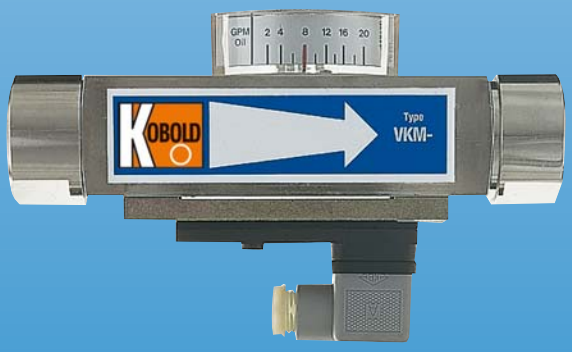
Zertifiziertes QM-System
DIN EN ISO 9001
Zertifikat-Nr. 01017

Viscosity-Compensated Flow Meters and Switches

for Viscous Liquids

measuring • monitoring • analysing

- Measuring range:
  oil 0.01 - 0.07 to 8 - 80 L/min
- Basic accuracy: ±4 % f. s.
- p_{max} 350 bar,
  t_{max} 100 °C
- Viscosity range:
  1 ... 540 mm²/s
- Connection:
  G ¼ ... G 1 female
  ¼ ... 1 NPT female
- Material:
  brass, stainless steel



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KOBOLD Messring GmbH
Nordring 22-24
D-65719 Hofheim/Ts.
☎ +49(0)6192 299-0
Fax +49(0)6192 23398
E-Mail: info.de@kobold.com
Internet: www.kobold.com

Model:
VKM

Description

The KOBOLD flow meters and switches model VKM have a spring-loaded float, which slides within a cylindrical measuring tube and has an integral orifice which is believed to be unique.

This and other design features means that it has for the first time become possible to create a flow meter and switch which fully compensates for viscosity and to a large extent for density even with very low flows. The float of these patented devices contains a permanent magnet which actuates a potential free bistable reed contact mounted outside the flow thus ensuring her-metic separation between the medium and the electrical contact system. The contact is embedded within a height-adjustable plastic housing to prevent damage to the contacts by mechanical action or aggressive atmospheres.

As the medium enters the instrument the float rises. Once its magnetic field reaches the contact tips of the reed switch the contact closes. As the flow increases the float rises further until it reaches its stop. This prevents the float from going beyond the contact range of the magnetic operating tube, that is, the contact remains closed thus ensuring bistable switching.

Viscosity compensation

If the viscosity changes from 1 mm²/s to 540 mm²/s the indicated value is still accurate within ±5%, even with very low flows, for example, 0.1 L/min.

Comparable devices, for instance conventional float-type flow meters, are, if the viscosity changes to such an extent, subject to indicating errors up to 2500%, especially with comparable low flows. Other instruments with spring-loaded floats, which are allegedly viscosity compensated, still produce indicating errors of more than 500% with the same change in viscosity and a flow of 0.1 L/min.

Thanks to the virtually perfect viscosity compensation and good density compensation the flow meters and switches of the latest generation are suitable both for water and highly viscous oil, without having to change the scale and without readjustment. This constitutes an extremely important advance especially in the critical area of oil lubrication circuits where measurement and switching are necessary at changing media temperatures.

Applications

- Lubrication circuits
- Paper-making machines
- Machine tools
- Oil lubrication circuits
- Hydraulics
- Extruding plant
- Printing presses

Technical Details

Body:	VKM-x1...: brass, nickel-plated VKM-x2...: stainless steel 1.4301
Screwed fitting:	VKM-x1...: brass, nickel-plated VKM-x2...: stainless steel 1.4310
Float:	VKM-x1...: brass, nickel-plated VKM-x2...: stainless steel 1.4310
Orifice:	stainless steel 1.4310
Spring:	stainless steel 1.4310
Magnet:	oxide ceramics
Seals:	VKM-x1...: NBR VKM-x2...: FPM
Max. temperature:	+100 °C
Max. pressure:	VKM-x1...: 250 bar VKM-x2...: 350 bar
Installation position:	any
Basic accuracy:	±4% f. s. (with a viscosity of 105 mm²/s)
Measuring error due to change in viscosity:	for changes in viscosity within 1 - 540 mm²/s the additional deviation is ±5% f. s. maximum
Viscosity range:	1 - 540 mm²/s

Contacts:
Optional with VKM-1..., VKM-3...

Electrical connection:	2 m cable (VKM-...F..) for all other types: connector DIN 43 650
Electrical switching values:	N/O contact (CSA) max. 240 V_{AC} / 100 VA / 1.5 A changeover contact (CSA) max. 240 V_{AC} / 60 VA / 1 A N/O contact (UL) 250 V_{AC} - 0.4 A / 200 V_{DC} - 0.25 A 50 V_{DC} -1.0 A changeover contact (UL) max. 250 V_{DC} / 0.136 A - 30 V_{DC} / 1 A N/O contact Ex II 2G EEx m II T6 / 2D IP67 T80 °C max. 250 V_{DC} / 100 VA / 1.5 A (I_K = 5 A)
Ex range:	ATEX zone 1 as “simple operator” or with N/O contact Ex
Protection:	IP 65 (electrical contact) IP 54 (side indicator)

Order Details

Viscosity-compensated flow switches model: VKM-1...

Measuring range L/min oil	Pressure loss Δ P [bar] at rated flow* min.	max.	Brass	Stainless steel	Contact	Connection		Option special connect.	Flow direction
0.01...0.07	0.02	1.0	**VKM-1101...**	**VKM-1201...**	..R0.. = 1 N/O contact ..U0.. = 1 changeover contact ..F0.. = 1 Ex N/O contact ..C0.. = 1 N/O contact (UL) ..D0.. = 1 changeover contact (UL) ..RR.. = 2 N/O contact ..UU.. = 2 changeover contact ..CC.. = 2 N/O contact (UL) ..DD.. = 2 changeover contact (UL)	**..R08** = G ¼	**..N08** = ¼ NPT	**0** = without option **B** = outlet female thread inlet BVB manifold	**B** = from bottom **T** = from top **L** = from left **R** = from right
0.1...0.45	0.03	0.8	**VKM-1102...**	**VKM-1202...**					
0.2...1.2	0.05	1.1	**VKM-1103...**	**VKM-1203...**		**..R08** = G ¼ **..R15** = G ½	**..N08** = ¼ NPT **..N15** = ½ NPT		
0.5...2	0.07	1.2	**VKM-1104...**	**VKM-1204...**					
0.8...3.4	0.05	0.9	**VKM-1105...**	**VKM-1205...**					
2...9	0.05	0.8	**VKM-1106...**	**VKM-1206...**					
4...14	0.08	1.1	**VKM-1107..**	**VKM-1207...**		**..R15** = G ½ **..R20** = G ¾	**..N15** = ½ NPT **..N20** = ¾ NPT		
5...20	0.05	1.1	**VKM-1108...**	**VKM-1208...**					
4...40	0.1	0.4	**VKM-1109...**	**VKM-1209...**		**..R20** = G ¾ **..R25** = G 1	**..N20** = ¾ NPT **..N25** = 1 NPT		
5...55	0.15	1.1	**VKM-1110...**	**VKM-1210...**					
7...70	0.15	1.1	**VKM-1111...**	**VKM-1211...**					
8...80	0.15	1.1	**VKM-1112...**	**VKM-1212...**		**..R25** = G 1	**..N25** = 1 NPT		

*Pressure loss refers to water

Viscosity-compensated flow meter model: VKM-2...

Measuring range L/min oil	Pressure loss Δ P [bar] at rated flow* min.	max.	Brass	Stainless steel	Contact	Connection		Option special connect.	Flow direction
0.01...0.07	0.02	1.0	**VKM-2101...**	**VKM-2201...**	..00.. = with contact	**..R08** = G ¼	**..N08** = ¼ NPT	**0** = without option **B** = outlet female thread inlet BVB manifold	**B** = from bottom **T** = from top **L** = from left **R** = from right
0.1...0.45	0.03	0.8	**VKM-2102...**	**VKM-2202...**					
0.2...1.2	0.05	1.1	**VKM-2103...**	**VKM-2203...**		**..R08** = G ¼ **..R15** = G ½	**..N08** = ¼ NPT **..N15** = ½ NPT		
0.5...2	0.07	1.2	**VKM-2104...**	**VKM-2204...**					
0.8...3.4	0.05	0.9	**VKM-2105...**	**VKM-2205...**					
2...9	0.05	0.8	**VKM-2106...**	**VKM-2206...**					
4...14	0.08	1.1	**VKM-2107..**	**VKM-2207...**		**..R15** = G ½ **..R20** = G ¾	**..N15** = ½ NPT **..N20** = ¾ NPT		
5...20	0.05	1.1	**VKM-2108...**	**VKM-2208...**					
4...40	0.1	0.4	**VKM-2109...**	**VKM-2209...**		**..R20** = G ¾ **..R25** = G 1	**..N20** = ¾ NPT **..N25** = 1 NPT		
5...55	0.15	1.1	**VKM-2110...**	**VKM-2210...**					
7...70	0.15	1.1	**VKM-2111...**	**VKM-2211...**					
8...80	0.15	1.1	**VKM-2112...**	**VKM-2212...**		**..R25** = G 1	**..N25** = 1 NPT		

*Pressure loss refers to water

Viscosity-compensated flow meters and switches model: VKM-3...

Measuring range L/min oil	Pressure loss Δ P [bar] at rated flow* min.	max.	Brass	Stainless steel	Contact	Connection		Option special connect.	Flow direction
0.01...0.07	0.02	1.0	**VKM-3101...**	**VKM-3201...**	..R0.. = 1 N/O contact ..U0.. = 1 changeover contact ..F0.. = 1 Ex N/O contact ..C0.. = 1 N/O contact (UL) ..D0.. = 1 changeover contact (UL) ..RR.. = 2 N/O contact ..UU.. = 2 changeover contact ..CC.. = 2 N/O contact (UL) ..DD.. = 2 changeover contact (UL)	**..R08** = G ¼	**..N08** = ¼ NPT	**0** = without option **B** = outlet female thread inlet BVB manifold	**B** = from bottom **T** = from top **L** = from left **R** = from right
0.1...0.45	0.03	0.8	**VKM-3102...**	**VKM-3202...**					
0.2...1.2	0.05	1.1	**VKM-3103...**	**VKM-3203...**		**..R08** = G ¼ **..R15** = G ½	**..N08** = ¼ NPT **..N15** = ½ NPT		
0.5...2	0.07	1.2	**VKM-3104...**	**VKM-3204...**					
0.8...3.4	0.05	0.9	**VKM-3105...**	**VKM-3205...**					
2...9	0.05	0.8	**VKM-3106...**	**VKM-3206...**					
4...14	0.08	1.1	**VKM-3107..**	**VKM-3207...**		**..R15** = G ½ **..R20** = G ¾	**..N15** = ½ NPT **..N20** = ¾ NPT		
5...20	0.05	1.1	**VKM-3108...**	**VKM-3208...**					
4...40	0.1	0.4	**VKM-3109...**	**VKM-3209...**		**..R20** = G ¾ **..R25** = G 1	**..N20** = ¾ NPT **..N25** = 1 NPT		
5...55	0.15	1.1	**VKM-3110...**	**VKM-3210...**					
7...70	0.15	1.1	**VKM-3111...**	**VKM-3211...**					
8...80	0.15	1.1	**VKM-3112...**	**VKM-3212...**		**..R25** = G 1	**..N25** = 1 NPT		

*Pressure loss refers to water

Order Details

Viscosity-compensated flow meter with analogue output model: VKM-6...

Measuring range L/min oil approx.	Pressure loss Δ P [bar] at rated flow* min.	max.	Brass	Stainless steel	Output	Connection		Option special connect.	Flow direction
0.01...0.063	0.02	1.0	VKM-6101...	VKM-6201...	...0A.. = 0-20 mA ...4A.. = 4-20 mA ...0V.. = 0-10 V_{DC}	..R08 = G ¼	..N08 = ¼ NPT	0 = without option	B = from bottom T = from top L = from left R = from right
0.1...0.4	0.03	0.8	VKM-6102...	VKM-6202...					
0.2...1.1	0.05	1.1	VKM-6103...	VKM-6203...		..R08 = G ¼ ..R15 = G ½	..N08 = ¼ NPT ..N15 = ½ NPT		
0.5...1.8	0.07	1.2	VKM-6104...	VKM-6204...					
0.8...3.1	0.05	0.9	VKM-6105...	VKM-6205...					
2...8.1	0.05	0.8	VKM-6106...	VKM-6206...					
4...12.6	0.08	1.1	VKM-6107..	VKM-6207...		..R15 = G ½ ..R20 = G ¾	..N15 = ½ NPT ..N20 = ¾ NPT		
5...18	0.05	1.1	VKM-6108...	VKM-6208...					
4...36	0.1	0.4	VKM-6109...	VKM-6209...		..R20 = G ¾ ..R25 = G 1	..N20 = ¾ NPT ..N25 = 1 NPT		
5...50	0.15	1.1	VKM-6110...	VKM-6210...					
7...63	0.15	1.1	VKM-6111...	VKM-6211...					
8...72	0.15	1.1	VKM-6112...	VKM-6212...		..R25 = G 1	..N25 = 1 NPT		

*Pressure loss refers to water

Viscosity-compensated flow meter with evaluating electronics model: VKM-7...

Measuring range L/min oil approx.	Pressure loss Δ P [bar] at rated flow* min.	max.	Brass	Stainless steel	Output	Connection		Flow direction
0.01...0.063	0.02	1.0	VKM-7101...	VKM-7201...	...B00... = bargraph ind. 230 V_{AC} ...B30... = bargraph ind. 24 V_{DC} ...D04... = digital indication 230 V_{AC}, 4-20 mA ...D34... = digital indication 24 V_{DC}, 4-20 mA ...K04... = combination ind. 230 V_{AC}, 4-20 mA ...K34... = combination ind. 24 V_{DC}, 4-20 mA	..R08 = G ¼	..N08 = ¼ NPT	B = from bottom T = from top L = from left R = from right
0.1...0.4	0.03	0.8	VKM-7102...	VKM-7202...				
0.2...1.1	0.05	1.1	VKM-7103...	VKM-7203...		..R08 = G ¼ ..R15 = G ½	..N08 = ¼ NPT ..N15 = ½ NPT	
0.5...1.8	0.07	1.2	VKM-7104...	VKM-7204...				
0.8...3.1	0.05	0.9	VKM-7105...	VKM-7205...				
2...8.1	0.05	0.8	VKM-7106...	VKM-7206...				
4...12.6	0.08	1.1	VKM-7107..	VKM-7207...		..R15 = G ½ ..R20 = G ¾	..N15 = ½ NPT ..N20 = ¾ NPT	
5...18	0.05	1.1	VKM-7108...	VKM-7208...				
4...36	0.1	0.4	VKM-7109...	VKM-7209...		..R20 = G ¾ ..R25 = G 1	..N20 = ¾ NPT ..N25 = 1 NPT	
5...50	0.15	1.1	VKM-7110...	VKM-7210...				
7...63	0.15	1.1	VKM-7111...	VKM-7211...				
8...72	0.15	1.1	VKM-7112...	VKM-7212...		..R25 = G 1	..N25 = 1 NPT	

*Pressure loss refers to water

Viscosity-compensated flow meter with compact electronics model: VKM-8...

Measuring range L/min oil approx.	Pressure loss Δ P [bar] at rated flow* min.	max.	Brass	Stainless steel	Output	Connection		Flow direction
0.01...0.063	0.02	1.0	VKM-8101...	VKM-8201...	...C0R... = compact electr. 24 V_{DC}, 2 x PNP ...C0M.. = compact electr. 24 V_{DC}, 2 x NPN ...C4P... = compact electr. 24 V_{DC}, 4-20 mA, 1 x PNP ...C4N... = compact electr. 24 V_{DC}, 4-20 mA, 1 x NPN	..R08 = G ¼	..N08 = ¼ NPT	B = from bottom T = from top L = from left R = from right
0.1...0.4	0.03	0.8	VKM-8102...	VKM-8202...				
0.2...1.1	0.05	1.1	VKM-8103...	VKM-8203...		..R08 = G ¼ ..R15 = G ½	..N08 = ¼ NPT ..N15 = ½ NPT	
0.5...1.8	0.07	1.2	VKM-8104...	VKM-8204...				
0.8...3.1	0.05	0.9	VKM-8105...	VKM-8205...				
2...8.1	0.05	0.8	VKM-8106...	VKM-8206...				
4...12.6	0.08	1.1	VKM-8107..	VKM-8207...		..R15 = G ½ ..R20 = G ¾	..N15 = ½ NPT ..N20 = ¾ NPT	
5...18	0.05	1.1	VKM-8108...	VKM-8208...				
4...36	0.1	0.4	VKM-8109...	VKM-8209...		..R20 = G ¾ ..R25 = G 1	..N20 = ¾ NPT ..N25 = 1 NPT	
5...50	0.15	1.1	VKM-8110...	VKM-8210...				
7...63	0.15	1.1	VKM-8111...	VKM-8211...				
8...72	0.15	1.1	VKM-8112...	VKM-8212...		..R25 = G 1	..N25 = 1 NPT	

*Pressure loss refers to water

Model VKM-6...

Analogue output:	0 or 4 - 20 mA or 0-10 V 4-wire version, non-linear
Auxiliary power:	24 V_{AC} or 24 V_{DC}
Max. temperature:	+80 °C
Max. load:	500 Ω

Model VKM-8...

Indication:	3-digit LED
Switching output:	semiconductor PNP or NPN
Analogausgang:	4 - 20 mA, 3-wire max. 500 Ω, linear
Power supply:	24 V_{DC} ±20 %
Max. temperature:	+80 °C
Electr. connection:	connector M12x1

Model VKM-7...

With this version our proven evaluating electronics ADI (see also brochure S4) in a field housing are fitted to the flow meter.

Three different evaluating electronics are available:

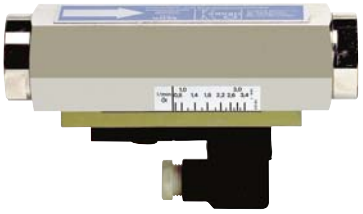
- Digital indication
- Bargraph indication
- Combined indication (digital/bargraph)

Important!
The max. upper range values are approximately 10 % lower than for other types.

VKM Versions

Six different versions are available

VKM-1...:
Flow switches
with 1 contact



VKM-2...:
Flow meters

VKM-3..:
Flow Meters and switches
with 1 contact

VKM-6...
Flow meters with
analogue output

VKM-7...
Flow meters with
evaluating electronics

VKM-8...
Flow meters with
compact electronics

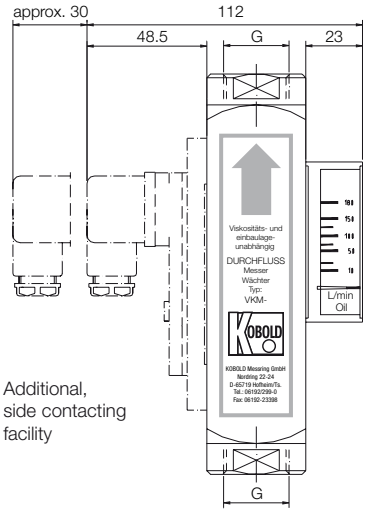
Dimensions

Model	Square [mm]	Length L [mm] Connection	AF [mm] Connection	Weight* [kg]
VKM-..01	40 x 40	162	36	1.7
VKM-..02	40 x 40	162	36	1.7
VKM-..03	40 x 40	162	36	1.7
VKM-..04	40 x 40	162	36	1.7
VKM-..05	40 x 40	162	36	1.7
VKM-..06	40 x 40	162	36	1.7
VKM-..07	40 x 40	162	36	1.6
VKM-..08	40 x 40	162	36	1.6
VKM-..09	40 x 40	162 (186.5)**	36 (41)**	1.7
VKM-..10	40 x 40	162 (186.5)**	36 (41)**	1.7
VKM-..11	40 x 40	162 (186.5)**	36 (41)**	1.7
VKM-..12	40 x 40	186.5	41	1.7

*Weight valid for: VKM-1.., VKM-2...
for model VKM-3... + 0.1 kg
for model VKM-6... + 0.2 kg
for model VKM-7... + 1.4 kg

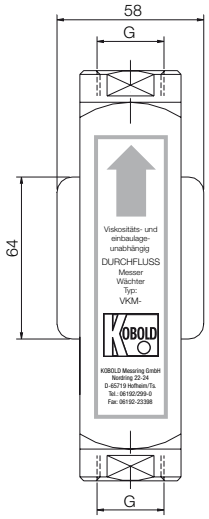
**with G 1 or 1 NPT

VKM-1.., VKM-2.., VKM-3..

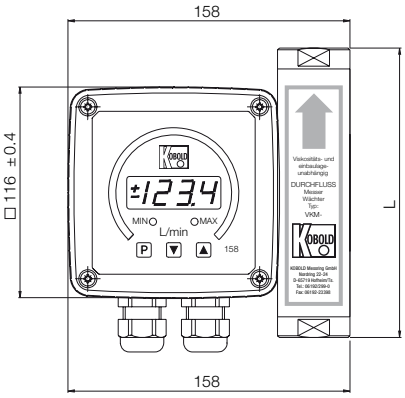


Additional, side contacting facility

VKM-6...



VKM-7...



Depth 127 mm

VKM-8...