BROOKFIELD KU-3

Viscometer

Operating Instructions

Manual No. M04-243

BROOKFIELD AMETEK®

INSTRUMENTATION & SPECIALTY CONTROLS DIVISION

11 Commerce Boulevard, Middleboro, MA 02302 USA
Tel: 508-946-6200 or 800-628-8139 (USA excluding MA)
Fax: 508-946-6262 Internet http://www.brookfieldengineering.com

Table of Contents

I. INTRODUCTION

The Brookfield KU-3 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 (g), 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.I Components

The KU-3 Viscometer package includes:

(1) KU-3 Viscometer, upright rod and base
(1) Power Supply (AV-6)
(1) Paddle spindle (KU-1030)
(1) Power Cord, 115/230 V (P/N varies) (not shown)
(1) Adapter for US pint and US 1/2 pint cans (KU-1004)
(1) Operating instructions (M04-243)

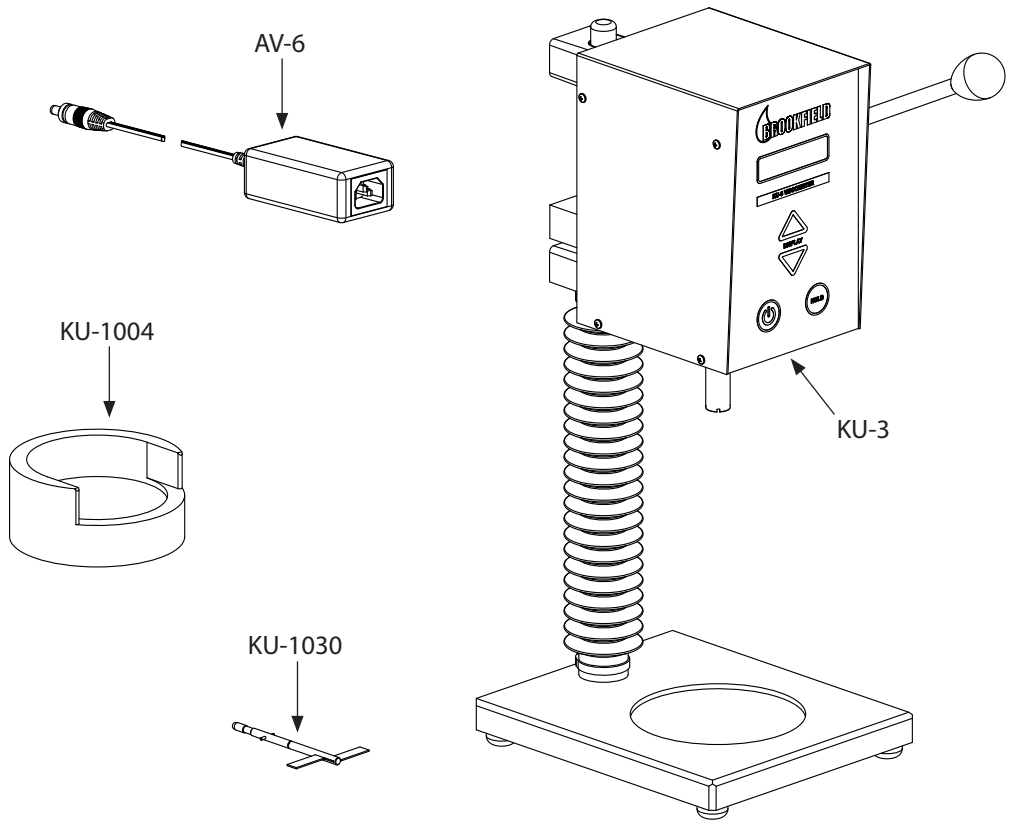


Figure I-1

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 AMETEK Brookfield or your local authorized dealer immediately. Any shipping damage must be reported to the carrier.

Note: Keep all packing materials for future use.

I.2 Options

1.2.1 Optional Paste Spindle

The paste spindle, Part No. KU-1031 (Figure I-2), 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.

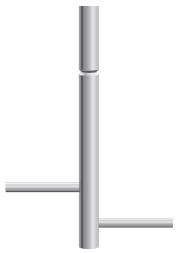


Figure I-2

I.3 Specifications

Range:	40–141 KU
	32–1,099 g
	27 - 5,274 cP*
Accuracy:	± 1% of full scale range
Repeatability:	± 0.5% of full scale range
Paddle speed:	200 rpm ± 0.1 rpm
Net weight:	18 lb. (8.2 kg)
Gross weight:	22.5 lb. (10.2 kg)
Dimensions:	21 x 12 x 17in - Carton
Operating Environment:	0°C (32°F) to 40°C (104°F)
	20% - 80% R.H.: non-condensing atmosphere
Ingress Protection Rating:	IP20

Electrical Certifications:

Conforms to CE Standards:

BSEN 61326:	Electrical equipment for measurement, control and laboratory use - EMC requirements.
BSEN 61010-1:	Safety requirements for electrical equipment, for measurement, control and laboratory use.
BSEN 50581:2012:	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances (ROHS).

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

NOTICE TO CUSTOMERS:

This symbol indicates that this product is to be recycled at an appropriate collection center.

Users within the European Union:

Please contact your dealer or the local authorities in charge of waste management on how to dispose of this product properly. All AMETEK Brookfield offices and our network of representatives and dealers can be found on our website: www.brookfieldengineering.com.

Users outside of the European Union:
Please dispose of this product according to your local laws.

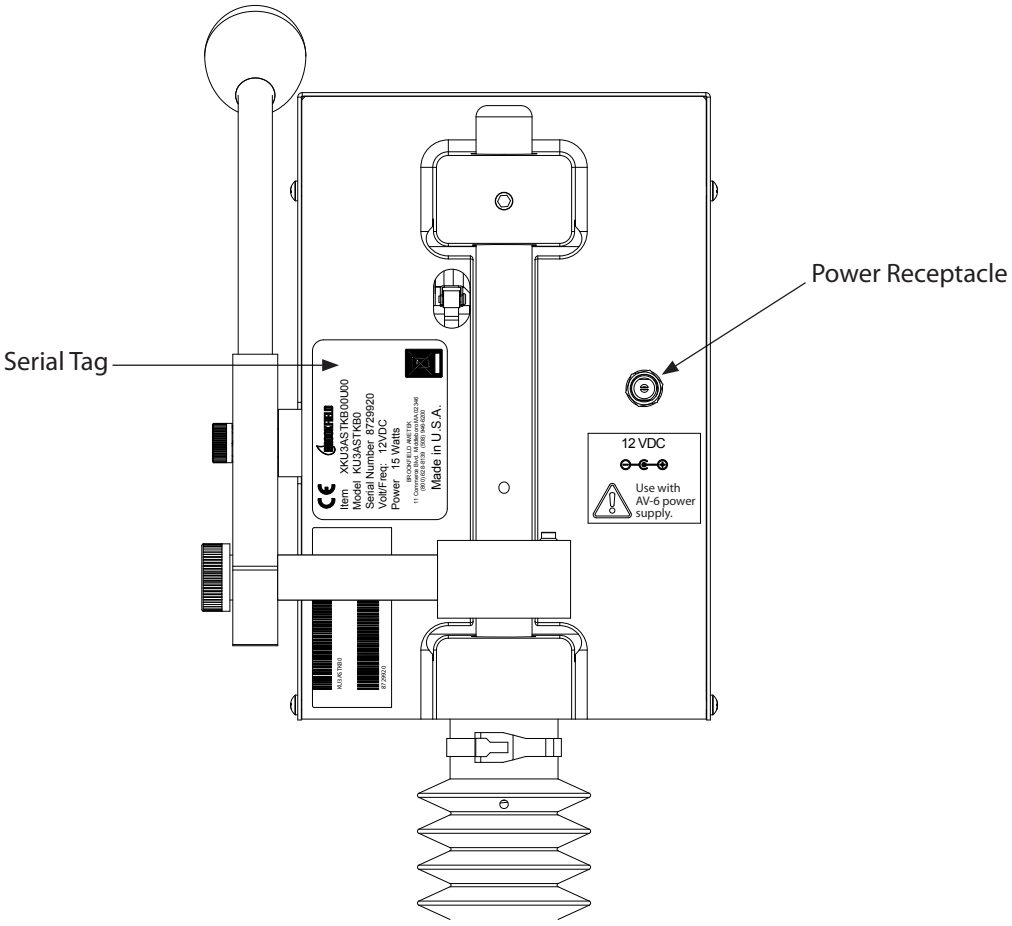
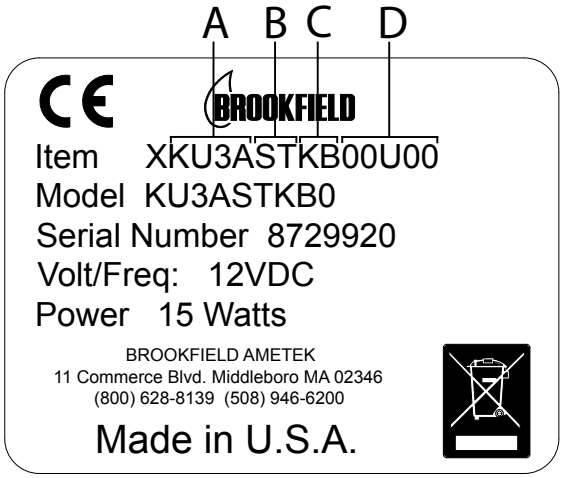


Figure I-3

The instrument can be identified by the item or model number. The item and model numbers appear on the Serial tag located at the back of the instrument. Below is an explanation on how to read these numbers.



A. KU-3 Designation

B. Standard Torque

C. K: Magnetic Coupling
B: Ball Bearing Suspension

D. Unused

I.4 Sample Container Specifications

Container Dimensions:

	Can Height	Bottom Flange Diameter
U.S. Pint	3.923" (9.97 cm)	3.400" (8.64 cm)
U.S. Half Pint	3.000" (7.62 cm)	2.885" (7.33 cm)
U.S. Quart	4.850" (12.32 cm)	4.240" (10.77 cm)

If you have a requirement for container dimensions other than those listed above, please contact AMETEK Brookfield or your local authorized dealer.

I.5 Utilities

VAC; Hz Limits: 100-240 VAC; 50/60 Hz ±5%
Power Supply: 15 Watts, Class II Certified Plug-in Power Supply Rated: 12V@1.25VAC


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


Must be used with AV-6 power supply. Alternate power sources may cause damage to the instrument.

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 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-3 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 DV1MRV. The centipoise values displayed on the KU-3 are for reference only. Comparisons to measured values from other instruments should not be made.

I.8 Cleaning

⚠ 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 spindle shaft and cause interference between the shaft and the magnetic coupling.

⚠ Be sure to remove the spindle from the instrument prior to cleaning. 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.

Note: Optional screen protector (Part No. KU-1404) is available from AMETEK Brookfield or your local authorized dealer.

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.

⚠ Keep the recess in the viscometer base free from sample material.

II. OPERATION

II.1 Set-up

1) The KU-3 is supplied with the viscometer head mounted to the stand. Remove the entire viscometer from the packing container and place on a sturdy level surface.

   ⚠ 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.

2) Move the operating handle to the top (upper most) position.
3) ***Optional***: Attach the screen protector, Part No. KU-1404.
4) Plug the metal jacket of the power supply into the circular receptacle on the back of the viscometer. Screw the threaded collar on the metal jacket securely to the threads on the receptacle. Connect the power cord to the socket on the power supply and plug into the appropriate power source.
5) Insert the paddle spindle (KU-1030) into the viscometer spindle shaft. Align the cross bars of the spindle to the coupling. Insert the spindle shaft completely until the magnetic connection is achieved.
6) For ***Quart Cans***: Place the quart can directly into the recess of the viscometer base.
7) For ***Pint Cans***: Place the can adapter (KU-1004) into the recess of the viscometer base. The deep side of the adapter should be facing up. Place the pint can directly into the adapter.

   Caution*:* Slide the pint can into the can adapter to avoid making contact with the paddle spindle. Contact between the can and paddle spindle may result in damage to the KU-3 Viscometer.
8) For ***½ Pint Can***s: Place the can adapter (KU-1004) into the recess of the viscometer base. The deep side of the adapter should be facing down. Place the ½ pint can directly into the adapter.

II.2 Key Functions

Figure II-1 shows the control keys on the face of the KU-3 Viscometer. The following describes the function of each key.

POWER KEY
Turns power On/Off to KU-3 Viscometer. Press the power key once to turn power ON. Press the power key twice to turn power OFF.

HOLD
Holds readings on the display. Press the Hold key during viscosity measurement to "Hold" the current reading. Readings will be presented on the display even when the handle is lifted and the motor stops.

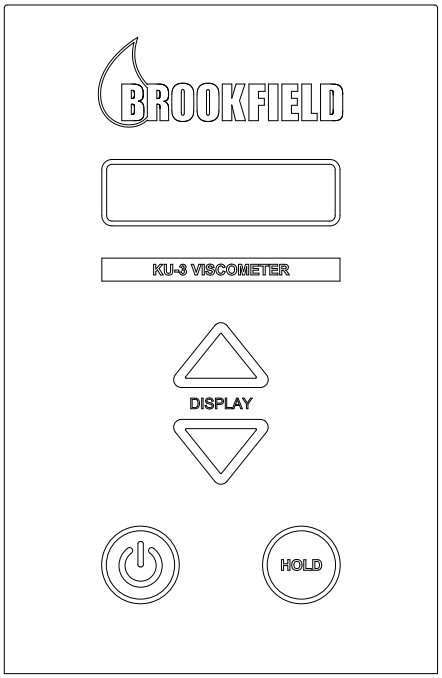


Figure II-1

UP/DOWN ARROWS

Up and Down Arrow Keys return active to change display units. Change the display unit from KU → g → cP.

II.3 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) Press the KU-3 power key (see Figure II.2).
4) Select the desired display (KU, g or cP) using the display arrows. (This setting may be changed at any time during the test.)
5) For ***Quart Cans:*** Place the sample container on the Viscometer base.
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 II-2

⚠ **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.

⚠ **CAUTION:** Do not touch the spindle or shaft while it is rotating. Touching the spindle during rotation may cause the KU-3 to over-range "*EEEE*". An over-range condition may damage the sensing system of the KU-3 viscometer

9) Wait 5 seconds for the display reading to stabilize. A display of "*EEEE*" indicates an over-range condition.
10) Press the Hold key. The display arrow keys 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) Pull down on the spindle to remove for cleaning.

II.4 Troubleshooting

1) Display is frozen on a single reading:
   - Press the Hold key
   - Power Cycle KU-3

2) Handle movement is difficult:
   - Adjust the tension bolt (hex) on top of the mounting block (back of the KU-3)

Appendix A - KU-3 Calibration Information

The accuracy of the KU-3 is verified using viscosity standard fluids calibrated in Krebs Units, which are available from AMETEK Brookfield or your local authorized dealer. 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:

Table A-1

Brookfield Viscosity Standard	Nominal Viscosity (KU)	Temperature (°C)
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.

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 KU1-1004 adapter. Use the Arrow Keys to select "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. Press the Hold Key. **You will need to record measurements in KU and g**. These two values work together to let you interpret the calibration results.

6) After you have recorded the results in KU, press the Arrow Keys until "g" is displayed and record your reading in grams.

Interpretation of Calibration Check Results

When verifying the calibration of the KU-3, the instrument tolerance and viscosity standard fluid tolerance must be **combined** to calculate the total allowable error.

The KU-3 is accurate to ± 11 grams, which is 1% of the full scale range in grams. The Brookfield Viscosity Standard is accurate to ± 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 ± 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-3 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-3 is accurate to ± 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 ± 0.9 KU. ***This is the accuracy for the Viscometer in KU, ± 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 ± 1% of the stated value in KU. The viscosity standard is calibrated at 104.8 KU, ± 1% is equal to ± 1.0 KU.

0.9 KU (instrument accuracy)
+ 1.0 KU (fluid accuracy)
1.9 KU (total allowable error)

5) Total allowable error for the calibration check in this example is 104.8 KU, ± 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

g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP
-	-	-	76	54.2	243	126	66.8	489	176	77.2	735	226	85.7	981	276	92.1	1227
-	-	-	77	54.5	248	127	67	494	177	77.4	740	227	85.9	986	277	92.2	1232
-	-	-	78	54.8	253	128	67.2	499	178	77.6	745	228	86	991	278	92.3	1236
-	-	-	79	55	258	129	67.5	504	179	77.8	750	229	86.1	995	279	92.5	1241
-	-	-	**80**	**55.3**	**263**	**130**	**67.7**	**509**	**180**	**78**	**754**	**230**	**86.3**	**1000**	**280**	**92.6**	**1246**
-	-	-	81	55.6	268	131	67.9	513	181	78.2	759	231	86.4	1005	281	92.7	1251
32	40.2	27	82	55.9	272	132	68.1	518	182	78.4	764	232	86.6	1010	282	92.8	1256
33	40.6	32	83	56.2	277	133	68.4	523	183	78.6	769	233	86.7	1015	283	92.9	1261
34	40.9	36	84	56.5	282	134	68.6	528	184	78.8	774	234	86.8	1020	284	93	1266
35	**41.3**	**41**	**85**	**56.7**	**287**	**135**	**68.8**	**533**	**185**	**79**	**779**	**235**	**87**	**1025**	**285**	**93.2**	**1271**
36	41.6	46	86	57	292	136	69	538	186	79.1	784	236	87.1	1030	286	93.3	1276
37	42.0	51	87	57.3	297	137	69.2	543	187	79.3	789	237	87.2	1035	287	93.4	1281
38	42.3	56	88	57.6	302	138	69.5	548	188	79.5	794	238	87.4	1040	288	93.5	1286
39	42.6	61	89	57.8	307	139	69.7	553	189	79.7	799	239	87.5	1045	289	93.6	1291
40	**43**	**66**	**90**	**58.1**	**312**	**140**	**69.9**	**558**	**190**	**79.9**	**804**	**240**	**87.6**	**1050**	**290**	**93.7**	**1295**
41	43.3	71	91	58.4	317	141	70.1	563	191	80.1	809	241	87.8	1054	291	93.8	1300
42	43.6	76	92	58.6	322	142	70.3	568	192	80.3	813	242	87.9	1059	292	94	1305
43	44.0	81	93	58.9	327	143	70.5	572	193	80.4	818	243	88	1064	293	94.1	1310
44	44.3	86	94	59.1	332	144	70.7	577	194	80.6	823	244	88.2	1069	294	94.2	1315
45	**44.6**	**91**	**95**	**59.4**	**336**	**145**	**71**	**582**	**195**	**80.8**	**828**	**245**	**88.3**	**1074**	**295**	**94.3**	**1320**
46	45	95	96	59.6	341	146	71.2	587	196	81	833	246	88.4	1079	296	94.4	1325
47	45.3	100	97	59.9	346	147	71.4	592	197	81.2	838	247	88.6	1084	297	94.5	1330
48	45.6	105	98	60.1	351	148	71.6	597	198	81.3	843	248	88.7	1089	298	94.6	1335
49	45.9	110	99	60.4	356	149	71.8	602	199	81.5	848	249	88.8	1094	299	94.7	1340
50	**46.3**	**115**	**100**	**60.6**	**361**	**150**	**72**	**607**	**200**	**81.7**	**853**	**250**	**88.9**	**1099**	**300**	**94.8**	**1345**
51	46.6	120	101	60.9	366	151	72.2	612	201	81.8	858	251	89.1	1104	301	95	1350
52	46.9	125	102	61.1	371	152	72.4	617	202	82	863	252	89.2	1109	302	95.1	1354
53	47.2	130	103	61.4	376	153	72.6	622	203	82.2	868	253	89.3	1113	303	95.2	1359
54	47.5	135	104	61.6	381	154	72.8	627	204	82.3	872	254	89.4	1118	304	95.3	1364
55	**47.9**	**140**	**105**	**61.9**	**386**	**155**	**73**	**632**	**205**	**82.5**	**877**	**255**	**89.6**	**1123**	**305**	**95.4**	**1369**
56	48.2	145	106	62.1	391	156	73.2	636	206	82.7	882	256	89.7	1128	306	95.5	1374
57	48.5	150	107	62.4	395	157	73.4	641	207	82.8	887	257	89.8	1133	307	95.6	1379
58	48.8	154	108	62.6	400	158	73.6	646	208	83	892	258	89.9	1138	308	95.7	1384
59	49.1	159	109	62.8	405	159	73.8	651	209	83.2	897	259	90.1	1143	309	95.8	1389
60	**49.4**	**164**	**110**	**63.1**	**410**	**160**	**74**	**656**	**210**	**83.3**	**902**	**260**	**90.2**	**1148**	**310**	**95.9**	**1394**
61	49.7	169	111	63.3	415	161	74.2	661	211	83.5	907	261	90.3	1153	311	96	1399
62	50	174	112	63.6	420	162	74.4	666	212	83.6	912	262	90.4	1158	312	96.1	1404
63	50.3	179	113	63.8	425	163	74.6	671	213	83.8	917	263	90.6	1163	313	96.2	1409
64	50.6	184	114	64	430	164	74.8	676	214	84	922	264	90.7	1168	314	96.3	1413
65	**50.9**	**189**	**115**	**64.3**	**435**	**165**	**75**	**681**	**215**	**84.1**	**927**	**265**	**90.8**	**1172**	**315**	**96.4**	**1418**
66	51.2	194	116	64.5	440	166	75.2	686	216	84.3	932	266	90.9	1177	316	96.5	1423
67	51.5	199	117	64.7	445	167	75.4	691	217	84.4	936	267	91	1182	317	96.7	1428
68	51.8	204	118	65	450	168	75.6	695	218	84.5	941	268	91.2	1187	318	96.8	1433
69	52.1	209	119	65.2	454	169	75.8	700	219	84.7	946	269	91.3	1192	319	96.9	1438
70	**52.4**	**213**	**120**	**65.4**	**459**	**170**	**76**	**705**	**220**	**84.8**	**951**	**270**	**91.4**	**1197**	**320**	**97**	**1443**
71	52.7	218	121	65.7	464	171	76.2	710	221	85	956	271	91.5	1202	321	97.1	1448
72	53	223	122	65.9	469	172	76.4	715	222	85.1	961	272	91.6	1207	322	97.2	1453
73	53.3	228	123	66.1	474	173	76.6	720	223	85.3	966	273	91.8	1212	323	97.3	1458
74	53.6	233	124	66.3	479	174	76.8	725	224	85.4	971	274	91.9	1217	324	97.4	1463
75	**53.9**	**238**	**125**	**66.6**	**484**	**175**	**77**	**730**	**225**	**85.6**	**976**	**275**	**92**	**1222**	**325**	**97.5**	**1468**

Table A-2 (continued)

g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP
326	97.6	1472	376	102.1	1718	426	106.1	1964	476	110.1	2210	526	114.1	2456	576	118	2702
327	97.7	1477	377	102.2	1723	427	106.2	1969	477	110.2	2215	527	114.2	2461	577	118.1	2707
328	97.8	1482	378	102.2	1728	428	106.2	1974	478	110.2	2220	528	114.2	2466	578	118.2	2712
329	97.9	1487	379	102.3	1733	429	106.3	1979	479	110.3	2225	529	114.3	2471	579	118.2	2717
330	**98**	**1492**	**380**	**102.4**	**1738**	**430**	**106.4**	**1984**	**480**	**110.4**	**2230**	**530**	**114.4**	**2476**	**580**	**118.3**	**2722**
331	98.1	1497	381	102.5	1743	431	106.5	1989	481	110.5	2235	531	114.5	2481	581	118.4	2727
332	98.2	1502	382	102.6	1748	432	106.6	1994	182	110.6	2240	532	114.6	2486	582	118.4	2732
333	98.3	1507	383	102.6	1753	433	106.6	1999	483	110.6	2245	533	114.6	2491	583	118.5	2736
334	98.4	1512	384	102.7	1758	434	106.7	2004	484	110.7	2250	534	114.7	2495	584	118.6	2741
335	**98.5**	**1517**	**385**	**102.8**	**1763**	**435**	**106.8**	**2009**	**485**	**110.8**	**2254**	**535**	**114.8**	**2500**	**585**	**118.6**	**2746**
336	98.6	1522	386	102.9	1768	436	106.9	2013	486	110.9	2259	536	114.9	2505	586	118.7	2751
337	98.7	1527	387	103	1772	437	107	2018	487	111	2264	537	115	2510	587	118.8	2756
338	98.8	1532	388	103	1777	438	107	2023	488	111	2269	538	115	2515	588	118.8	2761
339	98.9	1536	389	103.1	1782	439	107.1	2028	489	111.1	2274	539	115.1	2520	589	118.9	2766
340	**99**	**1541**	**390**	**103.2**	**1787**	**440**	**107.2**	**2033**	**490**	**111.2**	**2279**	**540**	**115.2**	**2525**	**590**	**119**	**2771**
341	99.1	1546	391	103.3	1792	441	107.3	2038	491	111.3	2284	541	115.3	2530	591	119.0	2776
342	99.2	1551	392	103.4	1797	442	107.4	2043	492	111.4	2289	542	115.4	2535	592	119.1	2781
343	99.3	1556	393	103.4	1802	443	107.4	2048	493	111.4	2294	543	115.4	2540	593	119.2	2786
344	99.4	1561	394	103.5	1807	444	107.5	2053	494	111.5	2299	544	115.5	2545	594	119.2	2791
345	**99.4**	**1566**	**395**	**103.6**	**1812**	**445**	**107.6**	**2058**	**495**	**111.6**	**2304**	**545**	**115.6**	**2550**	**595**	**119.3**	**2795**
346	99.5	1571	396	103.7	1817	446	107.7	2063	496	111.7	2309	546	115.7	2554	596	119.4	2800
347	99.6	1576	397	103.8	1822	447	107.8	2068	497	111.8	2313	547	115.8	2559	597	119.4	2805
348	99.7	1581	398	103.8	1827	448	107.8	2072	498	111.8	2318	548	115.8	2564	598	119.5	2810
349	99.8	1586	399	103.9	1832	449	107.9	2077	499	111.9	2323	549	115.9	2569	599	119.6	2815
350	**99.9**	**1591**	**400**	**104**	**1836**	**450**	**108**	**2082**	**500**	**112**	**2328**	**550**	**116**	**2574**	**600**	**119.6**	**2820**
351	100	1595	401	104.1	1841	451	108.1	2087	501	112.1	2333	551	116.1	2579	601	119.7	2825
352	100.1	1600	402	104.2	1846	452	108.2	2092	502	112.2	2338	552	116.2	2584	602	119.7	2830
353	100.2	1605	403	104.2	1851	453	108.2	2097	503	112.2	2343	553	116.2	2589	603	119.8	2835
354	100.3	1610	404	104.3	1856	454	108.3	2102	504	112.3	2348	554	116.3	2594	604	119.8	2840
355	**100.3**	**1615**	**405**	**104.4**	**1861**	**455**	**108.4**	**2107**	**505**	**112.4**	**2353**	**555**	**116.4**	**2599**	**605**	**119.9**	**2845**
356	100.4	1620	406	104.5	1866	456	108.5	2112	506	112.5	2358	556	116.5	2604	606	120	2850
357	100.5	1625	407	104.6	1871	457	108.6	2117	507	112.6	2363	557	116.6	2609	607	120	2854
358	100.6	1630	408	104.6	1876	458	108.6	2122	508	112.6	2368	558	116.6	2613	608	120.1	2859
359	100.7	1635	409	104.7	1881	459	108.7	2127	509	112.7	2372	559	116.7	2618	609	120.1	2864
360	**100.8**	**1640**	**410**	**104.8**	**1886**	**460**	**108.8**	**2132**	**510**	**112.8**	**2377**	**560**	**116.8**	**2623**	**610**	**120.2**	**2869**
361	100.9	1645	411	104.9	1891	461	108.9	2136	511	112.9	2382	561	116.9	2628	611	120.2	2874
362	101	1650	412	105	1895	462	109	2141	512	113	2387	562	117	2633	612	120.3	2879
363	101	1654	413	105	1900	463	109	2146	513	113	2392	563	117	2638	613	120.3	2884
364	101.1	1659	414	105.1	1905	464	109.1	2151	514	113.1	2397	564	117.1	2643	614	120.4	2889
365	**101.2**	**1664**	**415**	**105.2**	**1910**	**465**	**109.2**	**2156**	**515**	**113.2**	**2402**	**565**	**117.2**	**2648**	**615**	**120.4**	**2894**
366	101.3	1669	416	105.3	1915	466	109.3	2161	516	113.3	2407	566	117.3	2653	616	120.5	2899
367	101.4	1674	417	105.4	1920	467	109.4	2166	517	113.4	2412	567	117.4	2658	617	120.6	2904
368	101.4	1679	418	105.4	1925	468	109.4	2171	518	113.4	2417	568	117.4	2663	618	120.6	2909
369	101.5	1684	419	105.5	1930	469	109.5	2176	519	113.5	2422	569	117.5	2668	619	120.7	2913
370	**101.6**	**1689**	**420**	**105.6**	**1935**	**470**	**109.6**	**2181**	**520**	**113.6**	**2427**	**570**	**117.6**	**2672**	**620**	**120.7**	**2918**
371	101.7	1694	421	105.7	1940	471	109.7	2186	521	113.7	2432	571	117.7	2677	621	120.8	2923
372	101.8	1699	422	105.8	1945	472	109.8	2191	522	113.8	2436	572	117.7	2682	622	120.8	2928
373	101.8	1704	423	105.8	1950	473	109.8	2195	523	113.8	2441	573	117.8	2687	623	120.9	2933
374	101.9	1709	424	105.9	1954	474	109.9	2200	524	113.9	2446	574	117.9	2692	624	120.9	2938
375	**102**	**1713**	**425**	**106**	**1959**	**475**	**110**	**2205**	**525**	**114**	**2451**	**575**	**117.9**	**2697**	**625**	**121**	**2943**

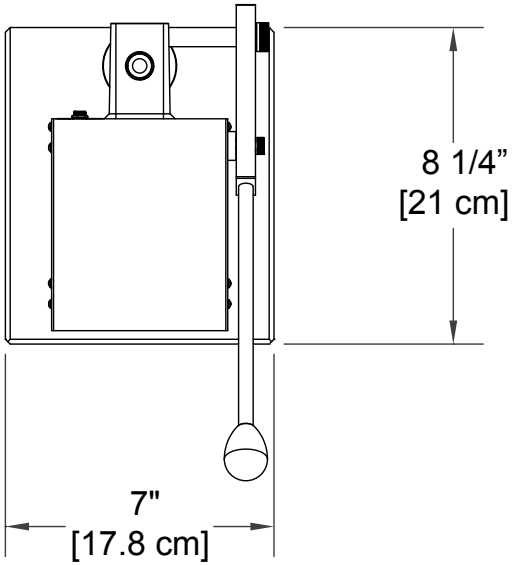
Table A-2 (continued)

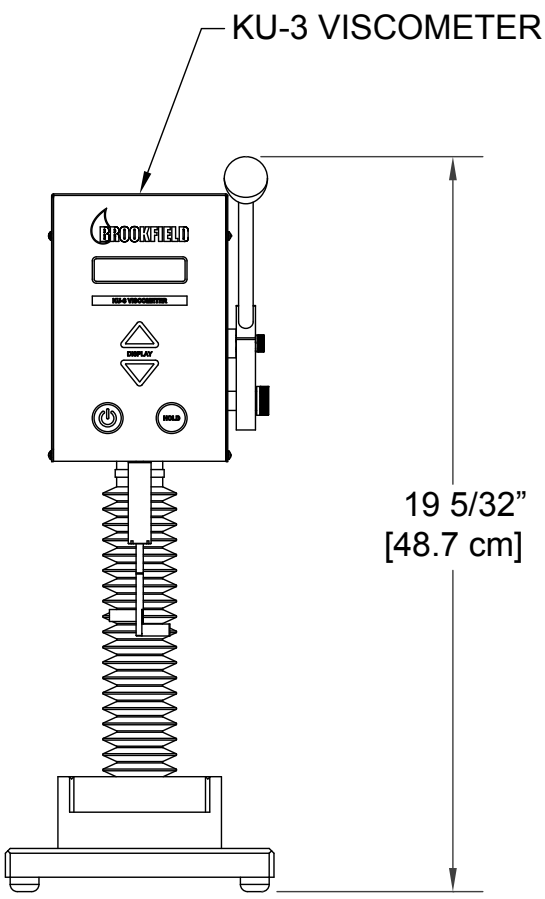
g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP
626	121	2948	676	123.6	3194	726	126.6	3440	776	129.7	3686	826	132.6	3932	876	135	4177
627	121.1	2953	677	123.7	3199	727	126.6	3445	777	129.8	3691	827	132.6	3936	877	135	4182
628	121.1	2958	678	123.7	3204	728	126.7	3450	778	129.8	3695	828	132.7	3941	878	135.1	4187
629	121.2	2963	679	123.8	3209	729	126.7	3454	779	129.9	3700	829	132.7	3946	879	135.1	8192
630	**121.2**	**2968**	**680**	**123.8**	**3213**	**730**	**126.8**	**3459**	**780**	**130**	**3705**	**830**	**132.8**	**3951**	**880**	**135.2**	**4197**
631	121.3	2972	681	123.9	3218	731	126.9	3464	781	130	3710	831	132.8	3956	881	135.2	4202
632	121.3	2977	682	123.9	3223	732	126.9	3469	782	130.1	3715	832	132.9	3961	882	135.3	4207
633	121.4	2982	683	124	3228	733	127	3474	783	130.2	3720	833	132.9	3966	883	135.3	4212
634	121.4	2987	684	124	3233	734	127	3479	784	130.2	3725	834	133	3971	884	135.4	4217
635	**121.5**	**2992**	**685**	**124.1**	**3238**	**735**	**127.1**	**3484**	**785**	**130.3**	**3730**	**835**	**133**	**3976**	**885**	**135.4**	**4222**
636	121.6	2997	686	124.2	3243	736	127.2	3489	786	130.4	3735	836	133	3981	886	135.4	4227
637	121.6	3002	687	124.2	3248	737	127.2	3494	787	130.4	3740	837	133.1	3986	887	135.5	4232
638	121.7	3007	688	124.3	3253	738	127.3	3499	788	130.5	3745	838	133.1	3991	888	135.5	4236
639	121.7	3012	689	124.3	3258	739	127.3	3504	789	130.5	3750	839	133.2	3995	889	135.6	4241
640	**121.8**	**3017**	**690**	**124.4**	**3263**	**740**	**127.4**	**3509**	**790**	**130.6**	**3754**	**840**	**133.2**	**4000**	**890**	**135.6**	**4246**
641	121.8	3022	691	124.5	3268	741	127.5	3513	791	130.7	3759	841	133.3	4005	891	135.6	4251
642	121.9	3027	692	124.5	3272	742	127.5	3518	792	130.7	3764	842	133.3	4010	892	135.7	4256
643	121.9	3032	693	124.6	3277	743	127.6	3523	793	130.8	3769	843	133.4	4015	893	135.7	4261
644	122	3036	694	124.6	3282	744	127.6	3528	794	130.8	3774	844	133.4	4020	894	135.8	4266
645	**122**	**3041**	**695**	**124.7**	**3287**	**745**	**127.7**	**3533**	**795**	**130.9**	**3779**	**845**	**133.5**	**4025**	**895**	**135.8**	**4271**
646	122	3046	696	124.8	3292	746	127.8	3538	796	131	3784	846	133.6	4030	896	135.8	4276
647	122.1	3051	697	124.8	3297	747	127.8	3543	797	131	3789	847	133.6	4035	897	135.9	4281
648	122.1	3056	698	124.9	3302	748	127.9	3548	798	131.1	3794	848	133.7	4040	898	135.9	4286
649	122.2	3061	699	124.9	3307	749	128	3553	799	131.1	3799	849	133.7	4045	899	136	4291
650	**122.2**	**3066**	**700**	**125**	**3312**	**750**	**128**	**3558**	**800**	**131.2**	**3804**	**850**	**133.8**	**4050**	**900**	**136**	**4295**
651	122.3	3071	701	125.1	3317	751	128.1	3563	801	131.2	3809	851	133.8	4054	901	136	4300
652	122.3	3076	702	125.1	3322	752	128.2	3568	802	131.3	3813	852	133.9	4059	902	136.1	4305
653	122.4	3081	703	125.2	3327	753	128.2	3572	803	131.3	3818	853	133.9	4064	903	136.1	4310
654	122.4	3086	704	125.2	3332	754	128.3	3577	804	131.4	3823	854	134	4069	904	136.2	4315
655	**122.5**	**3091**	**705**	**125.3**	**3336**	**755**	**128.4**	**3582**	**805**	**131.4**	**3828**	**855**	**134**	**4074**	**905**	**136.2**	**4320**
656	122.6	3095	706	125.4	3341	756	128.4	3587	806	131.5	3833	856	134	4079	906	136.2	4325
657	122.6	3100	707	125.4	3346	757	128.5	3592	807	131.6	3838	857	134.1	4084	907	136.3	4330
658	122.7	3105	708	125.5	3351	758	128.6	3597	808	131.6	3843	858	134.1	4089	908	136.3	4335
659	122.7	3110	709	125.5	3356	759	128.6	3602	809	131.7	3848	859	134.2	4094	909	136.4	4340
660	**122.8**	**3115**	**710**	**125.6**	**3361**	**760**	**128.7**	**3607**	**810**	**131.7**	**3853**	**860**	**134.2**	**4099**	**910**	**136.4**	**4345**
661	122.8	3120	711	125.7	3366	761	128.7	3612	811	131.8	3858	861	134.3	4104	911	136.4	4350
662	122.9	3125	712	125.7	3371	762	128.8	3617	812	131.8	3863	862	134.3	4109	912	136.5	4354
663	122.9	3130	713	125.8	3376	763	128.9	3622	813	131.9	3868	863	134.4	4113	913	136.5	4359
664	123	3135	714	125.8	3381	764	128.9	3627	814	131.9	3872	864	134.4	4118	914	136.6	4364
665	**123**	**3140**	**715**	**125.9**	**3386**	**765**	**129**	**3632**	**815**	**132**	**3877**	**865**	**134.5**	**4123**	**915**	**136.6**	**4369**
666	123.1	3145	716	126	3391	766	129.1	3636	816	132	3882	866	134.5	4128	916	136.6	4374
667	123.1	3150	717	126	3395	767	129.1	3641	817	132.1	3887	867	134.6	4133	917	136.7	4379
668	123.2	3154	718	126.1	3400	768	129.2	3646	818	132.1	3892	868	134.6	4138	918	136.7	4384
669	123.2	3159	719	126.1	3405	769	129.3	3651	819	132.2	3897	869	134.7	4143	919	136.8	4389
670	**123.3**	**3164**	**720**	**126.2**	**3410**	**770**	**129.3**	**3656**	**820**	**132.2**	**3902**	**870**	**134.7**	**4148**	**920**	**136.8**	**4394**
671	123.3	3169	721	126.3	3415	771	129.4	3661	821	132.3	3907	871	134.8	4153	921	136.8	4399
672	123.4	3174	722	126.3	3420	772	129.5	3666	822	132.3	3912	872	134.8	4158	922	136.9	4404
673	123.4	3179	723	126.4	3425	773	129.5	3671	823	132.4	3917	873	134.9	4163	923	136.9	4409
674	123.5	3184	724	126.4	3430	774	129.6	3676	824	132.4	3922	874	134.9	4168	924	137	4413
675	**123.6**	**3189**	**725**	**126.5**	**3435**	**775**	**129.7**	**3681**	**825**	**132.5**	**3927**	**875**	**134.9**	**4172**	**925**	**137**	**4418**

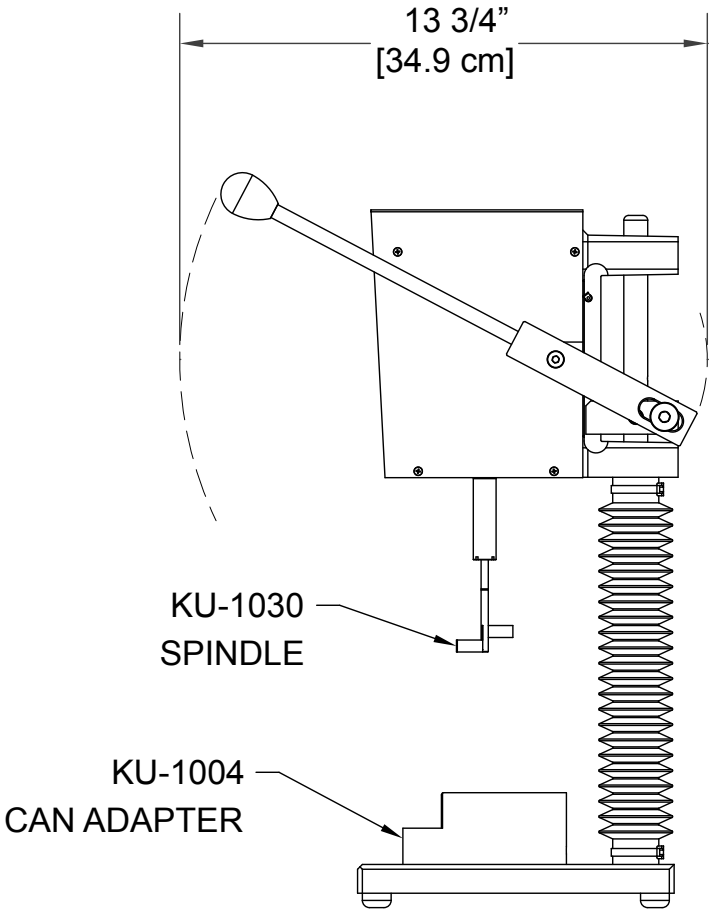
Table A-2 (continued)

g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP	g	KU	cP
926	137	4423	956	138.2	4571	986	139.4	4718	1016	140	4866	1046	140.5	5013	1076	141	5161
927	137.1	4428	957	138.3	4576	987	139.4	4723	1017	140	4871	1047	140.5	5018	1077	141	5166
928	137.1	4433	958	138.3	4581	988	139.4	4728	1018	140	4876	1048	140.6	5023	1078	141	5171
929	137.2	4438	959	138.3	4586	989	139.5	4733	1019	140.1	4881	1049	140.6	5028	1079	141	5176
930	**137.2**	**4443**	**960**	**138.4**	**4591**	**990**	**139.5**	**4738**	**1020**	**140.1**	**4886**	**1050**	**140.6**	**5033**	**1080**	**141**	**5181**
931	137.2	4448	961	138.4	4595	991	139.5	4743	1021	140.1	4891	1051	140.6	5038	1081	141	5186
932	137.3	4453	962	138.5	4600	992	139.6	4748	1022	140.1	4895	1052	140.6	5043	1082	141	5191
933	137.3	4458	963	138.5	4605	993	139.6	4753	1023	140.1	4900	1053	140.7	5048	1083	141	5195
934	437.4	4463	964	138.6	4610	994	139.6	4758	1024	140.1	4905	1054	140.7	5053	1084	141	5200
935	**137.4**	**4468**	**965**	**138.6**	**4615**	**995**	**139.6**	**4763**	**1025**	**140.1**	**4910**	**1055**	**140.7**	**5058**	**1085**	**141**	**5205**
936	137.4	4472	966	138.6	4620	996	139.7	4768	1026	140.2	4915	1056	140.7	5063	1086	141	5210
937	137.5	4477	967	138.7	4625	997	139.7	4772	1027	140.2	4920	1057	140.7	5068	1087	141	5215
938	137.5	4482	968	138.7	4630	998	139.7	4777	1028	140.2	4925	1058	140.7	5072	1088	141	5220
939	137.6	4487	969	138.8	4635	999	139.7	4782	1029	140.2	4930	1059	140.8	5077	1089	141	5225
940	**137.6**	**4492**	**970**	**138.8**	**4640**	**1000**	**139.8**	**4787**	**1030**	**140.2**	**4935**	**1060**	**140.8**	**5082**	**1090**	**141**	**5230**
941	137.6	4497	971	138.8	4645	1001	139.8	4792	1031	140.2	4940	1061	140.8	5087	1091	141	5235
942	137.7	4502	972	138.9	4650	1002	139.8	4797	1032	140.2	4945	1062	140.8	5092	1092	141	5240
943	137.7	4507	973	138.9	4654	1003	139.8	4802	1033	140.3	4950	1063	140.8	5097	1093	141	5245
944	137.8	4512	974	139	4659	1004	139.8	4807	1034	140.3	4954	1064	140.8	5102	1094	141	5250
945	**137.8**	**4517**	**975**	**139**	**4664**	**1005**	**139.9**	**4812**	**1035**	**140.3**	**4959**	**1065**	**140.8**	**5107**	**1095**	**141**	**5254**
946	137.8	4522	976	139	4669	1006	139.9	4817	1036	140.3	4964	1066	140.9	5112	1096	141	5259
947	137.9	4527	977	139.1	4674	1007	139.9	4822	1037	140.3	4969	1067	140.9	5117	1097	140	5264
948	137.9	4532	978	139.1	4679	1008	139.9	4827	1038	140.4	4974	1068	140.9	5122	1098	141	5269
949	138	4536	979	139.1	4684	1009	139.9	4832	1039	140.4	4979	1069	140.9	5127	1099	141	5274
950	**138**	**4541**	**980**	**139.2**	**4689**	**1010**	**139.9**	**4836**	**1040**	**140.4**	**4984**	**1070**	**140.9**	**5132**			
951	138	4546	981	139.2	4694	1011	139.9	4841	1041	140.4	4989	1071	140.9	5136			
952	138.1	4551	982	139.2	4699	1012	140	4846	1042	140.4	4994	1072	140.9	5141			
953	138.1	4556	983	139.3	4704	1013	140	4851	1043	140.5	4999	1073	140.9	5146			
954	138.2	4561	984	139.3	4709	1014	140	4856	1044	140.5	5004	1074	140.9	5151			
955	**138.2**	**4566**	**985**	**139.3**	**4713**	**1015**	**140.0**	**4861**	**1045**	**140.5**	**5009**	**1075**	**140.9**	**5156**			

Appendix B - Instrument Dimensions







Appendix C - References

The KU-3 Viscometer is compatible with:

ASTM D562 Standard Test Method for Consistency of Paint Using the Stormer Viscometer

Appendix D - 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: MA-MID.sales@ametek.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

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 E - Warranty Repair and Service

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 **AMETEK Brookfield** or the authorized dealer from whom it was purchased for a warranty evaluation. Transportation is at the purchaser's expense. The Viscometer should be shipped in the packaging originally provided with the instrument. If returning to Brookfield, please contact us for a return authorization number prior to shipping. Failure to do so will result in a longer repair time.

For a copy of the Repair Return Form, go to the Brookfield website, www.brookfieldengineering.com

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

AMETEK Brookfield
11 Commerce Boulevard
Middleboro, MA 02346 U.S.A.

Telephone: (508) 946-6200 Fax: (508) 923-5009
www.brookfieldengineering.com

For repair or service outside the United States, consult AMETEK Brookfield or the authorized dealer from whom you purchased the instrument.

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

AMETEK (GB) Limited
Brookfield Technical Centre
Stadium Way
Harlow, Essex CM19 5GX, England

Telephone: (44) 1279/451774 Fax: (44) 1279/451775
www.brookfield.co.uk

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

AMETEK GmbH
Hauptstrasse 18
D-73547 Lorch, Germany

Telephone: (49) 7172/927100 Fax: (49) 7172/927105
www.brookfield-gmbh.de

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

AMETEK Commercial Enterprise (Shanghai) Co., Ltd Guangzhou Branch
Room 810 Dongbao Plaza, No. 767 East Dongfeng Road
Guangzhou, 510600 China

Telephone: (86) 20/3760-0548 Fax: (86) 20/3760-0548
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.