



# Viscosity-Compensated Flow Meters and Switches

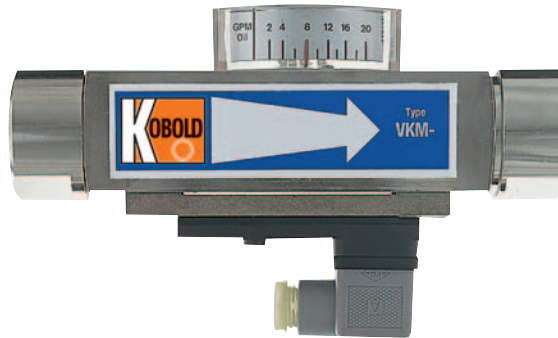
for Viscous Liquids



measuring  
•  
monitoring  
•  
analysing



- Measuring Range:  
Oil 0.01 - 0.07 to 8 - 80 L/min
- Basic accuracy:  
± 4 % f. s.
- p<sub>max</sub> 350 bar,  
t<sub>max</sub> 100 °C
- Viscosity range:  
1 ... 540 mm<sup>2</sup>/s
- Connection: G ¼... G 1 female
- Material:  
Brass, stainless steel



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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 hermetic 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 mm<sup>2</sup>/s to 540 mm<sup>2</sup>/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 mm <sup>2</sup> /s)
Measuring error due to change in viscosity:	For changes in viscosity within 1 - 540 mm <sup>2</sup> /s the additional deviation is ±5 % f. s. maximum
Viscosity range:	1 - 540 mm <sup>2</sup> /s
<b>Contacts:</b> <b>Optional with VKM-1..., VKM-3...</b>	
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 <sub>AC</sub> / 100 VA / 1.5 A Changeover contact (CSA) max. 240 V <sub>AC</sub> / 60 VA / 1 A N/O contact (UL) 250 V <sub>AC</sub> - 0.4 A / 200 V <sub>DC</sub> - 0.25 A 50 V <sub>DC</sub> - 1.0 A Changeover contact (UL) max. 250 V <sub>DC</sub> / 0.136 A - 30 V <sub>DC</sub> / 1 A N/O contact Ex II 2G EEx m II T6 / 2D IP67 T80 °C max. 250 V <sub>DC</sub> / 100 VA / 1.5 A (I <sub>K</sub> = 5 A)
Ex range:	ATEX zone 1 as "simple operator" or with N/O contact Ex
Protection:	IP 65 (electr. 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*		Brass	Stainless steel	Contact*	Connection		Option special connect.	Flow direction
	min.	max.							
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)	..R08 = G 1/4	..N08 = 1/4 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...		..R08 = G 1/4	..N08 = 1/4 NPT		
0.2...1.2	0.05	1.1	VKM-1103...	VKM-1203...		..R15 = G 1/2	..N15 = 1/2 NPT		
0.5...2	0.07	1.2	VKM-1104...	VKM-1204...		..R15 = G 1/2	..N15 = 1/2 NPT		
0.8...3.4	0.05	0.9	VKM-1105...	VKM-1205...		..R20 = G 3/4	..N20 = 3/4 NPT		
2...9	0.05	0.8	VKM-1106...	VKM-1206...		..R20 = G 3/4	..N20 = 3/4 NPT		
4...14	0.08	1.1	VKM-1107...	VKM-1207...		..R25 = G 1	..N25 = 1 NPT		
5...20	0.05	1.1	VKM-1108...	VKM-1208...		..R25 = G 1	..N25 = 1 NPT		
4...40	0.1	0.4	VKM-1109...	VKM-1209...					
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...					

\*This instrument is also available with 2 contacts. Please specify in writing.

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

Measuring range L/min oil	Pressure loss Δ P [bar] at rated flow*		Brass	Stainless steel	Contact	Connection		Option special connect.	Flow direction
	min.	max.							
0.01...0.07	0.02	1.0	VKM-2101...	VKM-2201...	...00.. = without contact ...EX.. = with ATEX approval	..R08 = G 1/4	..N08 = 1/4 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...		..R08 = G 1/4	..N08 = 1/4 NPT		
0.2...1.2	0.05	1.1	VKM-2103...	VKM-2203...		..R15 = G 1/2	..N15 = 1/2 NPT		
0.5...2	0.07	1.2	VKM-2104...	VKM-2204...		..R15 = G 1/2	..N15 = 1/2 NPT		
0.8...3.4	0.05	0.9	VKM-2105...	VKM-2205...		..R20 = G 3/4	..N20 = 3/4 NPT		
2...9	0.05	0.8	VKM-2106...	VKM-2206...		..R20 = G 3/4	..N20 = 3/4 NPT		
4...14	0.08	1.1	VKM-2107...	VKM-2207...		..R25 = G 1	..N25 = 1 NPT		
5...20	0.05	1.1	VKM-2108...	VKM-2208...		..R25 = G 1	..N25 = 1 NPT		
4...40	0.1	0.4	VKM-2109...	VKM-2209...					
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...					

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

Measuring range L/min oil	Pressure loss Δ P [bar] at rated flow*		Brass	Stainless steel	Contact	Connection		Option special connect.	Flow direction
	min.	max.							
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)	..R08 = G 1/4	..N08 = 1/4 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...		..R08 = G 1/4	..N08 = 1/4 NPT		
0.2...1.2	0.05	1.1	VKM-3103...	VKM-3203...		..R15 = G 1/2	..N15 = 1/2 NPT		
0.5...2	0.07	1.2	VKM-3104...	VKM-3204...		..R15 = G 1/2	..N15 = 1/2 NPT		
0.8...3.4	0.05	0.9	VKM-3105...	VKM-3205...		..R20 = G 3/4	..N20 = 3/4 NPT		
2...9	0.05	0.8	VKM-3106...	VKM-3206...		..R20 = G 3/4	..N20 = 3/4 NPT		
4...14	0.08	1.1	VKM-3107...	VKM-3207...		..R25 = G 1	..N25 = 1 NPT		
5...20	0.05	1.1	VKM-3108...	VKM-3208...		..R25 = G 1	..N25 = 1 NPT		
4...40	0.1	0.4	VKM-3109...	VKM-3209...					
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...					

\*This instrument is also available with 2 contacts. Please specify in writing.



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*		Brass	Stainless steel	Output	Connection		Option special connect.	Flow direction
	min.	max.				..R08 = G 1/4	..N08 = 1/4 NPT		
0.01...0.063	0.02	1.0	VKM-6101...	VKM-6201...	...0A.. = 0-20 mA ...4A.. = 4-20 mA ...0V.. = 0-10 V <sub>DC</sub>	..R08 = G 1/4	..N08 = 1/4 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...0.4	0.03	0.8	VKM-6102...	VKM-6202...		..R08 = G 1/4	..N08 = 1/4 NPT		
0.2...1.1	0.05	1.1	VKM-6103...	VKM-6203...		..R15 = G 1/2	..N15 = 1/2 NPT		
0.5...1.8	0.07	1.2	VKM-6104...	VKM-6204...		..R15 = G 1/2	..N15 = 1/2 NPT		
0.8...3.1	0.05	0.9	VKM-6105...	VKM-6205...		..R20 = G 3/4	..N20 = 3/4 NPT		
2...8.1	0.05	0.8	VKM-6106...	VKM-6206...		..R20 = G 3/4	..N20 = 3/4 NPT		
4...12.6	0.08	1.1	VKM-6107...	VKM-6207...		..R25 = G 1	..N25 = 1 NPT		
5...18	0.05	1.1	VKM-6108...	VKM-6208...		..R25 = G 1	..N25 = 1 NPT		
4...36	0.1	0.4	VKM-6109...	VKM-6209...					
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...					

\*This instrument is also available with 2 contacts. Please specify in writing.

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

Measuring range L/min oil approx.	Pressure loss Δ P [bar] at rated flow*		Brass	Stainless steel	Output	Connection		Flow direction
	min.	max.				..R08 = G 1/4	..N08 = 1/4 NPT	
0.01...0.063	0.02	1.0	VKM-7101...	VKM-7201...	...B00... = bargraph ind. 230 V <sub>AC</sub>	..R08 = G 1/4	..N08 = 1/4 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...	...B30... = bargraph ind. 24 V <sub>DC</sub>	..R08 = G 1/4	..N08 = 1/4 NPT	
0.2...1.1	0.05	1.1	VKM-7103...	VKM-7203...	...D04... = digital indication 230 V <sub>AC</sub> , 4-20 mA	..R15 = G 1/2	..N15 = 1/2 NPT	
0.5...1.8	0.07	1.2	VKM-7104...	VKM-7204...	...D34... = digital indication 24 V <sub>DC</sub> , 4-20 mA	..R15 = G 1/2	..N15 = 1/2 NPT	
0.8...3.1	0.05	0.9	VKM-7105...	VKM-7205...	...K04... = combination ind. 230 V <sub>AC</sub> , 4-20 mA	..R20 = G 3/4	..N20 = 3/4 NPT	
2...8.1	0.05	0.8	VKM-7106...	VKM-7206...	...K34... = combination ind. 24 V <sub>DC</sub> , 4-20 mA	..R25 = G 1	..N25 = 1 NPT	
4...12.6	0.08	1.1	VKM-7107...	VKM-7207...		..R20 = G 3/4	..N20 = 3/4 NPT	
5...18	0.05	1.1	VKM-7108...	VKM-7208...		..R25 = G 1	..N25 = 1 NPT	
4...36	0.1	0.4	VKM-7109...	VKM-7209...		..R25 = G 1	..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...				

\*This instrument is also available with 2 contacts. Please specify in writing.

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

Measuring range L/min oil approx.	Pressure loss Δ P [bar] at rated flow*		Brass	Stainless steel	Output	Connection		Flow direction
	min.	max.				..R08 = G 1/4	..N08 = 1/4 NPT	
0.01...0.063	0.02	1.0	VKM-8101...	VKM-8201...	...C0R... = compact electr. 24 V <sub>DC</sub> , 2 x PNP	..R08 = G 1/4	..N08 = 1/4 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...	...C0M... = compact electr. 24 V <sub>DC</sub> , 2 x NPN	..R08 = G 1/4	..N08 = 1/4 NPT	
0.2...1.1	0.05	1.1	VKM-8103...	VKM-8203...	...C4P... = compact electr. 24 V <sub>DC</sub> , 4-20 mA, 1 x PNP	..R15 = G 1/2	..N15 = 1/2 NPT	
0.5...1.8	0.07	1.2	VKM-8104...	VKM-8204...	...C4N... = compact electr. 24 V <sub>DC</sub> , 4-20 mA, 1 x NPN	..R15 = G 1/2	..N15 = 1/2 NPT	
0.8...3.1	0.05	0.9	VKM-8105...	VKM-8205...		..R20 = G 3/4	..N20 = 3/4 NPT	
2...8.1	0.05	0.8	VKM-8106...	VKM-8206...		..R20 = G 3/4	..N20 = 3/4 NPT	
4...12.6	0.08	1.1	VKM-8107...	VKM-8207...		..R25 = G 1	..N25 = 1 NPT	
5...18	0.05	1.1	VKM-8108...	VKM-8208...		..R25 = G 1	..N25 = 1 NPT	
4...36	0.1	0.4	VKM-8109...	VKM-8209...				
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...				

\*This instrument is also available with 2 contacts. Please specify in writing.

**Model VKM-6...**

Analogue output: 0 or 4 - 20 mA or 0-10 V  
4-wire version,  
non-linear

Auxiliary power: 24 V<sub>AC</sub> or 24 V<sub>DC</sub>

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<sub>DC</sub> ± 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





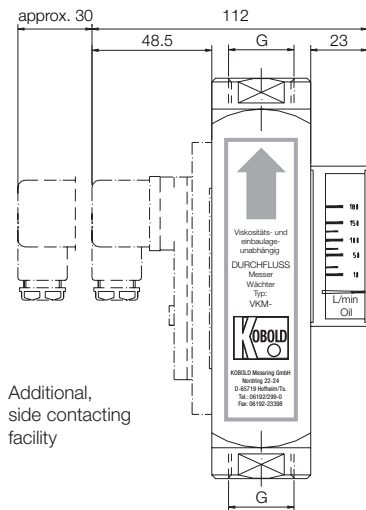
Dimensions

Model	Square [mm]	Length L [mm] Connection	SW [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

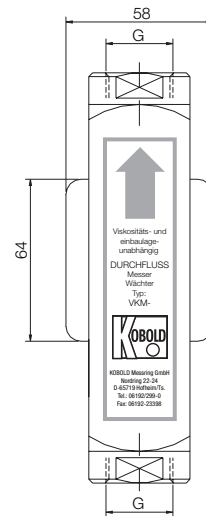
\*Weight valid for: VKM-1..., VKM-2...  
 for model VKM-3... + 0.1 kg  
 for model VKM-6... + 0.2 kg  
 for model VKM-7... + 1.4 kg

\*\*with G 1 or 1 NPT

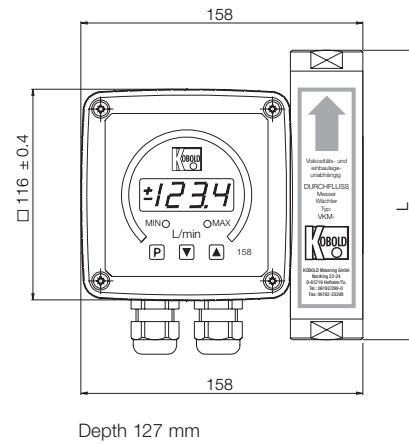
VKM-1..., VKM-2..., VKM-3...



VKM-6...



VKM-7...



VKM-8...

