



Method of operation

The model KAL-... electronic flow monitor continuously monitors liquid media. It is suited for securely monitoring flows with minimum pressure loss. Sensitivity to soiling is significantly reduced by means of a single-part sensor.

Theory of operation

The operation of the model KAL-... electronic flow monitor is based on the calorimetric principle. The end face of the sensor is heated to a few degrees above the temperature of the flow medium. When the medium flows, the heat generated in the sensor is transferred to the medium, ie, the sensor is cooled. The cooling procedure is an accurate measure of the flow velocity.

The sensor signal is compared with the reference data stored in a microcontroller. An alarm signal and/or an analog signal (4-20 mA) that is proportional to the flow velocity is output if the actual flow velocity deviates from the desired flow velocity. The microcontroller allows the flow indicator to be easily calibrated and the temperature to be compensated.

Features

- Optimal temperature compensation
- Intelligent switching
- Measuring range adjustment
- No moving parts
- Easy to fit and put into service
- Minimum pressure loss
- Easy to use

Measuring and switching ranges

Nominal size (mm)	Appr. meas. range l/min. water	Nominal size (mm)	Appr. meas. range l/min. water
8	0,12 - 6,0	40	3,0 - 150
10	0,19 - 9,4	50	4,7 - 235
15	0,42 - 21,8	60	6,8 - 340
20	0,75 - 37,7	80	12,0 - 603
25	1,18 - 59,0	100	18,8 - 942
30	1,7 - 84,8	150	42,4 - 2120

Important: The flow velocity has been converted for the pipe nominal size for the specified measuring ranges. Please note that the flow velocity approaches zero in the pipeline in the direction of the wall. Depending on the pipe nominal size, depth of engagement of the sensor, and flow profile, the deviations from the specified flow rates can be of considerable magnitude.

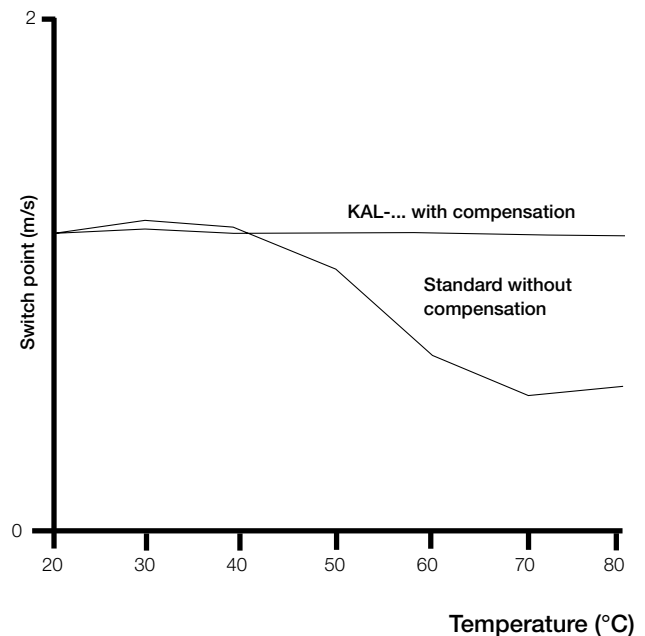
Temperature compensation

The temperature of the KOBOLD flow monitor is compensated with a microcontroller. All data required for temperature compensation are stored in EEPROMS, and are maintained for at least 10 years after power failure. The instruments may be easily adjusted by the customer to suit process conditions.

The measured flow rate is compared with the zero-point adjustment values stored in the EEPROM and the stored characteristic curves. The data is processed by the microcontroller and controls the alarm signal or the analog output.

The sensor switching point is absolutely consistent, as the sensors have been adapted to suit the process data.

Drift of operating point with respect to temperature



Range of models

Compact devices

- KAL-A... Flow meter with analog output (4-20 mA)
- KAL-AK Flow meter /-monitor with analog output (4-20 mA) and alarm signal (PNP/NPN, make contact)
- KAL-K... Flow indicator alarm signal (PNP/NPN, N/O contact)

Separate version

- KAL-.. Sensor
- KAL-E1.. Electronics with relay contact for flow monitoring
- KAL-E2.. Electronics with relay contact and trend indication for flow monitoring
- KAL-E3.. Electronics with relay contact for flow and temperature monitoring
Trend indication for flow monitoring



Technical details:

Electronics:

Power supply: 24 VDC ± 10 %
 110 VDC ± 30 %, 110, 230 VAC ± 20 %,

Power input: max. 4,5 (typically 1,2 W)
 max. 3,6 W for 24 VDC

Ambient temperature: -20° C ... +60° C
 Temperature of medium: -20° C ... +80° C
 CIP compatibility: max. 140° C non-operating
 Max. pressure: 100 bar
 Time delay before availability: max. 12 s
 Switching range: approx. 4 cm/s to 200 cm/s
 Temperature gradient: unlimited
 Response time: typically 5,6...12 s
 upon request: 2- 5,6 s (KAL-KS...)

Flow rate indication: trend indication with 8-LED's

Switch point adjustment: with potentiometer, optical indication on LED chain with flashing LED

Output indicator: LED, red= alarm, green= flow OK

Switching output: 24 VDC version: semiconductor PNP/NPN switchable, max. 400 mA, short-circuit proof
 110 VDC version: relay max. 0,2 A /110 VDC
 110 VAC, 230 VAC version: relay max. 5 A

N/O function: actual value ≥ setpoint value; (standard setting: green LED is energized) output switched through

N/C function: available as option

Protection type: IP 65
 Case material: polyamide



Electrical connection

	KAL-K... 24 VDC	KAL-K..., with cable connection 110 VDC, 110 VAC, 230 VAC
1	Output	white make contact (1) black make contact (2)
2	Ground	brown AC/DC supply (3)*
3	+24 VDC	blue AC/DC supply (4)* green/yellow PE conductor (with AC only)*

*Voltage according to nameplate

Order details

Connection	Order numbers for materials			Type of contact	Electrical connection	Supply
	1.4301	1.4305	1.4571			
G 1/4	KAL K1308	-	KAL K1408*	S=N/O contact (NPN/PNP switchable)	PG=PG 13,5 ST=connector M12x1	0=230 VAC 1=110 VAC 3 = 24 VAC 6=110 VDC
G 1/2	KAL K1315	KAL K1215	KAL K1415			
G 3/4	KAL K1320	-	KAL K1420*			
M 12x1	KAL K0312	-	-			
1/4" NPT	KAL K5308	-	KAL K5408*			
1/2" NPT	KAL K5315	-	KAL K5415			
3/4" NPT	KAL K5320	-	KAL K5420*	O=N/C contact (optional)		
Tri clamp, DIN 32676	-	-	KAL K4440			

Example of order: KAL-K 5320 S PG 1

*Stainless steel hexagon 1.4301



Technical details

Sensor:

Material case: see order details
 cable: PVC, option (KAL-...HT): silicone
 cable gland: Brass nickel-plated; PG 7

Cable: 2x0,56 mm², length = 2 m
 max. line length 100 m

Switching range: 4 cm/s to 200 cm/s

Temperature of medium: -20° C to +80° C,
 (KAL-...HT) option: 0° C to +120° C

Ambient temperature: -20° C to +80° C,
 KAL-...HT: -20 to +120 °C

Max. pressure: 100 bar (KAL-1132 and KAL-1140: 25bar)

Protection type (DIN 40050): IP 68

Important!

For cable lengths >10m, the client can lucrease the absolute switching accuracy manually by adjustment (cable resistance must be considered). (See Compensation – Temperature).

Model KAL-E(H)..electronics

Power input: max. 3,6 W

Switching capacity: max. 250 V, max. 3 A

Switch point adjustment: with potentiometer

Switching function: relay picks up with flow
 (terminals 9 & 10 closed)
 (KAL-E3..) option: relay picks up if temperature falls below setpoint, LED is energized
 (terminals 12 & 13 closed)

Output: relay with 1 changeover contact

Output indicator: with LED

Time delay before availability: max. 12 s

Temperature range: -20...+80° C

Accuracy: temperature limit value ± 2 %

Reproducibility: approx. 2 %

Response time: typically 5 ... 12 sec

DIN rail fitting: DIN EN 50022 und DIN 46277

Protection type: case: IP 40, terminals: IP 20

Case: polycarbonate, L 75 x W 55 x H 110 mm

Sensor output: short-circuit proof, cable break is detected as flow stoppage

Power failure: calibration data are stored for at least 10 years without battery power.

Sensor order details

	Connection	Order numbers				Electrical Connection
		Sensor for coupling fitting		Sensor with pipe fitting		
		1.4301	1.4571	Brass fitting/ Sensor 1.4301	Fitting 1.4301/ Sensor 1.4301	
	G ¼	KAL 1308	KAL 1408	KAL 1108	KAL 1208	00= 2 m PVC-cable
	G ½	KAL 1315	KAL 1415	KAL 1115	KAL 1215	
	G ¾	KAL 1320	KAL 1420	KAL 1120	KAL 1220	
	G 1	-	-	KAL 1125	KAL 1225	
	G 1¼	-	-	KAL 1132	KAL 1232	
	G 1½	-	-	KAL 1140	KAL 1240	HT= 2 m silicone cable
	M 12x1	KAL 0312	-	-	-	ST= M12x1connector
	¼" NPT	KAL 5308	KAL 5408	-	-	
	½" NPT	KAL 5315	KAL 5415	-	-	
	¾" NPT	KAL 5320	KAL 5420	-	-	

Order details electronics (KAL-E..standard, KAL-EH..high temperature version)

	Field of application	Flow trend indication	Temperature monitoring	Supply voltage			
				24 VDC	24 VAC	110 VAC	230 VAC
	Flow	-	-	KAL E(H)13	KAL E(H)12	KAL E(H)11	KAL E(H)10
	Flow	8-LEDs	-	KAL E(H)23	KAL E(H)22	KAL E(H)21	KAL E(H)20
	Flow/ Temperature	8-LEDs	-20..+80°C	KAL E33	KAL E32	KAL E31	KAL E30
			0..+120°C	KAL H33	KAL H32	KAL H31	KAL H30

Example of order: KAL 1308 HT