

# Electronic flow switch with display For liquid media Model FSD-4

WIKA data sheet FL 80.02



## Applications

- Control of cooling lubricant systems
- Monitoring of coolant circuits
- Control of filter units
- Dry run protection in pumps

## Special features

- Wear-free flow monitoring of liquid media using the calorimetric principle
- Flexibly configurable switching and analogue outputs for flow and temperature
- Easily parameterisable via 3-button operation or optionally via IO-Link 1.1
- Exact adaptation to the conditions on-site



Electronic flow switch, model FSD-4

## Description

The model FSD-4 electronic flow switch offers full flexibility in monitoring and controlling flow based on the velocities of liquid media. The switch points of the model FSD-4 can be freely configured very easily via the 3-button operation directly on the instrument or optionally via IO-Link. The model FSD-4 can output both absolute values in various units and relative flow values and display them on the digital indicator.

### Exact matching to the conditions on-site

The flow is determined by many factors such as the pipe diameter, the system set-up or the medium. Therefore, depending on the application, the actual flow value may differ from the calibrated value. Thanks to the teach function, the model FSD-4 can be set to the zero point and the maximum flow at the respective measuring location and thus optimally adjusted to the measuring conditions. The compression fitting on the flow switch offers additional flexibility. Depending on the pipe diameter, the immersion depth and alignment can be individually adjusted.

### Flexibly configurable switching outputs

Depending on the configuration, the model FSD-4 has up to two switch points plus analogue output, which can be freely programmed. Since the switch determines its flow data using a calorimetric measurement principle, the second switching output can also be enabled for a temperature value, while the first outputs a switching signal using the flow value. The flow switch can thus additionally be used for simple temperature-controlled processes.

### Easy access via IO-Link version 1.1

The parameters are set either via 3-button operation on the instrument or, optionally, via IO-Link. When changing the instrument, the settings for the respective measuring location can be transferred directly to the new flow switch. This eliminates the need for any repeat parameterisation at the measuring location and reduces the necessary integration effort. With IO-Link, additional functions such as an operating hours counter or max value memory can be called up and used for condition monitoring.

## Specifications

The model FSD-4 features a flow outlet as standard. A temperature output is available as an option.

Accuracy specifications	
<b>Accuracy under calibration conditions</b>	<p>The accuracy of the flow switch depends on various parameters such as flow profile, flow conditions, viscosity and/or thermal conductivity of the medium, possible contamination and/or deposits on the sensor. Therefore, the reference measured values given only constitute an accuracy under calibration conditions.</p> <p>The model FSD-4 offers extensive adjustment possibilities to adapt the instrument to the on-site conditions in the best possible way.</p> <p>As a flow switch it is used for reliable monitoring, for example, of dry running. The flow value output should only be used as a trend indicator in order to monitor process changes.</p>
Flow	0.05 ... ≤ 1 m/s      ≤ ±5 % of end value of measuring range
	> 1 ... ≤ 1.75 m/s      ≤ ±10 % of end value of measuring range
	> 1.75 ... 3 m/s      ≤ ±20 % of end value of measuring range
Temperature	≤ ±2 K
Non-repeatability per IEC 62828-1	
Flow	±2 % of end value of measuring range
Temperature	≤ 0.5 K (for flow ≥ 0.2 m/s)
<b>Temperature error, flow at -20 ... +85 °C [-4 ... +185 °F]</b>	0.13 % of end value of measuring range per K (typical)
<b>Reference conditions</b>	Per IEC 62828-1
Calibration conditions	
Medium	Water
Nominal position	Process connection downwards Inner diameter of pipe 26 mm Upstream/Downstream pipe 1 m/0.5 m Marking towards the upstream flow side ±5° twist

Measuring range		
Measuring range		
Flow	0 ... 3 m/s [0 ... 9.84 ft/s]  The in-factory adjustment is carried out with the medium water. It is recommended to carry out the adjustment, relative to the minimum/maximum flow of the system, via the menu.	
Temperature	-20 ... +85 °C [-4 ... +185 °F]	
<b>Turndown ratio (flow or temperature)</b>	The analogue output signal is freely scalable within the range of 5:1 When setting turndown, there is a proportional increase in the measuring deviation and temperature error.	
Digital display		
Indication range	14 segments	
Unit	Flow	%, m/s, l/min, m <sup>3</sup> /h, ft/s, ft <sup>3</sup> /min, gal(US)/min, gal(l)/min Factory setting: m/s
	Temperature	°C, °F Factory setting: °C
		The units are freely configurable.
Colour	Red (LED)	
Character size	9 mm [0.35 in]	
Digits	4-digit	
Display	The display can be rotated electronically through 180°.	

Process connection			
Standard	Thread	Insertion length L	Sealing
ISO 225-1	M18 x 1.5	52 mm [2.05 in]	FPM/FKM
DIN EN ISO 1179-2 (formerly DIN 3852-E)	G ¼ A	28 mm [1.1 in]	<ul style="list-style-type: none"> <li>■ NBR (standard)</li> <li>■ FPM/FKM (option)</li> <li>■ Without (option)</li> </ul>
	G ½ A	30 mm [1.18 in]	
	G ½ A	49 mm [1.93 in]	
	G ½ A	79 mm [3.11 in]	
	G ½ A	119 mm [4.69 in]	
ANSI/ASME B1.20.1	¼ NPT	22 mm [0.87 in]	-
	½ NPT	38 mm [1.5 in]	-
- 1)	Without	140 mm [5.51 in]	-

1) For version with compression fitting

### Output signal

When ordering the FSD-4, only one of the three following output signal variants has to be selected. The signal type, as well as the assignment of the second switching output and the analogue output, can be individually programmed during commissioning.

IO-Link is optionally available for all output variants.

Output signal	Switching output 1	Switching output 2	Analogue output	IO-Link option
Output variant 1	x	x	-	x
Output variant 2	x	-	x	x
Output variant 3	x	x	x	x

### Further details on: Output signal

#### Signal type

Switching output 1	<ul style="list-style-type: none"> <li>■ Flow, PNP</li> <li>■ Flow, NPN</li> </ul> Factory setting: Flow, PNP
Switching output 2	<ul style="list-style-type: none"> <li>■ Flow, PNP</li> <li>■ Flow, NPN</li> <li>■ Temperature, PNP</li> <li>■ Temperature, NPN</li> </ul> Factory setting: Flow, PNP
Analogue output	<ul style="list-style-type: none"> <li>■ Flow, 4 ... 20 mA</li> <li>■ Flow, 0 ... 10 V</li> <li>■ Temperature, 4 ... 20 mA</li> <li>■ Temperature, 0 ... 10 V</li> </ul> Factory setting: Flow, 4 ... 20 mA
IO-Link	IO-Link is optionally available for all output signal configurations.
Switching function	<ul style="list-style-type: none"> <li>■ Hysteresis</li> <li>■ Window</li> </ul> Factory setting: Hysteresis
Contact function	<ul style="list-style-type: none"> <li>■ Normally closed</li> <li>■ Normally open</li> </ul> Factory setting: Normally open

Further details on: Output signal		
<b>Setting range of the switch points</b>		
Flow	0.05 ... 3 m/s [0.16 ... 9.84 ft/s] Factory setting: 3 m/s	
Temperature	-18.2 ... +85 °C [-0.8 ... +185 °F] Factory setting: 85 °C	
<b>Switch hysteresis</b>		
Flow	Adjustable, min. 1.7 % of end value of measuring range Factory setting: 0.3 m/s	
Temperature	Min. 1.8 K Factory setting: 1.8 K	
<b>Load in <math>\Omega</math></b>		
Analogue signal 4 ... 20 mA	$\leq 500 \Omega$	
Analogue signal DC 0 ... 10 V	$> \text{max. output voltage} / 1 \text{ mA}$	
<b>Signal clamping</b>	<ul style="list-style-type: none"> <li>■ <math>I_{\min} = 3.8 \text{ mA}</math></li> <li>■ <math>I_{\max} = 20.5 \text{ mA}</math></li> <li>■ <math>U_{\min} = 0 \text{ V}</math></li> <li>■ <math>U_{\max} = 10.3 \text{ V}</math></li> </ul>	
<b>Switching current</b> <sup>1)</sup>	Max. 250 mA per switching output	
<b>Switching voltage</b>	Supply voltage - 1 V	
<b>Communication</b>		
Communication protocol	IO-Link 1.1, if IO-Link option has been selected	
<b>Voltage supply</b>		
Supply voltage	DC 15 ... 35 V	
Current supply	Max. 650 mA including switching current	
Oversvoltage protection	DC 40 V	
<b>Dynamic properties per IEC 62828-1</b>		
Settling time	Flow	■ 6 s (0 ... 100 %, 100 ... 0 %)
	Temperature	■ 4 s ( $t_{90}$ )
		■ 2 s ( $t_{63}$ )
Warm-up time	10 s	

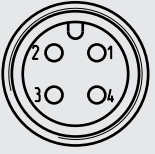
1) For max. switching currents, see derating curves on page 6.

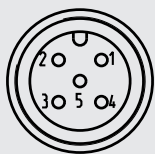
Electrical connection	
<b>Connection type</b>	<ul style="list-style-type: none"> <li>■ Circular connector M12 x 1 (4-pin)</li> <li>■ Circular connector M12 x 1 (5-pin) <sup>1)</sup></li> </ul>
<b>Pin assignment</b>	→ See below
<b>Ingress protection (IP code) per IEC 60529</b> <sup>2)</sup>	IP65 and IP67
<b>Short-circuit resistance</b>	S+ / SP1 / SP2 vs. U-
<b>Reverse polarity protection</b>	U+ vs. U-
<b>Insulation voltage</b>	DC 500 V

1) Only for version with two switching outputs and additional analogue output signal.

2) The stated IP codes (per IEC 60529) only apply when plugged in using mating connectors that have the appropriate IP code.

## Pin assignment

Circular connector M12 x 1 (4-pin)		
	U+	1
	U-	3
	S+ / SP2 <sup>1)</sup>	2
	SP1 / C	4

Circular connector M12 x 1 (5-pin)		
	U+	1
	U-	3
	S+	5
	SP1 / C	4
	SP2	2

1) Depending on the configuration of the output signals

### Legend:

U+	Positive power supply terminal
U-	Negative power supply terminal
SP1	Switching output 1
SP2	Switching output 2
S+	Analogue output
C	Communication with IO-Link

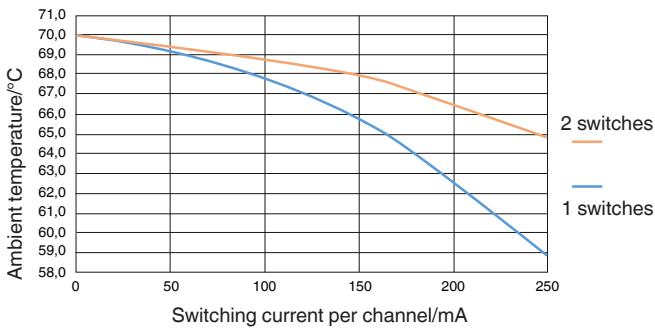
Material	
<b>Material (wetted)</b>	
Process connection, probe	Stainless steel 316Ti
Sealing	→ See "Process connection"
<b>Material (in contact with the environment)</b>	
Case	Stainless steel 304
Keyboard	TPE-E
Display window	PC
Display head	PC+ABS blend

Operating conditions	
Medium temperature range <sup>1)</sup>	-20 ... +85 °C [-4 ... +185 °F]
Ambient temperature range <sup>1)</sup>	-20 ... +70 °C [-4 ... +158 °F]
Storage temperature range	-20 ... +80 °C [-4 ... +176 °F]
Derating curves	→ See below
Max. operating pressure	<ul style="list-style-type: none"> <li>■ 40 bar [580 psi]</li> <li>■ 30 bar [435 psi] with process connection M18 x 1.5</li> <li>■ 20 bar [290 psi] with optional compression fitting (→ see "Accessories")</li> </ul>
Vibration resistance per IEC 60068-2-6	<ul style="list-style-type: none"> <li>■ 6 g, under resonance</li> <li>■ 3 g, 10 ... 500 Hz (with compression fitting)</li> </ul>
Shock resistance per IEC 60068-2-27	50 g, mechanical
Mounting position	→ See operating instructions
Ingress protection per IEC 60529	→ See "Electrical connection"
Service life	100 million switching cycles

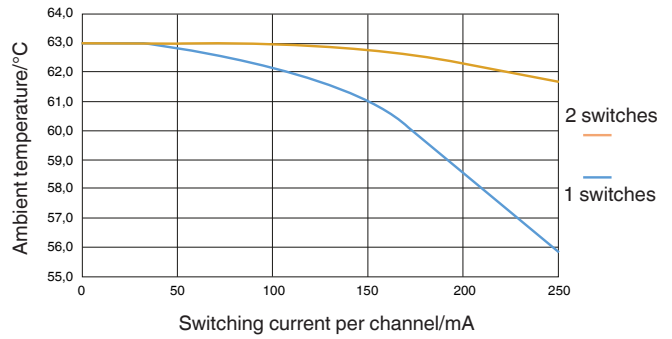
1) For permissible medium and ambient temperature, see derating curves on page 6.

## Derating curves

Max. ambient temperature, if ambient temperature  $\geq$  medium temperature



Max. ambient temperature, if medium temperature = 85 °C [185 °F]



## Packaging and instrument labelling

<b>Packaging</b>	Individual packaging
<b>Instrument labelling</b>	<ul style="list-style-type: none"> <li>■ WIKA product label, glued</li> <li>■ Customer-specific product label on request</li> </ul>

## Approvals

### Approvals included in the scope of delivery

Logo	Description	Country
	<b>EU declaration of conformity</b> EMC directive EN 61326 emission (group 1, class B) and immunity (industrial application) RoHS directive	European Union
	<b>UL</b> Safety (e.g. electr. safety, overpressure, ...)	USA and Canada

## Manufacturer's information

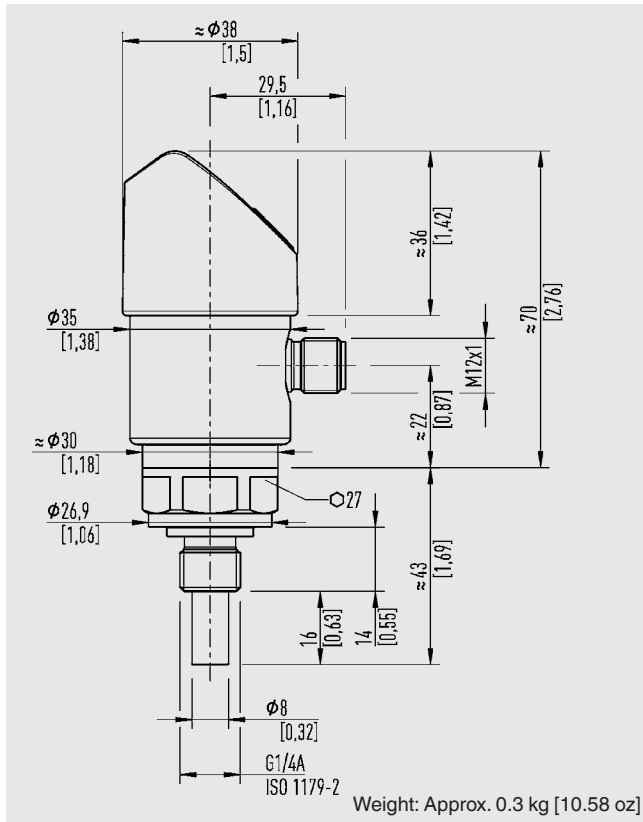
Logo	Description
-	China RoHS directive

→ Approvals and certificates, see website

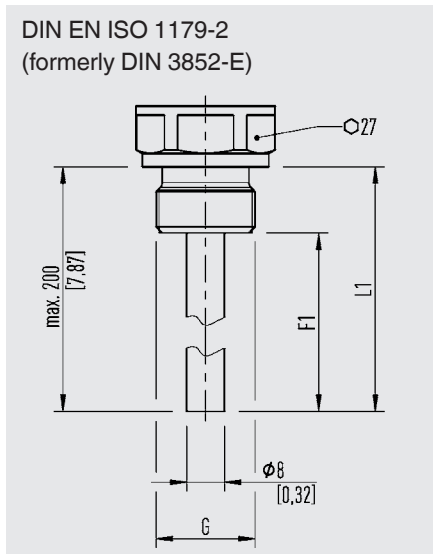
## Safety-related characteristic values

Safety-related characteristic values	
<b>MTTF</b>	> 100 years

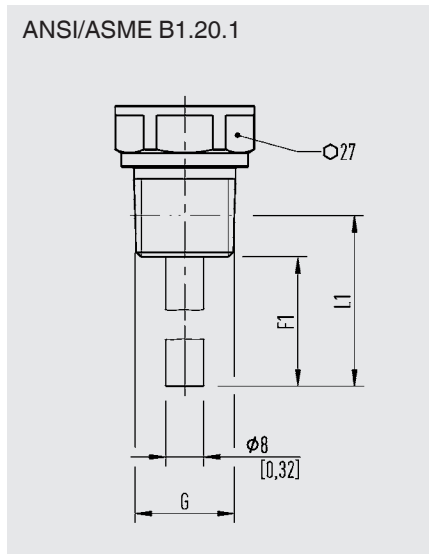
## Dimensions in mm [in]



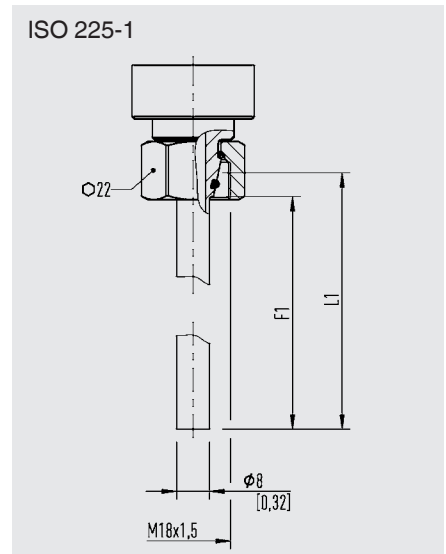
## Process connections



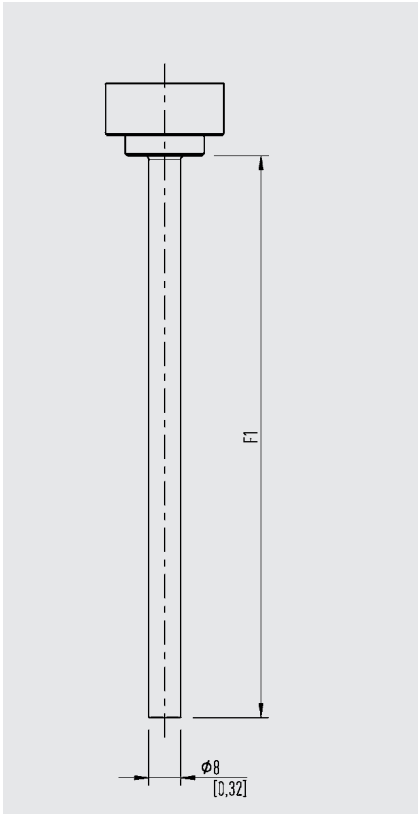
G	F1	L1
<b>G ¼ A</b>	16 [0.63]	28 [1.1]
<b>G ½ A</b>	16 [0.63]	30 [1.18]
	35 [1.38]	49 [1.93]
	65 [2.65]	79 [3.11]
	105 [4.13]	119 [4.69]



G	F1	L1
<b>¼ NPT</b>	16 [0.63]	22 [0.87]
<b>½ NPT</b>	30 [1.18]	38 [1.5]



G	F1	L1
<b>M18 x 1.5</b>	45 [1.77]	52 [2.47]



G	F1
-	140 [5.51]


**Legend:**

F1 Probe length


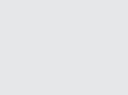


L1 Insertion length



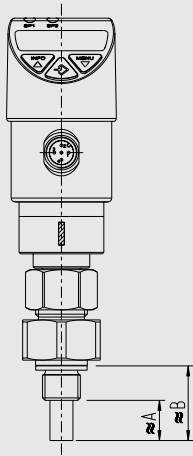
## Spare parts

Sealings	Description		Order number
	Profile sealing G ¼ A DIN EN ISO 1179-2 (formerly DIN 3852-E)	NBR	1537857
		FPM/FKM	1576534
	Profile sealing G ½ A DIN EN ISO 1179-2 (formerly DIN 3852-E)	NBR	1039067
		FPM/FKM	1039075

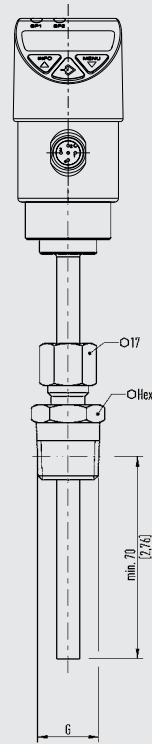
## Accessories

Circular connector M12 x 1 with moulded cable							
Model	Description	Material	IP code	Temperature range	Cable diameter	Cable length	Order number
	Straight version, cut to length, 4-pin, UL listed	PUR	IP67	-20 ... +80 °C [-4 ... +176 °F]	4.5 mm [0.18 in]	2 m [6.6 ft]	14086880
						5 m [16.4 ft]	14086883
						10 m [32.8 ft]	14086884
	Straight version, cut to length, 5-pin, UL listed	PUR	IP67	-20 ... +80 °C [-4 ... +176 °F]	5.5 mm [0.22 in]	2 m [6.6 ft]	14086886
						5 m [16.4 ft]	14086887
						10 m [32.8 ft]	14086888
	Angled version, cut to length, 4-pin, UL listed	PUR	IP67	-20 ... +80 °C [-4 ... +176 °F]	4.5 mm [0.18 in]	2 m [6.6 ft]	14086889
						5 m [16.4 ft]	14086891
						10 m [32.8 ft]	14086892
	Angled version, cut to length, 5-pin, UL listed	PUR	IP67	-20 ... +80 °C [-4 ... +176 °F]	5.5 mm [0.22 in]	2 m [6.6 ft]	14086893
						5 m [16.4 ft]	14086894
						10 m [32.8 ft]	14086896

### FSD-4 with adapter



### FSD-4 with compression fitting



#### Legend:

- A Maximum probe immersion depth
- B Distance between sealing face and probe tip

### Adapters and compression fittings

Model	Description	Recommended for pipe Ø	B	A	Order number
	From M18 x 1.5 to G ¼	22 ... 50 mm [0.86 ... 0.97 in]	28 mm [1.10 in]	16 mm [0.63 in]	14242761
	From M18 x 1.5 to G ½, long	25 ... 60 mm [0.98 ... 2.36 in]	31 mm [1.22 in]	17 mm [0.67 in]	14242759
	From M18 x 1.5 to G ½, short	32 ... 100 mm [1.26 ... 3.93 in]	36 mm [1.41 in]	22 mm [0.86 in]	14242760
	Compression fitting, G ½	140 ... 400 mm [5.51 ... 15.75 in]	70 ... 110 mm [2.76 ... 4.33 in]	56 ... 96 mm [2.2 ... 3.78 in]	3199551

Adapters and compression fittings					
Model	Description	Recommended for pipe Ø	B	A	Order number
	Compression fitting, G ¼	140 ... 400 mm [5.51 ... 15.75 in]	70 ... 110 mm [2.76 ... 4.33 in]	58 ... 98 mm [2.28 ... 3.86 in]	11193396
	Compression fitting, ½ NPT	140 ... 400 mm [5.51 ... 15.75 in]	-	56 ... 96 mm [2.20 ... 3.78 in]	11397625
	Compression fitting, ¼ NPT	140 ... 400 mm [5.51 ... 15.75 in]	-	58 ... 98 mm [2.28 ... 3.86 in]	14268712

## Ordering information

Model / Output variant / Probe length / Process connection / Sealing / Accessories

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