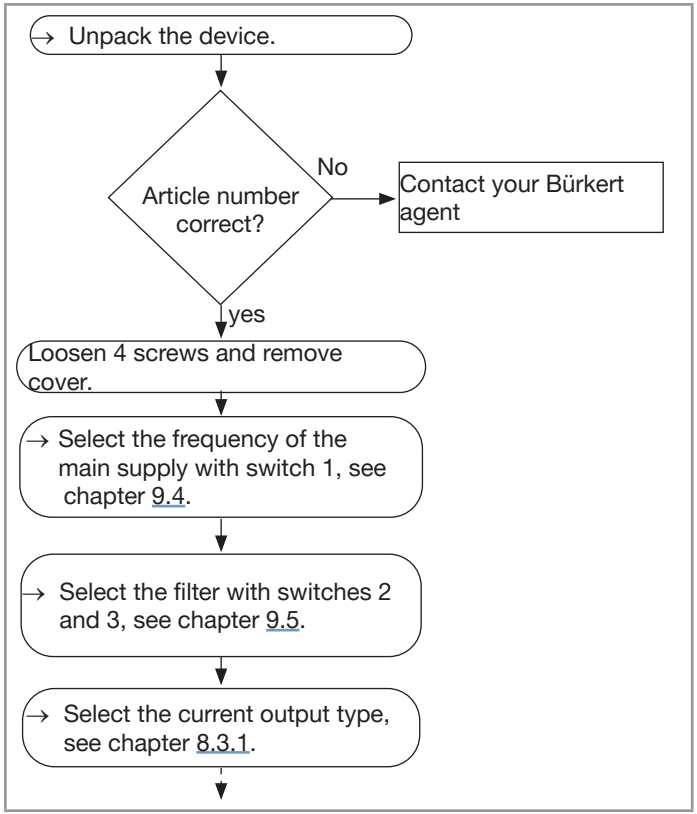
Example:

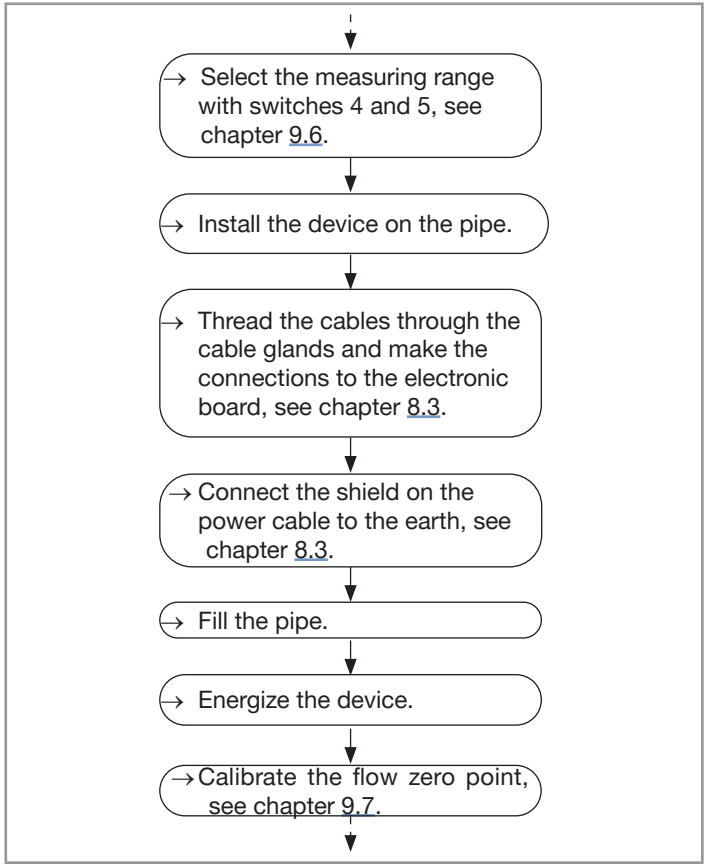
If the full scale of the device is set to 5 m/s, the value of the current output will be:

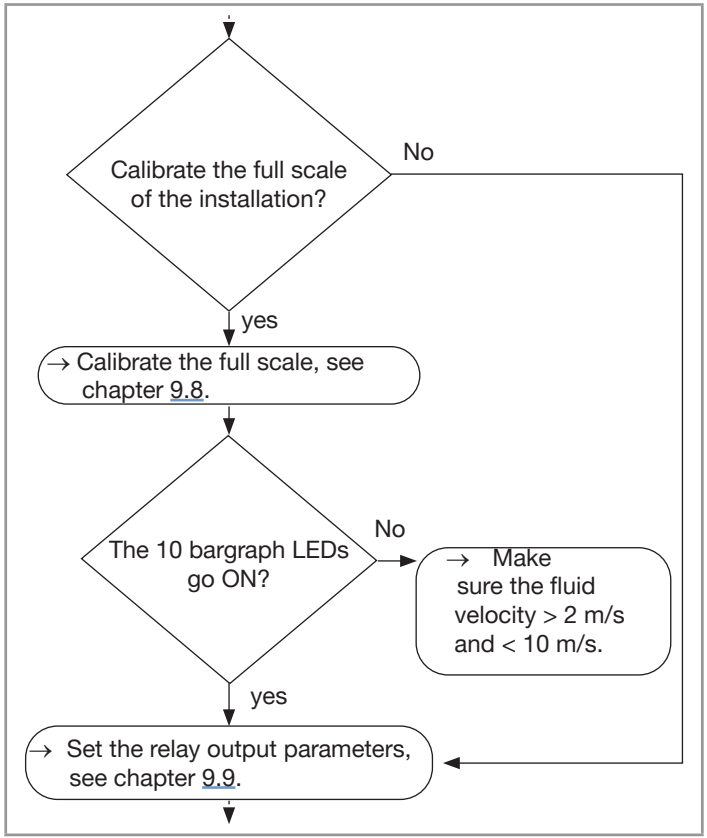
$$I = \frac{40}{3*K_{fitting}} Q + 4$$

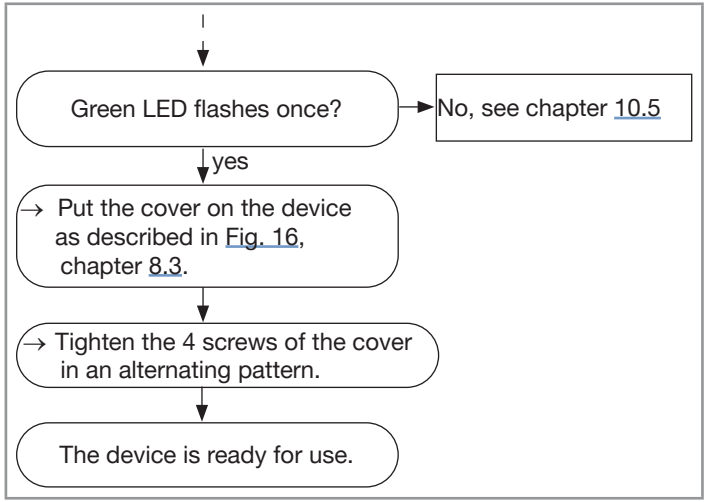
with I in mA, $K_{fitting}$ in pulse/litre and Q in l/s.

7. QUICK INSTALLATION






Calibrate the full scale of the installation?
No
yes
→ Calibrate the full scale, see chapter 9.8.
The 10 bargraph LEDs go ON?
No
→ Make sure the fluid velocity > 2 m/s and < 10 m/s.
yes
→ Set the relay output parameters, see chapter 9.9.


Green LED flashes once?
No, see chapter 10.5
yes
→ Put the cover on the device as described in Fig. 16, chapter 8.3.
→ Tighten the 4 screws of the cover in an alternating pattern.
The device is ready for use.

8. INSTALLATION

8.1. Safety instructions

DANGER

Risk of injury due to high pressure in the installation.

- Stop the circulation of fluid, cut off the pressure and drain the pipe before loosening the process connections.

Risk of injury due to high fluid temperatures.

- Use safety gloves to handle the device.
- Stop the circulation of fluid and drain the pipe before loosening the process connections.

Risk of injury due to the nature of the fluid.

- Respect the prevailing regulations on accident prevention and safety relating to the use of aggressive fluids.

Risk of injury due to electrical voltage.

- If a 18...36 V DC powered version is installed either in a wet environment or outdoors, all the electrical voltages must be of max. 35 V DC.
- Shut down the electrical power source of all the conductors and isolate it before carrying out work on the system.
- Observe all applicable accident protection and safety regulations for electrical equipment.

WARNING

Risk of injury due to non-conforming installation.

- The electrical and fluid installation can only be carried out by qualified and skilled staff with the appropriate tools.
- Install appropriate safety devices (correctly rated fuse and/or circuit-breaker).

Risk of injury due to unintentional switch on of power supply or uncontrolled restarting of the installation.

- Take appropriate measures to avoid unintentional activation of the installation.
- Guarantee a set or controlled restarting of the process subsequent to any intervention on the device.

WARNING

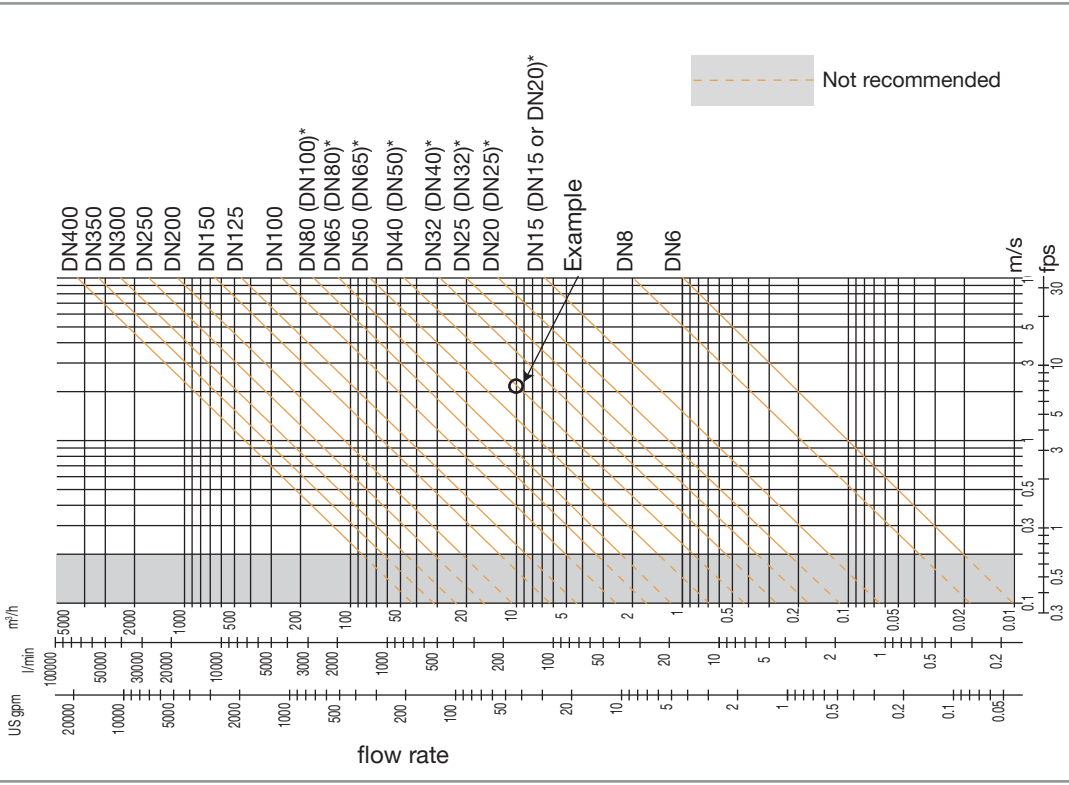
Risk of injury if the fluid temperature/pressure dependency is not respected.

- Observe the fluid temperature/pressure dependency according to the nature of the material of the fitting used (see Fig. 5 and Fig. 6).

8.2. Installation onto the pipe

8.2.1. Recommendations for installing the 8041 on the pipe

→ Choose a fitting appropriate to the velocity of the fluid inside the pipe; refer to the graphs below:



* For the fittings:
-with external thread connections acc. to SMS 1145;
-with weld end connections acc. to SMS 3008, BS 4825-1/ ASME BPE/DIN 11866 series C or DIN 11850 series 2/ DIN 11866 series A/DIN EN 10357 series A;
-with Clamp connections acc. to SMS 3017, BS 4825-3/ASME BPE or DIN 32676 series A.

Example:
- Specification: if the nominal flow rate is 10 m^3/h, the ideal flow velocity is between 2 and 3 m/s
- Solution: intersection between flow rate and flow velocity in the graph gives the appropriate pipe diameter, DN40 (or DN50 for the asterisked fittings).

→ Install the device on the pipe to have the upstream and downstream distances respected according to the design of the pipes, refer to standard EN ISO 5167-1 and Fig. 7:

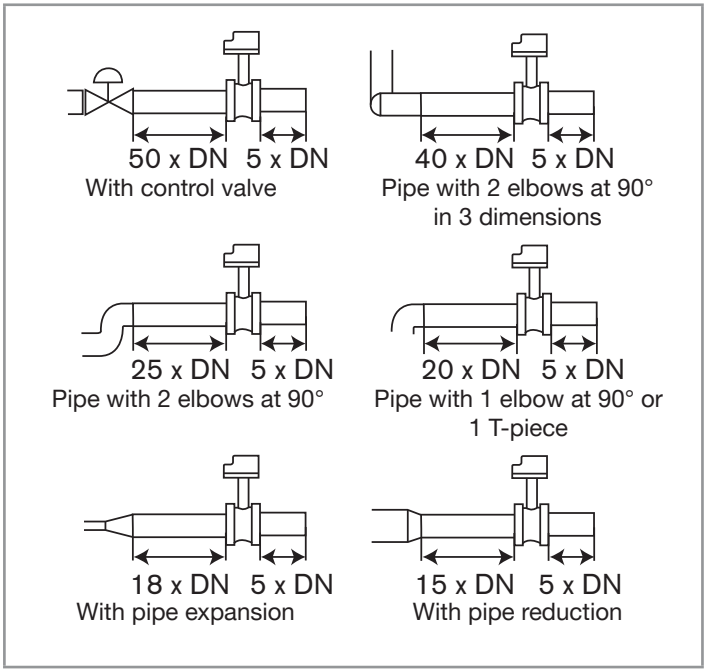


Fig. 7: Upstream and downstream distances depending on the design of the pipes.

→ Respect the following additional mounting conditions to ensure that the measuring device operates correctly:

- We recommend to install the device at a 45° angle to the horizontal centre of the pipe to prevent deposits on the electrodes and false measurements due to air bubbles (see Fig. 8);

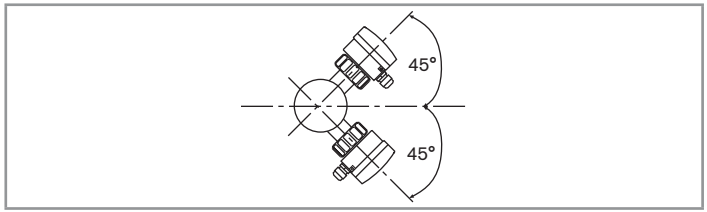


Fig. 8: Mounting angle on the pipe

- Ensure that the pipe is always filled in the section around the device (see Fig. 9).
- When mounting vertically ensure that the flow direction is in an upward direction (see Fig. 9).
- Prevent the formation of air bubbles in the pipe in the section around the device (see Fig. 10).
- Always mount the device upstream a possible injection point in the pipe of a high-conductivity fluid (for example: acid, base, saline, ...).

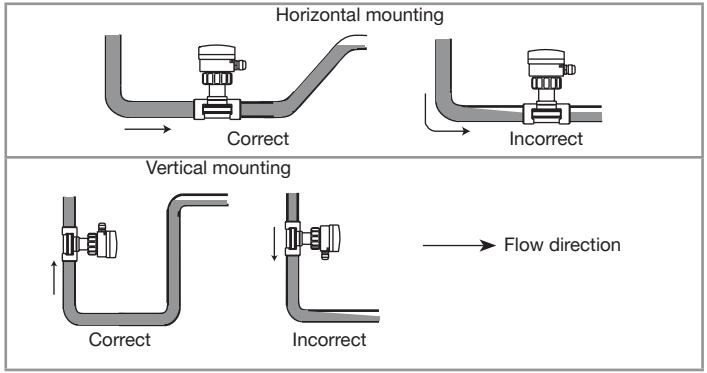


Fig. 9: Filling of the pipe

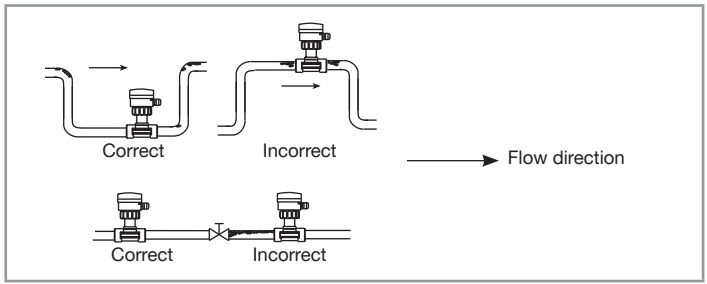


Fig. 10: Air bubbles within the pipe

→ If necessary, use a flow conditioner to improve measurement precision.

8.2.2. Installation into the pipe of a 8041 with a G2" nut

Observe the installation recommendations described at chapter 8.2.1 and in the Operating Instructions of the S020.

→ Install the S020 fitting (mark 4, Fig. 11) on the pipe.

→ Check that there is a seal 6 on the device 1 and that it is not damaged. Replace the seal if necessary.

→ Insert the nut 3 on the fitting 4.

→ Insert the snap ring 2 into the groove 5.

→ Position the cable glands parallel to the pipe and insert the device 1 into the fitting 4.

→ Tighten the nut 3 by hand on the device 1.

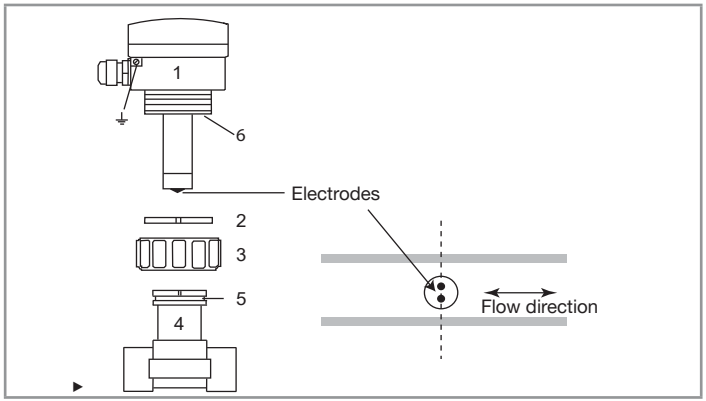
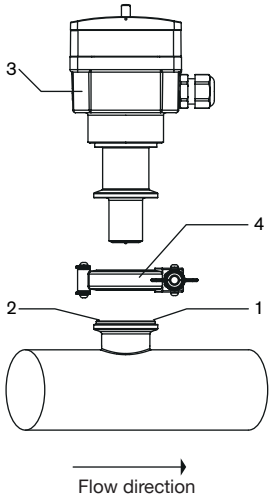


Fig. 11: Installation into the pipe of the flowmeter with a G2" nut

8.2.3. Installation into the pipe of a 8041 with a clamp connection

Observe the installation recommendations described at chapter 8.2.1 and in the Operating Instructions of the S020.

→ Install the S020 fitting on the pipe.



→ Install the seal (mark 1) on the S020 fitting.

→ Make sure that the polarizing pin (mark 2) is on the fitting.

→ Insert the device (mark 3) into the fitting. Position the device in order the arrow on the side of the housing indicates the direction of the flow: the totalizers will increment.

→ Tighten by hand the clamp collar (mark 4).

→ Charge the pipe to make sure the installation is tight.

Fig. 12: Installation into the pipe of a 8041 with a clamp connection

8.3. Wiring

DANGER

Risk of injury due to electrical voltage.

- If a 18...36 V DC powered version is installed either in a wet environment or outdoors, all the electrical voltages must be of max. 35 V DC.
- Shut down the electrical power source of all the conductors and isolate it before carrying out work on the system.
- Observe all applicable accident protection and safety regulations for electrical equipment.

DANGER

Danger due to the operation of the relay outputs of a UL device in a wet location.

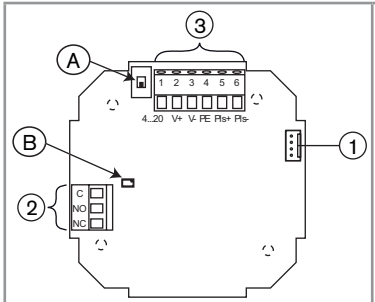
- If a UL device is used in a wet location:
  - energize the relay outputs with an alternating voltage of max. 16 Vrms and 22.6 Vpeak.
  - or energize the relay outputs with a direct voltage of max. 35 V DC.

- Use a high quality electrical power supply (filtered and regulated).
- Use cables with an operating temperature limit correct for your application.

→ Protect the power supply by means of a 300 mA fuse and a switch.

→ Do not install the cables near high voltage or high frequency cables. If this cannot be avoided, observe a min. distance of 30 cm.

→ Loosen the 4 screws of the cover to access the electronic board of the device (see Fig. 13).



Connector 1: connection of the flat cable coming from the flow sensor (to energize the flow sensor)

Terminal block 2: wiring the relay output

C: common point

NO: normally open

NC: normally closed

LED Ⓑ : status LED of the relay (LED ON = contact closed)

Selector Ⓐ: Sink/source selector of the 4...20 mA output

Terminal block 3

Terminal 1: 4...20 mA output

Terminal 2: V+ (positive voltage)

Terminal 3: V- (power supply ground)

Terminal 4: PE, shield of the power supply cable; Earth cable coming from the housing and, second cable on a version with flow sensor holder in stainless steel (see Fig. 14)

Terminal 5: Pls+, positive frequency output

Terminal 6: Pls-, negative frequency output

Fig. 13: Terminal assignment

Make sure the installation is equipotential (power supply - 8041):

→ Connect together the various earth spots in the installation to eliminate the potential differences that may occur between two earthes.

→ In the housing, connect the power supply cable shield to terminal no. 4 of the electronic board connector (Fig. 14). On a version with stainless steel flow sensor, a second cable is coming from the sensor.

→ Connect the negative power supply terminal to the earth to suppress the effects of common mode currents. If this connection cannot be made directly, a 100 nF/50 V capacitor can be connected between the negative power supply terminal and the earth (marked 1, Fig. 15).

- If the pipes are made of metal:

→ connect to the same earth the different metallic instruments (valve, pump...) located near the device (marks 2, Fig. 15).

- If the pipes are made of plastic:

→ insert the metal parts (not provided) in the plastic pipes, upstream and downstream of the device (marked 2, Fig. 15).

→ connect the metal parts to the same earth (Fig. 15).

NOTICE

The device is not tight if only one or none of the cable glands is used

▸ The device is only tight when the cable glands are either wired or sealed. To seal a cable gland, do the following:

→ Loosen the nut of the unused cable gland.

→ Remove the transparent disk.

→ Insert the supplied blanking plug.

→ Screw the nut of the cable gland.

→ Loosen the nuts of the cable glands.

→ Insert each cable through a nut than through a cable gland.

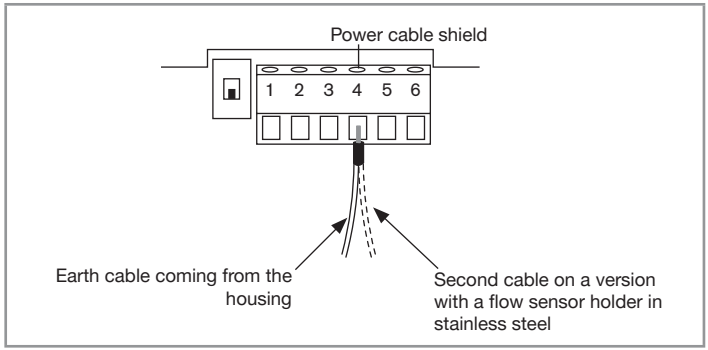


Fig. 14: Earth connection terminal

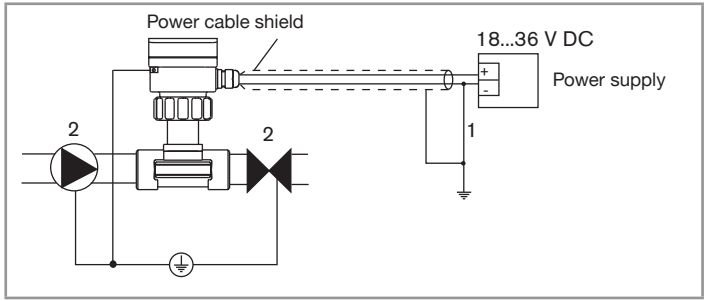


Fig. 15: Earthing the device

→ Wire the 4...20 mA current output (see chapter 8.3.1).
→ Wire the frequency output (see chapter 8.3.2).
→ Wire the relay output (see chapter 8.3.3).
→ Put the cover of the housing as described in Fig. 16.
→ Screw the 4 screws in an alternating pattern.

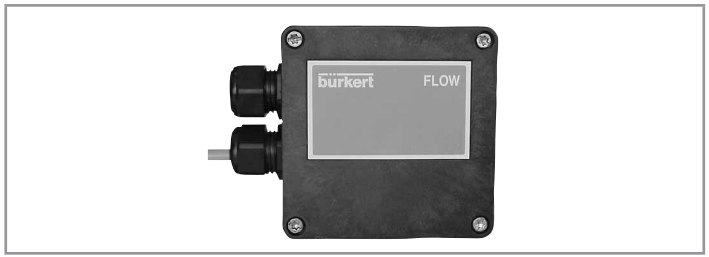
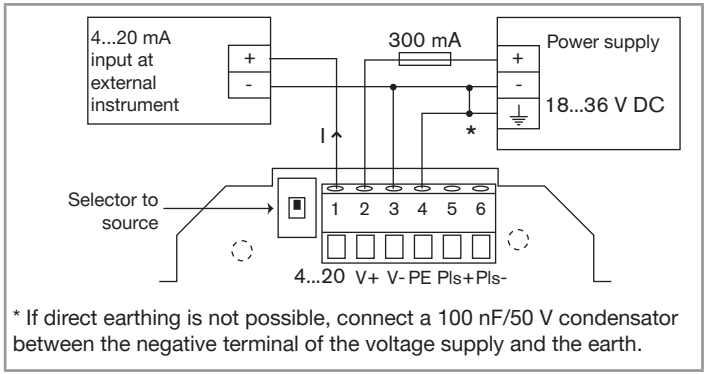


Fig. 16: Position of the cover of the device

8.3.1. Wiring the 4...20 mA output

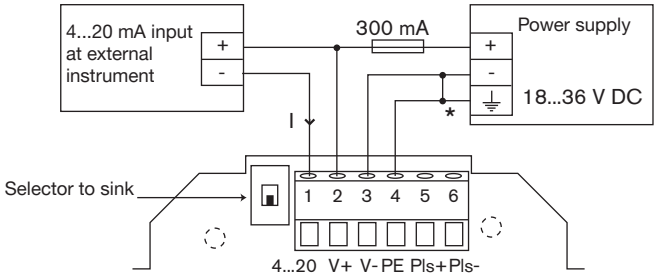
The current output of the 8041 can be connected to a PLC or a valve, either in sourcing mode or in sinking mode.

→ Set the selector of the electronic board to the sourcing or the sinking position (see Fig. 17 or Fig. 18).
→ Connect the 4...20 mA output in sourcing mode (see Fig. 17) or in sinking mode (see Fig. 18).
→ Earth the device (see Fig. 17 or Fig. 18).



* If direct earthing is not possible, connect a 100 nF/50 V condensator between the negative terminal of the voltage supply and the earth.

Fig. 17: Connection of the current output in sourcing mode



* If direct earthing is not possible, connect a 100 nF/50 V condensator between the negative terminal of the voltage supply and the earth.

Fig. 18: Connection of the current output in sinking mode

8.3.2. Wiring the frequency output

→ Connect the frequency output:

- to a PLC in PNP or in NPN mode (see Fig. 19 and Fig. 20) ;
- or to a load such as an electromechanical counter or a relay (see Fig. 21),
- or to a load such as an electronic counter with its own power supply (see Fig. 22).

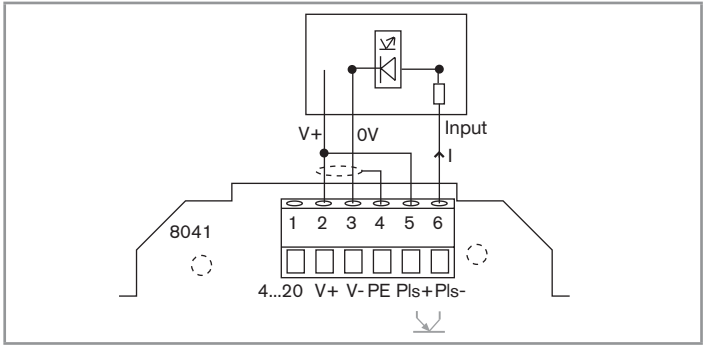


Fig. 19: PNP connection of the frequency output to a PLC

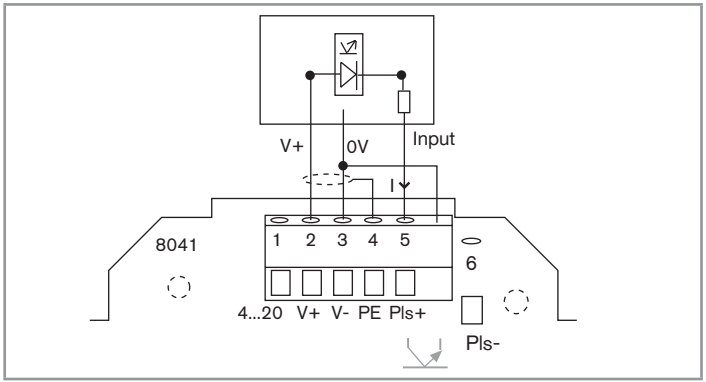


Fig. 20: NPN connection of the frequency output to a PLC

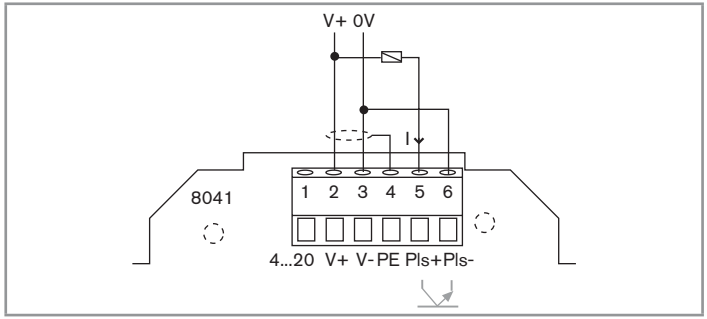


Fig. 21: Connection of the frequency output to an electromechanical counter or a relay

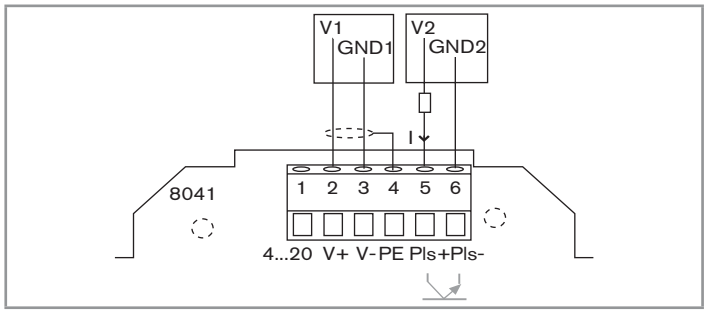


Fig. 22: Connection of the frequency output to an electromechanical counter with its own power supply

8.3.3. Wiring the relay output

DANGER

Danger due to the operation of the relay outputs of a UL device in a wet location.

- If a UL device is used in a wet location:
  - energize the relay outputs with an alternating voltage of max. 16 Vrms and 22.6 Vpeak.
  - or energize the relay outputs with a direct voltage of max. 35 V DC.

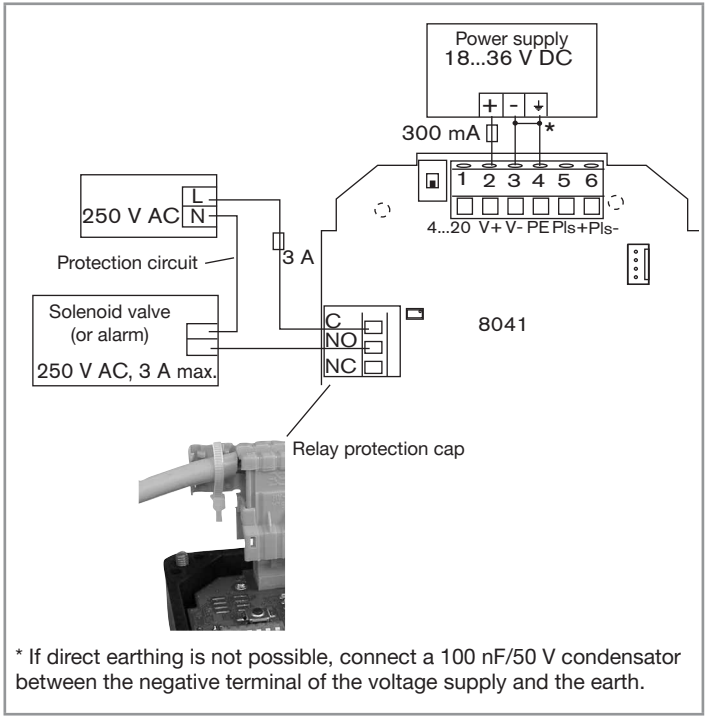
The relay output operates either in normally open mode (NO) or in normally closed mode (NC), depending on the connection of the load to the electronic board of the device.

→ Protect the relay with a fuse (3 A max.) and, depending on the application, with a circuit breaker.

Do not apply both a dangerous voltage and a safety extra low voltage (SELV) to the relay.

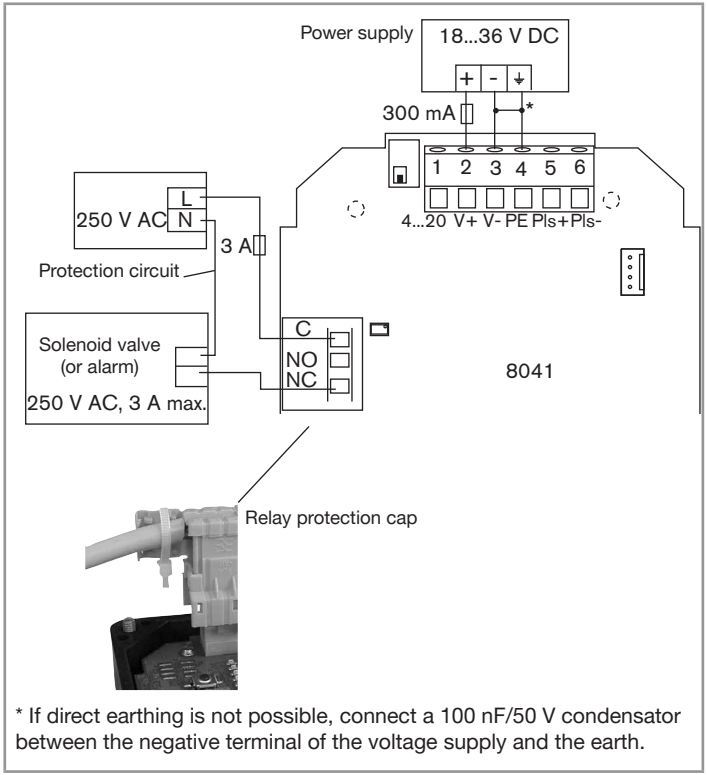
→ Wire the relay output to operate in normally open mode (see Fig. 23) or in normally closed mode (see Fig. 24).

→ Earth the device (see Fig. 23 or Fig. 24).



* If direct earthing is not possible, connect a 100 nF/50 V condensator between the negative terminal of the voltage supply and the earth.

Fig. 23: Connection of the relay output for a normally open operating



* If direct earthing is not possible, connect a 100 nF/50 V condensator between the negative terminal of the voltage supply and the earth.

Fig. 24: Connection of the relay output for a normally closed operating

9. ADJUSTMENT AND COMMISSIONING

9.1. Safety instructions

DANGER

Risk of injury due to electrical voltage.

- If a 18...36 V DC powered version is installed either in a wet environment or outdoors, all the electrical voltages must be of max. 35 V DC.
- Shut down the electrical power source of all the conductors and isolate it before carrying out work on the system.
- Observe all applicable accident protection and safety regulations for electrical equipment.

WARNING

Risk of injury due to non-conforming operating.

Non-conforming operating could lead to injuries and damage the device and its surroundings.

- The operators in charge of operating must have read and understood the contents of these Operating Instructions.
- In particular, observe the safety recommendations and intended use.
- The device/installation must only be operated by suitably trained staff.

WARNING

Danger due to non-conforming commissioning.

Non-conforming commissioning can lead to injuries and damage the device and its surroundings.

- Before commissioning, make sure that the staff in charge have read and fully understood the contents of these Operating Instructions.
- In particular, observe the safety recommendations and intended use.
- The device / the installation must only be commissioned by suitably trained staff.

NOTICE

The device may be damaged by the environment

Protect this device against electromagnetic interference, ultraviolet rays and, when installed outdoors, the effects of the climatic conditions.

When the device is energized and if the cover is open, there is no protection against electric shocks.

9.2. Description of the electronic board

The device has 2 operating modes: the Read mode and the Parameterizing mode. The functions of each mode are summarised in the following table.

Operating mode	Functions
Read	To view: • the fluid velocity measured by the device; • the values set for the relay function.
Parameterizing	• To calibrate the device. • To set the relay parameters.

The 5 switches, the push-button, the green LED, the red LED and the bargraph are used to set the parameters of the device (see Fig. 25).

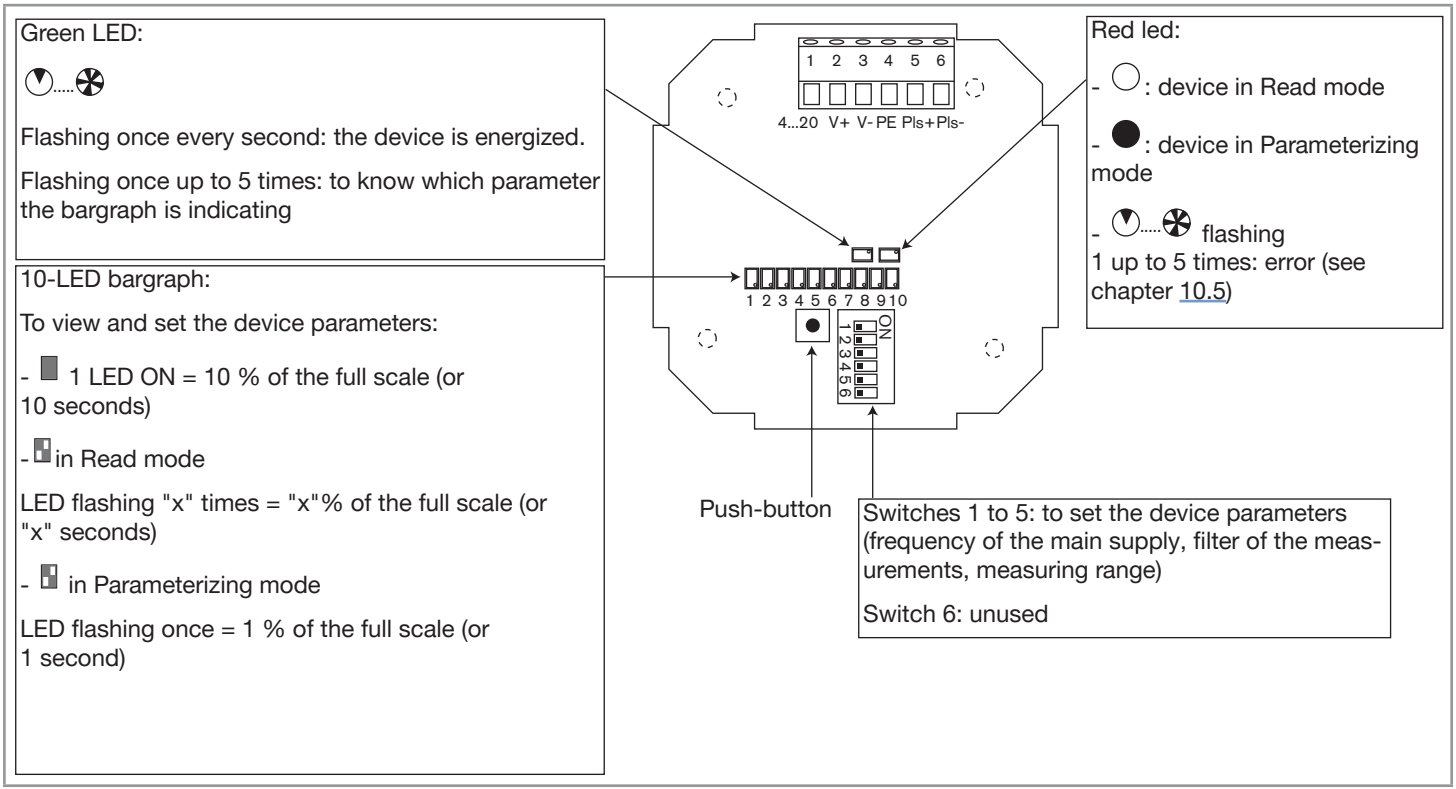
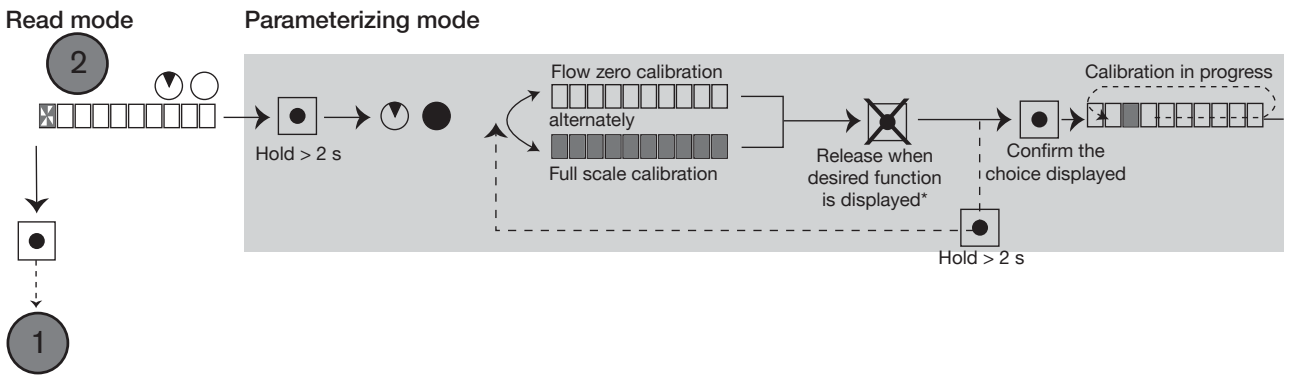
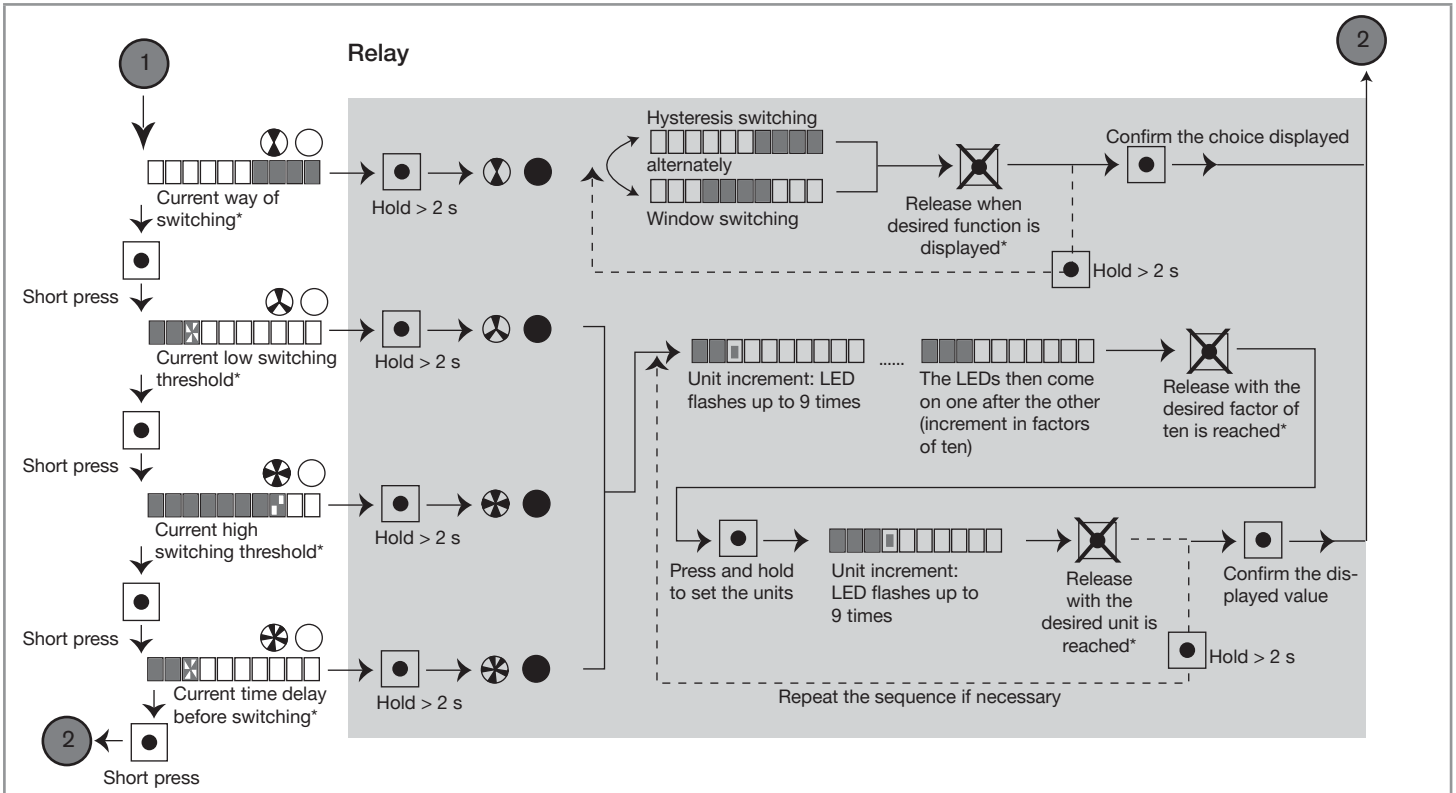


Fig. 25: Electronic board of the device

9.3. General diagram of the Read and Parameterizing modes



* If no action for 10 s, the device goes back to Read mode, using the parameters from the previous adjustment.



* If no action for 10 s, the device goes back to Read mode, using the parameters from the previous adjustment.

9.4. Selecting the frequency of the main supply

Switch 1 is used to select the frequency of the current provided by the electricity network.

→ Position switch 1 to ON or OFF depending on the frequency of the main supply (see Fig. 25, chapter 9.2, and the following table).

Frequency of the power supplied by the network	Position of switch 1
50 Hz	OFF
60 Hz	ON

9.5. Filter selection

The filter is used to attenuate the fluctuations in the flow indicated by the bargraph and on the current and frequency outputs. The device can operate with or without filter.

→ Position switch 2 (see Fig. 25, chapter 9.2, and the following table) to activate or deactivate the filter feature.

Filter	Position of switch 2
Disabled	OFF
Enabled	ON

When the filter is enabled, switch 3 is used to select the filter level: slow or fast.

"Slow" filter is used to even out high variations in flow (example: fluid containing air bubbles), see Fig. 26.

"Fast" filter is used to even out low variations in flow (see Fig. 26).

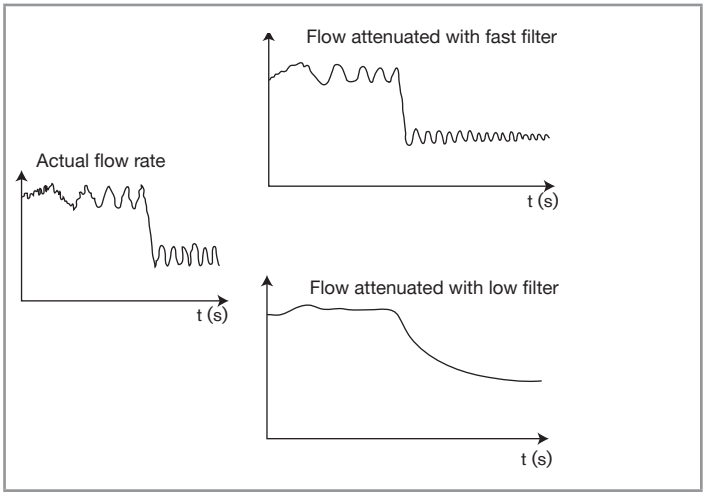


Fig. 26: Flow filters

→ Position switch 3 to the filter level selected (see Fig. 25, and the following table).

Filter	Position of switch 3
slow (Response time 10...90 % = 14 s)	OFF
fast (Response time 10...90 % = 5 s)	ON

9.6. Selecting the measurement range

The output signal is proportional to the measured flow velocity. Switches 4 and 5 are used to adjust the measuring range of the device to your application.

→ Position switches 4 and 5 to select the measuring range (see Fig. 25, and the following table).

After the measuring range has been modified, the percentages set for the low and high switching thresholds are applied to the new full scale selected.

Measuring range	Position of switch 4	Position of switch 5
0...2 m/s	ON	OFF
0...5 m/s	OFF	ON
0...10 m/s	OFF	OFF
0 to calibrated full scale (between 2...10 m/s)	ON	ON

9.7. Calibrating the flow zero point

→ Calibrate the device on commissioning and after each maintenance task.

- Before calibrating the zero point on commissioning:

→ immerse the measuring element in the fluid for 24 h before calibration.

- Before calibrating the zero point after each maintenance task:

→ immerse the measuring element in the fluid for 1 h before calibration.

→ Before calibration, ensure that the pipe does not contain any air bubbles and that the fluid is not moving.

→ Fill the pipe with fluid.
→ Stop the flow.
→ Calibrate the "zero flow" point (see Fig. 27 and Fig. 28).

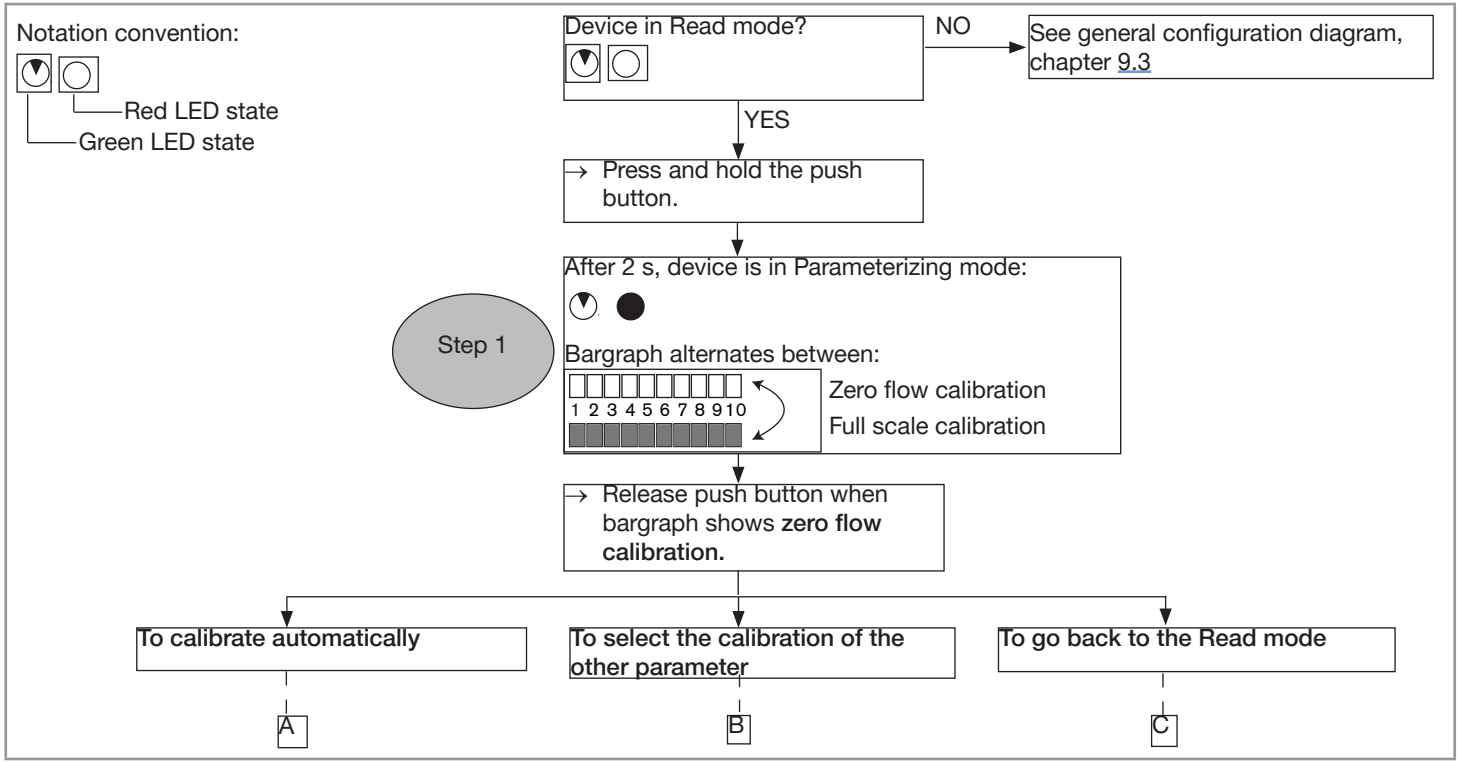


Fig. 27: Calibration of the zero flow point, part 1

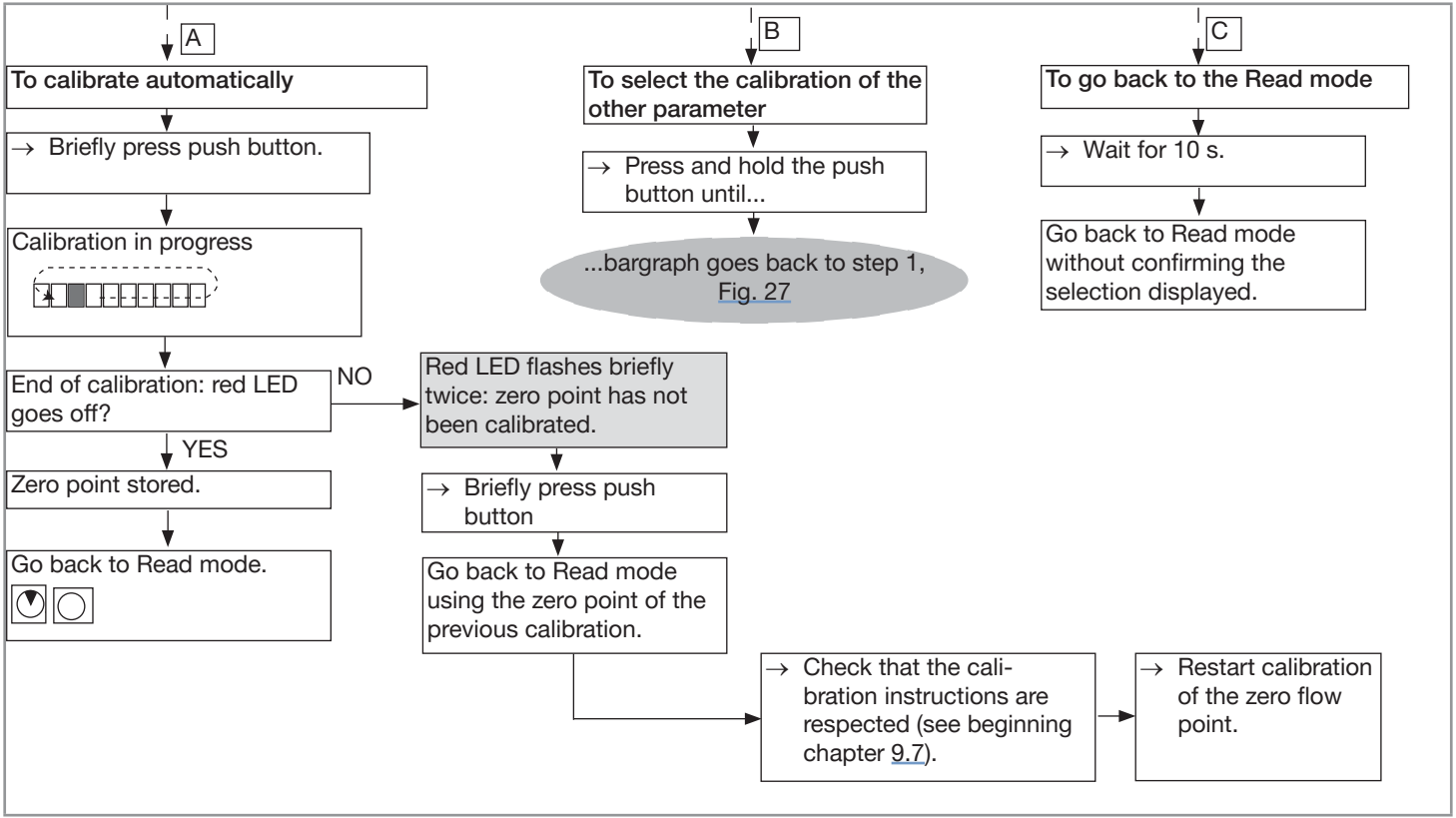


Fig. 28: Calibration of the zero flow point, part 2

9.8. Calibrating the full scale

The Fig. 29 and the Fig. 30 show the relation between the measured fluid velocity and the value of the frequency or current provided by the outputs.

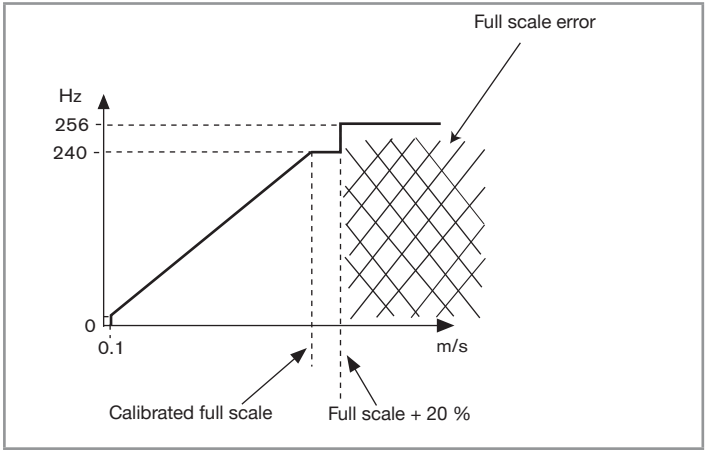


Fig. 29: Relation between the measured fluid velocity and the value of the frequency output

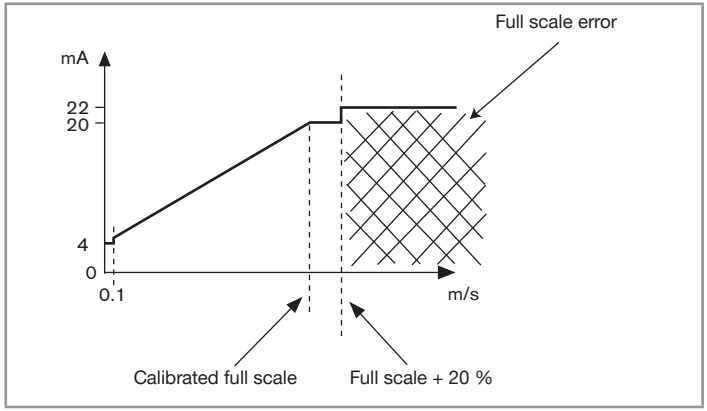


Fig. 30: Relation between the measured fluid velocity and the value of the current output

If no predefined measuring range is applicable to your process, the device can be calibrated with the actual max. flow velocity of the application.

The low bound of the measuring range is 0 m/s.

→ Position the switches 4 and 5 to ON (see Fig. 25, chapter 9.2).

→ Install the device on the pipe as described in chapter 8.

→ Allow the fluid to circulate in the pipe at maximum velocity.

→ Calibrate the full scale, see Fig. 31 and Fig. 32.

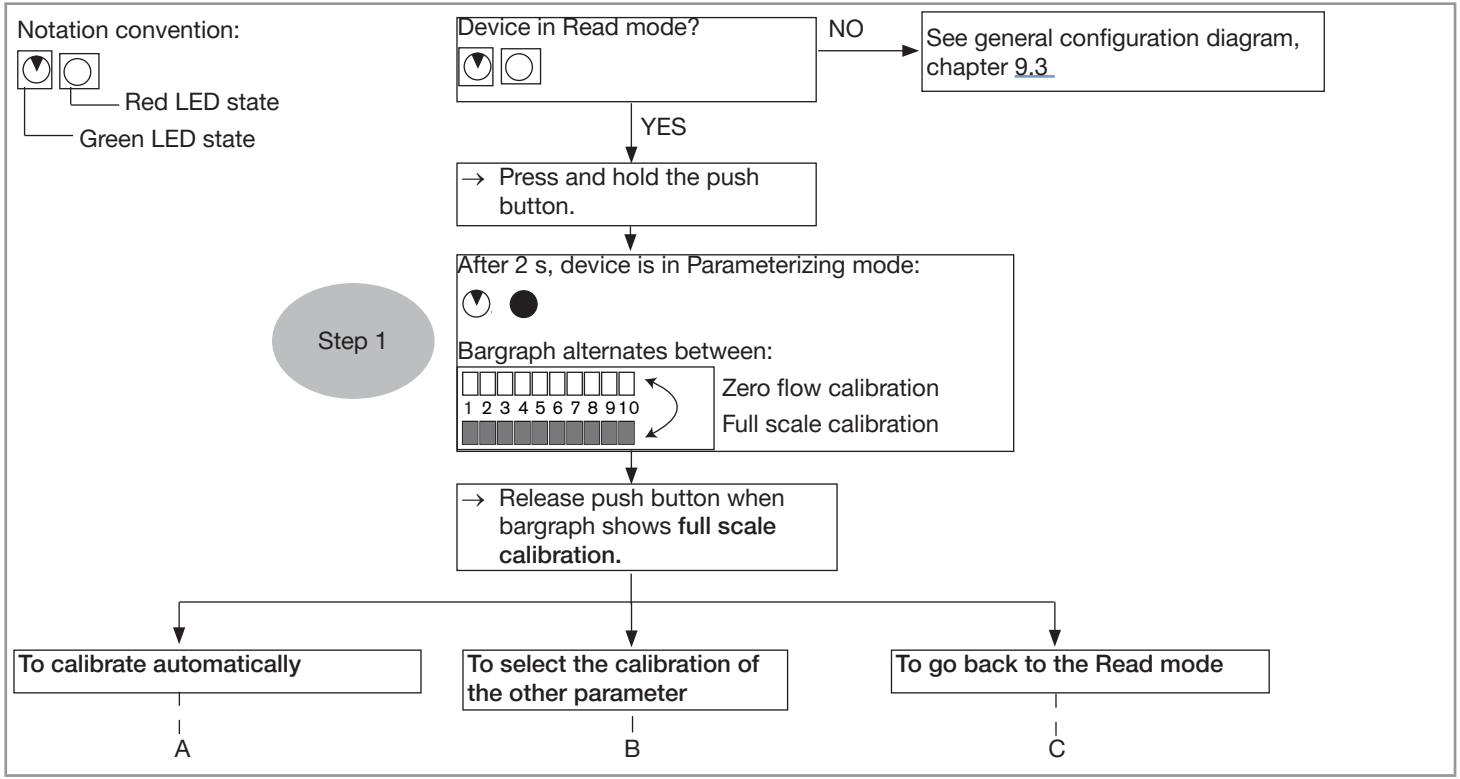


Fig. 31: Calibration of the full scale, part 1

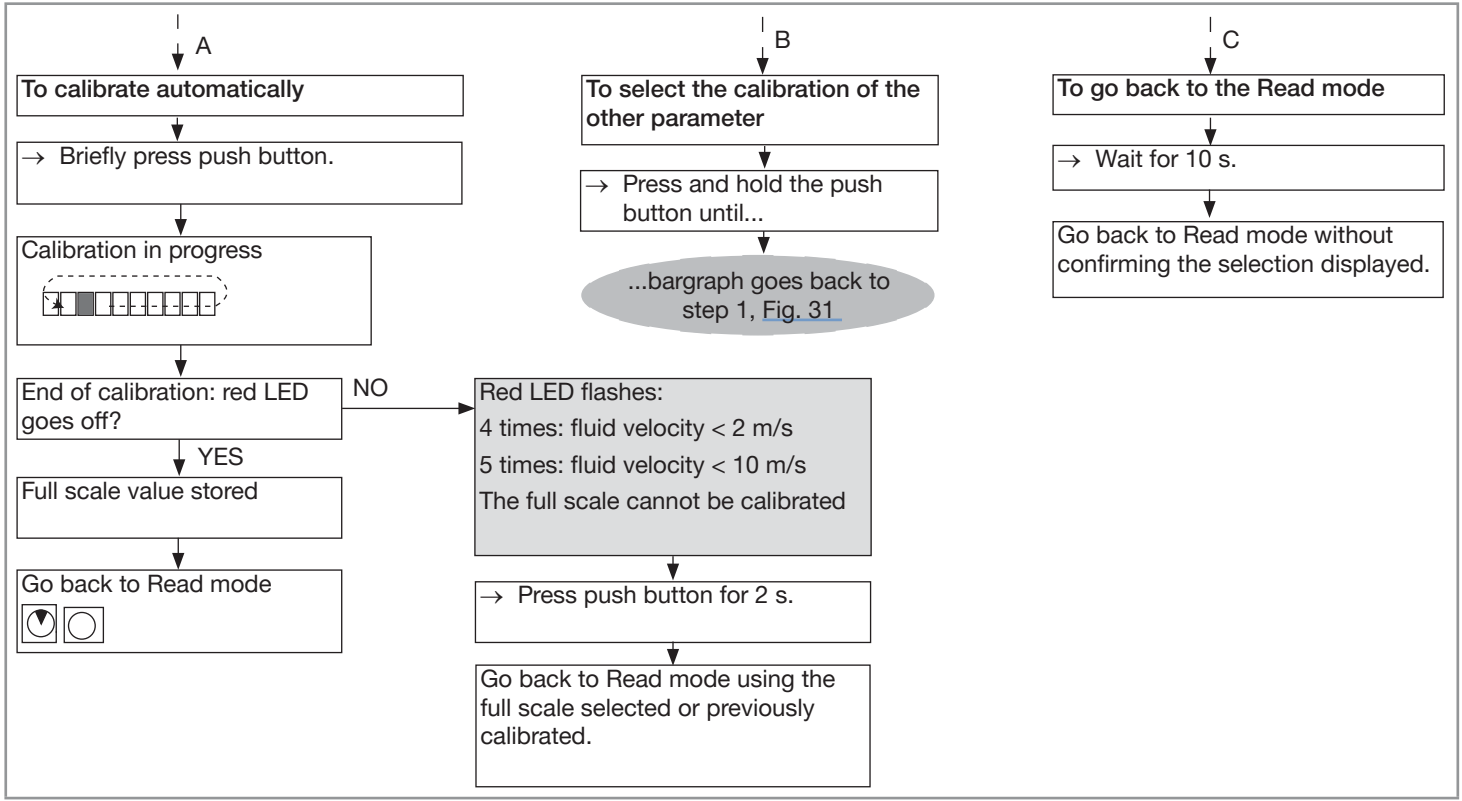


Fig. 32: Calibration of the full scale, part 2

9.9. Setting the parameters of the relay output

The Fig. 33 shows the behaviour of the relay output depending on the parameter settings and the measured velocity.

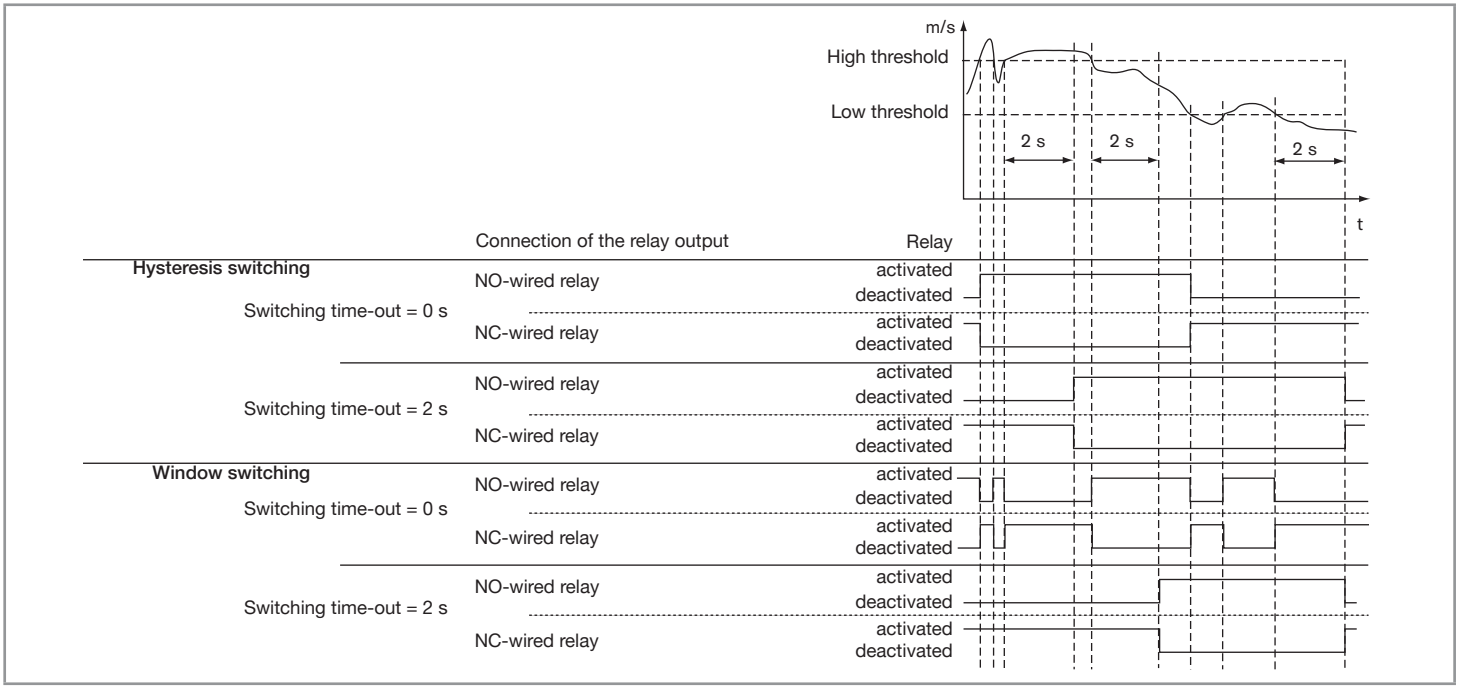


Fig. 33: Behaviour of the relay output depending on the parameter settings and the measured velocity

The wiring of the relay determines the function of the relay: Normally Open (NO) or Normally Closed (NC).

The following parameters of the relay output can be set:

- the switching way: window or hysteresis (see chapter 9.9.1)
- the value of the low switching threshold, as a percentage of the full scale (see chapter 9.9.2)
- the value of the high switching threshold, as a percentage of the full scale (see chapter 9.9.2)
- the time delay before switching: from 0 to 100 seconds (see chapter 9.9.3).

9.9.1. Choosing the switching way of the relay output

Two switching ways of the relay are available, window or hysteresis.

In window switching, the state of the relay output is changed whenever one of the thresholds is detected (see Fig. 34 and Fig. 35).

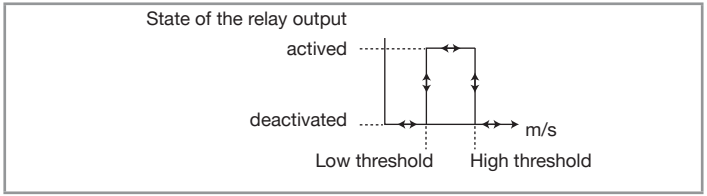


Fig. 34: Change of state of the relay output in window switching with a relay wired as NO

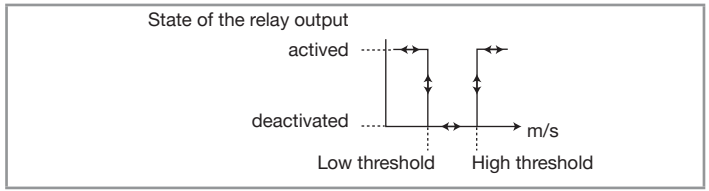


Fig. 35: Change of state of the relay output in window switching with a relay wired as NC

In hysteresis switching (see Fig. 36 and Fig. 37), the state of the relay output is changed:

- when both the high threshold is detected and the fluid velocity increases;
- when both the low threshold is detected and the fluid velocity decreases.

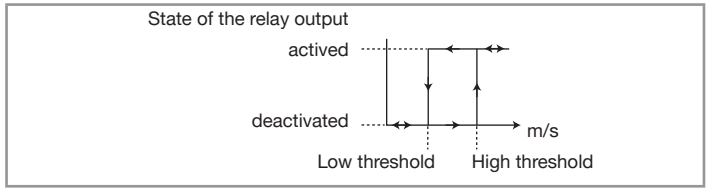


Fig. 36: Change of state of the relay output in hysteresis switching with a relay wired as NO

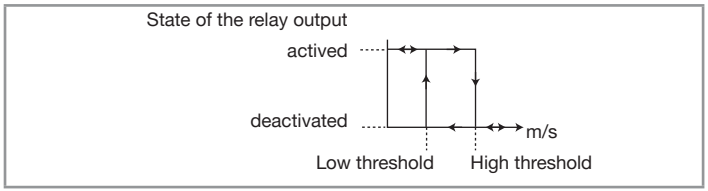
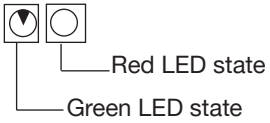


Fig. 37: Change of state of the relay output in hysteresis switching with a relay wired as NC

→ Select the way of switching of the relay (see Fig. 38 and Fig. 39).

Notation convention for the following diagram:



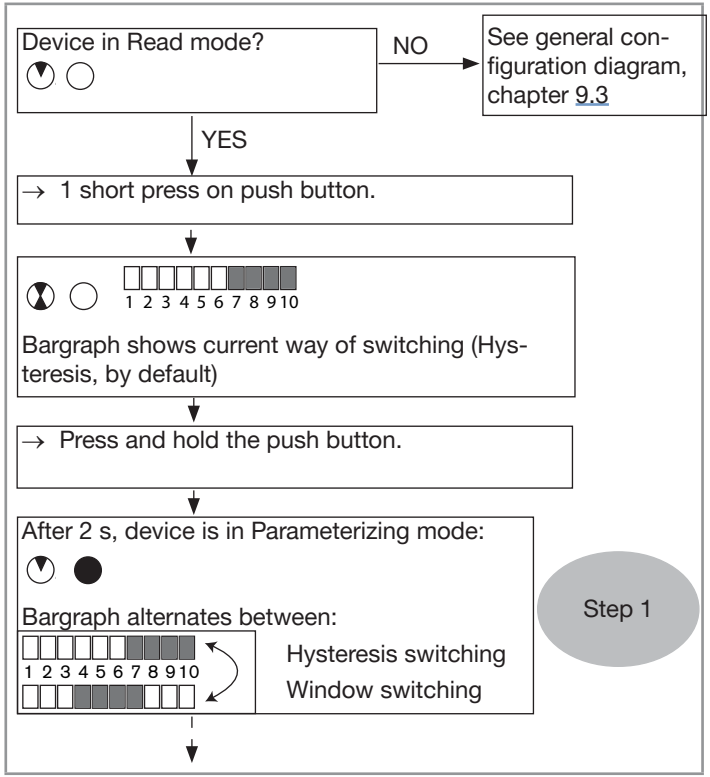


Fig. 38: Choosing the relay switching way, part 1

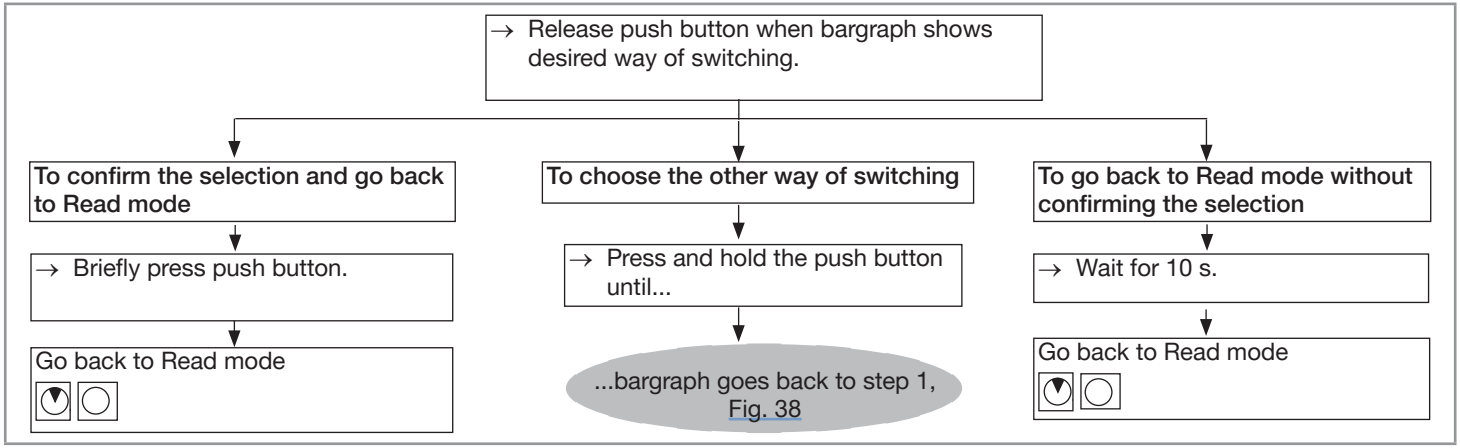


Fig. 39: Choosing the relay switching way, part 2

9.9.2. Viewing and setting the low and high switching thresholds

The low switching threshold can be set in the range from 0 to the high switching threshold value.

The high switching threshold can be set in the range from the low switching threshold value to 100 % of the full scale.

The low and high switching thresholds are set in 2 steps:

- setting the factors of ten;
- setting the units.

→ Viewing and/or setting the low and high switching thresholds (see Fig. 40, Fig. 41 and Fig. 42).

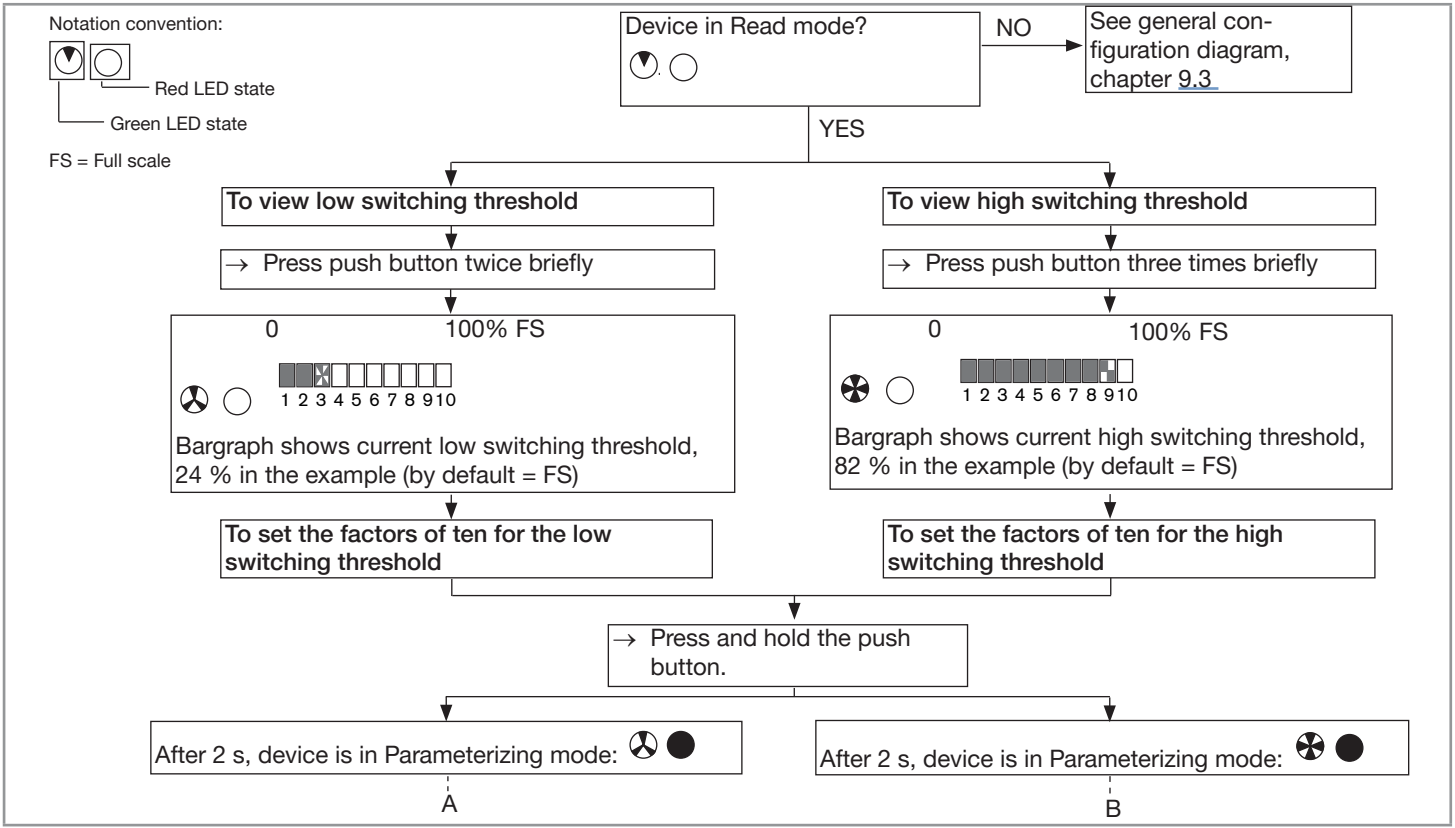


Fig. 40: Setting the relay switching thresholds, part 1

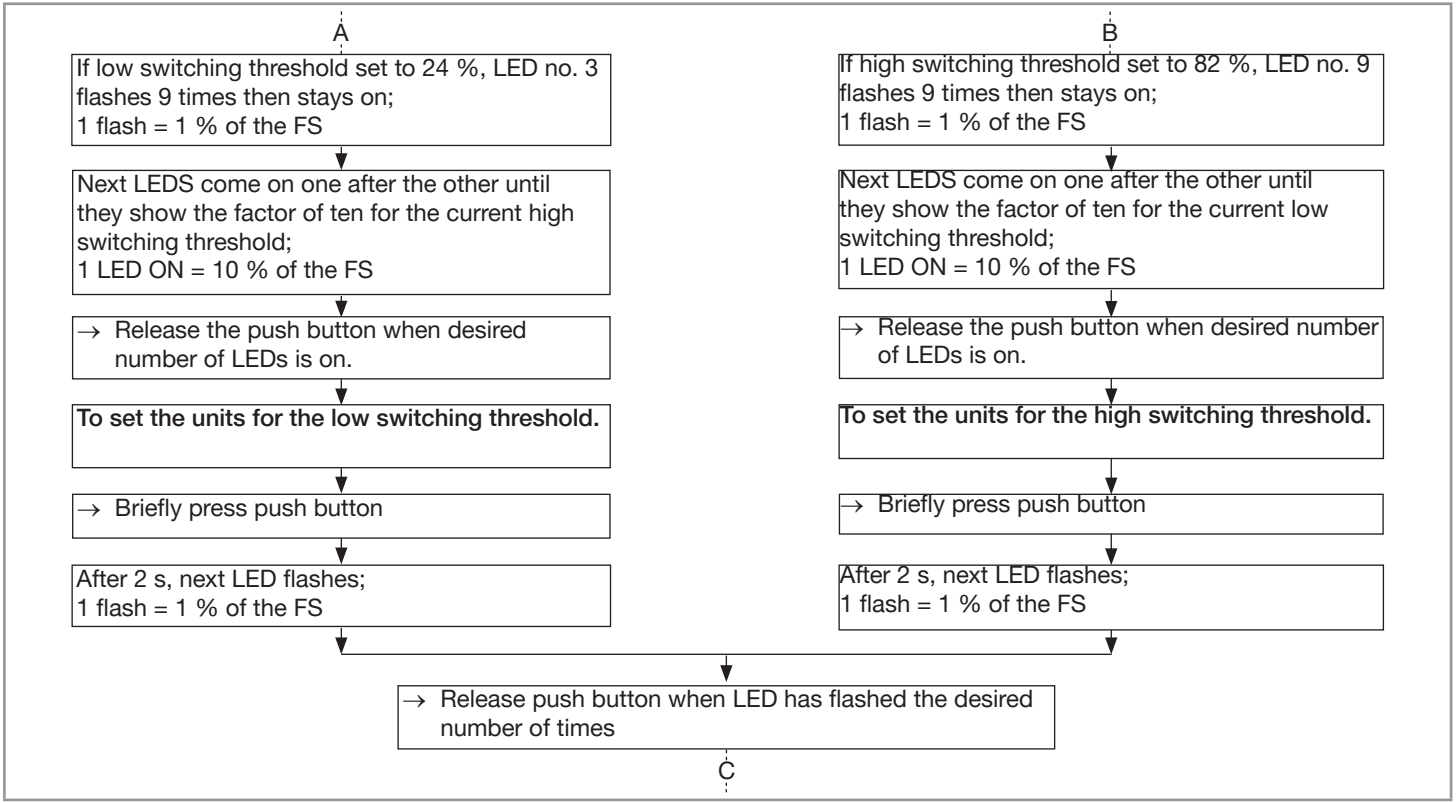


Fig. 41: Setting the relay switching thresholds, part 2

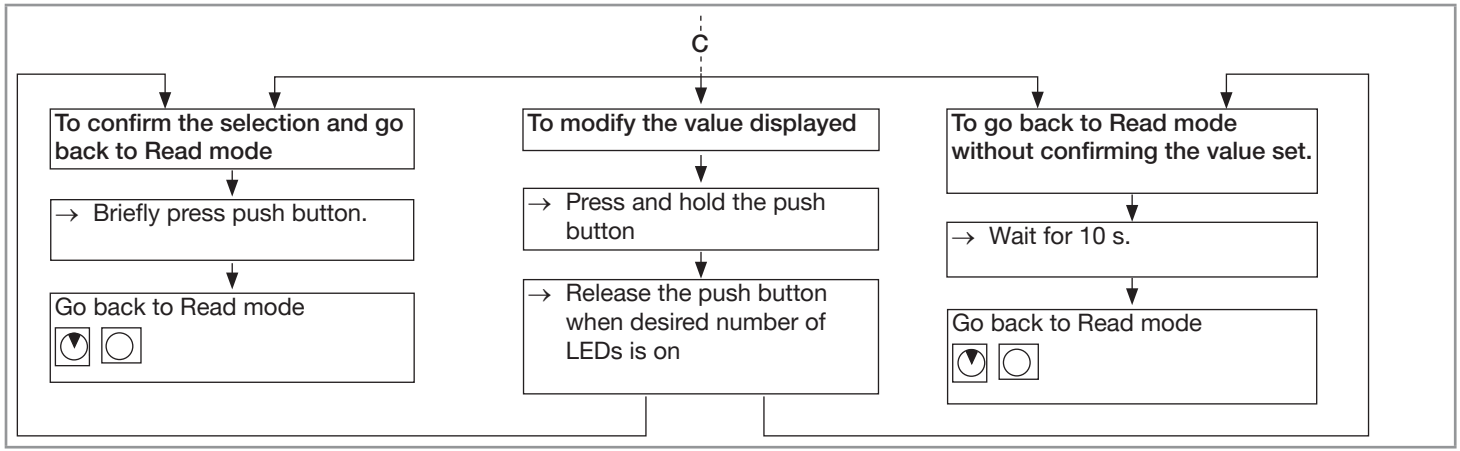


Fig. 42: Setting the relay switching thresholds, part 3

9.9.3. Viewing and setting the time delay before switching

Switching occurs if one of the thresholds (low, high) is exceeded for a period longer than the set time delay. The time delay applies to both switching thresholds.

The time delay before switching must be set to between 0 and 100 s. If the time delay is equal to 0, switching occurs immediately.

The time delay before switching is set in 2 steps:

- setting the factors of ten for the seconds;
- setting the seconds.

→ Viewing and/or setting the time delay before switching (see Fig. 43, Fig. 44 and Fig. 45).

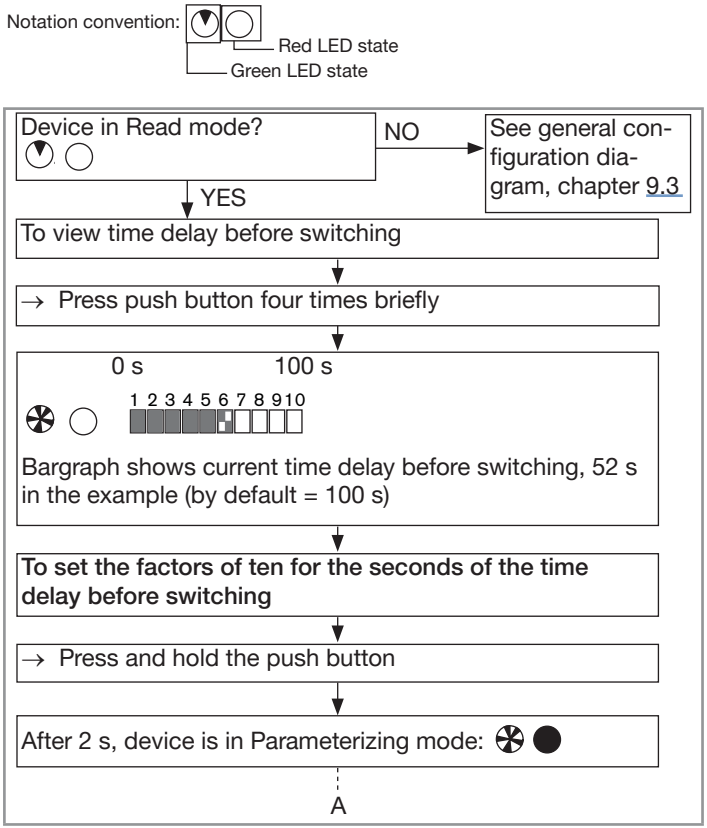


Fig. 43: Setting the time delay before relay switching, part 1

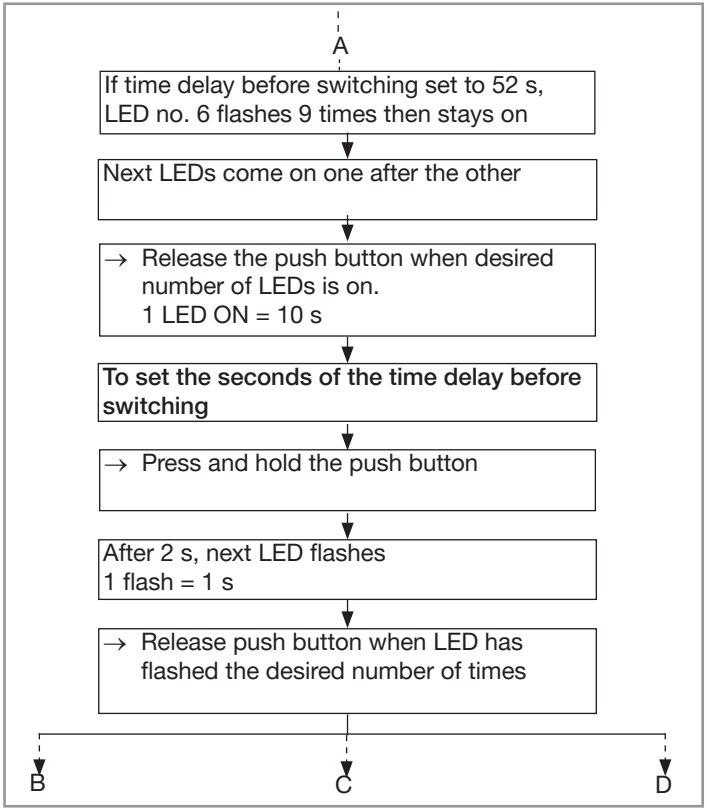


Fig. 44: Setting the time delay before relay switching, part 2

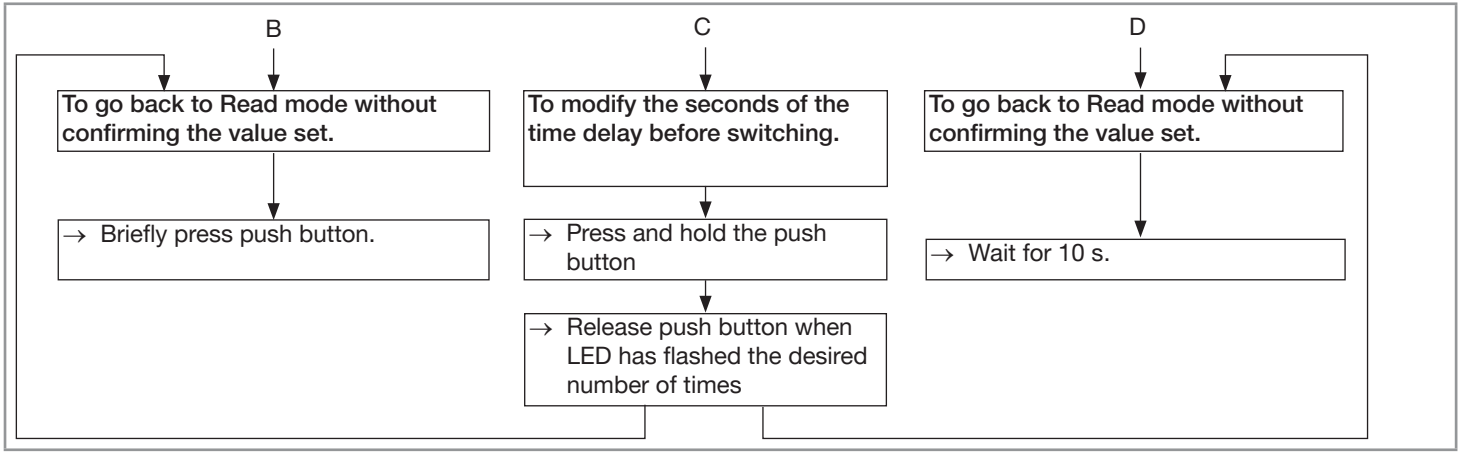


Fig. 45: Setting the time delay before relay switching, part 3

10. MAINTENANCE AND TROUBLESHOOTING

10.1. Safety instructions

DANGER

Risk of injury due to high pressure in the installation.

- Stop the circulation of fluid, cut off the pressure and drain the pipe before loosening the process connections.

Risk of injury due to high fluid temperatures.

- Use safety gloves to handle the device.
- Stop the circulation of fluid and drain the pipe before loosening the process connections.

Risk of injury due to the nature of the fluid.

- Respect the prevailing regulations on accident prevention and safety relating to the use of aggressive fluids.

Risk of injury due to electrical voltage.

- Shut down the electrical power source of all the conductors and isolate it before carrying out work on the system.
- Observe all applicable accident protection and safety regulations for electrical equipment.

WARNING

Risk of injury due to non-conforming maintenance.

- Maintenance must only be carried out by qualified and skilled staff with the appropriate tools.
- Guarantee a set or controlled restarting of the process subsequent to any intervention.

10.2. Cleaning the device

NOTICE

The device may be damaged by the cleaning product.

- Clean the device with a cloth dampened with water or a detergent compatible with the materials the device is made of.
- Do not use any abrasive acting materials.

10.3. Cleaning the electrodes

NOTICE

Dirt on the electrodes may cause measurement errors.

- Regularly clean the wetted parts.
- Rinse the electrodes after cleaning.

10.4. Replacing the seal on a device with G2" nut

NOTE

Do not scratch the seal groove.

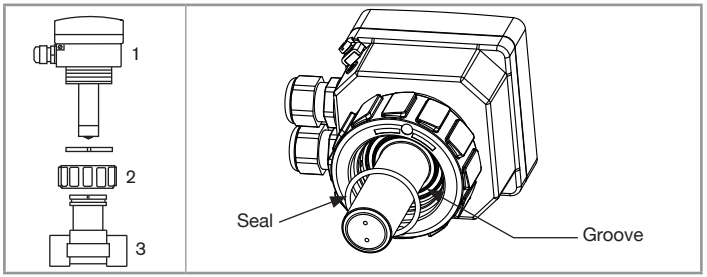


Fig. 46: Dismounting the device and location of the seal

→ Loosen the nut of the device (mark 2).
→ Remove the device from the fitting (mark 1).
→ Remove the seal from the groove.
→ Clean the seal groove.
→ Insert the new O-ring in the groove (see chapter 11).
→ Insert the device into the fitting.
→ Tighten the nut (mark 2) by hand on the device.

10.5. If you encounter problems

DANGER

Risk of injury due to high pressure in the installation.

- Stop the circulation of fluid and cut off the pressure before loosening the process connections.

Risk of injury due to electrical voltage.

- Shut down the electrical power source of all the conductors and isolate it before carrying out work on the system.
- Observe all applicable accident protection and safety regulations for electrical equipment.

Risk of injury due to high fluid temperatures.

- Use safety gloves to handle the device.
- Stop the circulation of fluid and drain the pipe before loosening the process connections.

Risk of injury due to the nature of the fluid.

- Respect the prevailing regulations on accident prevention and safety relating to the use of aggressive fluids.

Problem	Bargraph state	Red LED state	Green LED state	Current or frequency output state	Meaning / Cause	Recommended action
The device does not respond	OFF	Flashes once briefly every 2 s	Flashes once every second	22 mA and 256 Hz	Measuring range exceeded by more than 20 %	→ Clear the error by briefly pressing the push-button. → Consult the graphs (see chapter 8.2.1).
The device does not respond	OFF	Flashes twice briefly every 2 s	Flashes once every second	22 mA and 0 Hz	The flow zero point calibration failed.	→ Clear the error by briefly pressing the push-button. → Check upstream/downstream distances (see chapter 8.2.1). → Restart the calibration (see chapter 9.7). → If the error persists, contact your Bürkert retailer.
The device does not respond	OFF	Flashes 3 times briefly every 2 s	Flashes once every second	22 mA and 0 Hz	The device is out of service	→ Contact your Bürkert retailer.
The device does not respond	OFF	Flashes 4 times briefly every 2 s	Flashes once every second	22 mA and 0 Hz	The full scale calibration failed because the fluid velocity < 2 m/s	→ Clear the error by briefly pressing the push-button. → Check the fluid velocity. → Restart the calibration of the full scale (see chapter 9.8).
The device does not respond	OFF	Flashes 5 times briefly every 2 s	Flashes once every second	22 mA and 0 Hz	The calibration of the full scale failed because the fluid velocity > 10 m/s.	→ Clear the error by briefly pressing the push-button. → Check the fluid velocity. → Restart the calibration of the full scale (see chapter 9.8).

Problem	Bargraph state	Red LED state	Green LED state	Current or frequency output state	Meaning / Cause	Recommended action
The sensor does not work	OFF	OFF	OFF	0 mA and 0 Hz	The device is not connected.	→ Connect the device.
					The fuse of the installation is in a bad condition	→ Replace the fuse.
					The switch of the installation is set to OFF	→ Position the installation switch to ON.
				-	The power supply has been wrong connected to the + and - terminals	→ Check the wiring (see chapter 8.3.1, 8.3.2, 8.3.3).
			Flashes irregularly or is off	0 mA and 0 Hz	The power supply is not stable.	→ Replace the power supply.
			OFF	0 mA and 0 Hz	The device is out of service	→ Return the device to your Bürkert retailer.
Incorrect flow measurement.	-	OFF	Flashes once every second	-	The K-factor has not been correctly calculated.	→ Recalculate the K-factor (see chapter 6.8).
	All the LEDs are ON	OFF	Flashes once every second	20 mA and 240 Hz	Measuring range exceeded by less than 20 %.	→ Select the higher measuring range (see chapter 9.6).

Problem	Bargraph state	Red LED state	Green LED state	Current or frequency output state	Meaning / Cause	Recommended action
The flow rate measure-ments are not stable	Unstable	OFF	Flashes once every second	> 4 mA and > 0 Hz	The electrodes are dirty.	→ Clean the electrodes (see chapter 10.3).
					The electrodes are not in contact with the fluid.	→ Make sure the electrodes are always in contact with the fluid
					Air bubbles appear in the fluid.	→ Respect the mounting recommen-dations (see chapter 8.2). → Select the "slow" filter (see chapter 9.5).
					The flow sensor has not been immersed for 24 h before calibration of the "flow zero" point.	→ Respect the calibration procedure (see chapter 9.7).
					The flow rate fluctua-tions are very important.	→ Select the "slow" filter (see chapter 9.5).
					Upstream-downstream connection has not been correctly done.	→ Respect the mounting recommen-dations (see chapter 8.2).
The device transmits no current or no frequency at all.	shows a value	OFF	Flashes once every second	0 mA and/ or 0 Hz	The position of the sink/ source selector is not correct.	→ Correctly position the sink/source selector (see chapter 8.3.1).
					The outputs are not cor-rectly wired.	→ Check the wiring of the outputs (see chapter 8.3.1, 8.3.2, 8.3.3).
The sensor does not measure a nil flow rate.	Lit	OFF	Flashes once every second	> 4 mA and > 0 Hz	The calibration of the flow zero point has not been correctly done.	→ Calibrate again (see chapter 9.7).

11. SPARE PARTS AND ACCESSORIES

CAUTION

Risk of injury and/or damage caused by the use of unsuitable parts.

Incorrect accessories and unsuitable replacement parts may cause injuries and damage the device and the surrounding area.

- Use only original accessories and original spare parts from Bürkert.

Spare parts	Article number
Set of: - 2 M20x1.5 cable glands - 2 neoprene flat seals for cable glands or a screw plugs - 2 M20x1.5 screw plugs - 2 multiway seals 2x6 mm	449 755
Set of: - 2 M20x1.5 / NPT 1/2" reductions - 2 neoprene flat seals for cable glands - 2 M20x1.5 screw plugs	551 782
Set of: - 1 blanking plug for an M20x1.5 cable gland - 1 multiway seal, 2x6 mm, for cable gland - 1 green FKM seal for the flow sensor of a 8041 with G2" nut - 1 mounting instruction sheet	558 102
Snap ring	619 205
PPA nut	440 229
PC nut	619 204
Set of: - 1 green FKM seal - 1 black EPDM seal	552 111
Relay connection kit with: - Terminal block - 1 protective cap - 1 cable clip - 1 mounting instruction sheet	552 812
EPDM seal with FDA agreement (for a 8041 with a clamp connection)	730 837
FEP seal with FDA agreement (for a 8041 with a clamp connection)	730 839

Spare parts	Article number
Clamp collar	731 164
Set of: - 1 blanking plug for an M20 x 1.5 cable gland - 1 multi-way seal, 2 x 6 mm, for a cable gland	565 384

12. PACKAGING, TRANSPORT

CAUTION

Damage due to transport

Transport may damage an insufficiently protected device.

- ▸ Transport the device in shock-resistant packaging and away from humidity and dirt.
- ▸ Do not expose the device to temperatures outside the admissible storage temperature range.
- ▸ Protect the electrical interfaces using protective plugs.

13. STORAGE

CAUTION

Poor storage can damage the device.

- ▸ Store the device in a dry place away from dust.
- ▸ Storage temperature: –20...+60 °C.
- ▸ Humidity: < 80 %, non condensated.

14. DISPOSAL OF THE DEVICE

Environmentally friendly disposal

→ Follow national regulations regarding disposal and the environment.

→ Collect electrical and electronic devices separately and dispose of them as special waste.

Further information: country.burkert.com.

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