

## Thermal Flow Switch for Water-Based Liquids



measuring  
•  
monitoring  
•  
analyzing

KAL



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



KOBOLD companies worldwide:

AUSTRALIA, AUSTRIA, BELGIUM, BULGARIA, CANADA, CHINA, CZECHIA, FRANCE, GERMANY, GREAT BRITAIN, HUNGARY, INDIA, INDONESIA, ITALY, MALAYSIA, MEXICO, NETHERLANDS, PERU, POLAND, REPUBLIC OF KOREA, RUSSIA, SPAIN, SWITZERLAND, THAILAND, TUNISIA, TURKEY, USA, VIETNAM

KOBOLD Instruments, Inc.  
1801 Parkway View Drive  
Pittsburgh, PA 15205  
Main Office:  
1.800.998.1020  
1.412.788.4890  
info@koboldusa.com  
www.koboldusa.com



**Description**

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 one-piece, stainless steel sensor has no moving parts, making the KAL very reliable. 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 media. Flow of the media 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 electronics allow the user to interface with the sensor to provide access to flow or temperature control. 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.

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.

**Temperature Compensation**

The KAL flow switch uses a microprocessor to compensate for temperature changes through use of an internal table. End-users can easily adapt the equipment to 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.

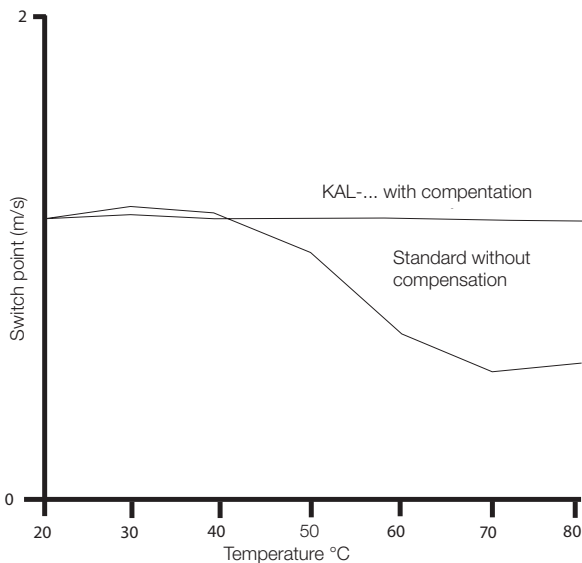


**Approximate Switching Range at Various Pipe Diameters**

| Nominal ID (inch) | Range Water (GPM) | Nominal ID (inch) | Range Water (GPM) |
|-------------------|-------------------|-------------------|-------------------|
| 1/4               | 0.02...1.0        | 2 1/2             | 2.0...100         |
| 5/16              | 0.04...1.5        | 3                 | 3.0...140         |
| 3/8               | 0.05...2.2        | 4                 | 6.0...250         |
| 1/2               | 0.08...4.0        | 6                 | 12.0...575        |
| 3/4               | 0.2...9.0         | 8                 | 20...1025         |
| 1                 | 0.4...16          | 10                | 35...1600         |
| 1 1/4             | 0.5...25          | 12                | 50...2300         |
| 1 1/2             | 0.8...36          | 16                | 85...4100         |
| 2                 | 1.3...64          | 20                | 130...6400        |

**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.



**Specifications**

**Sensor**

**Material**  
**T-Piece Housing:** 304 SS or Brass  
**Probe:** 304 SS or 316 SS  
 (Depending on Model Code)  
**Cable:** PVC Clad, Silicone Optional  
**Cable Gland:** Ni-plated Brass

**Cable**  
**Length:** 6 feet (Max. 330 feet)  
**Conductors:** 2x20 AWG  
**Media:** Water-Based Liquids

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

**Operating Conditions**  
**Temperature:** 0...176 °F  
**Option “..HT“:** 32...250 °F  
**Pressure:** (1450 PSIG Maximum  
 360 PSIG for Models  
 KAL-5132 & 5140)

**Protection:** IP 68

**Accuracy**  
**Display:** ± 10%  
**Temperature:** ± 2%  
**Repeatability:** ± 2%  
**Response Time:** 5...12 seconds (typically)

**Controller**

**Power:** 3.6 W Max. at 24 V<sub>DC</sub>  
 or 24/110/230 V<sub>AC</sub>

**Relay:** Fail-safe SPDT  
 3 A at 250 V<sub>AC</sub> Max.

**Status Indicator:** LED for Relay & Power

**Adjustments:** For Type of Liquid and  
 Switch Point Via Potentiometer

**Ambient Temperature Range:** 0...176 °F

**Protection**  
**Case:** IP 40  
**Terminals:** IP 20

**Housing:** Polycarbonate  
**LxWxD:** 2.95" x 2.17" x 4.33"

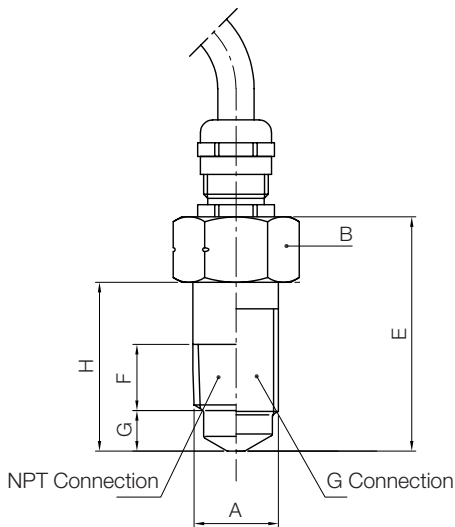
**Fail Safe Features**  
**Power Loss:** 10 Year Memory  
 Retention  
**Switch:** Relay Energizes  
 During Normal  
 Operation

**Cable Break:** Alarm State Signaled

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

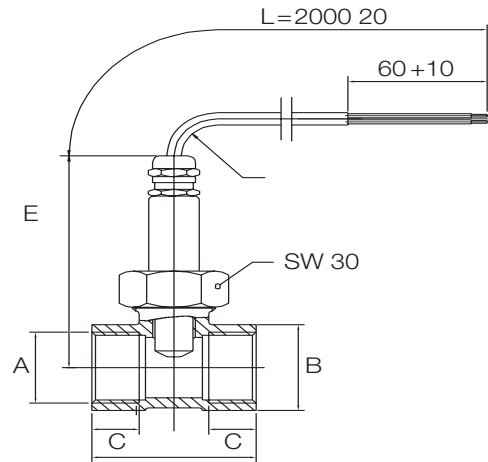
**Dimensions**

**KAL-6000**



| A (NPT) | B (Hex) | E    | F    | G     | H     |
|---------|---------|------|------|-------|-------|
| 1/4"    | 19 mm   | 1.7" | 0.5" | 0.22" | 1.02" |
| 1/2"    | 27 mm   | 2.3" | 0.8" | 0.43" | 1.7"  |
| 3/4"    | 32 mm   | 2.3" | 0.6" | 0.63" | 1.7"  |

**KAL-5000**



| 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" |



## Thermal Flow Switch Model KAL

### 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 the KAL-E300 series units, temperature correction is required with cable lengths over 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 for quick installation on terminal rails.

#### • 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 to 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. media temperature 176 °F (250 °F Optional)
- Sensor wetted parts

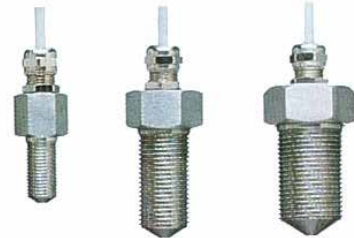
### Order Details for Probe with Integral T-Piece (Example: KAL-5240 HT)

| Fitting (NPT) | Probe Material | Order Number     |          | Option                               |
|---------------|----------------|------------------|----------|--------------------------------------|
|               |                | Housing Material |          |                                      |
|               |                | Brass            | 304 SS   | Suffix "...HT"                       |
| 1/4"          | 304 SS         | KAL-5105         | KAL-5205 | High Temperature Sensor, 32...250 °F |
| 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 |                                      |



### Order Details for Insertion Style Probe (Example: KAL-6305 HT)

| Fitting  | Order Number   |          | Option                               |
|----------|----------------|----------|--------------------------------------|
|          | Probe Material |          |                                      |
|          | 304 SS         | 316 SS   | Suffix "...HT"                       |
| 1/4" NPT | KAL-6205       | KAL-6305 | High Temperature Sensor, 32...250 °F |
| 1/2" NPT | KAL-6215       | KAL-6315 |                                      |
| 3/4" NPT | KAL-6220       | KAL-6320 |                                      |
| M 12x1   | KAL-6212       | -        |                                      |



### Order Details for Controller (Example: KAL-E310 HT)

| Description   | Supply Voltage                 | Order Number | Option                                   |
|---|--------------------------------|--------------|--|
|   |                                |              | Suffix "...HT"                           |
| 1 Flow Rate Output  | 230 V <sub>AC</sub> (± 10%)    | KAL-E100     | High Temperature Controller, 32...250 °F |
|   | 110 V <sub>AC</sub> (± 10%)    | KAL-E110     |  |
|   | 24 V <sub>AC</sub> (± 10%)     | KAL-E120     |  |
|   | 24 V <sub>DC</sub> (+ 15%–10%) | KAL-E130     |  |
| 1 Flow Rate Output with Trend Indicator                             | 230 V <sub>AC</sub> (± 10%)    | KAL-E200     |  |
|   | 110 V <sub>AC</sub> (± 10%)    | KAL-E210     |  |
|   | 24 V <sub>AC</sub> (± 10%)     | KAL-E220     |  |
|   | 24 V <sub>DC</sub> (+ 15%–10%) | KAL-E230     |  |
| 1 Flow Rate Output with Trend Indicator, 1 Temperature Relay Output | 230 V <sub>AC</sub> (± 10%)    | KAL-E300     |  |
|   | 110 V <sub>AC</sub> (± 10%)    | KAL-E310     |  |
|   | 24 V <sub>AC</sub> (± 10%)     | KAL-E320     |  |
|   | 24 V <sub>DC</sub> (+ 15%–10%) | KAL-E330     |  |

