

HIGH-TEMPERATURE HIGH-SHEAR D 4683

SIGNIFICANCE AND USE

Viscosity at the shear rate and temperature of this test method is thought to be representative of the condition encountered in the bearings of automotive engines in severe service. The importance of viscosity to engine lubrication at these conditions has been addressed in many publications. This test method covers the laboratory determination of the viscosity of engine oils at 150°C and $1 \times 10^6 \text{ s}^{-1}$ shear rate using a tapered bearing simulator-viscometer (TBS Viscometer) equipped with a refined thermoregulator system.

APPARATUS/TEST FIXTURES

A motor drives a tapered rotor that is closely fitted inside a matched stator. The rotor exhibits a reactive torque response when it encounters a viscous resistance from an oil that fills the gap between the rotor and stator. Two oils, a calibration oil and a non-Newtonian reference oil, are used to determine the gap distance between the rotor and stator so that a shear rate of a $1 \times 10^6 \text{ s}^{-1}$ is maintained. Additional calibration oils are used to establish the viscosity/torque relationship which is required for the determination of the apparent viscosity of test oils at 150°C.



DSC_0109

TEST METHOD/SUMMARY

A viscometer consisting of a synchronous two-speed motor that drives a slightly tapered bearing in a matched stator is used. A console contains the power source for the load cell, thermoregulator circuit, heating coil, and motor. It also contains the circuitry for regulating and monitoring the temperature of the oil in the test cell, as well as the amplifier and digital readout of the load cell response. A flow of dry compressed air is passed around the stator to provide supplementary cooling when testing fluids of higher viscosity. Ports are provided in the stator housing for the circulation of compressed air. A 50-mL glass syringe, with a filter, equipped with Luer needle lock, fits the top of the filling tube for injection of test oil into the test cell.

REPORT

The apparent viscosity to the nearest 0.01 cP (mPa·s) at 150°C and $1 \times 10^6 \text{ s}^{-1}$ shear rate is reported.



DSC_0117

