

# **BROOKFIELD KU-2**

## **Viscometer**

Operating Instructions

Manual No. **M04-242-E1213**



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# I. INTRODUCTION

The Brookfield KU-2 Viscometer measures fluid viscosity in Krebs units. A paddle type spindle is driven at 200 rpm by a constant speed motor. The reaction torque of the spindle rotating at 200 rpm is converted to viscosity in Krebs Units. The digital display of the Viscometer shows viscosity in Krebs Units (KU), the associated grams value (gm), and viscosity in centipoise (cP). The value for centipoise is a conversion from the Krebs value as described in the ASTM standard D562. The Viscometer will measure viscosity from 40 KU to 141 KU, at weights of 32 to 1,099 grams (the equivalent centipoise range is 27 - 5,274 cP). Application reference information can be found in ASTM D562.

## I.1 Components

The KU-2 Viscometer package (Figure 1 and Figure 1.1) includes:

- (1) KU-2 Viscometer, upright rod and base
- (1) Paddle spindle (KU1-10)
- (1) US 1/2 pint can adapter (KU1-73)
- (1) US pint can adapter (KU1-74)
- (1) U.S. pint can (KU1-34) - not shown
- (1) Power Cord, 115 VAC (DVP-65) or 220 VAC (DVP-66)
- (1) Operating instructions (M04-242)

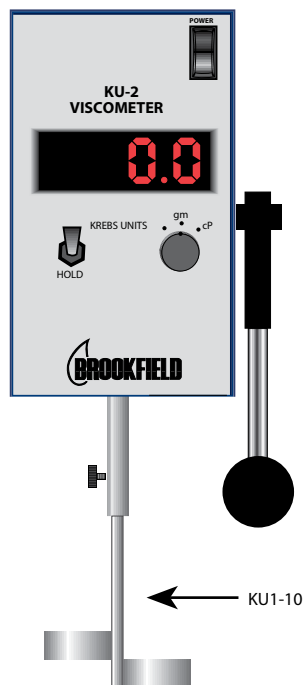


Figure 1 (front view)

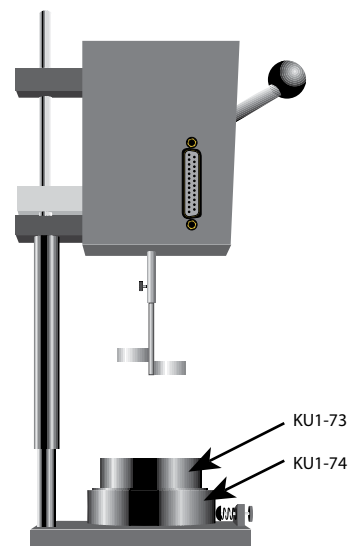


Figure 1.1 (side view)

Please check to be sure that you have received all components, and that there is no damage. If you are missing any parts, please notify Brookfield or your local Brookfield agent immediately. Any shipping damage must be reported to the carrier.

## I.2 Options

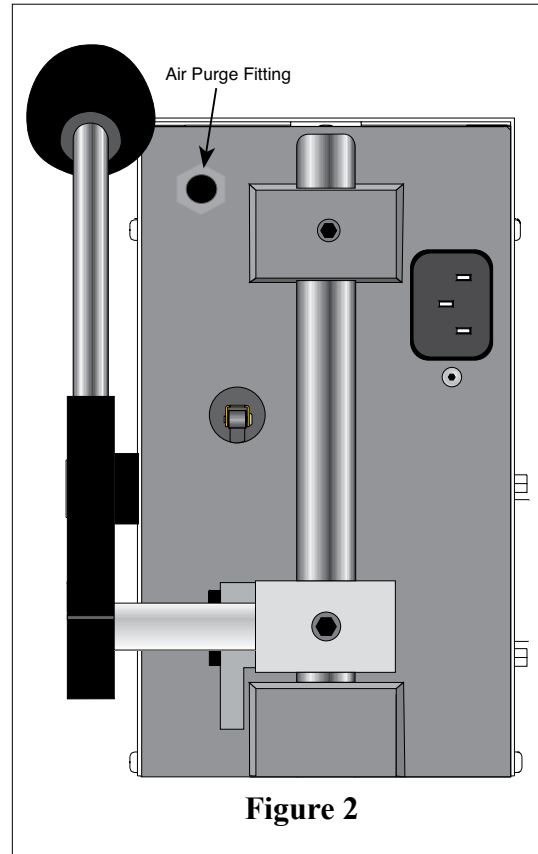
### I.2.1 Air Purge

The air purge option, Part No. KU-2A (Figure 2), allows the interior of the KU-2 to be pressurized with air (or an inert gas) when the instrument is to be used in a hazardous environment. A built-in pressure switch turns the instrument off when the pressure drops below 2.0 PSI (falling). The switch comes on at 10.0 PSI (rising).

Connect a regulated clean air (or inert gas) supply which is non-corrosive to brass to the fitting shown in Figure 2. Adjust the pressure to approximately 25 PSI.

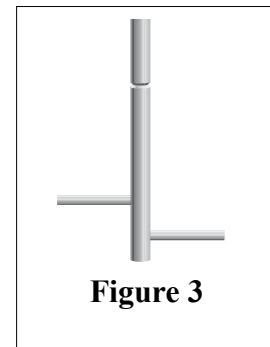
**Note:** The pressure switch range is 0-40 PSI.

 **DO NOT CONNECT PRESSURE HIGHER THAN 40 PSI TO THE SWITCH!**



### I.2.2 Optional Paste Spindle

The paste spindle, Part No. KU1-75Y (Figure 3), is a special spindle; it is not included in a standard shipment/order. The design consists of offset rod-type vanes, approximately 2 mm diameter x 19 mm long. This spindle is suitable for use with high consistency materials such as roller mill pastes. *Do not use this spindle to report normal Krebs Unit measurements or centipoise.* Record the grams value shown in the digital display and note that the paste spindle was used to make the viscosity measurement.



### I.3 Specifications

Range:	40–141 KU 32–1,099 gm 27 - 5,274 cP*
Accuracy:	± 1% of full scale range
Repeatability:	± 0.5% of full scale range
Paddle speed:	200 rpm ± 0.1 rpm
Printer output:	25D-Type Centronics Parallel Printer Output
Net weight:	22 lb. (10 kg)
Gross weight:	25 lb. (11 kg)
Dimensions:	15 x 11 x 20
Operating Environment:	0°C (32°F) to 40°C (104°F) 20% - 80% R.H.: non-condensing atmosphere
Electrical Certifications:	Conforms to CE Standards for: Electromagnetic Compatibility (EMC), Low Voltage (LVD) and Safety Requirements for electrical equipment for measurement control and laboratory use.

\*Centipoise scale is for reference only. Do not use for calibration.

### I.4 Sample Container Specifications

#### Container Dimensions

	<u>Can Height</u>	<u>Bottom Flange Diameter</u>
U.S. Pint	3.850" (9.78 cm)	3.385" (8.60 cm)
U.S. Half Pint	2.850" (7.24 cm)	2.875" (7.30 cm)
U.S. Quart	4.845" (12.31 cm)	4.230" (10.74 cm)

If you have a requirement for container dimensions other than those listed above, please contact Brookfield or an authorized Brookfield agent.

### I.5 Utilities

Input voltage:	115 VAC or 230 VAC*
Input frequency:	50/60 Hz
Power consumption:	16 VA (watts)
Power cord color code:	



	<i>USA</i>	<i>Outside USA</i>
Hot (live)	Black	Brown
Neutral	White	Blue
Ground (earth)	Green	Green/Yellow

\*Main supply voltage fluctuations are not to exceed ± 10% of the nominal supply voltage.





## I.6 Safety Symbols and Precautions

### Safety Symbols

The following explains safety symbols which may be found in this operating manual.

-  Indicates hazardous voltages may be present.
-  Refer to the manual for specific warning or caution information to avoid personal injury or damage to the instrument.

### Precautions

-  If this instrument is used in a manner not specified by the manufacturer, the protection provided by the instrument may be impaired.
-  This instrument is not intended for use in a potentially hazardous environment.
-  In case of emergency, turn off the instrument and then disconnect the electrical cord from the wall outlet.
-  The user should ensure that the substances placed under test do not release poisonous, toxic or flammable gases at the temperatures to which they are subjected to during the testing.

## I.7 Printer Connection

The KU-2 is equipped with a parallel printer port located on the side of the instrument allowing printing with a parallel printer. A standard parallel printer cable (25 pin, Type D Centronics, available from Brookfield as part number CAP-86) is used to connect the viscometer to the printer.

When connected to a printer, the KU-2 will print one line of data each time the "Hold Reading" switch is moved to the down position.

The data line includes the viscosity (in Krebs Units and centipoise) and the associated weight (in grams):


```
xxxxgm      xxxxxKU      xxxxcP
51gm        46.6KU        120cP
```

Dashes in the printout indicate an "over-range" condition or that the handle has risen to the top position (i.e. the spindle is not rotating):

```
----g      -.-.-KU      ----cP
```

Parallel Printer Output Connection	
Pin	Function
1	STB
2	D0
3	D1
4	D2
5	D3
6	D4
7	D5
8	D6
9	D7
25	GND

Figure 4

-  When connecting the cable to the KU-2, THE PRINTER POWER (AC mains) SHOULD BE "OFF"!





## I.8 Viscosity Units

The Krebs Unit is a special measure of viscosity that is not based on the Newtonian model of flow. The ASTM test method D562 was originally developed around the special conditions of an instrument that used gravity to drive a paddle spindle at 200 rpm. The weight required to achieve 200 rpm varied depending upon the viscosity of the fluid under test. The Krebs unit was developed through the correlation of the weights used and the time required for 100 revolutions of the paddle. The ASTM standard also provided a correlation from Krebs Units to the scientific measure of viscosity in centipoise.

The Grams scale represents the weight required to drive the paddle through the test fluid at a rate of 200 rpm. The gravity drive system specified in ASTM D562 required that the weight be varied until 100 revolutions were achieved in 30 seconds (200 rpm). The KU-2 drives the unit at 200 rpm automatically and provides the grams value that would be required on the gravity drive system. The grams scale is not a viscosity unit.


The Centipoise scale is available through a correlation originally defined in the ASTM test method. Since this value is based on the Krebs Unit, it is not equivalent to centipoise values determined using other types of viscometers, such as the Brookfield RVDV-I+. The centipoise values displayed on the KU-2 are for reference only. Comparisons to measured values from other instruments should not be made.

## I.9 Cleaning

-  Make sure the instrument is in a decent working environment (dust-free, moderate temperature, low humidity, etc.).
-  Make sure the instrument is on a level surface.
-  Hands/fingers must be clean and free of residue sample. Not doing so may result in deposit build up on the upper part of the shaft and cause interference between the shaft and the pivot cup.
-  Be sure to remove the spindle from the instrument prior to cleaning. Note left-handed thread. Severe instrument damage may result if the spindle is cleaned in place.

Instrument and Keypad: Clean with a dry, non-abrasive cloth. Do not use solvents or cleaners.

Immersed Components (spindles): Spindles are made of stainless steel. Clean with a non-abrasive cloth and solvent appropriate for sample material.

-  When cleaning, do not apply excessive force, which may result in bending spindles.



## II. OPERATION

### II.1 Set-Up

- 1) Be sure that the power switch is off. Attach the power cord to the appropriate power source.
- 2) Move the operating handle to the top (upper most) position.
- 3) Connect the printer (if used) to the parallel port. Be sure the printer power is off.
- 4) Loosen the thumb screw on the Viscometer shaft; insert the paddle spindle into the Viscometer shaft, as far as it will go. Line up the groove on the spindle with the hole that the thumb screw goes into. Tighten the thumb screw.
- 5) **For Quart Cans:** The can will be placed directly on the viscometer base.
- 6) **For Pint Cans:** Place the pint can adapter (KU1-74) on the viscometer base, pulling the spring loaded front locator out and placing the adapter against the rear locating pins. Release the locator to secure the adapter in place.
- 7) **For 1/2 Pint Cans:** Follow the procedure for pint cans. Place the 1/2 pint can adapter (KU1-73) on top of the pint can adapter (KU1-74).

### II.2 Taking Measurements

- 1) Pour sample into the container. Fill to 3/4 inch (20 mm) below the container lip.
- 2) Bring the sample in the container to the specified temperature.
- 3) Switch on the KU-2 power switch and then the printer (if used). Switch the Hold Reading Switch to the up position. (See Figure 5.)
- 4) Select the desired display (KU, gm or cP) using the Display unit Selector switch. (This setting may be changed at any time during the test.)
- 5) **For Quart Cans:** Place the sample container on the Viscometer base by pulling the spring loaded front locator out, placing the container against the rear of the locating pins, and releasing the locator to secure the can in place.
- 6) **For Pint & 1/2 Pint Cans:** Place the sample container directly on the can adapter mounted on the viscometer base.
- 7) Move the Viscometer handle down to the lowest position. This will automatically immerse the spindle into the fluid. If the correct amount of fluid has been put into the container, the surface of the fluid will be at the immersion mark of the spindle.



Figure 5

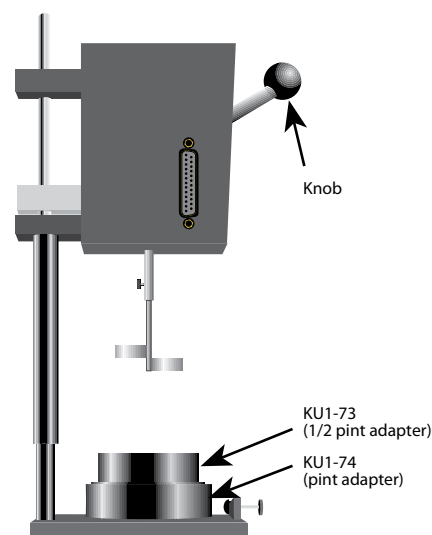
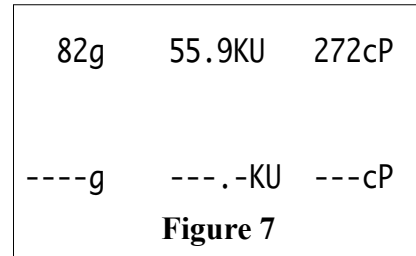


Figure 6

**⚠ CAUTION:** When using the 1/2 pint can, do not lower the spindle directly into the container. The narrow diameter of the can requires the spindle to be introduced at an angle. Tilt the 1/2 pint can while lowering the viscometer.

- 8) The spindle will begin to rotate once the handle is within 1/2 inch of the lowest position.
- 9) Wait 5 seconds for the display reading to stabilize. A display of "----" indicates an over-range condition. If a printer is being used, these dashes will print in place of data (Figure 7).
- 10) Move the Hold Reading Switch to the down position to "Hold" the display. If a printer is connected, a string of data will print as soon as the Hold reading switch is moved to the down position (Figure 7). The display unit selector switch may be used to change the display.
- 11) Raise the handle to the top position. This stops the spindle from rotating.



**Note:** When using 1/2 pint cans, you must lift the can and then tilt slightly to remove the spindle.

- 12) Loosen the thumb screw and remove spindle for cleaning.

**Note:** Do not remove the thumb screw. If dropped, it may fall into the sample.

### II.3 Troubleshooting

If the operating handle is in the DOWN position and the display locks up and/or the spindle does not rotate the following should be checked:

- Be sure the **HOLD** switch is in the **UP** position. If the hold switch was in the DOWN position prior to engaging the operating handle, dashes (—) or the previous reading may appear in the display.
- The KU-2 requires a shutdown (power off) period of at least 30 seconds before it can be operated properly. If the unit had previously been turned off and immediately turned back on (without a 30 second shutdown period) both the display and rotation may temporarily lock up.

If you experience these problems, simply raise the operating handle, turn the unit off and wait a minimum of 30 seconds before turning the power back on.

## Appendix A - KU-2 Calibration Information

The accuracy of the KU-2 is verified using viscosity standard fluids calibrated in Krebs Units, which are available from Brookfield Engineering Laboratories or your local Brookfield dealer/distributor/representative. Note: Calibration should not be verified using the centipoise scale. The centipoise scale is for reference use only and is based on a correlation from the Krebs Unit details in the ASTM test method D562. Viscosity Standards are calibrated at 25°C. Available standards are listed in Table A-1 below:

<u>Brookfield Viscosity Standard</u>	<u>Nominal Viscosity (KU)</u>	<u>Temperature (°C)</u>
KU61	61	25
KU73	73	25
KU87	87	25
KU99	99	25
KU106	106	25

### Brookfield Viscosity Standards

We recommend that Brookfield Viscosity Standard Fluids be replaced in accordance with the expiration date on the label. These fluids can be stored under normal laboratory conditions. Disposal should be in accordance with local, state and federal regulations. Material Safety Data Sheets are available on our website: [www.brookfieldengineering.com/support/documentation](http://www.brookfieldengineering.com/support/documentation).

### Calibration Check Procedure

The frequency of the calibration check should be based on your company's standard practice for test and calibration of instruments.

- 1) Select any two viscosity standards listed in Table A-1 to perform your calibration check. The viscosity standards are very temperature sensitive. The viscosity value of the fluid will change with temperature so it is important to control the temperature to 25.0°C.

**Note:** Do not use viscosity standards calibrated in centipoise.

- 2) Pour the selected fluid into a standard US 1-pint can. The spindle and the fluid in the can should come to temperature equilibrium before proceeding with the calibration check.

***It is important that the fluid and the spindle come to 25.0°C, ± 0.1°C, before proceeding with the calibration check.***

- 3) Once the fluid and spindle have come to thermal equilibrium, place the sample container on the viscometer base, using the KU1-74 adapter. Switch the power switch and printer (if used) to "ON". Switch the Hold Reading Switch to the "UP" position. Turn the Select knob to "KU".
- 4) Move the viscometer handle down to the lowest position. The spindle will begin rotating once the handle is within 1/2 inch of the lowest position.
- 5) Wait five (5) seconds for the reading to stabilize. Switch the Hold Reading Switch to the "DOWN" position. **You will need to record measurements in KU and gm.** These two values work together to let you interpret the calibration results.

- 6) After you have recorded results in KU, then move the Selector knob to the "gm" position and record your reading in grams. If you are using a printer, three measurements will be sent to the printer and will print out as soon as the Hold Display switch is switched back to the DOWN position.

### Interpretation of Calibration Check Results

When verifying the calibration of the KU-2, the instrument tolerance and viscosity standard fluid tolerance must be **combined** to calculate the total allowable error.

The KU-2 is accurate to  $\pm 11$  grams, which is 1% of the full scale range in grams. The Brookfield Viscosity Standard is accurate to  $\pm 1\%$  of the stated viscosity in KU.

The total allowable error should be stated in KU. Since the instrument accuracy is stated in grams, you will have to use the comparison table (Table A-2) and convert from grams to KU.

Correct interpretation of your calibration results requires that you compare your readings in grams to the equivalent in KU. You must then bracket your reading with upper and lower limits based on the allowable error of  $\pm 11.0$  grams. Convert this acceptable range in grams (as defined by the upper and lower limits) to KU units.

**Example:** Calculate the allowable error of the KU-2 using fluid KU106; the stated viscosity of the fluid is 104.8 KU. The viscometer indicated a measured viscosity of 105 KU and 410 grams.

- 1) Measured results from the calibration check in grams were 410 grams. Locate 410 grams on the conversion chart (Table A-2).
- 2) The KU-2 is accurate to  $\pm 11.0$  grams. Starting from 410 grams, count 11 places above and below the 410 grams. This is called "bracketing" the acceptable range. In this case, the acceptable range will be from 399 grams to 421 grams.
- 3) Convert the acceptable range in grams to KU. Locate the minimum and maximum grams bracketed. Look to the right of each number for the conversion to KU. In this case, it will be 103.9 KU minimum and 105.7 KU maximum. The total difference between 103.9 and 105.7 KU is 1.8 KU. Therefore, the accuracy is  $\pm 0.9$  KU. ***This is the accuracy for the Viscometer in KU,  $\pm 0.9$  KU.***
- 4) Now that you have the accuracy for the instrument, you can add it to the accuracy of the fluid. The fluid is accurate to  $\pm 1\%$  of the stated value in KU. The viscosity standard is calibrated at 104.8 KU,  $\pm 1\%$  is equal to  $\pm 1.0$  KU.

$$\begin{array}{r}
 0.9 \text{ KU (instrument accuracy)} \\
 + \underline{1.0 \text{ KU (fluid accuracy)}} \\
 \hline
 1.9 \text{ KU (total allowable error)}
 \end{array}$$

- 5) Total allowable error for the calibration check in this example is 104.8 KU,  $\pm 1.9$  KU (102.9 KU to 106.7 KU). Since the measured reading of 105 KU falls within this range, the Viscometer is considered in calibration.



**Table A-2 (continued)**

g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP
626	121.0	2948	701	125.1	3317	776	129.7	3686	851	133.8	4054	926	137.0	4423	1001	139.8	4792	1076	141.0	5161
627	121.1	2953	702	125.1	3322	777	129.8	3691	852	133.9	4059	927	137.1	4428	1002	139.8	4797	1077	141.0	5166
628	121.1	2958	703	125.2	3327	778	129.8	3695	853	133.9	4064	928	137.1	4433	1003	139.8	4802	1078	141.0	5171
629	121.2	2963	704	125.2	3332	779	129.9	3700	854	134.0	4069	929	137.2	4438	1004	139.8	4807	1079	141.0	5176
<b>630</b>	<b>121.2</b>	<b>2968</b>	<b>705</b>	<b>125.3</b>	<b>3336</b>	<b>780</b>	<b>130.0</b>	<b>3705</b>	<b>855</b>	<b>134.0</b>	<b>4074</b>	<b>930</b>	<b>137.2</b>	<b>4443</b>	<b>1005</b>	<b>139.9</b>	<b>4812</b>	<b>1080</b>	<b>141.0</b>	<b>5181</b>
631	121.3	2972	706	125.4	3341	781	130.0	3710	856	134.0	4079	931	137.2	4448	1006	139.9	4817	1081	141.0	5186
632	121.3	2977	707	125.4	3346	782	130.1	3715	857	134.1	4084	932	137.3	4453	1007	139.9	4822	1082	141.0	5191
633	121.4	2982	708	125.5	3351	783	130.2	3720	858	134.1	4089	933	137.3	4458	1008	139.9	4827	1083	141.0	5195
634	121.4	2987	709	125.5	3356	784	130.2	3725	859	134.2	4094	934	137.4	4463	1009	139.9	4832	1084	141.0	5200
<b>635</b>	<b>121.5</b>	<b>2992</b>	<b>710</b>	<b>125.6</b>	<b>3361</b>	<b>785</b>	<b>130.3</b>	<b>3730</b>	<b>860</b>	<b>134.2</b>	<b>4099</b>	<b>935</b>	<b>137.4</b>	<b>4468</b>	<b>1010</b>	<b>139.9</b>	<b>4836</b>	<b>1085</b>	<b>141.0</b>	<b>5205</b>
636	121.6	2997	711	125.7	3366	786	130.4	3735	861	134.3	4104	936	137.4	4472	1011	139.9	4841	1086	141.0	5210
637	121.6	3002	712	125.7	3371	787	130.4	3740	862	134.3	4109	937	137.5	4477	1012	140.0	4846	1087	141.0	5215
638	121.7	3007	713	125.8	3376	788	130.5	3745	863	134.4	4113	938	137.5	4482	1013	140.0	4851	1088	141.0	5220
639	121.7	3012	714	125.8	3381	789	130.5	3750	864	134.4	4118	939	137.6	4487	1014	140.0	4856	1089	141.0	5225
<b>640</b>	<b>121.8</b>	<b>3017</b>	<b>715</b>	<b>125.9</b>	<b>3386</b>	<b>790</b>	<b>130.6</b>	<b>3754</b>	<b>865</b>	<b>134.5</b>	<b>4123</b>	<b>940</b>	<b>137.6</b>	<b>4492</b>	<b>1015</b>	<b>140.0</b>	<b>4861</b>	<b>1090</b>	<b>141.0</b>	<b>5230</b>
641	121.8	3022	716	126.0	3391	791	130.7	3759	866	134.5	4128	941	137.6	4497	1016	140.0	4866	1091	141.0	5235
642	121.9	3027	717	126.0	3395	792	130.7	3764	867	134.6	4133	942	137.7	4502	1017	140.0	4871	1092	141.0	5240
643	121.9	3032	718	126.1	3400	793	130.8	3769	868	134.6	4138	943	137.7	4507	1018	140.0	4876	1093	141.0	5245
644	122.0	3036	719	126.1	3405	794	130.8	3774	869	134.7	4143	944	137.8	4512	1019	140.1	4881	1094	141.0	5250
<b>645</b>	<b>122.0</b>	<b>3041</b>	<b>720</b>	<b>126.2</b>	<b>3410</b>	<b>795</b>	<b>130.9</b>	<b>3779</b>	<b>870</b>	<b>134.7</b>	<b>4148</b>	<b>945</b>	<b>137.8</b>	<b>4517</b>	<b>1020</b>	<b>140.1</b>	<b>4886</b>	<b>1095</b>	<b>141.0</b>	<b>5254</b>
646	122.0	3046	721	126.3	3415	796	131.0	3784	871	134.8	4153	946	137.8	4522	1021	140.1	4891	1096	141.0	5259
647	122.1	3051	722	126.3	3420	797	131.0	3789	872	134.8	4158	947	137.9	4527	1022	140.1	4895	1097	141.0	5264
648	122.1	3056	723	126.4	3425	798	131.1	3794	873	134.9	4163	948	137.9	4532	1023	140.1	4900	1098	141.0	5269
649	122.2	3061	724	126.4	3430	799	131.1	3799	874	134.9	4168	949	138.0	4536	1024	140.1	4905	1099	141.0	5274
<b>650</b>	<b>122.2</b>	<b>3066</b>	<b>725</b>	<b>126.5</b>	<b>3435</b>	<b>800</b>	<b>131.2</b>	<b>3804</b>	<b>875</b>	<b>134.9</b>	<b>4172</b>	<b>950</b>	<b>138.0</b>	<b>4541</b>	<b>1025</b>	<b>140.1</b>	<b>4910</b>			
651	122.3	3071	726	126.6	3440	801	131.2	3809	876	135.0	4177	951	138.0	4546	1026	140.2	4915			
652	122.3	3076	727	126.6	3445	802	131.3	3813	877	135.0	4182	952	138.1	4551	1027	140.2	4920			
653	122.4	3081	728	126.7	3450	803	131.3	3818	878	135.1	4187	953	138.1	4556	1028	140.2	4925			
654	122.4	3086	729	126.7	3454	804	131.4	3823	879	135.1	4192	954	138.2	4561	1029	140.2	4930			
<b>655</b>	<b>122.5</b>	<b>3091</b>	<b>730</b>	<b>126.8</b>	<b>3459</b>	<b>805</b>	<b>131.4</b>	<b>3828</b>	<b>880</b>	<b>135.2</b>	<b>4197</b>	<b>955</b>	<b>138.2</b>	<b>4566</b>	<b>1030</b>	<b>140.2</b>	<b>4935</b>			
656	122.6	3095	731	126.9	3464	806	131.5	3833	881	135.2	4202	956	138.2	4571	1031	140.2	4940			
657	122.6	3100	732	126.9	3469	807	131.6	3838	882	135.3	4207	957	138.3	4576	1032	140.2	4945			
658	122.7	3105	733	127.0	3474	808	131.6	3843	883	135.3	4212	958	138.3	4581	1033	140.3	4950			
659	122.7	3110	734	127.0	3479	809	131.7	3848	884	135.4	4217	959	138.4	4586	1034	140.3	4954			
<b>660</b>	<b>122.8</b>	<b>3115</b>	<b>735</b>	<b>127.1</b>	<b>3484</b>	<b>810</b>	<b>131.7</b>	<b>3853</b>	<b>885</b>	<b>135.4</b>	<b>4222</b>	<b>960</b>	<b>138.4</b>	<b>4591</b>	<b>1035</b>	<b>140.3</b>	<b>4959</b>			
661	122.8	3120	736	127.2	3489	811	131.8	3858	886	135.5	4227	961	138.4	4595	1036	140.3	4964			
662	122.9	3125	737	127.2	3494	812	131.8	3863	887	135.5	4232	962	138.5	4600	1037	140.3	4969			
663	122.9	3130	738	127.3	3499	813	131.9	3868	888	135.6	4236	963	138.5	4605	1038	140.4	4974			
664	123.0	3135	739	127.3	3504	814	131.9	3872	889	135.6	4241	964	138.6	4610	1039	140.4	4979			
<b>665</b>	<b>123.0</b>	<b>3140</b>	<b>740</b>	<b>127.4</b>	<b>3509</b>	<b>815</b>	<b>132.0</b>	<b>3877</b>	<b>890</b>	<b>135.6</b>	<b>4246</b>	<b>965</b>	<b>138.6</b>	<b>4615</b>	<b>1040</b>	<b>140.4</b>	<b>4984</b>			
666	123.1	3145	741	127.5	3513	816	132.0	3882	891	135.7	4251	966	138.6	4620	1041	140.4	4989			
667	123.1	3150	742	127.5	3518	817	132.1	3887	892	135.7	4256	967	138.7	4625	1042	140.4	4994			
668	123.2	3154	743	127.6	3523	818	132.1	3892	893	135.8	4261	968	138.7	4630	1043	140.5	4999			
669	123.2	3159	744	127.6	3528	819	132.2	3897	894	135.8	4266	969	138.8	4635	1044	140.5	5004			
<b>670</b>	<b>123.3</b>	<b>3164</b>	<b>745</b>	<b>127.7</b>	<b>3533</b>	<b>820</b>	<b>132.2</b>	<b>3902</b>	<b>895</b>	<b>135.8</b>	<b>4271</b>	<b>970</b>	<b>138.8</b>	<b>4640</b>	<b>1045</b>	<b>140.5</b>	<b>5009</b>			
671	123.3	3169	746	127.8	3538	821	132.3	3907	896	135.9	4276	971	138.8	4645	1046	140.5	5013			
672	123.4	3174	747	127.8	3543	822	132.3	3912	897	135.9	4281	972	138.9	4650	1047	140.5	5018			
673	123.4	3179	748	127.9	3548	823	132.4	3917	898	136.0	4286	973	138.9	4654	1048	140.6	5023			
674	123.5	3184	749	128.0	3553	824	132.4	3922	899	136.0	4291	974	139.0	4659	1049	140.6	5028			
<b>675</b>	<b>123.6</b>	<b>3189</b>	<b>750</b>	<b>128.0</b>	<b>3558</b>	<b>825</b>	<b>132.5</b>	<b>3927</b>	<b>900</b>	<b>136.0</b>	<b>4295</b>	<b>975</b>	<b>139.0</b>	<b>4664</b>	<b>1050</b>	<b>140.6</b>	<b>5033</b>			
676	123.6	3194	751	128.1	3563	826	132.6	3932	901	136.1	4300	976	139.0	4669	1051	140.6	5038			
677	123.7	3199	752	128.2	3568	827	132.6	3936	902	136.1	4305	977	139.1	4674	1052	140.6	5043			
678	123.7	3204	753	128.2	3572	828	132.7	3941	903	136.2	4310	978	139.1	4679	1053	140.7	5048			
679	123.8	3209	754	128.3	3577	829	132.7	3946	904	136.2	4315	979	139.1	4684	1054	140.7	5053			
<b>680</b>	<b>123.8</b>	<b>3213</b>	<b>755</b>	<b>128.4</b>	<b>3582</b>	<b>830</b>	<b>132.8</b>	<b>3951</b>	<b>905</b>	<b>136.2</b>	<b>4320</b>	<b>980</b>	<b>139.2</b>	<b>4689</b>	<b>1055</b>	<b>140.7</b>	<b>5058</b>			
681	123.9	3218	756	128.4	3587	831	132.8	3956	906	136.3	4325	981	139.2	4694	1056	140.7	5063			
682	123.9	3223	757	128.5	3592	832	132.9	3961	907	136.3	4330	982	139.2	4699	1057	140.7	5068			
683	124.0	3228	758	128.6	3597	833	132.9	3966	908	136.4	4335	983	139.3	4704	1058	140.7	5072			
684	124.0	3233	759	128.6	3602	834	133.0	3971	909	136.4	4340	984	139.3	4709	1059	140.8	5077			
<b>685</b>	<b>124.1</b>	<b>3238</b>	<b>760</b>	<b>128.7</b>	<b>3607</b>	<b>835</b>	<b>133.0</b>	<b>3976</b>	<b>910</b>	<b>136.4</b>	<b>4345</b>	<b>985</b>	<b>139.3</b>	<b>4713</b>	<b>1060</b>	<b>140.8</b>	<b>5082</b>			
686	124.2	3243	761	128.7	3612	836														

## Appendix B - References

The KU-2 Viscometer is compatible with:

**ASTM D 562** Standard Test Method for Consistency of Paint Using the Stormer  
Viscometer

## Appendix C - Online Help and Additional Resources

### **www.brookfieldengineering.com\*\***

The Brookfield website is a good resource for additional and self-help whenever you need it. Our website offers a selection of “how-to” videos, application notes, conversion tables, instructional manuals, material safety data sheets, calibration templates and other technical resources.

### **<http://www.youtube.com/user/BrookfieldEng>**

Brookfield has its own YouTube channel. Videos posted to our website can be found here as well as other “home-made” videos made by our own technical sales group.

### **Viscosityjournal.com**

Brookfield is involved with a satellite website that should be your first stop in viscosity research. This site serves as a library of interviews with experts in the viscosity field as well as Brookfield technical articles and conversion charts. Registration is required, so that you can be notified of upcoming interviews and events, however, this information will not be shared with other vendors, institutions, etc..

### **Article Reprints**

- **Available in Print Only**
- Brookfield has an extensive library of published articles relating to viscosity, texture and powder testing. Due to copyright restrictions, these articles cannot be emailed. Please request your hardcopy of articles by calling our customer service department directly or by emailing: [marketing@brookfieldengineering.com](mailto:marketing@brookfieldengineering.com)
- **Available Online**
- Brookfield has a growing number of published articles that can be downloaded directly from the Brookfield website. These articles can be found on our main site by following this path: [http://www.brookfieldengineering.com/support/documentation/article reprints](http://www.brookfieldengineering.com/support/documentation/article%20reprints)

### **More Solutions to Sticky Problems**

Learn more about viscosity and rheology with our most popular publication. This informative booklet will provide you with measurement techniques, advice and much more. It's a must-have for any Brookfield Viscometer or Rheometer operator. More Solutions is available in print and also as a downloadable pdf on the Brookfield website by following this path:

<http://www.brookfieldengineering.com/support/documentation>

### **Training/Courses**

Whether it is instrument-specific courses, training to help you better prepare for auditing concerns, or just a better understanding of your methods, who better to learn from than the worldwide leaders of viscosity measuring equipment? Visit our Services section on our website to learn more about training.

\*\* Downloads will require you to register your name, company and email address. We respect your privacy and will not share this information outside of Brookfield.



## Appendix D - Warranty Repair and Service

### Warranty

Brookfield Viscometers are guaranteed for one year from date of purchase against defects in materials and workmanship. They are certified against primary viscosity standards traceable to the National Institute of Standards and Technology (NIST). The Viscometer must be returned to **Brookfield Engineering Laboratories, Inc.** or to the Brookfield dealer from whom it was purchased for a warranty evaluation service. Transportation is at the purchaser's expense. The Viscometer should be shipped in its carrying case together with all spindles originally provided with the instrument. If returning to Brookfield please contact us for a return authorization number prior to shipping.

For repair or service in the **United States** return to:

Brookfield Engineering Laboratories, Inc.  
11 Commerce Boulevard  
Middleboro, MA 02346 U.S.A.  
Telephone: (508) 946-6200 FAX: (508) 923-5009  
[www.brookfieldengineering.com](http://www.brookfieldengineering.com)

#### Before shipping the viscometer to Brookfield:

1. Visit our website and download the Repair Return Form. Complete this form and place it inside the viscometer carrying case. [www.brookfieldengineering.com](http://www.brookfieldengineering.com)
2. Contact Brookfield to receive a Return Authorization Number. Please have the viscometer model number and serial number available.

This return authorization number must be listed on the attention line of the shipping label.

For repair or service outside the United States consult Brookfield Engineering Laboratories, Inc. or the dealer from whom you purchased the instrument.

For repair or service in the **United Kingdom** return to:

Brookfield Viscometers Limited  
1 Whitehall Estate  
Flex Meadow, Pinnacles West  
Harlow, Essex CM19 5TJ, United Kingdom  
Telephone: (44) 27/945 1774 FAX: (44) 27/945 1775  
[www.brookfield.co.uk](http://www.brookfield.co.uk)

For repair or service in **Germany** return to:

Brookfield Engineering Laboratories Vertriebs GmbH  
Hauptstrasse 18  
D-73547 Lorch, Germany  
Telephone: (49) 7172/927100 FAX: (49) 7172/927105  
[www.brookfield-gmbh.de](http://www.brookfield-gmbh.de)

For repair or service in **China** return to:

Guangzhou Brookfield Viscometers and Texture Instruments Service Company Ltd.  
Room C1, 5/F, Tianxing Building East Tower, No. 21, Zhongshan Yi Road, Yuexiu District  
Guangzhou, 510600, P. R. China  
Telephone: (86) 20/3760-0548 FAX: (86) 20/3760-0548  
[www.brookfield.com.cn](http://www.brookfield.com.cn)

*On-site service at your facility is also available from Brookfield. Please contact our Service Department in the United States, United Kingdom, Germany or China for details.*

