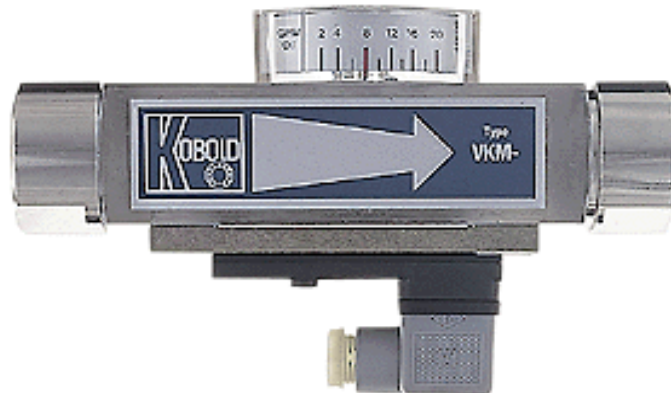


KOBOLD VKM FLOWMETER/SWITCH

User Instructions



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KOBOLD VKM FLOWMETER User Instructions

CAUTION: For safety reasons, please read the cautionary information located at the end of the manual, before attempting installation.

1.0 General

The KOBOLD VKM is a viscosity compensated flowmeter intended for use in applications where changing viscosities of the measured media make flow determination difficult.

The VKM offers viscosity independent behavior for fluids in the range of 1-540 cSt (full compensation). Ordinary float-type flow meters experience measurement errors of up to 1000% with this type of a viscosity change in the medium.

At a glance, the special features of the VKM are:

- Viscosity compensated for $\Delta v = 540$ cSt (mm²/s) enabling use of same scale - no need for recalibration.
- Density compensated for $\Delta p = 0.5$ kg/l, enabling use of same scale - no recalibration needed.
- Can be installed in any position.
- Can accurately measure flow of a wide range of media without recalibration.
- Compact.
- A large number of flow set points available (3 reed contacts and/or 5 electronic contacts).
- Hermetic separation between media and indicator/ electronics.
- Suitable for dark and turgid liquids.
- Easy installation.
- Reliable.

2.0 SpecificationsTable 2.1: Material Composition

| | Material: Brass | Material: Stainless Steel |
|-------------|------------------------|----------------------------------|
| Housing | Nickel-plated Brass | 304 Stainless Steel |
| Spring | 301 Stainless Steel | 301 Stainless Steel |
| Orifice | 301 Stainless Steel | 301 Stainless Steel |
| Magnet | Ceramic Oxide | Ceramic Oxide |
| Connections | Nickel-plated Brass | 304 Stainless Steel |
| Float | Brass | 304 Stainless Steel |
| O-rings | NBR | FKM |

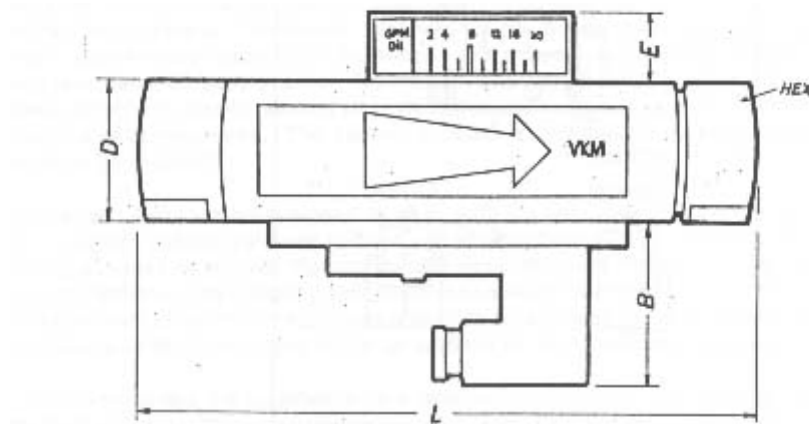
Table 2.2: Operational Limits

Viscosity Range: $\nu = 1 - 540 \text{ cSt (mm}^2/\text{s)}$

Maximum Medium Temperature: 240° F

Maximum Internal Pressure: Brass 3600 PSIG
SS 5000 PSIG

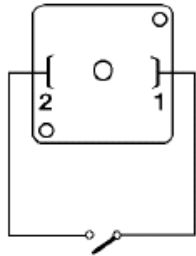
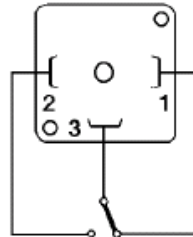
Diagram 2.3: Dimensions



| | HEX (in) | NPT | L (in) | B (in) | D (in) | E (in) | Weight (lb.) |
|---------|--------------|------------|--------------|--------|--------|--------|---------------|
| VKM-.02 | 1.42 | 1/4 | 6.38 | 2.09 | 1.57 | 0.87 | 1.55 |
| VKM-.03 | 1.42 | 1/4 (1/2)* | 6.38 | 2.09 | 1.57 | 0.87 | 1.55 (1.77)** |
| VKM-.04 | 1.42 | 1/4 (1/2)* | 6.38 | 2.09 | 1.57 | 0.87 | 1.55 (1.77)** |
| VKM-.05 | 1.42 | 1/4 (1/2)* | 6.38 | 2.09 | 1.57 | 0.87 | 1.55 (1.77)** |
| VKM-.06 | 1.42 | 1/4 (1/2)* | 6.38 | 2.09 | 1.57 | 0.87 | 1.55 (1.77)** |
| VKM-.07 | 1.42 | 1/2 (3/4)* | 6.38 (7.34)* | 2.09 | 1.57 | 0.87 | 1.77 |
| VKM-.08 | 1.42 | 1/2 (3/4)* | 6.38 (7.34)* | 2.09 | 1.57 | 0.87 | 1.77 |
| VKM-.09 | 1.42 (1.61)* | 3/4 (1)* | 6.38 (7.34)* | 2.09 | 1.57 | 0.87 | 1.77 (2.0)** |
| VKM-.10 | 1.42 (1.61)* | 3/4 (1)* | 6.38 (7.34)* | 2.09 | 1.57 | 0.87 | 1.77 (2.0)** |
| VKM-.11 | 1.42 (1.61)* | 3/4 (1)* | 6.38 (7.34)* | 2.09 | 1.57 | 0.87 | 1.77 (2.0)** |
| VKM-.12 | 1.61 | 1 | 7.34 | 2.09 | 1.57 | 0.87 | 2.0 |

* Larger fitting size listed in parenthesis is optional.

** Weight in parenthesis is for the VKM series with optional larger fitting size.

Diagram 2.4: Wiring of Reed Switch**N/O Contact****SPDT Contact**Table 2.5: Electrical Data and Operational Limits

| | |
|-----------------------------|--------------------------------------|
| Maximum Voltage: | 240 VAC |
| Maximum Current: | N/O: 1.5 A SPDT: 0.8 A |
| Maximum Power Dissipation: | N/O: 50 VA SPDT: 30 VA |
| Environmental Protection: | IP 65 (IEC 259) (Equal to NEMA 4) |
| UL recognized, CSA approved | |

3.0 Principle of Operation

The KOBOLD VKM flowmeter has a spring-loaded float which slides within a cylindrical measuring tube. Our patented process for achieving viscosity compensation hinges on the use of the nonlinear behavior of the float spring in combination with a unique orifice integral to the float itself. A large amount of medium density compensation is provided simultaneously.

Should flow monitoring be desired, limit switches may be added to the device easily. Permanent magnets on the float actuate an electrically isolated, sealed contact (reed switch) mounted on the outside of the instrument housing. This arrangement guarantees hermetic separation of the medium and the electrical system. The contact is embedded within a plastic housing to prevent damage to the contacts by mechanical action or aggressive atmospheres. The contact housing is mounted in slides to enable set point changes to be effected.

The flowing media raises the float against the spring force. When the magnetic field reaches the contact reeds of the reed switch, the contact actuates. As the flow increases, the float rises until it reaches its stop. This prevents the float from going beyond the contact range of the magnetic switch, i.e., the contact remains activated. The result is bistable switching without a latching relay is achieved.

The magnetic field may be used to couple to an external (i.e., hermetically separated) indicator. This configuration provides clear indication, even with dark media.

The magnetic field and the indicator are so designed that response to sudden surges in flow is almost immediate.

4.0 Installation Instructions

CAUTION: For safety reasons, please read the cautionary information located at the end of the manual, before attempting installation.

4.1 - Mounting

1. The VKM may be mounted in any orientation without effecting accuracy.
2. The medium must flow through the instrument from inlet to outlet. The inlet fitting can be identified as the fitting where the float rests in a no flow condition. Additionally, the flow direction arrow on the meter body points from inlet to outlet.
3. The medium must not contain any solids or contaminants prone to precipitate out of solution and deposition on the instrument's inner walls. This would

prevent proper operation of the device. Unclean media should be filtered upstream of the VKM. KOBOLD offers a magnetic/membrane filter for such purposes (Type MFR).

4. Do not install the meter on large masses of ferritic materials or in areas where strong electric fields are present, as this will hamper proper operation of the reed contact.

4.2 - Adjusting the Set point for Increasing Flow

The set point may be adjusted as follows:

1. Loosen the hold-down screws on the reed contact housing.
2. Slide the contact upwards along its rail until it reaches its stops.
3. Open the medium feed line and set flow to desired volume.
4. Slide the reed contact downwards until the contact actuates.
5. Tighten the hold-down screws.

4.3 - Adjusting the Set point for Decreasing Flow

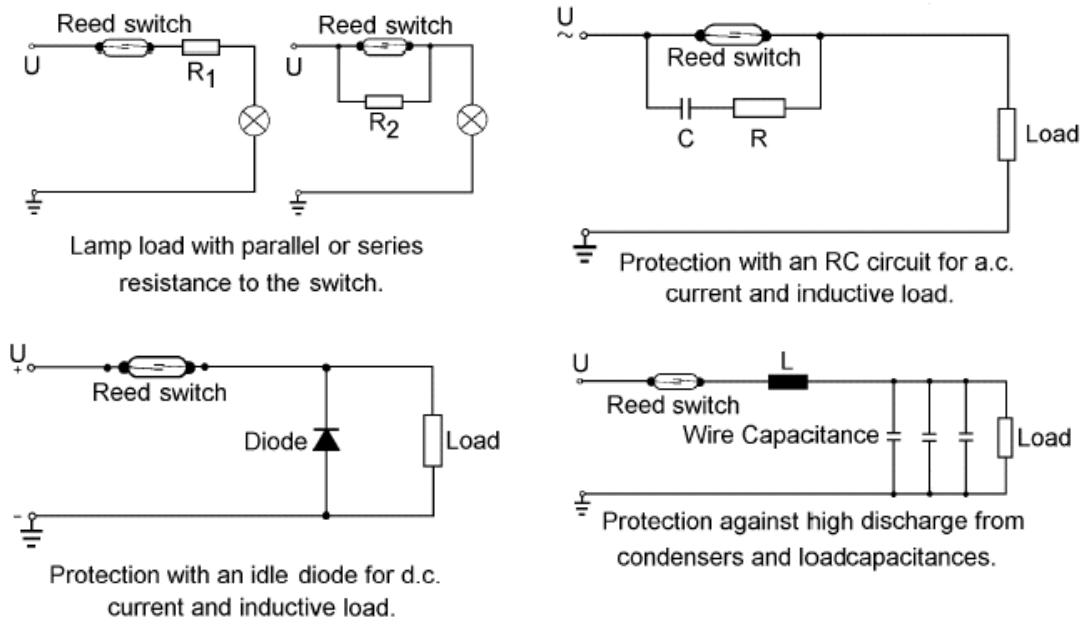
Adjust the set point as follows:

1. Loosen the hold-down screws on the reed contact housing.
2. Slide the contact downwards (toward inlet) along the rail until it reaches its stops. The reed contact will be actuated at this point.
3. Open the feed line and introduce flow until the reed contact de actuates, then lower the flow value to the desired minimum.
4. Slide the contact upwards (toward outlet) until the reed contact actuates again.
5. Tighten the hold-screws.

4.4 - Contact Protection

Maximum values of current and voltage must not be exceeded on the reed switch. When driving inductive or capacitive loads, we recommend protecting the contact as diagrammed below. If continuous load values exceed contact rating, we recommend the use of an isolation relay. KOBOLD provides a line of relays for such instances.

Diagram 2.6: Contact Protection



5.0 Arrival of Damaged Equipment

Your instrument was inspected prior to shipment and found to be defect-free. If damage is visible on the unit, we advise that you carefully inspect the packing in which it was delivered. If damage is visible, notify your local carrier at once, since the carrier is liable for a replacement under these circumstances. If your claim is refused, please contact KOBOLD Instruments for further advisement.

6.0 Need help with your VKM?

Call one of our friendly engineers at 412-788-2830.

Caution

PLEASE READ THE FOLLOWING GENERAL FLOW METER/ MONITOR WARNINGS BEFORE ATTEMPTING INSTALLATION OF YOUR NEW DEVICE. FAILURE TO HEED THE INFORMATION HEREIN MAY RESULT IN EQUIPMENT FAILURE AND POSSIBLE SUBSEQUENT PERSONAL INJURY.

- KOBOLD manufactures a wide range of process sensors and technologies. While each of these technologies are designed to operate in a wide variety of applications, it is the user's responsibility to select a technology that is appropriate for the application, to install it properly, to perform tests of the installed system, and to maintain all components. The failure to do so could result in property damage or serious injury.
- Inspect instrument for damage upon arrival. Cracked, fractured, bent or otherwise damaged instruments must not be put into use, since the device is weakened to an unknown extent. (The operations and installation guide will explain how to make a claim on damaged instruments.)
- Make sure that the model which you have selected is chemically compatible with the application liquids. While the meter is liquid and spray resistant when installed properly, it is not designed to be immersed.
- Under NO circumstances must the maximum tolerances (temperature and pressure) be exceeded.
- The maximum tolerances of the device have been determined using water, air and/or oil. If using other media, especially corrosive ones, it is critically important that the user determine chemical compatibility with our instruments. A list, detailing material composition of our instruments, is available from KOBOLD Instruments Inc. upon request. KOBOLD Instruments Inc. cannot accept responsibility for failure and consequences resulting from use of media other than water, mineral oil, air, and nitrogen.
- Install the device in a fully supported position within your flow system. This avoids excessive stresses which may damage the instrument. In particular:
 - a. Ensure that the plumbing leading to and from the instrument is fully supported and that the instrument does not perform the physical function of a joint.
 - b. When calculating stress on the device caused by plumbing, the weight of the medium in the pipes must be considered as well.
 - c. Misaligned runs of rigid piping can cause large stresses when connected to the instrument. Do not connect in such a fashion.
- During installation, avoid stresses on the instrument by following guidelines given below:
 - a. When connecting fittings, hold the instrument fittings rigid with a correctly sized wrench. Do not install by twisting the instrument into the pipe fittings.
 - b. Do NOT install by holding the device housing to provide counter-torque to the pipe fitting.

- c. Use an appropriate amount of PTFE tape on male threads of fitting. This reduces the twisting stresses produced by tightening the fittings into each other.
- d. Do not use pliers or wrenches on the housing, as this may damage it.
- e. Do not overtighten, as this may fracture the fittings.
- During operation there are a number of situations to avoid:
 - a. The sudden cessation of fluid flow causes what is typically referred to as “water hammer”. Most people are familiar with this phenomenon from their home experience - it is the cause behind the loud clank of water pipes which occurs when faucets are turned off too suddenly. The cause behind this “water hammer” is quite easy to visualize. Water is fairly massive. The amount of water in long runs of pipe is quite substantial. When the faucets are turned off suddenly, especially from a full on condition, the water has considerable momentum and does not want to stop flowing. The situation is similar to stopping a car by running into a wall, rather than by applying brakes. Both are sudden rather than gradual. The damage to the wall can be substantial (not to mention the car). The “water hammer” causes surges in fluid pressure which could cause the measurement instrument's pressure limit to be exceeded, resulting in failure and possible personal injury.
 - b. Fluid surges, as well as the water hammer, can be particularly damaging to empty flowmeters since there is no back pressure in the device. The damage is caused, once again, by momentary excess pressure. To avoid these surges, fluid lines should remain full (if possible) and water flow should be introduced to the device slowly.
 - c. If the instrument is isolated with inlet and outlet valves, the flowmeter must be completely drained when said valves are both closed. Failure to do so could result in damage to the device caused by thermal expansion of fluid.
 - d. Freezing of water in the instrument must be avoided since the resultant expansion will damage the flowmeter and make it unsafe for use.
- Design a fail-safe system
 - a. Design a fail-safe system that accommodates the possibility of switch or power failure. In critical applications, KOBOLD recommends the use of redundant backup systems and alarms in addition to the primary system.