



AEROSPACE STANDARD

AS6944™/1

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Dynamic Test Procedure for Acrylonitrile Butadiene Rubber (NBR) Composition Seals

RATIONALE

There is a need for a document that provides a standardized test procedure for the evaluation of an elastomer material to endure the application environment of a dynamic seal. This is because the material properties alone as defined in material specifications do not substantiate a material to be capable of functioning as a seal. This document meets this need for acrylonitrile butadiene rubber (NBR).

1. SCOPE

This SAE Aerospace Standard (AS) provides a standardized test procedure that can be used to evaluate material capability in a dynamic sealing application. This procedure will be utilized by applicable elastomer material specifications which are used for production of O-rings and other seals.

This specification is applicable to the dynamic testing requirements for aerospace elastomer parts utilizing materials conforming to AMS7XXX series specifications, user specifications, or print on a Purchase Order (PO) that calls out this document for aerospace applications.

This procedure is intended for testing NBR. Other elastomers may have different requirements which will require a separate procedure.

1.1 Purpose

The purpose of this document is to provide a well-defined test procedure to evaluate the material performance in a dynamic environment using a commonly produced O-ring configuration.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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Full document details: SAE AS6944_1

For more information on this standard, visit
<https://www.sae.org/standards/content/AS6944/1/>

Documents

Standard Sharing Hub

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS-P-83461 Packing, Preformed, Petroleum Hydraulic Fluid Resistant, Improved Performance at 275 °F (135 °C)

AS568 Aerospace Size Standard for O-Rings

AS6944 Dynamic Seal Test Fixture

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AS4716 Gland Design, O-Ring and Other Seals

3. FIXTURE AND TEST PROCEDURE

Test fixture shall be per AS6944. Test seal size is AS568-214.

3.1 Assembly

Assemble test block per AS6944 using the test fluid as required by the referencing specification.

3.2 Test Procedure

3.2.1 The test steps shall be per Table 1. In case of disagreement between this procedure and the one contained in the referencing specification, the procedure provided in the referencing specification shall take precedence.

3.2.2 The stroke length shall be 4.0 inches $\pm$.1 inch or as required by the referencing specification.

3.2.3 The pressure tolerance shall be $\pm 4\%$ or ± 10 psi (69 kPa), whichever is greater, unless otherwise specified.

3.2.4 High temperature tolerance shall be -0, +10 °F (+6 °C) and cold temperature tolerance shall be +0, -10 °F (-6 °C).

3.2.5 Temperature shall be measured with a thermocouple on the outside of the housing. A forced air source shall not blow directly on the housing to avoid application of a "shock" temperature to the housing.

3.2.6 Purge air from the fixture via the bleed port before start of testing. Step 0 pre-conditioning shall be performed with the O-rings installed in the fixture.

3.2.7 The test sample shall be the specimen which experiences dynamic motion in the opposite direction to the applied "system" pressure; referred to as the "retract stroke." The reverse is the "extend stroke" conducted at "return" pressure. One cycle shall consist of a retract stroke at system pressure and an extend stroke at return pressure for a total of two strokes per cycle. The cycle rate shall be 0.5 Hz $\pm 10\%$. The required pressure shall be attained and maintained for at least 50% of the stroke duration. The system shall have a cycle counter. The test port is at the seal that sees return pressure during extension. The control port is at the seal that sees system pressure during retraction.