

Calorimetric Flow Monitor FKS-141

Application

- Monitoring of flowing liquids in pipes
- The monitor can be used to measure liquids that are aqueous (water content $\geq 50\%$), that do not contain oil and that have a medium temperature less than $80\text{ }^{\circ}\text{C}$ (compensated range)

Application examples

- Flow monitoring in pipes from DN 25, e.g., as dry-run protection or for monitoring filters, agitators or cooling loops
- Also suitable for highly pure, aqueous media without particles or solids (e.g. ultra-filtered media, cola)

Hygienic design/Process connection

- The Negele weld-in sleeve EMS-132 or weld-in pipe EHG-.../ 1/2" creates a flow-optimized, hygienic and easy-to-clean installation configuration
- CIP cleaning to $100\text{ }^{\circ}\text{C}$
- All materials in contact with the product are FDA-compliant
- Sensor made entirely of stainless steel
- Further connections: Tri-Clamp, milk pipe, DRD, Varivent, APV Inline, BioControl

Features

- Calorimetric measuring principle with pulsed heating
- Only one sensor tip, flow-optimized shape
- Insensitive toward temperature shocks, short response time
- Integrated sensor protection: automatic switch-off at $T > 100\text{ }^{\circ}\text{C}$.
- Freely adjustable switch output $15\text{...}200\text{ cm/s} = 7\text{...}100\%$
- Minimum switch point setting 7%
- Indicator (within head), LED for switching state

Options/Accessories

- Lid with integrated sight glass (SF option)
- Preassembled cable for M12 plug

Functional principle

The functional principle of the FKS calorimetric flow monitor is based on a temperature sensor mounted on the sensor tip (1) that is periodically heated by a heating element (2). When the medium is stationary, a constant temperature difference ΔT arises between the heated and unheated state. When the medium flows, heat energy is withdrawn from the heated temperature sensor and the temperature difference changes in relation to the flow rate.

In contrast to designs with two separate temperature sensors, of which one is constantly being heated, the measuring principle of the FKS with only one sensor and periodic heating has a lower response time due to the optimized heat transfer and lower heat capacity.

The response time is also significantly influenced by the heat conductivity of the medium. In general, the lower the heat conductivity of the medium, the higher the medium flow rate must be for measurement to be possible.

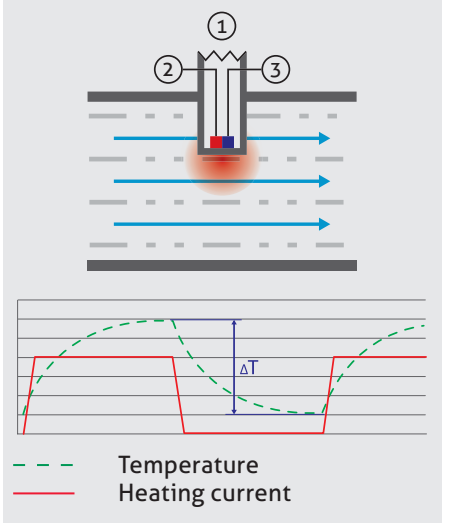
Authorisations



Flow monitor FKS-141



Schematic drawing



Specification		
Process connection	thread	G1/2" on sensor, combined with Negele weld-in sleeves max. 20 Nm
	tightening torque	
Materials	connecting head	stainless steel 1.4305, 60-mm dia.
	threaded connector	stainless steel 1.4404
	sensor tip	stainless steel 1.4435
	sight glass	PMMA
Temperature ranges	ambient	-20...+60 °C
	process	0...100 °C
	compensated range	0...80 °C
	CIP cleaning	to 100 °C
	short-term (SIP)	to 130 °C (no function)
Operating pressure		max. 10 bar
Protection class		IP 69 K
Measuring range		15...200 cm/s (0.098...78.7 in/s)
Response time reaction time		5 s
	in case of temperature leap	max. 10 s at 40 K
Accuracy*	in compensated temperature range	±10 % of full scale
	in nominal width range	DN25...DN100
Switch point	freely adjustable	7...100 %
	hysteresis	10 %
Indicator	7 segment red LED	in % of measuring range output switching state
Electrical connection	cable connector	M12 connector 1.4301
	supply voltage	16...32 V DC
	current consumption	typically 80 mA
Output		PNP, n.o./n.c. short circuit proof and protected against reverse polarity, max. 200 mA

*) Reference conditions in case of laminar flow profiles: calibration medium is water at ambient temperature.

Measurable media

The following media can be measured: aqueous liquids (water content $\geq 50\%$) and liquids that do not contain oil, such as water, milk, beer, fruit juice, CIP media, etc. Gases, oils and media containing oil cannot be measured with the FKS.

Notice

Flow monitor FKS-141 has an integrated self-protection mechanism that prevents damage:
At medium temperatures over 100 °C, the sensor is automatically switched off with a hysteresis of 10 K.
Three lines appear on the indicator.

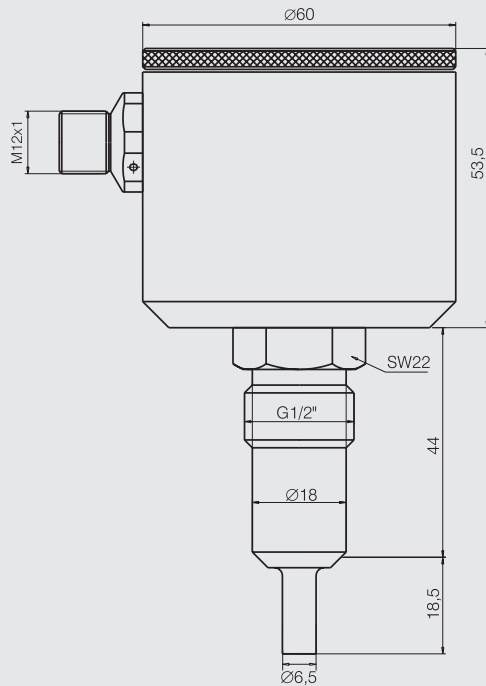
Intended use

- Not suitable for applications in potentially explosive areas.
- Not suitable for applications in safety-relevant system parts (SIL).

Standards and guidelines

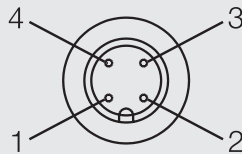
- Compliance with the applicable regulations and directives is mandatory.

Dimensional drawing FKS-141



Electrical connection FKS-141

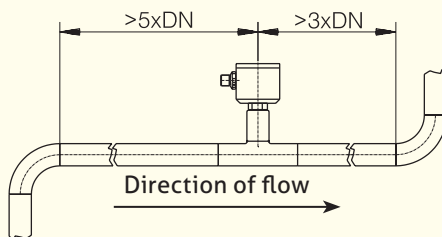
- 1: + power supply 16...32 V DC
- 2: Not assigned
- 3: 0 V supply voltage (GND)
- 4: Switch output active



Mechanical connection/Installation



- **Attention:** The M12 plug must face in the direction of the pipe against the direction of flow. Note the marking on the sleeve.
- Ensure that the pipe in which the sensor is installed is completely filled with liquid. Installation in a rising pipe is recommended (in which the direction of flow is upward)
- Note the inlet and outlet dimensions (see drawing DN = pipe cross section)



Inside view and key assignment



Operation FKS-141

1. Starting up

- Install the FKS-141 and make the electrical connections
- Initialization phase: Indicator displays "888" (flashing) for approx. 20 s
- Then the flow rate is displayed as a % of the measuring range
- The switch output is adjusted according to the set value

2. Menu guidance

- Open the operating mode: Key combination 2x , 2x , 2x press within 10 s
- Main menu level "SP" (switch point setting) appears on the indicator
- Navigation in the menu field:
 - to the right,
 - upward, changing the values
 - to the left, accepting the new parameter settings, leaving the operating mode

3. Setting the switch point

- Under "SP" in the main menu level, select the editing mode with
- Move to the first digit with ; the digit flashes
- Enter the desired value with
- Edit the next digit with ; the digit flashes, etc.
- Accept the switch point with 2x
- Leave the menu mode with 1x

4. Setting the switch output

- Default setting: normally open contact
- If the normally closed function is to be set, proceed as follows:
 - In the main menu level, select "O-C" with
 - Open the editing mode with ; the indicator shows "n.o." (normally open contact, default setting)
 - 1x , the indicator shows "n.c." (normally closed contact)
 - 2x : accept the setting
 - : leave the menu mode

Conversion table m/s to l/min

DN	DN 25	DN 40	DN 50	DN 65	DN 80	DN 100
Flow [m/s]	[l/min]	[l/min]	[l/min]	[l/min]	[l/min]	[l/min]
0.1	2.9	7.5	11.8	19.9	30	47
0.2	5.9	15.1	23.6	39.8	60	94
0.4	11.8	30.1	47.1	79.6	121	188

Conversion table in/s to gal/min

DN (plate size)		1" (25.4 mm)	1½" (38.1 mm)	2" (50.8 mm)	3" (76.2 mm)	4" (101.6 mm)
Flow [in/s]	[m/s]	[gal/min]	[gal/min]	[gal/min]	[gal/min]	[gal/min]
4.0	0.10	0.82	1.84	3.26	7.34	13.05
8.0	0.20	1.63	3.67	6.53	14.68	26.10
16.0	0.41	3.26	7.34	13.05	29.36	52.20
24.0	0.61	4.89	11.01	19.58	44.05	78.30
32.0	0.81	6.53	14.68	26.10	58.73	104.41
40.0	1.02	8.16	18.35	32.63	73.41	130.51
48.0	1.22	9.79	22.02	39.15	88.09	156.61
56.0	1.42	11.42	25.69	45.68	102.77	182.71
64.0	1.63	13.05	29.36	52.20	117.46	208.81
72.0	1.83	14.68	33.03	58.73	132.14	234.91
80.0	2.03	16.31	36.71	65.25	146.82	261.01
88.0	2.24	17.94	40.38	71.78	161.50	287.12
96.0	2.44	19.58	44.05	78.30	176.18	313.22
104.0	2.64	21.21	47.72	84.83	190.87	339.32

Transport/storage



- Do not store outside
- Store in an area that is dry and dust-free
- Do not expose to corrosive media
- Protect against solar radiation
- Avoid mechanical shock and vibration
- Storage temperature 0...40 °C
- Relative humidity max. 80 %

Reshipment



- Sensors and process connection must be clean and must not be contaminated with hazardous media and/or heat-conductive paste. Note the cleaning information!
- To avoid damage of the equipment, use suitable transport packaging only.

Cleaning/maintenance



- When using a pressure washer, do not point the nozzle directly at the electrical connections.

Notice on conformity



Applicable directives:

- Electromagnetic Compatibility Directive 2004/108/EC
- The CE label confirms compliance of this product with the applicable EC directives.
- You have to guarantee the compliance of all guidelines applicable for the entire equipment.

Order code

FKS-141

Sight glass lid

- X (without)
- SF (sight glass in lid, LED indicator visible from the outside)

FKS-141 / SF

Disposal



- This instrument is not subject to the WEEE directive 2002/96/EC and the respective national laws.
- Give the instrument directly to a specialized recycling company and do not use the municipal collecting points.