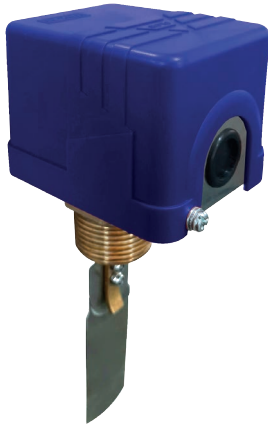


# Contents

EN

Flow switch  
Model FSM-6100



1. General information
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Declarations of conformity can be found online at [www.wika.com](http://www.wika.com).

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Prior to starting any work, read the operating instructions!  
Keep for later use!

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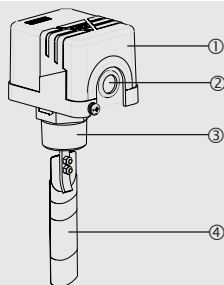
 Part of your business

## 1. General information

- The flow switch described in the operating instructions has been designed and manufactured using state-of-the-art technology. All components are subject to stringent quality and environmental criteria during production. Our management systems are certified to ISO 9001.
- These operating instructions contain important information on handling the instrument. Working safely requires that all safety instructions and work instructions are observed.
- Observe the relevant local accident prevention regulations and general safety regulations for the instrument's range of use.
- The operating instructions are part of the product and must be kept in the immediate vicinity of the instrument and readily accessible to skilled personnel at any time.
- Skilled personnel must have carefully read and understood the operating instructions prior to beginning any work.
- The general terms and conditions contained in the sales documentation shall apply.
- Subject to technical modifications.
- Further information:
  - Internet address: [www.wika.de](http://www.wika.de) / [www.wika.com](http://www.wika.com)
  - Relevant data sheet: FL 60.01

## 2. Design and function

### 2.1 Overview



- ① Removable case
- ② Electrical connection
- ③ Process connection
- ④ Paddle

### 2.2 Description

The flow element of the model FSM-6100 is a paddle that works against a spring mechanism with an adjustable pre-load force. On the spring mechanism there is a contact arm for actuating the switch contact. The switch is actuated as soon as the force generated by the flow is greater than the set pre-load force.

### 2.3 Terms used

#### Reset point

The flow value at which the switch returns to the starting position. Mathematically, the flow value for the reset point is equal to the flow value of the switch point minus the switch differential on rising flow. On falling flow, the flow value for the reset point is equal to the flow value of the switch point plus the switch differential.

#### Maximum operating flow

The maximum flow with which the instrument can be used without changing the assured performance data.

#### Maximum operating pressure

The maximum static pressure with which the instrument can be used without changing the assured performance data.

#### Overpressure limit

The maximum pressure which the instrument can withstand without damage occurring to the system and in the environment.

### 2.4 Scope of delivery

Flow switch, operating instructions

Cross-check scope of delivery with delivery note.

## 3. Safety

### 3.1 Explanation of symbols



#### WARNING!

... indicates a potentially dangerous situation that can result in serious injury or death, if not avoided.



#### CAUTION!

... indicates a potentially dangerous situation that can result in light injuries or damage to property or the environment, if not avoided.



#### DANGER!

... identifies hazards caused by electrical power. Should the safety instructions not be observed, there is a risk of serious or fatal injury.



#### WARNING!

... indicates a potentially dangerous situation that can result in burns, caused by hot surfaces or liquids, if not avoided.



#### Information

... points out useful tips, recommendations and information for efficient and trouble-free operation.

### 3.2 Intended use

The model FSM-6100 flow switch is fitted with an SPDT switch contact (single pole double throw) and is used in control, monitoring and alarm applications.

The switch point can be specified by the customer on site. The instrument can switch electrical loads of up to AC 230 V, 15 A.

Model FSM-6100 enables use for flow measurement in a variety of applications with water, ethylene glycol and other liquids that are not corrosive to brass, phosphor bronze and nitrile materials.



#### WARNING!

##### Injuries due to incorrect application

Use in the wrong application can lead to considerable personal injury and damage to equipment.

- ▶ Only use the instrument in applications that lie within its technical performance limits (e.g. max. ambient temperature, material compatibility, ...). For performance limits see chapter 9 "Specifications".
- ▶ This instrument is not permitted to be used in hazardous areas!

The instrument has been designed and built solely for the intended use described here, and may only be used accordingly.

The manufacturer shall not be liable for claims of any type based on operation contrary to the intended use.

### 3.3 Improper use



#### WARNING!

##### Injuries through improper use

Improper use of the instrument can lead to hazardous situations and injuries.

- ▶ Refrain from unauthorised modifications to the instrument.
- ▶ Do not use the instrument within hazardous areas.
- ▶ The instrument should not be used for abrasive or corrosive media.

Any use beyond or different to the intended use is considered as improper use.

### 3.4 Personnel qualification



#### WARNING!

##### Risk of injury should qualification be insufficient!

Improper handling can result in considerable injury and damage to equipment.

- ▶ The activities described in these operating instructions may only be carried out by skilled personnel who have the qualifications described below.

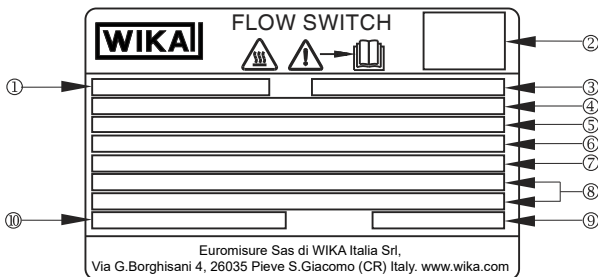
#### Skilled electrical personnel

Skilled electrical personnel are understood to be personnel who, based on their technical training, know-how and experience as well as their knowledge of country-specific regulations, current standards and directives, are capable of carrying out work on electrical systems and independently recognising and avoiding potential hazards. The skilled electrical personnel have been specifically trained for the work environment they are working in and know the relevant standards and regulations. The skilled electrical personnel must comply with current legal accident prevention regulations.

Special operating conditions require further appropriate knowledge, e.g. of aggressive media.

## 3.5 Labelling, safety marks

### Product label (example)



- |                      |                             |
|----------------------|-----------------------------|
| ① Model number       | ⑥ Ambient temperature       |
| ② Approvals          | ⑦ Medium temperature        |
| ③ Article number     | ⑧ Electrical rating         |
| ④ Serial number      | ⑨ Coded date of manufacture |
| ⑤ Operating pressure | ⑩ Ingress protection        |



Before mounting and commissioning the instrument, ensure you read the operating instructions!

## 4. Transport, packaging and storage

### 4.1 Transport

Check the instrument for any damage that may have been caused by transport. Obvious damage must be reported immediately.



#### CAUTION!

##### Damage through improper transport

With improper transport, a high level of damage to property can occur.

- ▶ When unloading packed goods upon delivery as well as during internal transport, proceed carefully and observe the symbols on the packaging.
- ▶ With internal transport, observe the instructions in chapter 4.2 "Packaging and storage".

If the instrument is transported from a cold into a warm environment, the formation of condensation may result in instrument malfunction. Before putting it back into operation, wait for the instrument temperature and the room temperature to equalise.

## 4.2 Packaging and storage

Do not remove packaging until just before mounting.

Keep the packaging as it will provide optimum protection during transport (e.g. change in installation site, sending for repair).

### Permissible conditions at the place of storage:

- Storage temperature: -20 ... +70 °C [-4 ... +158 °F]
- Humidity: 35 ... 85 % relative humidity (non-condensing)

### Avoid exposure to the following factors:

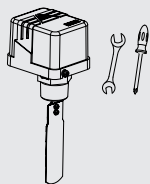
- Direct sunlight or proximity to hot objects
- Mechanical vibration, mechanical shock (putting it down hard)
- Soot, vapour, dust and corrosive gases
- Hazardous environments, flammable atmospheres

Store the instrument in its original packaging in a location that fulfils the conditions listed above.

## 5. Commissioning, operation

Before installation, commissioning and operation, ensure that the appropriate instrument has been selected in terms of design and specific measuring conditions.

Tools: Cross-head screwdriver, open-ended spanner 36 mm, 7 mm, 5.5 mm



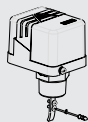
### 5.1 Requirements at the measuring point

- The process pressure and flow must never exceed the specified maximum operating pressure and flow.
  - The ambient and medium temperatures must never be outside the permissible operating conditions (→ see chapter 9 "Specifications").
  - Protected from weather influences.
  - Protected against falling down.
  - The instrument must not be subjected to any external loading (e.g. use as a climbing aid, support for objects).
  - Sealing faces are clean and undamaged.
  - Sufficient space for a safe electrical installation.
- For performance limits see chapter 9 "Specifications"

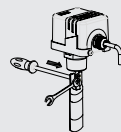
### 5.2 Mounting of the paddle

1. After unpacking the instrument, a visual inspection for damage must be carried out.
2. Select a paddle suitable for the pipe size and tighten it to the paddle arm with screws and a nyloc nut (approx. 0.6 Nm).
3. When using several paddles, start with the smallest and then mount the larger ones in order of increasing size.
4. Ensure that the paddle can move freely in the pipe and does not catch on the wall.

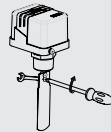
Remove the screws



Mount and tighten the paddle



Rear view



Front view

### 5.3 Mechanical mounting

- Mounting is only permitted in the no-flow state. Reliably isolate the instrument from the flow system using the available valves and protective devices.
- Use seals suitable for the process connection provided.
- When screwing the instruments in, the force required for sealing must not be applied through the case, but only through the spanner flats provided for this purpose on the process connection, and using a suitable tool. The tightening torque is dependent on the selected process connection.
- After screwing in, make sure that no damage or cracks have occurred at the process connection.
- Ensure that the flow runs in line with the arrow marking on the process connection.
- Mount the flow switch in a horizontal or vertical pipe section with a straight run of at least 5 pipe diameters both upstream and downstream. The straight run should be free of bends, valves and other restrictions.

1. Drill a hole with a diameter of 30 mm in the pipe.
2. Ensure that the bore is free from sharp edges.
3. Weld a bushing with a female thread of 1" BSPT/1" NPT onto the pipe. The neck height of 25 mm should be maintained (→ see the following graphic). A change in the assembly dimensions can lead to a malfunction.

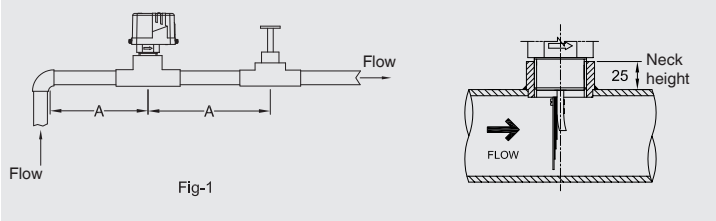


Fig-1

**i** Length A must be at least 5 times the minimum diameter of the pipe away from the nearest restrictions (e.g. bends, valves).

## 5.4 Electrical mounting

The connection cable must ensure basic insulation for external circuits of protection class I. The instrument must be able to be completely de-energised via a switch or control unit. Depending on the load, additional protective measures, e.g. for motor rotation, may be required.



### **DANGER!**

#### **Danger to life caused by electric current**

Upon contact with live parts, there is a direct danger to life.

- ▶ The instrument may only be installed and mounted by skilled personnel.
- ▶ Operation using a defective power supply unit (e.g. short-circuit from the mains voltage to the output voltage) can result in life-threatening voltages at the instrument!

### **Cable preparation**

- The cable gland used must be suitable for achieving an IP30 ingress protection.
- Ensure strain relief for the installed cables.
- Size the connection leads for the largest current strength in the circuits and ensure sufficient UV resistance and mechanical stability.

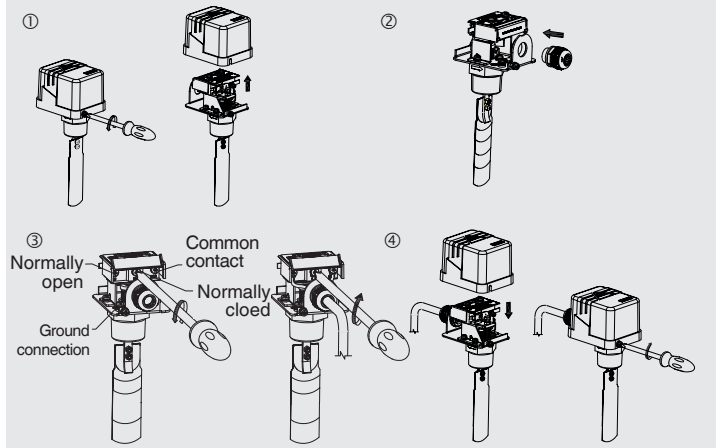
Recommendation: 4-wire cable with conductor cross-section of 2 ... 2.5 mm<sup>2</sup>. Provide wire ends with suitable insulated ring cable lugs.

### **Grounding**

Include the ground connection in the inside of the instrument into the grounding concept of the application.

### **Clamping the cable**

1. Remove 2 screws and open case, max. torque: 1.5 Nm
2. Fit suitable cable gland and feed in the cable
3. Carry out the terminal assignment according to the switching function, tightening torque: 2 Nm
4. Close the case again and fix it with the 2 supplied screws



## 5.5 Switch point setting

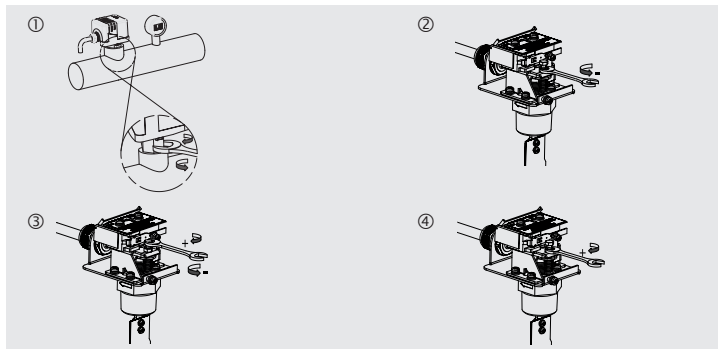
The flow switch is preset approximately to the minimum limit of the flow (falling condition). For an exact setting of the switch point, a test setup with corresponding flow rate and flow reference is required. This test setup can be realised, for example, with a flow meter and a flow generating pump (not shown).

1. Connect the model FSM-6100 flow switch, the flow reference and the flow generator to a common flow system.
2. With the flow generator and flow reference, slowly approach the required switch point flow.
  - ▶ If the instrument switches before the required switch point is reached, the switch point setting must be turned anticlockwise (+) with the socket wrench.
  - ▶ If the instrument switches after the required switch point is reached, the switch point setting must be turned clockwise (-) with the socket wrench.
  - ▶ After each correction, release/build up the flow and repeat this procedure until the switch point is set correctly.
3. Release the flow slowly and check the reset point.
4. If the switch point and the reset point coincide with the desired flow values, the switch point setting is complete.

The switch point setting must be checked after 3 months.

### Mounting in the process

1. Screw in and seal the process connection.
2. Loosen the hexagon nut.
3. Turn the hexagon screw clockwise (-) or anticlockwise (+) (see chapter 5.5 "Switch point setting").
4. Tighten the hexagon nut.



## 6. Faults



### **WARNING!** Physical injuries and damage to property and the environment caused by hazardous media

Upon contact with hazardous media, harmful media (e.g. corrosive, toxic, carcinogenic), and also with refrigeration plants and compressors, there is a danger of physical injuries and damage to property and the environment. Should a failure occur, aggressive media with extremely high temperature and under high pressure or vacuum may be present at the instrument.

- ▶ For these media, in addition to all standard regulations, the appropriate existing codes or regulations must also be followed.



### **CAUTION!** Physical injuries and damage to property and the environment

If faults cannot be eliminated by means of the measures listed above, the instrument must be taken out of operation immediately.

- ▶ Ensure that there is no longer any pressure present and the load circuit is switched off and protect it against being put into operation accidentally.
- ▶ Contact the manufacturer.
- ▶ If a return is needed, please follow the instructions given in chapter 8.2 "Return".



For further information see chapter 1 "General information".

| Faults   | Causes                                       | Measures  |
|--|--|---|
| <b>Contact is not switching in accordance with the specification at the set switch point/reset point</b> | Electrical connection is interrupted         | Carry out a continuity test on the electrical connection leads  |
|  | Wiring error, e.g. short-circuit             | Check the pin assignment and correct it if necessary  |
|  | Electrical load unsuitable                   | Maintain the permissible electrical loads   |
|  | Contact contaminated                         | Replace instrument  |
| <b>Short-circuit</b>   | Moisture in the instrument                   | Only use in ambient conditions for which the ingress protection is suitable                                   |
| <b>Contact chatter (repeated, shortduration opening and closing)</b>                                     | Turbulent flow oscillations                  | Maintain laminar flow with control valves   |
|  |  | Decouple the instrument mechanically  |
| <b>Switching status remains unchanged despite reaching the switch point/reset point</b>                  | Error with switch point setting              | Carry out switch point setting with matching test assembly, see chapter 5.5 "Switch point setting"            |
|  | Contacts defective (e.g. fused contact zone) | Replace instrument<br>Before recommissioning the new instrument, provide a protective circuit for the contact |
|  | Flow port blocked                            | Replace instrument  |
|  | Leakage                                      | Carry out a leak test<br>Seal the process connection or replace the instrument                                |

For the replacement of the instrument chapters 8 "Dismounting, return and disposal" and 5 "Commissioning, operation" must be observed.

## 7. Maintenance and cleaning

### 7.1 Maintenance

This instrument is maintenance-free.

The switch point setting must be checked after 3 months.

Carry out switch point setting with matching test assembly, see chapter 5.5 "Switch point setting".

Repairs must only be carried out by the manufacturer.

### 7.2 Cleaning



### **WARNING!** Risk of burns

With cleaning there is a risk through hot surfaces.

- ▶ Before cleaning the instrument, allow it to cool sufficiently and use protective equipment!

**CAUTION!****Physical injuries and damage to property and the environment**

Improper cleaning may lead to physical injuries and damage to property and the environment. Residual media in the dismantled instrument can result in a risk to persons, the environment and equipment.

- ▶ Carry out the cleaning process as described below.

1. Before cleaning, correctly disconnect the instrument from the flow system and switch off the load circuit.
2. Use the requisite protective equipment.
3. Clean the instrument with a moist cloth.  
Electrical connections must not come into contact with moisture!

**CAUTION!****Damage to the instrument**

Improper cleaning may lead to damage to the instrument!

- ▶ Do not use any aggressive cleaning agents.
- ▶ Do not use any hard or pointed objects for cleaning.

4. Wash or clean the dismantled instrument, in order to protect persons and the environment from exposure to residual media.

## 8. Dismounting, return and disposal

**WARNING!****Physical injuries and damage to property and the environment through residual media**

Residual media in the dismantled instrument can result in a risk to persons, the environment and equipment.

- ▶ Observe the information in the material safety data sheet for the corresponding medium.
- ▶ Wash or clean the dismantled instrument, in order to protect persons and the environment from exposure to residual media.

### 8.1 Dismounting

**WARNING!****Risk of burns**

During dismantling there is a risk of dangerously hot media escaping.

- ▶ Let the instrument cool down sufficiently before dismantling it!

**DANGER!****Danger to life caused by electric current**

Upon contact with live parts, there is a direct danger to life.

- ▶ The dismantling of the instrument may only be carried out by skilled personnel.
- ▶ Remove the instrument once the system has been isolated from power sources.

**WARNING!****Physical injury**

When dismantling, there is a danger from aggressive media and high pressures.

- ▶ Observe the information in the material safety data sheet for the corresponding medium.
- ▶ Dismount the instrument when the flow is interrupted.

### 8.2 Return

**Strictly observe the following when shipping the instrument:**

All instruments delivered to WIKA must be free from any kind of hazardous substances (acids, bases, solutions, etc.) and must therefore be cleaned before being returned.

**WARNING!****Physical injuries and damage to property and the environment through residual media**

Residual media in the dismantled instrument can result in a risk to persons, the environment and equipment.

- ▶ With hazardous substances, include the material safety data sheet for the corresponding medium.
- ▶ Clean the instrument, see chapter 7.2 "Cleaning".

When returning the instrument, use the original packaging or a suitable transport packaging.

### 8.3 Disposal

Incorrect disposal can put the environment at risk.

Dispose of instrument components and packaging materials in an environmentally compatible way and in accordance with the country-specific waste disposal regulations.



Do not dispose of with household waste. Ensure a proper disposal in accordance with national regulations.

## 9. Specifications

### Basic information

|                            |  |
|----------------------------|--|
| <b>Connection location</b> | Horizontal and vertical pipe mounting<br>Flow direction in line with the arrow marking on the process connection |
| <b>Case</b>                | Plastic (ABS) <ul style="list-style-type: none"> <li>■ Blue (RAL 5022)</li> <li>■ Red (RAL 3028)</li> </ul>      |

### Sensor element

|                                  |  |
|----------------------------------|--|
| <b>Type of measuring element</b> | Paddle   |
| <b>Material</b>                  | Stainless steel 316 and bellows from phosphor bronze |

| Process connection         |  |
|----------------------------|--|
| <b>Thread size</b>         | <ul style="list-style-type: none"> <li>■ 1" NPT, male per ASME B1.20.1</li> <li>■ 1" BSPT, male per ISO 7</li> </ul> |
| <b>Connection location</b> | Lower mount  |
| <b>Material</b>            | Brass (ASTM B455 C38500)   |
| <b>Sealing</b>             | NBR  |

| Output signal                             |  |        |
|---|--|--------|
| <b>Switching function</b>                 | 1 x SPDT (single pole double throw)              |        |
| <b>Setting range of the switch points</b> | → See table "Setting range of the switch points" |        |
| <b>Switch point repeatability</b>         | ± 5 % of span                                    |        |
| <b>Contact material</b>                   | Silver alloy, UL-certified                       |        |
| Electrical rating AC                      |  |        |
| Resistive load                            | 125 V  | 15 A   |
|   | 250 V  | 15 A   |
| Inductive load                            | 125 V  | 15 A   |
|   | 250 V  | 15 A   |
| Electrical rating DC                      |  |        |
| Resistive load                            | 125 V  | 0.5 A  |
|   | 250 V  | 0.25 A |
| Inductive load                            | 30 V   | 5 A    |
|   | 125 V  | 0.05 A |
|   | 250 V  | 0.03 A |

| Electrical connection  |                              |
|------------------------|------------------------------|
| <b>Connection type</b> | M16 via feed-through grommet |

| Operating conditions                              |   |
|---|---|
| <b>Medium temperature range</b>                   | -20 ... +100 °C [-4 ... +212 °F]  |
| <b>Ambient temperature range</b>                  | -20 ... +70 °C [-4 ... +158 °F]   |
| <b>Storage temperature range</b>                  | -20 ... +70 °C [-4 ... +158 °F]   |
| <b>Max. operating pressure</b>                    | 10 bar  |
| <b>Overpressure limit</b>                         | 15 bar  |
| <b>Permissible media</b>                          | Water, ethylene glycol and other liquids that are not corrosive to brass, phosphor bronze and nitrile materials |
| <b>Ingress protection (IP code) per IEC 60529</b> | IP30  |

| Operating conditions |  |
|----------------------|--|
| <b>Service life</b>  | > 500,000 cycles                                 |
| <b>Weight</b>        | Approx. 400 to 420 g, depending on setting range |

### Setting range of the switch points

| Nominal bore in mm [in] | Length of paddle combinations (L) in mm | Switch point with decreasing flow in l/min |       | Switch point with increasing flow in l/min |       | Max. operating flow in l/min |
|-------------------------|---|--|-------|--|-------|------------------------------|
|                         |   | Min.                                       | Max.  | Min.                                       | Max.  |                              |
| <b>25 [1]</b>           | 28                                      | 15   | 50    | 25   | 60    | 150                          |
| <b>32 [1.25]</b>        | 28                                      | 45   | 100   | 50   | 110   | 200                          |
| <b>40 [1.5]</b>         | 28                                      | 50   | 140   | 60   | 160   | 350                          |
|                         | 37                                      | 100  | 240   | 110  | 260   | 450                          |
| <b>50 [2]</b>           | 37 + 50                                 | 50   | 160   | 60   | 180   | 450                          |
|                         | 37                                      | 225  | 480   | 230  | 520   | 1,000                        |
| <b>65 [2.5]</b>         | 37 + 50                                 | 140  | 320   | 150  | 340   | 1,000                        |
|                         | 37                                      | 320  | 750   | 380  | 860   | 1,300                        |
| <b>80 [3]</b>           | 37 + 50                                 | 210  | 550   | 225  | 635   | 1,000                        |
|                         | 37 + 50 + 80                            | 105  | 320   | 115  | 340   | 1,000                        |
|                         | 37                                      | 500  | 1,400 | 590  | 1,700 | 2,500                        |
| <b>100 [4]</b>          | 37 + 50                                 | 350  | 1,100 | 400  | 1,300 | 2,000                        |
|                         | 37 + 50 + 80                            | 200  | 580   | 230  | 680   | 2,000                        |
|                         | 37                                      | 730  | 1,750 | 1,030                                      | 2,100 | 3,200                        |
| <b>125 [5]</b>          | 37 + 50                                 | 500  | 1,500 | 650  | 2,050 | 3,200                        |
|                         | 37 + 50 + 80                            | 400  | 1,000 | 475  | 1,250 | 2,000                        |
|                         | 37 + 50 + 80 + 100                      | 300  | 800   | 330  | 930   | 2,000                        |
| <b>150 [6]</b>          | 37                                      | 2,650                                      | 3,000 | 2,750                                      | 3,100 | 4,000                        |
|                         | 37 + 50                                 | 850  | 2,400 | 990  | 2,600 | 4,000                        |
|                         | 37 + 50 + 80                            | 650  | 1,800 | 750  | 1,900 | 3,200                        |
|                         | 37 + 50 + 80 + 100                      | 350  | 1,450 | 450  | 1,550 | 3,200                        |

The above flow ranges are considered with water as the medium (density  $\rho = 1,000 \text{ kg/m}^3$  at pressure,  $p = 1 \text{ atm}$ , temperature = 25 °C [77 °F]).

For further specifications see WIKA data sheet FL 60.01 and the order documentation.