



# Standard Test Methods for and Suggested Limits for Determining Compatibility of Elastomer Seals for Industrial Hydraulic Fluid Applications<sup>1</sup>

This standard is issued under the fixed designation D6546; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope\*

1.1 These test methods cover the procedure for measuring physical properties of elastomer seals in the form of O-rings after exposure to industrial hydraulic fluids and thermal aging. The measured properties are then compared to the physical properties of elastomer seals that have not been exposed to the industrial hydraulic fluids and thermal aging. The changes in these properties form a basis for assessing compatibility when these changes are compared against the suggested limits in [Table 1](#).

1.2 While these test methods involve the use of O-rings, they can also be used to evaluate the compatibility of the elastomeric compounds of specialty seals with industrial hydraulic fluids and their resistance to thermal aging. The compounds can be molded into O-rings for evaluation purposes.

1.3 These test methods provide procedures for exposing O-ring test specimens to industrial hydraulic fluids under definite conditions of temperature and time. The resulting deterioration of the O-ring material is determined by comparing the changes in work function, hardness, physical properties, compression set, and seal volume after immersion in the test fluid to the pre-immersion values.

1.4 The values stated in SI units are to be regarded as the standard.

1.4.1 *Exception*—The values given in parentheses are for information only.

1.5 *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.*

<sup>1</sup> These test methods are under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.N0 on Hydraulic Fluids.

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## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

D395 Test Methods for Rubber Property—Compression Set  
D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

D471 Test Method for Rubber Property—Effect of Liquids

D1414 Test Methods for Rubber O-Rings

D2000 Classification System for Rubber Products in Automotive Applications

D2240 Test Method for Rubber Property—Durometer Hardness

D3677 Test Methods for Rubber—Identification by Infrared Spectrophotometry

D3767 Practice for Rubber—Measurement of Dimensions

D5028 Test Method for Curing Properties of Pultrusion Resins by Thermal Analysis

E1131 Test Method for Compositional Analysis by Thermogravimetry

### 2.2 SAE Standard:<sup>3</sup>

AS568A O-ring Sizes

## 3. Terminology

### 3.1 Definitions:

3.1.1 *batch*—all the O-rings molded from the same lot of material and presented for inspection at one time.

3.1.2 *compound*—a fully formulated elastomer material containing all fillers and cross-linking agents.

3.1.3 *fluid saturation effect*—the absorption of fluid by the elastomer until an equilibrium swell value is reached at a particular temperature.

3.1.4 *O-ring*—a rubber seal of homogeneous composition molded in one piece to the configuration of a torus with circular cross section.

3.1.4.1 *Discussion*—O-rings are used as both dynamic and static seals. The size of the O-ring is normally designated by a

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

<sup>3</sup> Available from Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.

\*A Summary of Changes section appears at the end of this standard