

Thermal Flow Switch for Water-Based Liquids



measuring
•
monitoring
•
analyzing

KAL-K



- Flow Velocities from 0.04...2 m/s
- $T_{\max} : 250\text{ }^{\circ}\text{F}$, $P_{\max} : 1450\text{ PSIG}$
- NPT and 3-A Compliant Sanitary Fittings
- No Moving Parts
- Intelligent Temperature Compensation
- Extremely Low Pressure Loss
- Easy to Operate
- Insensitive to Dirt



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Description

The KAL-K thermal flow switch utilizes KOBOLD's temperature compensating electronics. This compact, one-piece unit provides reliable readings unaffected by temperature or physical characteristics of non-viscous water-based liquids. This is made possible through the use of state-of-the-art microprocessor technology. The microprocessor can be field calibrated to both the liquid properties and operating range in a simple, five minute set-up procedure. This intelligence, coupled with a "no moving parts" design, make the KAL a superior performer in virtually all applications. The KAL-K is also offered in a 3-A compliant version.

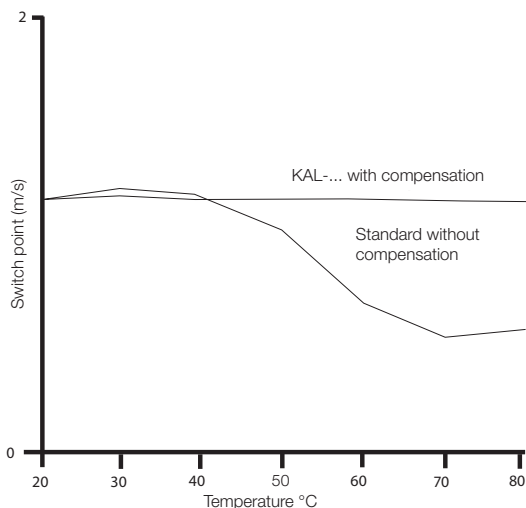
The KAL-K incorporates an 8 segment bar-graph LED flow trend indicator and one flow alarm setpoint. The setpoint is fully configurable as NPN, PNP, normally open or normally closed.

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 causes removal of heat from the sensor, resulting in a cooling effect. The rate of cooling is a measure of the flow velocity. The microprocessor based design of the KAL distinguishes it from the competition. Full temperature compensation of the flow rate is readily obtained through a simple, one-time, calibration procedure. This assures elimination of flow rate reading drift caused by temperature variations in the process liquid.

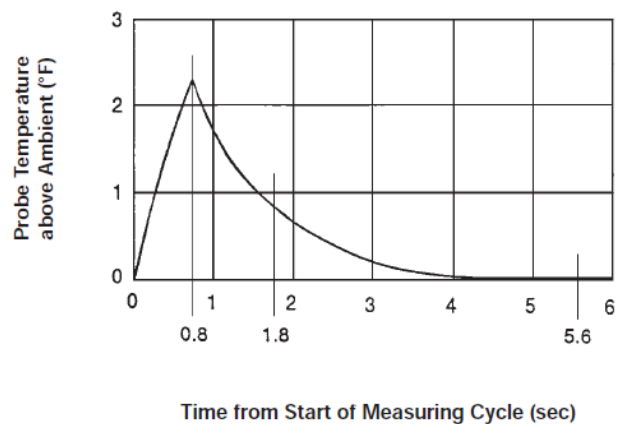
Temperature Compensation

The KOBOLD KAL flow products use 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. Unlike conventional calorimetric flow switches, the technically advanced design of the KAL provides a flow reading which is unaffected by temperature.



KAL Timing - Heating and Measuring Cycle

Typical Flow Measuring Cycle



Operating Behavior

1. At $t=0$, the probe temperature is recorded. This reading represents the ambient liquid temperature.
2. Still at $t=0$, the KAL begins heating the probe.
3. At $t=0.8$ seconds, the heating cycle ends and the KAL begins monitoring the probe temperature.
4. At $t=1.8$ seconds, a temperature reading is taken and compared to the $t=0.8$ second temperature. The rate of cooling is calculated and compared to a Cooling Rate vs Flow Rate table specific to the ambient temperature recorded at $t=0$.
5. The probe is allowed to cool until $t=5.6$ seconds. A temperature reading is taken and compared to the initial $t=0$ reading. If the temperatures are equal (or nearly so), the flow reading is determined valid and passes through to the KAL output. If the temperatures are not equal, the KAL waits another 5.6 sec, and Step 5 repeats.

Specifications

Switching Range:	0.04...2 m/s
Media:	Water-Based Liquids (Water Content at least 90%); not Suitable for Oils or Fuels
Response Time	
Typical:	5.6 seconds
Optional w/"F":	1.2 seconds
Fittings	
Standard:	1/2" or 3/4" NPT
Sanitary:	1-1/2" Tri-Clamp®
Flow Trend Indicator:	8 Red LEDs
Temperature Rating	
Operating:	32...250 °F
CIP:	280 °F (non-operating)
Maximum Pressure	
Threaded:	1450 PSIG
Sanitary:	600 PSIG or per Clamp Rating
Wetted Parts	
Standard NPT:	304 SS
Optional NPT:	316-Ti SS
Sanitary:	316L SS
Housing	
Standard:	IP 65
Sanitary:	IP 65
Power Requirements	
Supply Voltage:	24 V _{DC} ± 10%
Optional:	110 V _{AC}
Current Draw:	300 mA Max.
Switch Characteristics	
Adjustment:	By Potentiometer
Status Indicator:	Bi-colored LED
24 V_{DC} Units	
Type:	PNP or NPN, Open Collector
Switch Rating	
DC Only:	400 mA at 24V
110 VAC Units:	
Type:	N/O Dry Contact
Switch Rating	
AC Only:	5A at 240 V
DC Only:	0.2 A at 110V



Approximate Switch Points at Various Pipe Diameters

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

Note:

The approximate 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 very significant deviations from the flow ranges in this data sheet.

For correct operation of the KAL-K thermal flow switch, the tip of the flow sensor must be located sufficiently into the flow stream of the process to sense the liquid flow. Therefore it is very important to consider the sensor's insertion depth and how it is installed in the process pipe. If the sensor tip is not adequately immersed into the flow stream, the sensor will not measure flow rate correctly, or worst case will not detect any flow at all. Ideally for correct detection, we recommend the sensor tip be located at a distance from the pipe wall equal to 20% of the internal cross-section diameter of the pipe. Note that NPT fittings are tapered, and consideration should be given to the fact that when installed together, NPT mating fittings will not fully thread down to the bottom of the female connection.

KAL-K Order Details (Example: KAL-4315C)

Fitting	Model (304 SS)	Model (316-Ti SS)	Model (316 L SS)	Options
1/2" NPT	KAL-4215	KAL-4315	-	..C = 1/2" NPT Conduit Electrical Connection
3/4" NPT	-	KAL-4320	-	..EP = Extended Probe*
1-1/2" Tri-Clamp®	-	-	KAL-4340S	..F = Fast Response Time (24 V _{DC} Units Only) ..K = N/C Switch Logic ..M12 = Plug Connector w/6 ft Cable for 24 V _{DC} Units ..P03R = 110 V _{AC} Version with Dry Contact

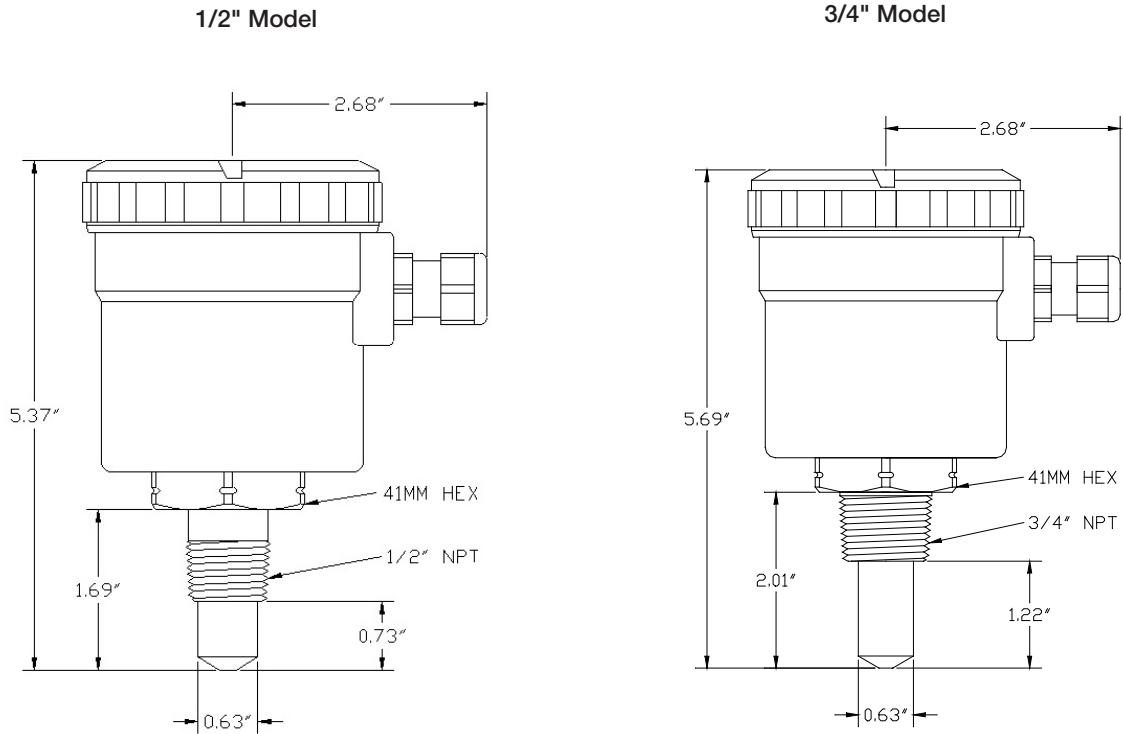
*specify probe length on your order (NPT models only)



Thermal Flow Switch Model KAL-K

Dimensions

Standard Version



Sanitary Version

