Viscosity-Compensated Flow Meters and Switches

for Viscous Liquids

KOBOLD

measuring • monitoring • analyzing

VKM

- ±5% Full Scale Accuracy
- Viscosity Compensation up to Δv=540 cSt
- Density Compensation up to Δp=30 lb/ft3
- Universal Mounting
- Direct Reading Scales for Oil
- Max. Pressure 3600 PSI Brass 5000 PSI Stainless Steel
- Housing Materials in Brass or Stainless Steel
- 4...20 mA Output and/or Digital Display Options

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Description

The VKM uses a spring-loaded float that travels within a cylindrical measuring tube. An integral orifice in the float enables it to compensate for viscosity and density changes — even at very low flow rates. A magnet embedded in the float is used to couple it to a side mounted flow scale and trigger optional switches. The bistable reed switches, if selected, are mounted outside the flow path, so the electrical contacts never come into contact with the fluid. As flow rises, the float moves up until the magnet reaches the switch and closes the contact; it then rises to a mechanical stop that keeps it within the switch's magnetic range, holding the contact closed for reliable switching. The switch itself is housed in a height-adjustable plastic enclosure that protects it from mechanical damage and harsh environments.

Viscosity Compensation

Across a viscosity range of 1 to 540 mm²/s, the VKM holds its accuracy to within ±5% — even at flows as low as 0.05 GPM. By comparison, conventional float-type flow meters can be off by as much as 2,500% under the same conditions, and other "viscosity-compensated" spring-loaded float meters can still show errors over 500%. This level of compensation means the VKM works for both water and highly viscous oil without needing a different scale or recalibration — a real advantage in oil lubrication systems, where temperature changes impact the oil's viscosity.

Applications

- Lubrication Circuits
- Hydraulics
- Machine Tools

Specifications

Flow Media:	Clean Mineral Oil, Water and other Compatible Liquids
Measuring Principle:	Float with Orifice, Spring-loaded
Mounting:	Universal, without Recalibration
Wetted Materials:	
Housing:	VKM-x1..: Nickel-plated Brass VKM-x2..: 304 SS
Fittings:	VKM-x1..: Nickel-plated Brass VKM-x2..: 304 SS
Float:	VKM-x1..: Nickel-plated Brass VKM-x2..: 304 SS
Orifice:	301 SS
Spring:	301 SS
Magnet:	Oxide Ceramic
Seals:	VKM-x1..: NBR VKM-x2..: FKM
Magnetic Pointer	
Indicator:	Nickel-plated Brass, Polycarbonate
Ingress Protection:	IP54
Accuracy:	±5% Full Scale (Viscosity of 1 cSt)
Viscosity Range:	1...540 cSt
Viscosity-Compensated:	Up to Δv=540 cSt with Same Scale, ±5% Additional Variation
Density-Compensated:	Up to Δp=30 lb/ft3 with Same Scale, ±5% Additional Variation
Max. Temperature:	212 °F (176 °F for VKM-8xxx)
Max. Pressure:	VKM-x1..: 3600 PSIG VKM-x2..: 5000 PSIG

Model VKM-1..., VKM-3...
Contacts

Electrical Connection:	Valve Connector DIN EN 175301-803
Switch Housing:	Plastic
Ingress Protection:	IP65
Reed Contact:	Standard: N/O, Optional: SPDT Max. 230 V_{DC} / 0.26 A / 60 W, 60 V_{DC} / 1 A / 60 W, Max. 240 V_{AC} / 0.42 A / 100 W, 100 V_{AC} / 1A / 100W cCSAus Approved

Model VKM-8...
Compact Electronics

Display:	3 digit LED
Power Requirement:	24 V_{DC} ±20%
Analog Output:	4-20 mA, 3-wire, max. 500 Ω, linear
Switching Output:	Semiconductor PNP or NPN
Electrical Connection:	M-12 Micro-DC plug, 5-Pin
Hysteresis:	Approx. 3.5 mm Float Movement
Max Temperature:	176 °F
Ingress Protection:	IP65

No responsibility taken for errors;
subject to change without prior notice.

Order Details

Viscosity Compensated Flow Switch: VKM-1... (Example: **VKM-110BGC0N080B**)

Measuring Range Oil		Pressure loss Δ P [PSI] at rated flow*		Brass	Stainless Steel	Flow Scale Units	Contact	Connection	Option Special Connection	Flow direction
GPM	LPM	min.	max.							
0.05...0.14	0.2...0.5	0.44	11.6	**VKM-110B...**	**VKM-120B...**	**without** = LPM **G** = GPM	...**C0**...= 1 N/O contact (cCSAus) ...**D0**...= 1 changeover contact (cCSAus) ...**CC**...= 2 N/O contacts (cCSAus) ...**DD**...= 2 changeover contacts (cCSAus)	..**N08** = ¼ NPT ..**R08** = G ¼	**0** = without **B** = outlet female thread inlet BVB manifold	**B** = from bottom **T** = from top **L** = from left **R** = from right
0.03...0.4	0.1...1.5	0.73	16.0	**VKM-110C...**	**VKM-120C...**			..**N08** = ¼ NPT ..**N15** = ½ NPT ..**R08** = G ¼ ..**R15** = G ½		
0.05...0.65	0.2...2.5	1.0	17.4	**VKM-110D...**	**VKM-120D...**					
0.08...1.3	0.3...5	0.73	13.1	**VKM-1105...**	**VKM-1205...**					
0.4...2.6	1.5...10	0.73	11.6	**VKM-1106...**	**VKM-1206...**					
0.5...4	2...15	1.2	16.0	**VKM-110G...**	**VKM-120G...**			..**N15** = ½ NPT ..**N20** = ¾ NPT ..**R15** = G ½ ..**R20** = G ¾		
0.5...5.5	2...20	0.73	16.0	**VKM-1108...**	**VKM-1208...**					
1...11	4...40	1.5	5.8	**VKM-1109...**	**VKM-1209...**			..**N20** = ¾ NPT ..**N25** = 1 NPT ..**R20** = G ¾ ..**R25** = G 1		
1...16	5...60	2.2	16.0	**VKM-11A0...**	**VKM-12A0...**					
1.9...18.5	7...70	2.2	16.0	**VKM-1111...**	**VKM-1211...**					
2.1...21	8...80	2.2	16.0	**VKM-1112...**	**VKM-1212...**			..**N25** = 1 NPT ..**R25** = G 1		

* Pressure loss refers to water

VKM-1...
Flow Switch

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Order Details

Viscosity Compensated Flow Meter: VKM-2... (Example: **VKM-210BG00N080B**)

Measuring Range Oil		Pressure loss Δ P [bar] at rated flow*		Brass	Stainless Steel	Flow Scale Units	Contact	Connection	Option Special Connection	Flow direction
GPM	LPM	min.	max.							
0.05...0.14	0.2...0.5	0.44	11.6	**VKM-210B...**	**VKM-220B...**	**without** = LPM **G** = GPM	...**00**...= without contact	..**N08** = ¼ NPT ..**R08** = G¼	**0** = without **B** = outlet female thread inlet BVB manifold	**B** = from bottom **T** = from top **L** = from left **R** = from right
0.03...0.4	0.1...1.5	0.73	16.0	**VKM-210C...**	**VKM-220C...**					
0.05...0.65	0.2...2.5	1.0	17.4	**VKM-210D...**	**VKM-220D...**			..**N08** = ¼ NPT ..**N15** = ½ NPT ..**R08** = G¼ ..**R15** = G½		
0.08...1.3	0.3...5	0.73	13.1	**VKM-2105...**	**VKM-2205...**					
0.4...2.6	1.5...10	0,.73	11.6	**VKM-2106...**	**VKM-2206...**					
0.5...4	2...15	1.2	16.0	**VKM-210G...**	**VKM-220G...**			..**N15** = ½ NPT ..**N20** = ¾ NPT ..**R15** = G½ ..**R20** = G¾		
0.5...5.5	2...20	0.73	16.0	**VKM-2108...**	**VKM-2208...**					
1...11	4...40	1.5	5.8	**VKM-2109...**	**VKM-2209...**			..**N20** = ¾ NPT ..**N25** = 1 NPT ..**R20** = G¾ ..**R25** = G1		
1...16	5...60	2.2	16.0	**VKM-21A0...**	**VKM-22A0...**					
1.9...18.5	7...70	2.2	16.0	**VKM-2111...**	**VKM-2211...**					
2.1...21	8...80	2.2	16.0	**VKM-2112...**	**VKM-2212...**			..**N25** = 1 NPT ..**R25** = G1		

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VKM-2...
Flow Meter with Scale

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Order Details

Viscosity Compensated Flow Meter with Switch: VKM-3... (Example: **VKM-310BGC0N080B**)

Measuring Range Oil		Pressure loss Δ P [PSI] at rated flow*		Brass	Stainless Steel	Flow Scale Units	Contact	Connection	Option Special Connection	Flow direction
GPM	LPM	min.	max.							
0.05...0.14	0.2...0.5	0.44	11.6	**VKM-310B...**	**VKM-320B...**	**without** = LPM **G** = GPM	...**C0**...= 1 N/O contact (cCSAus) ...**D0**...= 1 changeover contact (cCSAus) ...**CC**...= 2 N/O contacts (cCSAus) ...**DD**...= 2 changeover contacts (cCSAus)	..**N08** = ¼ NPT ..**R08** = G ¼	**0** = without **B** = outlet female thread inlet BVB manifold	**B** = from bottom **T** = from top **L** = from left **R** = from right
0.03...0.4	0.1...1.5	0.73	16.0	**VKM-310C...**	**VKM-320C...**			..**N08** = ¼ NPT ..**N15** = ½ NPT ..**R08** = G ¼ ..**R15** = G ½		
0.05...0.65	0.2...2.5	1.0	17.4	**VKM-310D...**	**VKM-320D...**					
0.08...1.3	0.3...5	0.73	13.1	**VKM-3105...**	**VKM-3205...**					
0.4...2.6	1.5...10	0.73	11.6	**VKM-3106...**	**VKM-3206...**					
0.5...4	2...15	1.2	16.0	**VKM-310G...**	**VKM-320G...**			..**N15** = ½ NPT ..**N20** = ¾ NPT ..**R15** = G ½ ..**R20** = G ¾		
0.5...5.5	2...20	0.73	16.0	**VKM-3108...**	**VKM-3208...**					
1...11	4...40	1.5	5.8	**VKM-3109...**	**VKM-3209...**			..**N20** = ¾ NPT ..**N25** = 1 NPT ..**R20** = G ¾ ..**R25** = G 1		
1...16	5...60	2.2	16.0	**VKM-31A0...**	**VKM-32A0...**					
1.9...18.5	7...70	2.2	16.0	**VKM-3111...**	**VKM-3211...**					
2.1...21	8...80	2.2	16.0	**VKM-3112...**	**VKM-3212...**			..**N25** = 1 NPT ..**R25** = G 1		

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VKM-3...
Flow Meter with Scale and Switch

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Order Details

Viscosity Compensated Flow Meter: VKM-8... (Example: **VKM-810BGC4PN08B**)

Measuring Range Oil		Pressure loss Δ P [bar] at rated flow*		Brass	Stainless Steel	Flow Scale Units	Output	Connection	Flow direction
GPM	LPM	min.	max.						
0.05...0.1	0.2...0.4	0.44	11.6	**VKM-810B...**	**VKM-820B...**	**without** = LPM **...G..** = GPM	**...C0R..** = compact electronic 24 V_{DC}, 2x PNP **...C0M..** = compact electronic 24 V_{DC}, 2x NPN **...C4P..** = compact electronic 24 V_{DC}, 4-20 mA, 1x PNP **...C4N..** = compact electronic 24 V_{DC}, 4-20 mA, 1x NPN	**..N08** = ¼ NPT **..R08** = G¼	**B** = from bottom **T** = from top **L** = from left **R** = from right
0.03...0.4	0.1...1.5	0.73	16.0	**VKM-810C...**	**VKM-820C...**				
0.05...0.63	0.2...2.4	1.0	17.4	**VKM-810D...**	**VKM-820D...**			**..N08** = ¼ NPT **..N15** = ½ NPT **..R08** = G¼ **..R15** = G½	
0.14...1.05	0.5...4	0.73	13.1	**VKM-8105...**	**VKM-8205...**				
0.4...2.37	1.5...9	0.73	11.6	**VKM-810F...**	**VKM-820F...**				
0.53...4	2...15	1.2	16.0	**VKM-810G...**	**VKM-820G...**			**..N15** = ½ NPT **..N20** = ¾ NPT **..R15** = G½ **..R20** = G¾	
0.53...5.28	2...20	0.73	16.0	**VKM-810H...**	**VKM-820H...**				
1.06...10	4...38	1.5	5.8	**VKM-810J...**	**VKM-820J...**			**..N20** = ¾ NPT **..N25** = 1 NPT **..R20** = G¾ **..R25** = G1	
1.32...14	5...53	2.2	16.0	**VKM-81A0...**	**VKM-82A0...**				
1.85...17.4	7...66	2.2	16.0	**VKM-81AA...**	**VKM-82AA...**				
2.12...21	8...80	2.2	16.0	**VKM-81AB...**	**VKM-82AB...**			**..N25** = 1 NPT **..R25** = G1	

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VKM-8...
Flow Meter with Compact Electronics

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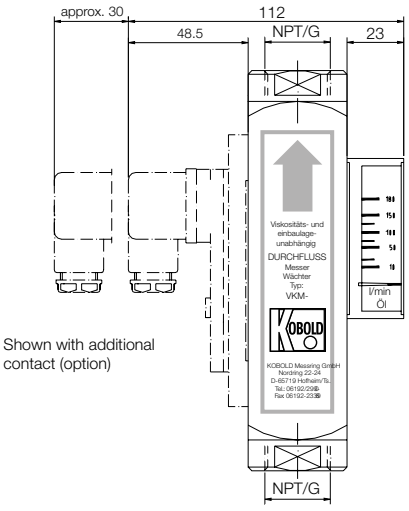
Dimensions

Model	Square (inch)	Length L Connection (inch)	AF Connection (mm)	Weight* (lb)
VKM-..0B	1.58 x 1.58	6.38	36	3.75
VKM-..0C	1.58 x 1.58	6.38	36	3.75
VKM-..0D	1.58 x 1.58	6.38	36	3.75
VKM-..05	1.58 x 1.58	6.38	36	3.75
VKM-..06/0F	1.58 x 1.58	6.38	36	3.75
VKM-..0G	1.58 x 1.58	6.38	36	3.75
VKM-..08/0H	1.58 x 1.58	6.38	36	3.75
VKM-..09/0J	1.58 x 1.58	6.38 (7.35)**	36 (41)**	3.75
VKM-..A0	1.58 x 1.58	6.38 (7.35)**	36 (41)**	3.75
VKM-..11/AA	1.58 x 1.58	6.38 (7.35)**	36 (41)**	3.75
VKM-..12/AB	1.58 x 1.58	7.35	41	3.75

* Weight valid for: VKM-1.., VKM-2...
for model VKM-3... add 0.22 lb
for model VKM-8...add 0.44 lb

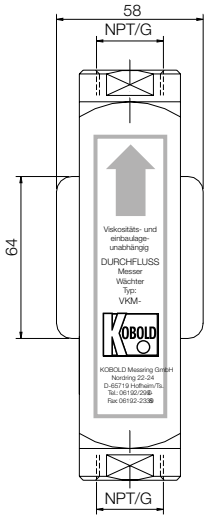
** with 1" NPT or G1

VKM-1.., VKM-3..,

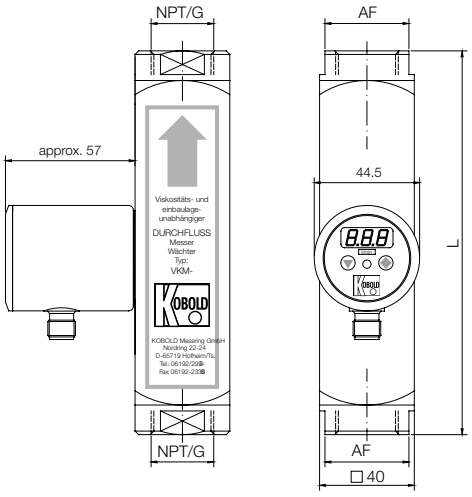


Shown with additional contact (option)

VKM-2...



VKM-8...



Dimensions in mm

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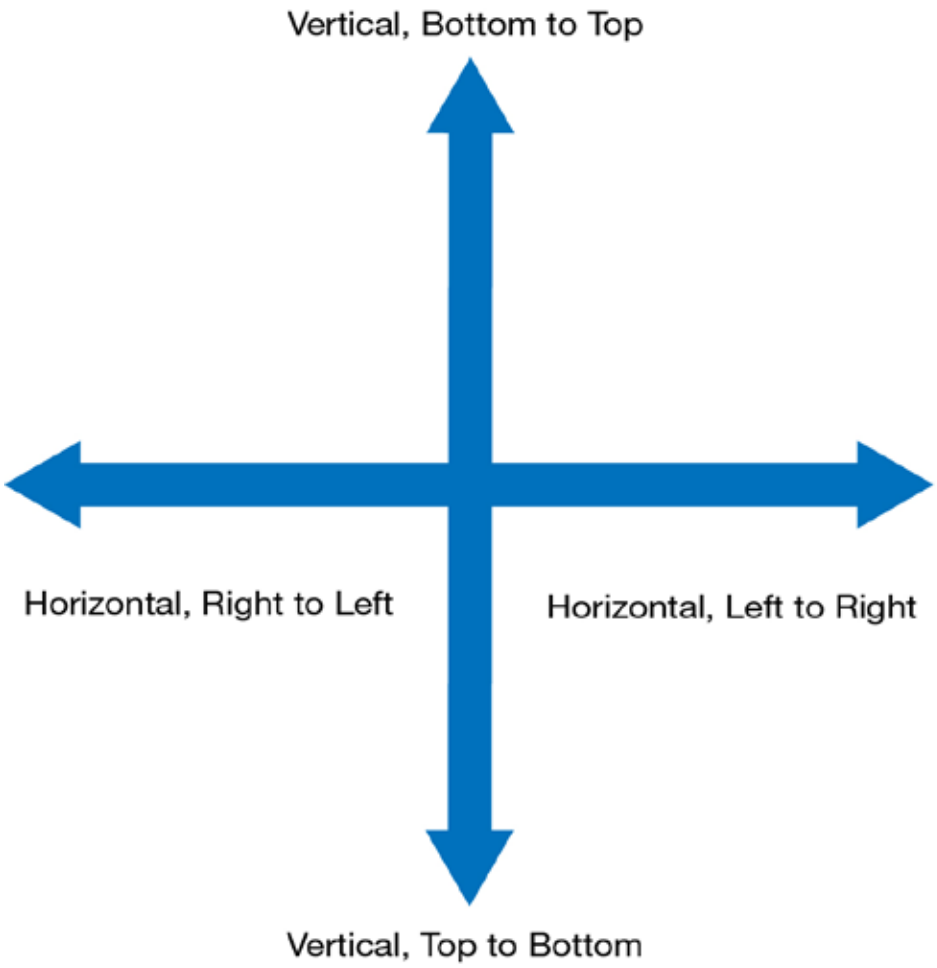
Flow Direction Diagram



Flow is in the direction of the arrow. Orientation is indicated as directly facing the flowmeter with flow direction aligned with the diagram.

Example: Vertical flow, bottom to top corresponds to Option "B"
Vertical flow, top to bottom corresponds to Option "T"
Horizontal flow, left to right corresponds to Option "L"
Horizontal flow, right to left corresponds to Option "R"

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