KRAL Volumeter® - OMG Series
Universal Flowmeters

KRAL

OMG
Flowmeters for a Wide Range of Applications

Operating Conditions and Materials

☐ Flow Range:	0,1 to 7500 l/min
☐ Max. Pressure:	250 bar
☐ Temperature Range:	-20 to 200 °C
☐ Viscosity Range:	1 to 1 x 10^6 mm^2/s
☐ Liquid:	chemically neutral, lightly lubricative, clean, non-abrasive
☐ Accuracy:	±0,1% of rate
☐ Casing:	cast iron
☐ Spindles:	nitrided steel
☐ Ball Bearings:	bearing steel
☐ Seals:	Viton®

KRAL Volumeter - the Original

KRAL developed the Volumeter over 20 years ago as a solution to an internal requirement. We needed a precision flowmeter as part of our production test stands but could not find a flowmeter that would meet our demands of accuracy, rangebility and robustness. Since we had expertise gained from 30 years of manufacturing positive displacement pumps, we had the idea to turn around the working principle of the pumps. Instead of a motor driving the pump spindles, we used flowing liquid to rotate the spindles. We overcame the serious problems of other meters, such as pressure drop, accuracy and operating conditions. Since then the KRAL Volumeter line has grown to meet a wide variety of industrial needs.

Robust and Precise

In most flow measuring instruments robustness and precision are mutually exclusive, but the OMG offers both.

At KRAL, our core competence in profiling screw spindles guarantees precision measuring chambers in the meter. Therefore extremely accurate measurements are possible and the OMG's operation is smooth and responsive. The OMG can even follow any rapid fluctuations in the flow caused by pulsations.

The OMG has an extremely sturdy design and is protected from external influences, such as plant vibrations and harsh environments.

Wide Range of Operating Conditions

Flowmeters are often specified for a given set of operating parameters. The performance of those meters may suffer if those operating parameters change.

Being a precision-made spindle PD meter, the exact measurement of the OMG covers a wide range of:

☐ liquids
☐ viscosities
☐ temperatures

Any selection of an OMG meter is therefore suitable for a wide variety of applications.

Easy Installation

There is often limited space available to install a flowmeter.

KRAL Volumeters are extremely compact devices. They are also insensitive to flow disturbances, so there are no upstream or downstream installation requirements. The OMG is also able to measure in any installation position, horizontal or vertical. Even bi-directional flow can be measured precisely.

The Solution

Wide Range of Applications

As a PD meter, the OMG covers a wide range of liquids and viscosities. OMG has a turn-down ratio up to 100:1.

Fast Response Measurement

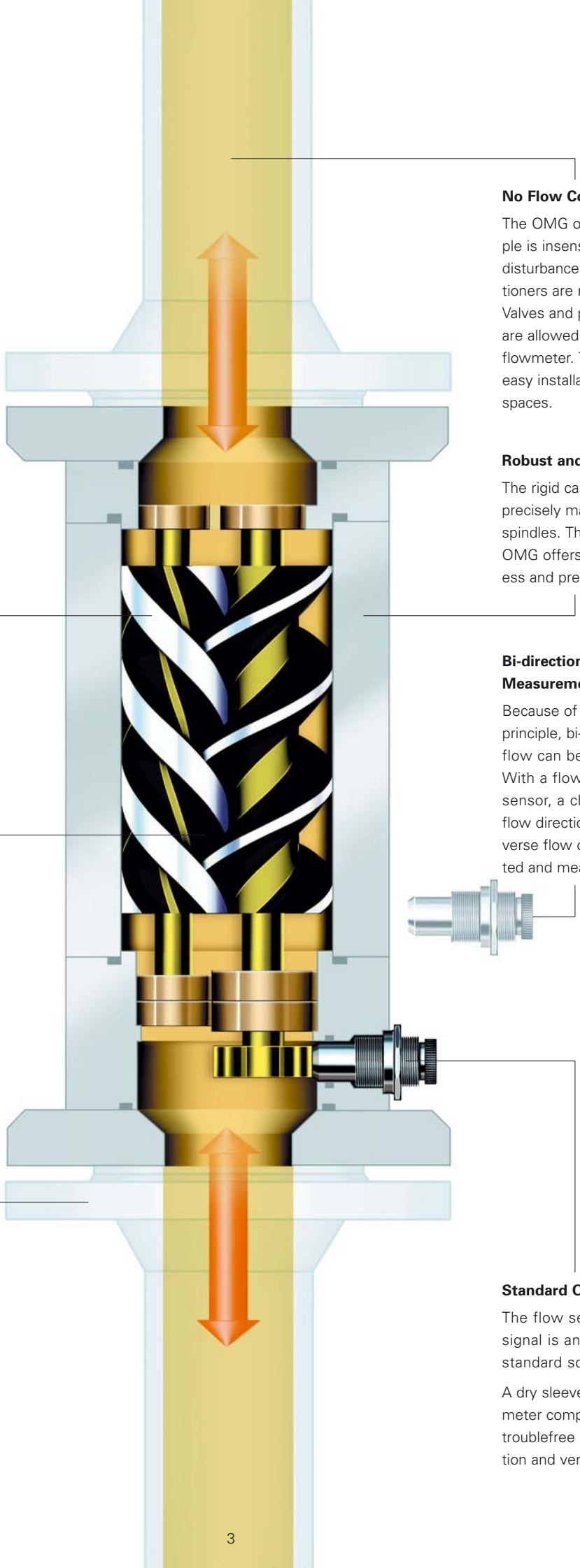
The fast response spindles can follow any rapid fluctuations in the flow causes by pulsations.

High Accuracy

Because of the precision measurement chamber, extremely accurate measurements are possible.

Various connections

Available are:
- Pipe thread
- DIN flange, ANSI, SAE, and JIS
- Custom



No Flow Conditioning

The OMG operating principle is insensitive to flow disturbances. Flow conditioners are not required. Valves and pipe elbows are allowed close to the flowmeter. That allows for easy installation in tight spaces.

Robust and Precise

The rigid casing protects precisely manufactured spindles. That is why the OMG offers both robustness and precision.

Bi-directional Flow Measurement

Because of the operating principle, bi-directional flow can be measured. With a flow direction sensor, a change of the flow direction or brief reverse flow can be detected and measured.

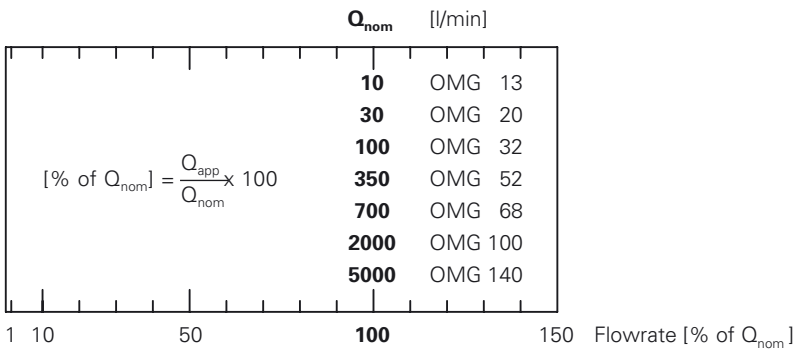
Standard Output Signal

The flow sensor output signal is an industry standard square wave.

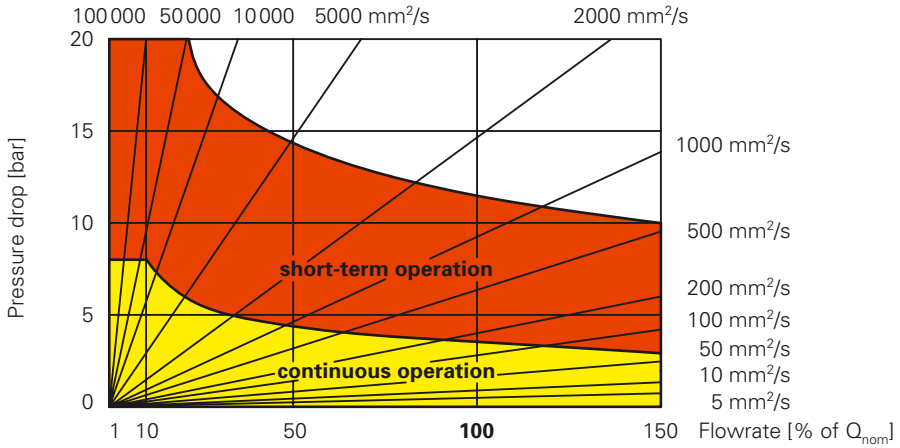
A dry sleeve seals the meter completely, for troublefree sensor installation and verification.

The following questions can assist you in selecting an OMG meter.	Explanation	Instructions	Notes
Which size is suitable for the flow range to be measured?	The selection of the correct size ensures a long service life, high measuring accuracy and an excellent cost-utilization ratio.	From the **Size** table, select a size, OMG 13 - 140, whose nominal flowrate, Q_{nom}, is near that of your application, Q_{app}. Then calculate flowrate in [% of Q_{nom}] using the equation shown at right.	The value of flowrate [% of Q_{nom}] is used in the following diagrams. Draw a line downward from this value to intersect the same value in the other diagrams. Moving the line left or right shows the effects of meter size on load rating and linearity.
Does the selected unit have the required service life? **What is the pressure drop?**	Service life and pressure drop are important factors in selecting a meter size. Verify that your selection will meet your expectations of service life and pressure drop. For increased service life and reduced pressure drop, select a larger size. This will reduce the flowrate [% of Q_{nom}] for a given application.	In the **Load Rating** diagram, find the intersection point of the viscosity [mm^2/s] and flowrate [% of Q_{nom}] for your application. To the left of this point, find the pressure drop for the nominal flow of your application. The color range where the point lies signifies either continuous operation (yellow) or short-term operation (red). A point in the white range is not a recommended load rating for an OMG.	The range of short-term operation can be purposely used for short times, such as a load reserve or safety factor.
What is the measuring accuracy of the selected unit?	High accuracy is expected from PD meters. The OMG delivers excellent accuracy over a wide range of flows. For the highest accuracy, linearization is possible. The KRAL BEM 4U can linearize the meter's performance curve for a defined viscosity. Special calibration may be required.	With the viscosity [mm^2/s] and flowrate [% of Q_{nom}] you can obtain the meter accuracy curve from the **Linearity** diagram. Yellow range signifies: The device operates within the range of maximum accuracy of ±0,1% of rate. Orange range signifies: The meter accuracy is within the limits of ± 0,3% of rate.	The OMG begins measuring at an extremely low flowrate, due to very low slippage past the spindles. As viscosity increases, so does the linear region of the accuracy curve.

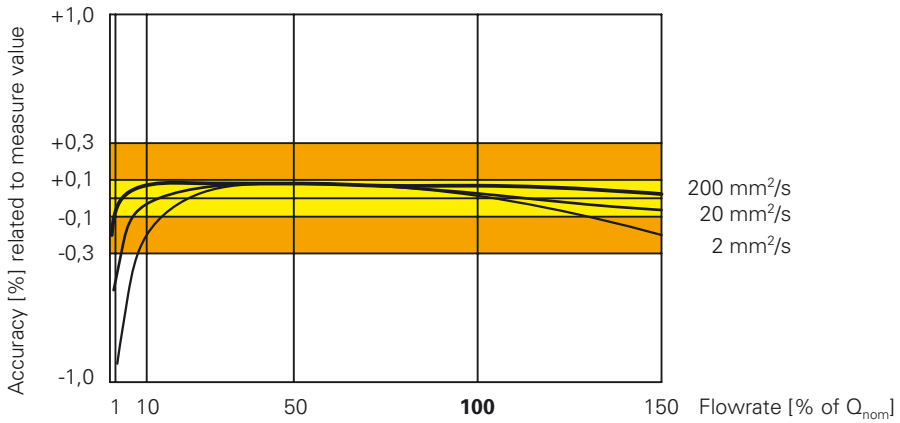
Size



Load Rating



Linearity



Are precision and sturdiness of the KRAL Volumeter fully utilized?

The OMG combines service life and accuracy to produce a measuring range of unmatched magnitude. Since normal flow conditions are never static, a wide range of acceptable viscosities and flows is important for precise measurement.

The **Measuring Range** diagram provides a visual impression of the wide measurement range available with a Volumeter.

①This is where accurate operation of the OMG starts.

②The OMG can be operated continuously up to this line.

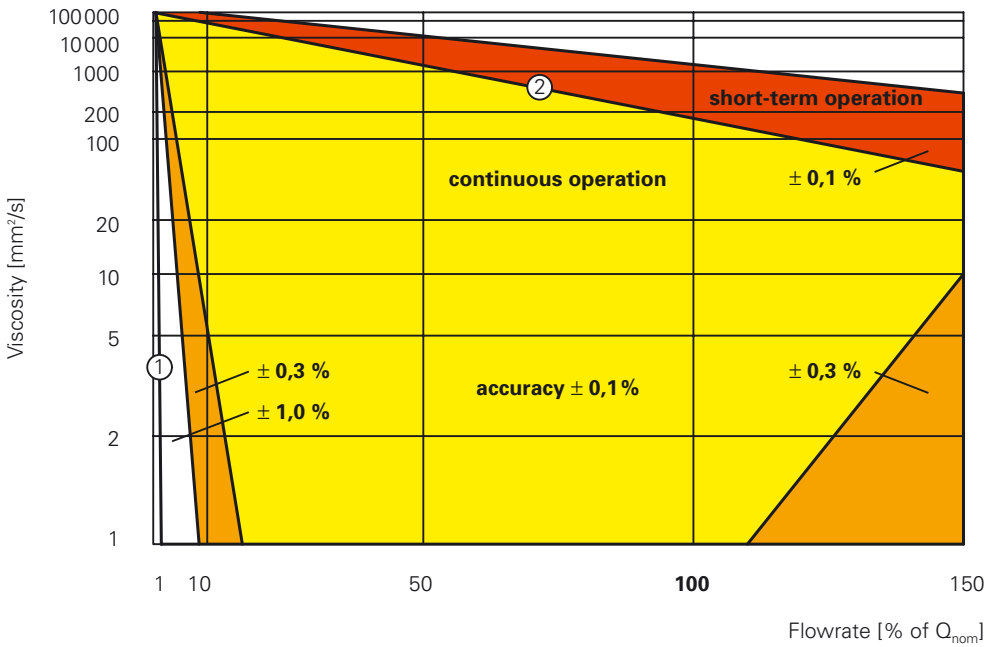
Notice the wide range of conditions where the OMG will measure with an accuracy of ±0,1% of rate.

Yellow range signifies: Best combination of accuracy and service life.

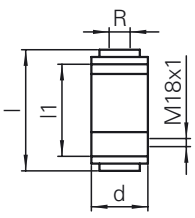
Orange range signifies: The meter is suitable for continuous operation with an accuracy of ±0,3% of rate.

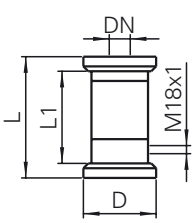
Red range signifies: Short-term Operation. The accuracy will be within ±0,1% of rate.

Measuring Range



Technical data		OMG 13	OMG 20	OMG 32	OMG 52	OMG 68	OMG 100	OMG 140
Flow								
Q_{max}	l/min	15	45	150	525	1050	3000	7500
Q_{nom}	**l/min**	**10**	**30**	**100**	**350**	**700**	**2000**	**5000**
Q_{min}	l/min	0,1	0,3	1	3,5	7	20	50
Pressure p_{max}	bar	250	250	250	160	100	40	40
Temperature $t_{min}...t_{max}$	°C	-20 to 200	-20 to 200	-20 to 200	-20 to 200	-20 to 200	-20 to 200	-20 to 200
Viscosity $v_{min}...v_{max}$	mm²/s	1 to 1x10⁶	1 to 1x10⁶	1 to 1x10⁶	1 to 1x10⁶	1 to 1x10⁶	1 to 1x10⁶	1 to 1x10⁶
K-Factor	K1 pulses/l	1216	640	234	71	39,8	16,8	8,85
	K2 pulses/l	2432	1280	468	142	79,6	33,6	17,7
	K3 pulses/l	7296	2560	1014	302	167	57,6	22,1
Frequency	f1 at Q_{nom} Hz	203	320	390	414	464	560	738
	f2 at Q_{nom} Hz	405	640	780	828	929	1120	1475
	f3 at Q_{nom} Hz	1216	1280	1690	1760	1949	1920	1842

Dimensions/Weights		OMG 13	OMG 20	OMG 32	OMG 52	OMG 68	OMG 100	OMG 140
								
R	**inch**	**1/2“**	**3/4“**	**1“**	**1 1/2“**	**2“**	**4“**	**6“**
p	bar	250	250	250	160	100	40	40
l	mm	145	145	215	295	355	480	645
d	mm	90	74	104	118	138	188	267
l1	mm	94	145	215	240	295	400	537
m	kg	4,6	4,1	11	18	29	70	180

																		
DN	**mm**	**15**	**15**	**15**	**20**	**15**	**15**	**32**	**25**	**25**	**40**	**40**	**50**	**50**	**100**	**100**	**150**	**150**
PN	bar	40	160	250	40	160	250	40	160	250	40	160	40	100	16	40	16	40
L	mm	145	145	145	185	185	195	265	265	275	285	295	340	355	450	460	600	610
D	mm	95	105	130	105	105	130	140	140	150	150	170	165	195	220	235	285	300
L1	mm	94	94	94	145	145	145	215	215	215	240	240	295	295	400	400	537	537
m	kg	4,7	4,8	6,0	6,0	6,0	8,1	16	16	19	21	23	31	37	65	70	170	180

KRAL Electronics

Sensor Selection

You have the choice between four sensors for the OMG meter. The sensors produce the signal necessary for flow measurement. Selection is based on:

- ☐ K-factor/frequency
- ☐ pressure
- ☐ temperature
- ☐ explosion proof requirements

The K-Factor describes the number of pulses per gallon. Three K-Factors, K1, K2 and K3, can be taken from the Technical Data table on page 7.

Industry Standard Signals

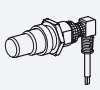
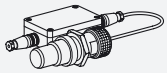
The BEG 43, 44, and 45 sensors supply a PNP square wave signal. The BEG 47 Ex-sensor produces a Namur signal. All of these can be processed by standard industrial interfaces.

Local Display

For local display of flowrate and total, the BEM 2U flow computer is an effortless solution. The compact and rugged unit can be mounted in many ways, is able to operate on battery power, and arrives ready for quick installation.

Complete Systems for Various Applications

For an easy to understand display and a stand-alone automation system, such as differential measurement, mass measurement or batching, the friendly BEM 4U is pre-programmed as a perfect compliment to the OMG.

Sensors **Amplifier**		**BEG 43**	**BEG 44**	**BEG 45** **BEV 13**	**BEG 47**
Design M18x1					
Signal		PNP square wave inductive	PNP square wave inductive	PNP square wave inductive	Namur sine wave inductive
Material		Arcap/Ceramic	Arcap	Arcap	1.4401 / Keramik
K-Factor		K1	K2	K3	K1
Pressure p_{max}	bar	250	420	420	40
Temperature $t_{min}...t_{max}$	°C	-20 to 100	-25 to 150	-70 to 230	-25 to 100

Successful Applications with the KRAL Volumeter OMG

Fuel Consumption Measurement in Boilers

Liquid: heavy fuel oil
Flowrate: 1,6 to 19 l/min
Pressure: 40 bar
Temperature: 130 to 150 °C
Viscosity: 10 to 15 mm^2/s
Measuring device:
two OMG 20's

The fuel consumption of the boiler is measured by determining the difference between the flow in the supply and return lines in order to:

- ☐ adjust the engine performance to an optimum
- ☐ continuously monitor the fuel consumption.

Since the fuel consumption makes up the greatest part of operating costs, high accuracy is important. Also at high temperatures, heavy fuel oil is aggressive and forms deposits.

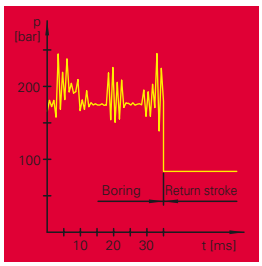
The accurate and self-cleaning OMG is perfect for this application

Flow Measurement in Polyurethane Blending

Liquid: polyol, isocyanate
Flowrate: 3,5 to 42 l/min
Pressure: 250 bar
Temperature: 10 to 80 °C
Viscosity: 20 to 2000 mm^2/s
Measuring device:
OMG 32

Measuring task: Accurate flow measurement of components to maintain the proper blend.

Blend errors can result in flawed product, such as car dashboards that are sensitive to heat and sunlight. Problems such as these, which are not discovered until the product is delivered to the customer, can be avoided with accurate measurement before of the blending head. Precise, reliable measurements ensure proper, consistent blends, and no subsequent claims. The OMG meets these requirements.



Tunnel-boring Hydraulics

Liquid: hydraulic oil
Flowrate: 0,3 to 45 l/min bi-directionally
Pressure: pulsating up to 250 bar
Temperature: 40 to 80 °C
Viscosity: 60 to 3000 mm^2/s
Measuring device:
OMG 20

The flowrate to the hydraulic cylinder of a tunnel-boring machine is measured in order to be able to determine the exact position of the boring bit. As the bit digs through dirt and rocks, the vibration is transmitted to the hydraulic cylinder as fluid pulsations. A diagram of these pulsations is shown above.

The OMG is trusted for reliable measurement in both flow directions although extreme vibrations and impacts occur during boring.

Measurement Traceability

Nine European standards laboratories used an OMG 100 for a calibration intercomparison. With results beyond expectations, the report suggests using our device as the default transfer standard between kerosene flow laboratories.

Every KRAL Volumeter is calibrated according to EN 17025 in our in-house test stand. The KRAL calibration laboratory has been accredited by the Department of Trade and Employment. The ÖKD (Austrian Calibration Service) calibration accreditation which is supplied with every flowmeter, states the traceability of the measurement results to national standards.

KRAL

Kräutler GmbH & Co., Bildgasse 40, A-6893 Lustenau, Austria, Telephone: +43 / (0) 55 77 / 8 66 44-0, Telefax: +43 / (0) 55 77 / 8 84 33
www.kral.at, E-mail: kral@kral.at