



KREBS VISCOMETER VK 2000 DV1300



User manual
(Stand 1.1 – 01/10)

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1 General information

1.1 Introduction

The Krebs VK 2000 is a high precision viscometer used for measuring the viscosity of paints, varnishes, adhesives, pastes and liquid inks according to ASTM D562 standard.

The viscometer delivers readings in three different units: krebs units, centipoises and grams. Its usability both in manual and automatic mode makes the Krebs VK 2000 an ideal viscometer for industrial and research applications.

1.2 Intended use

The Krebs VK 2000 viscometer has been specifically developed to fulfill viscosity measurements of paints, varnishes adhesives, pastes and liquid inks. Only skilled or specially trained personnel must operate the viscometer.

Everyone who works with the viscometer VK 2000 must strictly follow the security precautions and observe the safety rules of the laboratory.

It is not allowed to operate the viscometer for any other purpose as the one described in this chapter. No right to claim warranty will be granted if any of the above norms are disregarded.

1.3 Security symbols

Installation and operation of the viscometer are user-friendly and very easy if instructions of this manual are strictly followed.

Be aware that any use of this equipment out of the scope described by the manufacturer may compromise the security of the operator.

Besides this and in order to stress the points that may represent any risk both for the operator and the viscometer itself, this manual uses following symbols and messages:



DANGER

Wherever this symbol, along with the message DANGER, appears in this manual, it indicates a potential personal injury hazard or damage on the viscometer. For your security, strictly observe instructions provided.



CAUTION

Wherever this symbol, along with the message CAUTION, appears in this manual, it indicates that damages on the viscometer may occur if instructions are not observed.

For the proper operation of the equipment, instructions must be strictly observed.



INFORMATION

This symbol refers to specific details of the viscometer which must be specially considered because of their relevance.

Independent of the instructions contained in this manual, everyone who operates the Krebs VK 2000 viscometer is obliged to know and observe the security and hygienic measures of the laboratory where this device is operated.



Everyone who should operate and set up the viscometer must have completely read and understood these instructions before starting the operations.

1.4 Safety notes



Operator security may be at risk if instructions of this manual are not observed.

Please observe the following general precautions during operation of this instrument. Failure to comply with these precautions violates safety standards and the intended use of the instrument. Viscotech Hispania, S.L. is not liable for misuse of the instrument and failure to comply with basic safety requirements.

Instrument grounding

To avoid injury from electrical current, the instrument must be connected to the safety ground. The instrument is equipped with a three wire ground plug. The power outlet must be connected to the safety ground and must meet the International Electrotechnical Commission (IEC) regulations.

Caution: Voltage

Never remove instrument covers during operation. Component replacement as well as adjustments must only be carried out by trained personnel. Use only original spare parts when replacing any component. Unplug the unit before removing or opening the covers. Appliance coupler is considered as disconnecting device.

Danger in explosive environment

The instrument must not be operated in the presence of flammable gases. It is also forbidden to expose the instrument in environments where dangerous gas concentrations may occur.

Hazard of malfunction

To avoid damages on the instrument, it must be only operated in a controlled electromagnetic environment. According to this, transmitters such as mobile phones must not be operated near to it. In case of malfunctions and/or service work, please turn off the instrument and contact your local dealer.

1.5 Certification, warranty and documentation

Certification Viscotech Hispania, S.L. certifies that this instrument has been tested and checked carefully. Its technical data has been verified before shipment to be in accordance with the published specifications. The instrument complies with applicable international safety regulations.

Warranty This MYR product is warranted against defects in material and workmanship for a period of 2 (two) years. Parts which prove to be defective during the warranty period will be repaired or replaced free of charge. No other warranty is expressed or implied. Unauthorized modification or repair by third party persons will void the warranty. The warranty will expire in case of improper or wrong use of the instrument and in case the warning and precautionary messages are not observed. Viscotech Hispania, S.L. is not liable for any occurring damage.

Once the warranty period has expired, we recommend to sign a maintenance contract in order to guarantee the perfect functionality of the instrument. For more information on this subject, please contact your local dealer.

Documentation This user manual will be supplied together with each instrument. Further copies can be ordered at the local dealer by giving the serial number of the instrument, the number of the user manual and the date of issue.

This user manual is available in the following languages: English and Spanish.

Errors and omissions excepted. Subject to amendment and improvement without further notice.

2 Technical data

Krebs Viscometer VK 2000			
Power requirements	voltage		100-240V ±10%
	frequency		50-60Hz
	consumption		0,2A
	fuses		1 x 2 AT
Speed	One unique speed: 200 rpm ±1 rpm		
Viscosity range			
	<u>UNIT</u>	<u>RANGE</u>	<u>RESOLUTION</u>
	KU	40,2 - 141	0,1 KU
	g	32 - 1.099	1,0 g
	cP	27 - 5.274	5 cP
Accuracy	± 1% of full scale		
Repeatability	± 0,5%		
Dimensions	32,5 x 19 x 50 cm		
Weight	8,5 kg		
Operating conditions:	from +10°C until +40°C (at a max. rel. humidity of 80% without condensation) altitude up to 2000 m M.S.L. for indoor use only.		
Pollution degree:	2		
Overvoltage category:	II		
Protection category:	IP 20		

3 Setting up the viscometer

3.1 Reception and unpacking of the instrument

Follow these steps after receiving the instrument:

- Please check carefully the packaging box of the viscometer before removing it in order to find out transportation damages.
- Should the packaging box be broken or have suffered any other damage, please contact the shipping agency before opening it.
- Once you have taken the instrument out of the box, check if damages can be observed. Should this be the case, please inform the dealer that has delivered you the equipment.
- Remove all packing straps, protectors and accessories used during transport. Recyclable materials are to be disposed in the containers provided therefore.

Scope of delivered parts

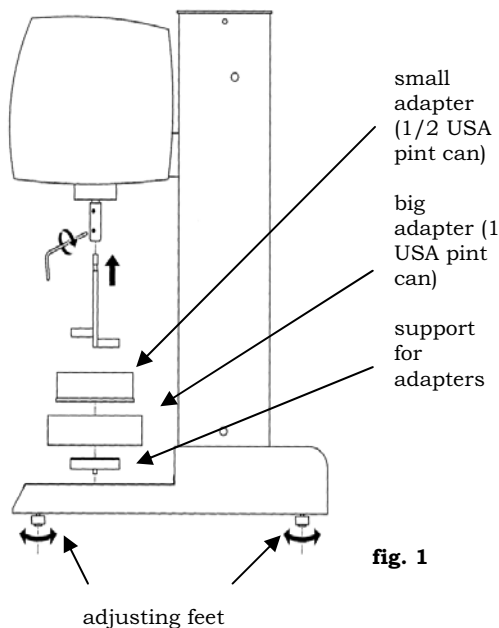
- Krebs viscometer mod. VK 2000
- Standard KREBS-type spindle (blade spindle)
- Adapters for big and small cans (1 USA pint y ½ USA pint respectively)
- Adapter's supporting base
- Standard 600 ml beaker (low model), required for automatic Mode
- Mains cable
- User manual

3.2 Setup

To set up the Krebs viscometer VK 2000 is very simple, because it only requires the adjustment of the big and the small container adapters (to accommodate respectively cans of 1 and ½ pint) and the spindle.

For installation, proceed as follows:

- Open the box and remove the packing straps, the supporting foams and the accessories.
- Take the VK 2000 out of the box by holding it from its base and column.



By doing this, it is strongly recommended not to hit neither the head nor the spindle shaft (fitted now with a protective hood) because the mechanical system could be damaged.

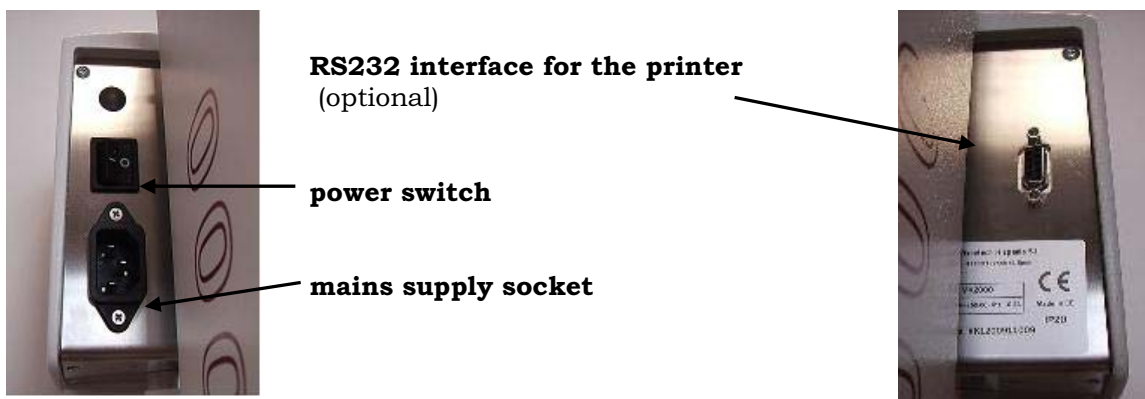
- Install the viscometer close to a power supply on a firm surface. Choose an installation site protected from vibrations or contacts that could have a negative influence on the results.
- Proceed levelling the viscometer by turning the adjusting feet located under the base of the viscometer (s. fig. 1)
- Locate the supporting elements for the cans according to the illustration.



Don't throw the box and the transport elements away as you could need them in case the viscometer should be returned to the manufacturer for reparation

3.3 Instrument connections

All connections of the instrument are placed on the rear plate of the head, as the illustration below shows :



- Connect the cables in their respective positions.



CAUTION

Before turning on the instrument for the first time, please check if the power requirements indicated on the type plate correspond to the power supply being used.



DANGER

Be sure that the power supply where you connect the viscometer is electrically grounded.

3.4 Setting up the spindle

To set up the spindle, proceed as follows:

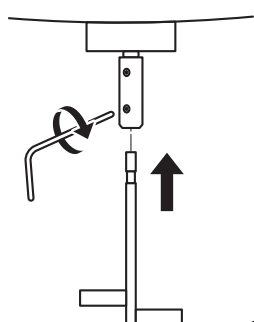


fig. 2

- Insert it through the hole of the pivot shaft until it reaches the maximum position (s. fig. 2).
- Tighten it slightly using a hex key turning it in a clockwise sense in order to clamp spindle to the pivot shaft through the anchoring zone.
- Pull the spindle down until it reaches the lowest position of the anchoring zone.
- Check manually that the spindle fits correctly.

4 Cleaning



DANGER

Before starting any cleaning operation, check that unit has been unplugged from the mains and that the spindle has been removed from the device.

The KREBS viscometer should be cleaned in regular periods of time. To carry out this operation, please observe following instructions:

- Use a clean piece of cloth to clean the instrument and the front panel.
- Avoid using solvents or cleaning agents to perform this operation.
- The spindle may be cleaned with solvents compatible with the sample to be analyzed.
- The spindle is made of stainless steel. Use therefore cleaning agents for this material.



CAUTION

Clean the spindle carefully to avoid bending it.

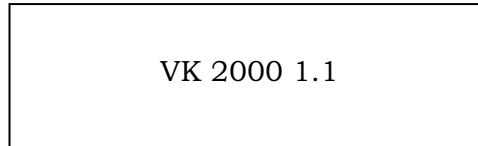
5 Operation

5.1 Initial turn-on and configuration

Before starting to work with the viscometer, the configuration of the equipment must be performed according to the specifications desired. The configuration menu allows you to select, in this order, the measurement units, the sample waiting time (SWT), the sample measuring time (SMT), the time and the date .

Initial turn-on and configuration

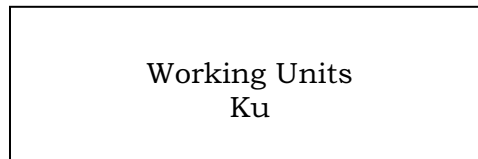
- Turn on the viscometer by pressing the mains switch placed on the rear panel of the viscometer. Afterwards, the presentation screen will appear on the display.



- To enter the configuration menu, press consecutively START and ENTER within the next 5 seconds.

Selection of measuring unit

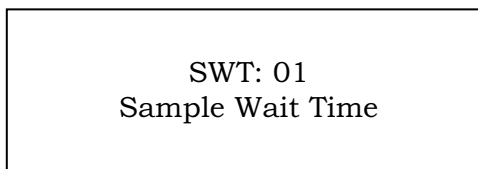
By default, the display will show following information:



- Use UP and DOWN buttons to scroll and select the measurement unit you want to work with: Ku (Krebs units), cP (centipoises) and g (grams).
- Once you reach the desired unit, press ENTER to confirm.

SWT (Sample Wait Time)

The SWT (Sample Wait Time) is the time that the spindle remains immersed in the fluid without any movement before starting the rotation. During this period of time, the sample stabilizes after experiencing some turbulence due to the immersion of the spindle. The display shows by default the following information.



By default, the SWT is set at 1 second. The viscometer allows you to select between 1 and 99 seconds, being the minimal selected possible time of 1 second.

-
- Use the UP and DOWN buttons to scroll and select the time you want the spindle to remain in the fluid before starting to rotate.
 - When you reach the desired value, press ENTER to confirm.

SMT (Sample Measure Time)

The SMT (Sample Measure Time) is the rotation time of the spindle within the fluid before the viscosity reading appears on the display.

The SMT selected by default is 10 seconds. The viscometer allows you to select between 5 and 99 seconds, being the minimal selection time of 5 seconds.

SMT: 10
Sample Measure Time

- Use the UP and DOWN buttons to scroll and select the time you want the spindle to rotate in the fluid.
- When you reach the desired value, press ENTER to confirm.

Time and date

By default, display shows following information

TIME/DATE
EU mode

The viscometer offers you two different modes for date and time (which will appear permanently on the display): EU mode (European mode: day-month-year) and US mode (month-day-year).

- Use the UP and DOWN buttons to scroll and select the mode you desire to display DATE and TIME .
- When you reach the desired value, press ENTER to confirm.

Set Clock EU mode
Friday (day)
04-12-09 (ddmmyy)
13:04:05 (hhmmss)

-
- Use the UP and DOWN buttons to scroll and select the **day of the week** (the first concept that flashes).
 - When you reach the desired value, press ENTER to confirm.
 - Select afterwards **the date**. Use the UP and DOWN buttons to scroll and select respectively the unit that flashes: day (dd), month (mm) and year (yy) –in the EU-mode–. Press ENTER after every selection to confirm the desired value.
 - Proceed the same way to select the **time**. Use the UP and DOWN buttons to scroll and select respectively the unit that flashes: hour (hh), minute (mm) and second(s) (ss). Press ENTER after every selection to confirm the desired value.

After introducing the seconds and having confirmed with ENTER, the configuration setup will be finished. On the display appears then shortly the following information:

VK 2000 1.1

and afterwards:

VK 2000 1.1
<START> automatic
<ENTER> manual
13:14:09

The VK 2000 is now ready for operation. You can choose between automatic mode or manual mode.

5.2 (START) Automatic mode measurement

Start

The automatic mode allows you to work with any sample container that can be placed between the working platform and the spindle and that allows the viscometer to reach the lowest position. We recommend to observe the following instructions in order to achieve an standard and reproducible process routine:

- Place the sample container on its working position.
- Insert the spindle in its shaft as described in chapter 3.4.
- Lower the spindle manually until it reaches the lowest position (acoustic signal will be activated).
- Fill in the sample into the container until it reaches the level mark in the spindle. Write down the quantity of sample used.

By means of this standardized process you will be able to perform different measurements with the same working conditions. This will allow you to compare reliable the results.

INFORMATION:



Fill 450 - 460 ml of sample in the 600 ml beaker (low model) delivered with the instrument and start working in automatic mode.

It is possible to change measurement units, KU (Krebs units), cP (centipoises) and g (grams), by pressing UP and DOWN buttons on the working mode selection screen.

```
VK 2000 1.1
<START> automatic
<ENTER> manual
13:14:09
```

- To begin working in automatic mode, just press START.

The display indicates SWT, SMT and measurement unit previously introduced during setup phase or already configured at the time the viscometer has been switched on:

```
automatic process
SWT: 01s. SMT: 05s.
Ku: 000.0
Press <START>
```

Use the UP and DOWN buttons to scroll and select SWT, SMT and measurement unit you want to work with.

- To confirm these values, press ENTER.
- Press START to lower the viscometer head.

Should the values on the display be OK, press START to begin with measurements.

```
automatic process
SWT: 01s. SMT: 05s.
Ku: 000.0
Going DOWN
```

SWT

When the spindle reaches its lowest position, the immersion time in the fluid begins to count down (SWT).



You may stop the process at this moment by pressing the STOP button, as showed on the display. In this case, the viscometer would return to its 'home' (upper) position and the display will show the working mode selection screen.

```
automatic process
SWT: 01s. SMT: 05s.
Going UP
```

SMT

Once the SWT is over, the spindle starts the rotation and the measurement time (SMT) begins to count down. During this process, the result of the reading appears on the display.

```
automatic process
SWT: 01s. SMT: 03s.
Ku: 121
<STOP> quit
```



You may stop the process at this moment by pressing the STOP button, as showed on the display. The viscometer remains in its position and the display shows the the working mode selection screen. Press START to enter the automatic mode and START again to initiate the measurement. If you wish to change to manual mode, press ENTER.

```
VK 2000 1.1
<START> automatic
<ENTER> manual
12:25:47
```

End

After completing measurement time, the viscometer head returns to its 'home' (upper) position. The final viscosity reading appears on the display together with the setup values (SWT, SMT and measure unit).

```
automatic process
SWT: 01s. SMT: 05s.
Ku: 000.0
<ENT> print <STP> quit
```

Print results

Should the viscometer be attached to a serial printer, it is possible to print the viscosity readings in 3 different units (Krebs, grams and centipoises) along with identification details of viscometer, and the date and time of operation by pressing ENTER (see fig. below).

```
-----  
KREBS VISCOMETER  
-----  
Model:  VK2000  
Ser.No. VK1200910006  
-----  
Time:  17:25:55  
Date:  14-12-09  
-----  
RESULTS  
  
Ku:   104.7  
  
g:    0538  
  
cP:   1881  
  
-----  
Signature  
  
-----  
www.mvl.com.es
```



In case that a failure in the lifting column comes up during the setup time established for lowering and lifting the viscometer head, the unit will get blocked. An alarm indication appears on the display and the equipment will emit a warning beep.

SECURITY STOP
mechanical
malfunction

When this occurs, the viscometer remains blocked and non operative, so as to avoid further damages on the main mechanics.

- Press **(STOP)** to switch the acoustic alarm off. The viscometer will still remain blocked.
- Please contact the Technical Service to solve this problem.

5.3 (ENTER) Manual mode measurement

Start

If you need to work with different containers and sample volumes, the spindle must then be positioned manually in order to immerse it at the right place in the sample. The manual mode helps you to perform this process.

It is possible to change measurement units, KU (Krebs units), cP (centipoises) and g (grams), by pressing UP and DOWN buttons on the working mode selection screen.

VK 2000 1.1
<START> automatic
<ENTER> manual
13:14:09

- Start this mode by pressing ENTER. After that, the display shows the following information:

<UP/DOWN> spindle
<START/STOP> measure
Ku: 000.0
<ENTER> print

UP/DOWN buttons:

Use the UP and DOWN buttons to adjust the position of the spindle in the sample. It should be immersed in the fluid until the surface level of the sample reaches the notch in the spindle.

When the viscometer reaches the lowest position, an acoustic alarm beeps and the viscometer automatically stops.



If you perform measurements with ½ pint USA, the spindle should be lowered before accommodating the can. As the length of the spindle blades is larger than the diameter of the can, the can must be slightly tilted to place it correctly.

START/STOP buttons:

When the spindle reaches the desired position, press START or STOP to activate or stop respectively the rotation and the viscosity reading.

Printed data

During measurement process, you can every time print a ticket with the viscosity readings and identification details of the unit by simply pressing ENTER.



When measurement is fulfilled, the viscometer head must return to its initial (upper) position by pressing the UP button. To realize that the position has been reached, the viscometer triggers an acoustic signal.

6 About viscometer's calibration

The instrument delivered has been calibrated with certified patrons (in Krebs units) by the manufacturer before shipping. We strongly recommend carrying out calibrations on a regular basis depending on operation frequency. For the correct calibration of the viscometer, please contact your local dealer. Calibration must not be verified using viscosity values in cP's.

7 Accessories (optional)

thermal printer
special paste spindle
standard certified oil (Krebs)

8 About viscosity

Description of KREBS unit

The digital KREBS viscometer is based on the stormer mechanical system (one blade that rotates at constant speed). The variation between products (viscosity) is determined by modifying the weight (grams) needed to maintain such constant velocity.

KU (KREB-units) is a scale normally used to refer to "viscosity" or "consistency" of paints applied by brush or with roller.

The equivalence in cP must only be considered on an information level and should never be compared with the measurement readings obtained with other viscometer types.

KREBS unit is defined by following equation:

- For viscosity ranges between 200 – 2100 cP
- $KU = 1,1187 + 0,8542 \ln(0,1938v + 36) - 0,0443[\ln(0,1938v + 36)]^2$
- For viscosity ranges between 2100 – 5000 cP
- $KU = 1,8118 + 0,596 \ln(0,1938v + 36) - 0,0206[\ln(0,1938v + 36)]^2$

where:

KU means viscosity in KREBS-units

v means viscosity in cP

10 Troubleshooting

Problem	Solution
The instrument doesn't work	<ul style="list-style-type: none">• Check the mains switch
	<ul style="list-style-type: none">• Check the connection to the mains
The instrument makes no reading = 0 when measuring without sample	<ul style="list-style-type: none">• Check if instrument is correctly levelled
	<ul style="list-style-type: none">• Contact your distributor
The viscosity reading is unstable or not very accurate	<ul style="list-style-type: none">• Check if instrument is correctly levelled
	<ul style="list-style-type: none">• Check if temperature of sample is stable
	<ul style="list-style-type: none">• Check the characteristics of the sample that must be analyzed