Designation: G181 – 11

Standard Test Method for Conducting Friction Tests of Piston Ring and Cylinder Liner Materials Under Lubricated Conditions[1]

This standard is issued under the fixed designation G181; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers procedures for conducting laboratory bench-scale friction tests of materials, coatings, and surface treatments intended for use in piston rings and cylinder liners in diesel or spark-ignition engines. The goal of this procedure is to provide a means for preliminary, cost-effective screening or evaluation of candidate ring and liner materials. A reciprocating sliding arrangement is used to simulate the contact that occurs between a piston ring and its mating liner near the top-dead-center position in the cylinder where liquid lubrication is least effective, and most wear is known to occur. Special attention is paid to specimen alignment, running-in, and lubricant condition.

1.2 This test method does not purport to simulate all aspects of a fired engine's operating environment, but is intended to serve as a means for preliminary screening for assessing the frictional characteristics of candidate piston ring and liner material combinations in the presence of fluids that behave as use-conditioned engine oils. Therefore, it is beyond the scope of this test method to describe how one might establish correlations between the described test results and the frictional characteristics of rings and cylinder bore materials for specific engine designs or operating conditions.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D6838 Test Method for Cummins M11 High Soot Test

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

G40 Terminology Relating to Wear and Erosion

3. Terminology

3.1 For definitions, see Terminology G40.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *conditioned oil*—a lubricating oil whose viscosity, composition, and other function-related characteristics have been altered by use in an operating engine, such that the oil's effects on friction and wear reflect those characteristic of the long-term, steady-state engine operation.

3.2.2 *conformal contact*—in friction and wear testing, any macro-geometric specimen configuration in which the curvature of one contact surface matches that of the countersurface.

3.2.2.1 *Discussion*—Examples of conformal contact include a flat surface sliding on a flat surface and a ball rotating in a socket that conforms to the shape of the ball. A pair of surfaces may begin a wear or friction test in a non-conforming contact configuration, but develop a conformal contact as a result of wear.

3.2.3 *lubrication regime*—in liquid-lubricated sliding contact, a certain range of friction coefficients that results from a combination of contact geometry, lubricant viscosity characteristics, surface roughness, normal pressure, and the relative speed of the bearing surfaces.

[1] This test method is under the jurisdiction of ASTM Committee G02 on Wear and Erosion and is the direct responsibility of Subcommittee G02.50 on Friction.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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