Viscometer- Diaco

Calibration check

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Ver. 1.0

Introduction

A calibration check only verifies the instrument's correct mechanical operation — its torsion springs, bearings, and shaft.
Changing the rotors and bobs only reconfigures the geometry of the shear gap. These changes do not affect the torsion springs, bearings, or shaft. Therefore, calibration is not required when changing rotors or bobs.
Periodically, the diaco viscometer should be checked for proper calibration. If the measurements do not meet the specified accuracy, then the viscometer should be calibrated or repaired. For continuous accurate measurements, the instrument must be properly calibrated.
In accordance with API 13B-1 and 13B-2, diaco recommends calibrating the diaco viscometer before it is placed in service and at least monthly while it is in service. However, calibration frequency depends on your usage and laboratory quality assurance program.
The calibration is checked by applying known torques to the bob shaft. For any applied torque, within the torque range of the spring, there should be a specific dial reading (plus or minus a small tolerance). There are two methods of calibration check — 1) dead weight calibration check, and 2) standard fluid calibration check.
If the spring requires adjustment, the proper setting can be easily verified.
The standard fluid calibration check verifies that the complete instrument is operating properly. This calibration method will identify a bent bob shaft, rotor eccentricity, and/or runout of the rotor or bob more effectively than the dead weight method.

Dead Weight Calibration

1. Remove rotor and bob. Be sure that the tapered end of the bob shaft is clean, and then install the calibrating spool.

2. Install the DW3 calibrating fixture by clamping it onto the upper portion of the viscometer support legs.

3. Insert the bead at the end of the thread into the recess in the top of the calibrating spool. Wrap the thread a little more than once around the spool and then drape the thread over the pulley.

4. Hang the selected weight on the thread, and then adjust the calibrating fixture up or down until the thread from the spool to the pulley is horizontal.

5. If necessary, adjust the torsion.
The factory tolerances for F1 spring only are 127 ± 1/2° for 50 grams and 254 ± 1/2° for 100 grams. A

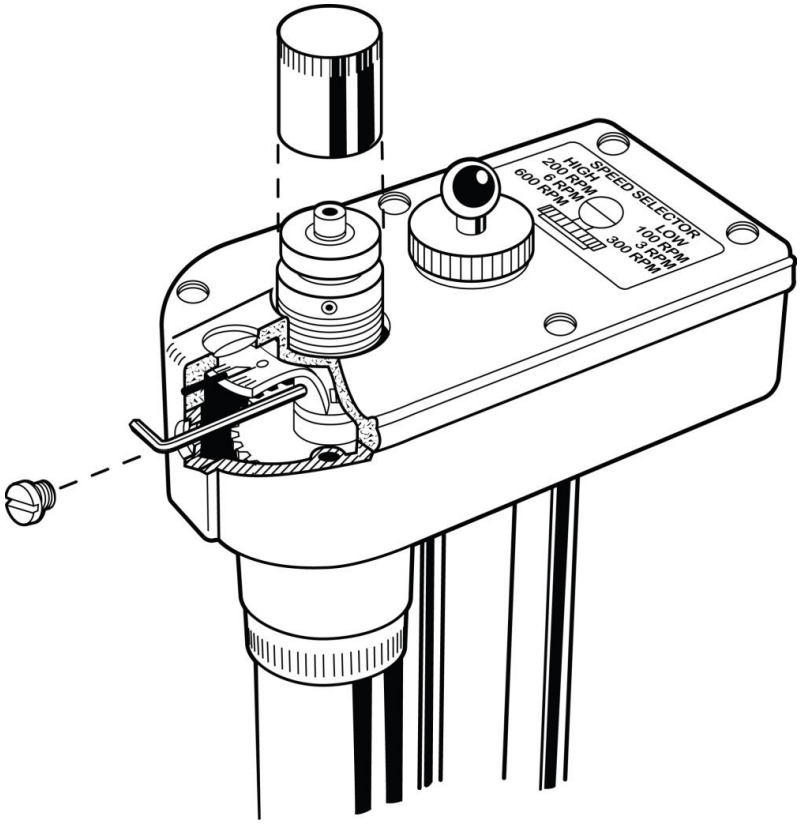
movement of ± 1/2° is permissible when the main shaft is turning. This movement will generally be dampened out when a fluid is being tested.
Check the linearity of the dial reading with at least three weights. If the spring appears to be non-linear, then bob shaft is probably bent. An instrument with these characteristics needs additional service and/or repair.

Fluid Calibration Check

This procedure describes the calibration check using only certified Newtonian calibration fluids. Fann calibration fluids are available for separate purchase. All calibration standards are certified by methods traceable to the United States National Institute of Standards and Technology (NIST).

1. Make sure that the instrument is clean before immersing the rotor and bob into the calibration fluid. If necessary, remove the rotor and thoroughly clean the bob, bob shaft, and rotor. Make sure the bob shaft and rotor are straight and have not been damaged.
2. Fill the sample cup to the scribed line with calibration fluid and place it on the instrument stage. Elevate the stage so that the rotor is immersed to the proper immersion depth.
3. Place a thermometer into the sample cup until it touches the bottom, and then secure it to the side of the viscometer to prevent breakage.
4. Operate the instrument at 100 rpm for approximately three minutes. This will equalize the temperature of the bob, rotor, and the fluid.
5. Read the dial at 300 rpm and 600 rpm. Record these numbers and the temperature from the thermometer to the nearest 0.1° C (0.15° F).
   The viscosity at the 300 rpm reading should be within ±1.5 cP of the viscosity from the temperature chart at the recorded temperature.
   Divide the 600 rpm reading by 1.98; compare this value to the value on the chart.
   The viscosity at the 600 rpm reading should be within ±1.5 cP of this viscosity value.
   Plot the 300 rpm reading and the 600 rpm reading then draw a straight line from zero through these two points. If the 300 and 600 points do not fall in a straight line, it is possible that the either rotor, bob, or bob shaft is bent or that other eccentricity exists.
   Points at 100 rpm and 200 rpm can be plotted if verification is needed.
   Readings outside the specified limits are indications that the instrument should be either calibrated or repaired.
   After completion of the calibration check, carefully wipe clean the rotor surfaces (inner and outer), bob, thermometer, sample cup, and work area.

Torsion Spring Calibration



Refer to Figure for identification of parts.

1. Remove dust cap, and then loosen set screw about one-half turn.
2. Insert the calibration tool into the spring and rotate the adjustable mandrel (inside the spring) slightly. Turn the mandrel counterclockwise if the dial reading is too low, or turn the mandrel clockwise if the dial reading is too high.
3. Tighten the set screw. The slot in the top of the adjustable mandrel should line up with clamping set screw.
4. Loosen the set screw to zero dial under index, then rotate knob as required for alignment, then adjust knob vertically to allow the spring to be clamped in a "free" position, neither stretched nor compressed.
5. Tighten the set screw and replace the dust cap.