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Dial Viscometer:
Installation Qualification, Operation Qualification, and Performance Qualification Procedure

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This guideline for IQ, OQ, PQ is offered as a supplement to the "Installation" section of this manual. Some customers have particular requirements for validation. It is hoped that this guideline will assist in meeting those needs. You may also contact Brookfield AMETEK for a more detailed document, or on-site IQ,OQ,PQ service conducted by a Brookfield AMETEK representative.

All Brookfield AMETEK instrumentation should be unpacked, assembled and operated according to the instrument operating instructions. Recommendations for installation, operation and performance qualification appear below.

IQ:	INSTALLATION QUALIFICATION – Inspect package for shipping damage – Confirm that all components have been supplied as detailed in the Operating Manual and Packing List – Assemble lab stand as shown in manual. – Mount viscometer head to assembled lab stand as shown in manual – Verify appropriate spindle set (LV #1-#4)(RV/HA/HB #2-#7) – Attach power supply
OQ:	OPERATION QUALIFICATION – Level viscometer using adjustable feet – Remove shipping cap on spindle coupling nut – Power on Viscometer – If necessary, switch on motor to rotate dial until zero is visible in viewing window – Perform oscillation check as described below
PQ:	PERFORMANCE QUALIFICATION – Verify calibration using a minimum of one calibrated viscosity standard fluid according to the procedure described below – Centipoise reading should be within the value stated on the fluid ± the instrument accuracy and the fluid accuracy as defined below

Successful completion of installation, operation and performance procedures as described above confirm that the Brookfield AMETEK Dial Viscometer is operating properly and to specification. **In the event that any of the above steps cannot be performed satisfactorily, please contact Brookfield AMETEK or the dealer from whom you purchased the equipment.**

Oscillation check

This check verifies the mechanical condition of the sensing mechanism in the viscometer. With the spindle removed, motor off and zero on the dial showing in the window, perform the oscillation check as follows:

1) Manually lift the spindle coupling nut and rotate counter clockwise until the pointer reaches 20%-30% deflection.
2) Gently lower and release the spindle coupling nut.
3) The pointer should oscillate freely and return to rest directly over the zero index mark.

Operational and Calibration Check

Determining Measurement Accuracy

All Brookfield AMETEK instruments are guaranteed to be accurate to within 1% of the *full scale range*(FSR) in use. The *full scale range* (FSR) is simply the maximum viscosity that can be measured with any spindle/speed combination. The *full scale range*(FSR), and consequently the relative accuracy of the measurement, will be different at each speed. The FSR is equal to the factor, for that spindle/speed combination, times 100. You will find tables of these factors on the Brookfield AMETEK Factor Finder supplied with your instrument. It is worth noting that 1% of the FSR is equal to the factor.

Calibration Check

In principle, all Brookfield AMETEK rotational viscometers are calibrated torque meters. Brookfield AMETEK offers a variety of viscosity calibration fluids that enable one to check the calibration and linearity of the instrument over its operating torque range of 10%-100% torque. It is not recommended to take viscosity readings below 10% torque.

Any spindle and any one of several calibration fluids may be used to perform a calibration check provided the torque limits stated above are observed. One spindle and one fluid should be used while taking measurements at multiple speeds. This enables multiple calculations of viscosity throughout the operating torque range of the instrument; one at low torque, one at medium torque and one at high torque. The FSR, and consequently the instrument accuracy in terms of centipoise, will be different at each speed.

The calibration fluid must be transferred into a 600 mL low form, Griffin beaker (without creating any bubbles) and, on LV and RV models, the instrument Guard Leg must be used. See the manual for a description of the use of the Guard Leg. The beaker, fluid, spindle and Guard Leg must stabilized at 25.0°C (±0.1°C) before the calibration check can be performed.

The example below shows typical calibration results using an LV#3 spindle with a calibration fluid whose actual viscosity is 5,120cP. The calibration check might look like the table below. At each speed a different torque is sensed allowing the manual computation of viscosity. The allowable error is the sum of 1% of the FSR (equal to the Brookfield AMETEK factor) plus 1% of the actual value of the calibration fluid. The lower and upper viscosity limits indicating acceptable calibration equals the actual value of the fluid, in this case 5,120cP ± the allowable error.

RPM	MIN cP	MAX cP (FSR)	1% of FSR (Factor)	% torque	cP READING	ALLOWABLE ERROR
12	1,000	10,000	100	51.2	5120	± 151
6	2,000	20,000	200	25.5	5100	± 251
3	4,000	40,000	400	12.7	5080	± 451

Remember, the total allowable error when conducting a calibration check is the sum of the factor plus 1% of the actual value of the calibration fluid itself. The instrument reading must be within the limits defined by the actual viscosity value of the calibration fluid ± the allowable error at each speed. The spindle, speeds and fluid you use may be different from these.

Calibration Worksheet

Calibration Test Results

A Fluid Value from Label cP	**B** 1% of Fluid Value cP	**C** Instrument Model	**D** Spindle	**E** RPM	**F** FSR (factor X 100) cP	**G** Factor cP	**H** % Torque	**I** Viscosity cP

Interpretation of Calibration Test Results

The viscosity reading should equal the **cP** value on the fluid standard to within the combined accuracies of the Viscometer and the viscosity standard as calculated below:

Low Limit = A – (B + G)	Reading I	High Limit = A + (B + G)	Pass or Fail

Any reading outside these limits may indicate a Viscometer problem. Contact the Brookfield AMETEK technical sales department or your local authorized Brookfield AMETEK dealer with test results to determine the nature of the problem.