

# KAL THERMAL FLOW SWITCH



Flow  
Pressure  
Level  
Temperature  
measurement  
monitoring  
control

- Optimal Temperature Compensation
- Simultaneous Monitoring of Temperature and Flow
- Remote Probe Allows Installation with Minimal Clearance
- Can be Used with Extremely Low Velocities
- No Moving Parts
- Extremely Low Pressure Loss
- Easy to Operate
- Insensitive to Dirt



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Model:  
KAL

### Features

- Optimal Temperature Compensation
- Simultaneous Monitoring of Temperature and Flow
- Remote Probe Allows Installation with Minimal Clearance
- Independent of Liquid Density
- Can be Used with Extremely Low Velocities
- No Moving Parts
- Extremely Low Pressure Loss
- Easy to Operate
- Insensitive to Dirt

The KAL electronic flow switch continuously monitors the flow of liquid media. It can be used wherever flows must be monitored with a minimal loss of pressure. The KAL's one-piece, stainless steel sensor has no moving parts making the KAL very reliable. High strength is another advantage inherent in this design allowing use at high pressures, and virtually eliminating any chance of mechanical damage.



### Operation

The KAL design is based on the time-proven calorimetric principle. The sensor is internally heated to a few degrees above the temperature of the medium. Flow of the medium causes removal of heat from the sensor, resulting in a cooling effect. The degree of cooling is a measure of the flow velocity.

The KAL electronic modules allow the user to interface with the sensor to provide access to flow or temperature control in his process. The system can act as either a flow switch only, or a combined flow and temperature switch. Switching is achieved by means of internal SPDT relays.

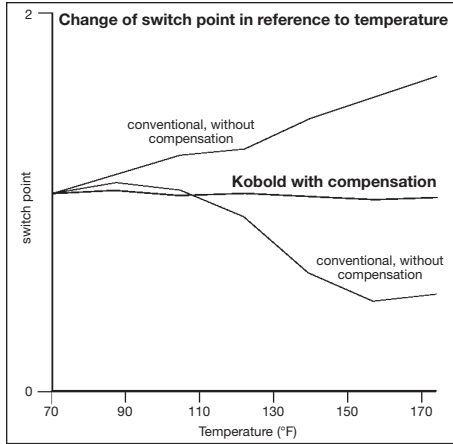
The microprocessor based design of the KAL distinguishes it from the competition. Full temperature compensation of the switch point is readily obtained through a simple, one-time, calibration procedure. This assures elimination of set-point drift caused by temperature variations in the process liquid.

### Approximate Switch Points at Various Pipe Diameters

Nominal ID inches	Range GPM Water	Nominal ID inches	Range GPM Water
1/4	0.05 – 0.8	2 1/2	4.4 – 80
5/16	0.08 – 1.4	3	7.9 – 140
3/8	0.1 – 2.2	4	12 – 220
1/2	0.3 – 5.0	6	28 – 500
3/4	0.5 – 8.9	8	50 – 900
1	0.8 – 14	10	78 – 1400
1 1/4	1.1 – 20	12	110 – 2000
1 1/2	2.0 – 35	16	200 – 3600
2	3.1 – 55	20	310 – 5600

**Note:**

The flow ranges specified in the table above have been calculated for each pipe diameter from the known flow velocity range of the KAL. It must be noted that flow in pipes is non-uniform across the pipe cross-section, and approaches zero at the pipe wall. This means that, in practice, the depth of installation of the probe, the internal pipe diameter, and the flow profile of the liquid in the pipe can interact to produce significant deviations from the flow ranges in this data sheet.



### Temperature Compensation

The Kobold KAL flow switch uses a microprocessor to compensate for temperature changes through use of an internal look-up table. End-users can easily adapt the equipment to the requirements of their unique installations. Compared to conventional calorimetric flow switches, the technically advanced design of the KAL provides a switch point which changes negligibly with temperature.

### Technical Data

#### Sensor

**Material**  
**Housing:** 304 SS  
**Cable:** PVC cladding  
**Cable Gland:** Ni-plated brass

**Cable**  
**Length:** 6 feet (max. 330 feet)  
**Conductors:** 2x 20 AWG

**Media:** Water-based Liquids  
 60 cSt max.

**Switching Range**  
**Water:** 0.2 to 6.6 ft/s

**Operating Conditions**  
**Temperature:** 0 to 176 °F  
**Option "-HT":** 32 to 250 °F  
**Pressure:** 1450 PSIG maximum  
 360 PSIG for models KAL-5132 & 5140  
**Protection:** NEMA 6

**Accuracy**  
**Display:** ± 10%  
**Temperature:** ± 2%  
**Reproducibility:** ± 2%

**Response Time**  
**Typical:** 5.6 seconds  
**Maximum:** 10 seconds

#### Controller

**Power:** 3 W max. @24 VDC  
 or 24/110/230 VAC

**Relay:** Fail-safe SPDT  
 3 A @ 250 VAC max.

**Status Indicator:** LED for relay & power

**Adjustments:** For type of liquid and switch point via potentiometer

**Amb. Temperature Range:** 32 °F to 140 °F

**Protection:** NEMA 1

**Housing:** Polycarbonate  
**LxWxD:** 2.95"x2.17"x4.33"

**Fail Safe Features**  
**Power Loss:** 10 year memory retention

**Switch:** Relay energizes during normal operation

**Cable Break:** Alarm state signalled

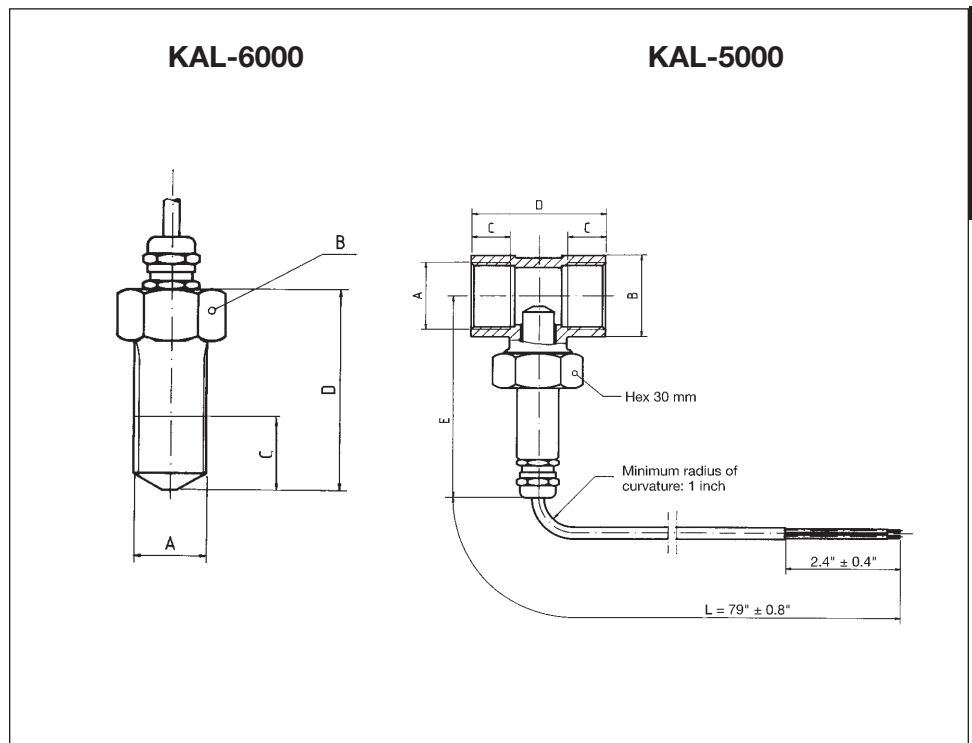
**Rail Mounting:** DIN EN 50022 and DIN 46277

### KAL-6000 Dimensions

A NPT	B Hex	C	D
1/4"	19 mm	1.0"	1.7"
1/2"	27 mm	1.7"	2.3"
3/4"	32 mm	1.7"	2.3"

### KAL-5000 Dimensions

A NPT	B Hex	C	D	E
1/4"	27 mm	0.4"	2.0"	3.2"
3/8"	27 mm	0.4"	2.0"	3.2"
1/2"	27 mm	0.4"	2.0"	3.2"
3/4"	32 mm	0.6"	2.1"	3.3"
1"	36 mm	0.6"	2.2"	3.4"
1 1/4"	46 mm	0.6"	2.0"	3.6"
1 1/2"	55 mm	0.6"	2.0"	3.7"



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### Selecting a System

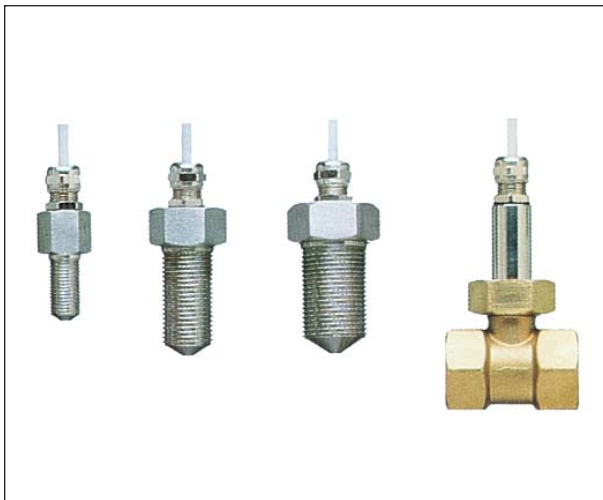
The electronic flow switch consists of:  
 – the controller  
 – the sensor

The connecting cable between the two parts may be up to 330 feet long. (with KAL-E300 series units, temperature correction is required with cable lengths above 33 feet.)

### Controllers

Three units are available. Each is compatible with the full series of sensors. Electronic circuitry is located in a standard DIN housing (NEMA 1) for quick installation on terminal rails.

### Probes



### KAL-E100 Series

The KAL-E100 is equipped with a flow rate sensitive, isolated SPDT relay. The relay status is indicated by means of a green LED.

### KAL-E200 Series

Same as the KAL-E100, but with a trend indicator for flow rate and switch point.

### KAL-E300 Series

Same as KAL-E200 but with a temperature switch. In addition to monitoring the flow, this model can be

used to monitor the temperature. The specified alarm temperature can be from 0–176 °F. SPDT relays are activated if the flow drops below the specified flow velocity, or if the temperature drops below the specified temperature.

### Sensors

All of the sensor models can be used with any of the three controllers.

Selection is a function of:

- connector threads
- max. operating pressure 1450 PSIG
- max. medium temperature 176°F (250°F Optional)
- sensor wetted parts

### Insertion Style Probe Ordering Information

Fitting (NPT)	Probe Material	Order Number
1/4"	304 Stainless Steel	KAL-6205
1/2"	304 Stainless Steel	KAL-6215
3/4"	304 Stainless Steel	KAL-6220
High Temperature Sensor, 32-250°F, add Suffix "-HT"		

### Probe with Integral T-Piece Ordering Information

Fitting (NPT)	Probe Material	Order Number	
		Housing Material Brass	Stainless Steel
1/4"	304 SS	KAL-5105	KAL-5205
3/8"	304 SS	KAL-5110	KAL-5210
1/2"	304 SS	KAL-5115	KAL-5215
3/4"	304 SS	KAL-5120	KAL-5220
1"	304 SS	KAL-5125	KAL-5225
1 1/4"	304 SS	KAL-5132	KAL-5232
1 1/2"	304 SS	KAL-5140	KAL-5240
High Temperature Sensor, 32-250°F, add Suffix "-HT"			

### Controllers



### Controller Ordering Information

Description	Supply Voltage	Order Number
1 Flow Rate Output	230 VAC (± 10 %)	KAL-E100
	110 VAC (± 10 %)	KAL-E110
	24 VAC (± 10 %)	KAL-E120
	24 VDC (+ 15 %–10 %)	KAL-E130
1 Flow Rate Output with Trend Indicator	230 VAC (± 10 %)	KAL-E200
	110 VAC (± 10 %)	KAL-E210
	24 VAC (± 10 %)	KAL-E220
	24 VDC (+ 15 %–10 %)	KAL-E230
1 Flow Rate Output with Trend Indicator 1 Temperature Relay Output	230 VAC (± 10 %)	KAL-E300
	110 VAC (± 10 %)	KAL-E310
	24 VAC (± 10 %)	KAL-E320
	24 VDC (+ 15 %–10 %)	KAL-E330
High Temperature Controller, 32-250°F, add Suffix "-HT"		