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Evaluation of Elastomers as O-ring Seals for Liquid Rocket Fuel and Oxidizer Systems Fracture and Aging of Elastomeric O-ring Seals Prediction of the Remanent Life of Elastomer O-ring Seals Elastomer O-ring Seals for Static Applications at Low Temperatures Polymeric Seals and Sealing Technology Suitable Test Sizes for O-ring Specifications ELASTOMER COMPATIBILITY CONSIDERATIONS RELATIVE TO O - RING AND SEALANT SELECTION Practical Seal Design Rubber Seals for Fluid and Hydraulic Systems Evaluation of O-rings of Various Elastomer Compounds for Service in Hot Water Composite Elastomer-metal O-ring Seals Elastomers and Components O-Ring, Preformed, Straight Thread Tube Fitting Boss, Type I Hydraulic (-65 to 160 °F) O-Ring, Preformed, Straight Thread Tube Fitting Boss, Type I Hydraulic (-65 to 160 °F) Rings, Sealing, Fluorocarbon (FKM) Rubber High-Temperature-Fluid Resistant Low Compression Set 70 to 80 Stiffness Determination of Elastomeric O-rings Using the Finite Element Method Rings, Sealing, Fluorocarbon (FKM) Rubber High-Temperature-Fluid Resistant Low Compression Set 85 to 95 Rubber, Fluorocarbon Elastomer, High Temperature, Fluid and Compression Set Resistant (O-Rings, Class 2, 90 Hardness) Determination of Spring Modulus for Several Types of Elastomeric Materials (O-rings) and Establishment of an Open Database for Seals Color Identification for O-ring Seals Effect of Temperature and Gap Opening Rate on the Resiliency of Candidate Solid Rocket Booster O-ring Materials An Investigation of Leakage of Large-diameter O-ring Seals on Spacecraft Air-lock Hatches Minnesota Rubber Fact Book for Selecting and Using Quad-ring Seals, O-rings, Kapseals Prediction of Fracture in Unconstrained Elastomeric O-ring Seals Rubber: Fluorocarbon Elastomer (FKM) Low Temperature Sealing Tg -40 °F (-40 °C) 70 to 80 Type A' Hardness For Elastomeric Seals in Aircraft Engine Oil, Fuel and Hydraulics Systems Functionality of Elastomer Seals

at Low Termperatures Using O-rings as an Example Rubber: Butyl (IIR Abbreviation) Phosphate Ester Resistant 65 to 75 Hardness For Seals In Hydraulic Systems, Etc RUBBER, FLUOROCARBON ELASTOMER, IMPROVED PERFORMANCE AT LOW TEMPERATURES, O-RINGS, SIZES AND TOLERANCES Stiffness and Damping Characteristics of Elastomer O-rings Secondary Seals Subjected to Reciprocating Twist Rings, Sealing, Perfluorocarbon (FFKM) Rubber High Temperature Fluid Resistant 70 - 80 Engineering Elastomers 2003 Thermal Stability Evaluation of Elastomeric Seal Materials Practical Seal Design Characterization of Elastomer O-rings Failure Used in the LHG-8 Rod Amplifier Assembly O-RING TENSION TESTING CALCULATIONS AEROSPACE SIZE STANDARD FOR O-RINGS Rubber: Fluorocarbon Elastomer (FKM) 70 to 80 Hardness, Low Temperature Sealing Tg 40 °F (40 °C) For Elastomeric Seals in Aircraft Engine Oil, Fuel and Hydraulics Systems Rubber: Fluorocarbon (FKM) High Temperature/Fluid Resistant Low Compression Set/85 to 95 Hardness For Seals In Fuel Systems and Specific Engine Oil Systems Patterns of O-ring Failures GLAND DESIGN, ELASTOMERIC O-RING SEALS, DYNAMIC RADIAL, 1500 PSI MAX

"Elastomeric and plastic O-ring seals were exposed to liquid and vapor phases of nitrogen tetroxide, chlorine trifluoride, 1:1 mixture of hydrazine-unsymmetrical dimethylhydrazine, and 90% hydrogen peroxide under in-use conditions. Materials included polyethylene, Teflon, butyl, ethylene/propylene, Vitons A and B, were tested under compression, in closed static system, in direct contact with text fluid. The rate of fluid loss through the seal was determined directly. Text method and results are described. Polyethylene encapsulated O-rings and metal-clad elastomeric O-rings as seals for nitrogen tetroxide systems are also discussed." -- page iii. This document establishes standard gland design criteria and dimensions for dynamic radial O-ring seal applications and provides recommendations for modifying these glands in special applications. There are no provisions in this document for anti-extrusion devices. This Aerospace

Recommended Practice sets forth the guidelines for the use of non-black O-ring seals. Black is the preferred color for polymer types other than Silicone and Fluorosilicone. When a color other than black is to be used, those established by this document are the preferred. This compact, on-the-job handbook provides all the practical and theoreticalinformation to design elastomeric O-ring seals for the full range of static,reciprocating, and rotary functions.Complete with fully illustrated, detailed examples to guide you step-bystepthrough virtually every seal design situation, Practical Seal Designprovides thorough coverage of ring seal geometry, material-compoundcapability, material performance, and design methods ... detailed designconsiderations including stretch, swell, shrinkage, and blowout prevention,as well as innovations to extend seal life span and minimize systemhysteresis ... unmatched treatment of piston-cylinder seal and shaft sealdesign ... and clearly elucidated specifications for military, aerospace, andindustrial standards.With quick-access features to facilitate prompt, proper, and effective design,Practical Seal Design is an essential single-source reference for mechanical,manufacturing, industrial, automotive, aeronautical, and ocean engineers.Furthermore, this one-of-a-kind work is an excellent reference text forprofessional seminars on hydrodynamic, pneumatic, and mechanicalengineering systems, and undergraduate mechanical design courses. Engineering or specialty elastomers are the stalwart materials of the rubber industry. They are high volume and medium priced elastomers, often employed in demanding applications, such as the automotive, industrial, medical and electrical industries. The Engineering Elastomers 2003 conference had an exciting series of papers from authors in both Europe and the USA, addressing the opportunities for growth in engineering elastomers, as well as the challenges to producers and users operating in a rapidly changing competitive environment. Session 1 Market Review; Session 2 Advances in Compounding and Production; Session 3 Advances in Elastomers; Session 4 Additives and Vulcanising Agents; Session 5: Technologies and Materials Analysis; Session 6: Developments In

Production And Processing Technologies And Equipment; Session 7 Inter-materials Competition; Session 8 Developments In End Use Applications Rubber Seals for Fluid and Hydraulic Systems is a comprehensive guide to the manufacturing and applications of rubber seals, with essential coverage for industry sectors including aviation, oil drilling and the automotive industry. Fluid leakage costs industry millions of dollars every year. In addition to wasted money, unattended leaks can result in downtime, affect product quality, pollute the environment, and cause injury. Successful sealing involves containment of fluid within a system while excluding the contaminants; the resilience of rubber enables it to be used to achieve these two objectives and create a tight sealing effect. A sound understanding of the complex factors involved in successful fluid sealing is essential for engineers who specify, design, operate and maintain machinery and mechanical equipment. This book focuses on the characteristics of rubbers as seals, their manufacturing procedures, the implications of their physical and chemical characteristics for the sealing function in the fluid and hydraulic systems, how rubbers seal and prevent leaks, what properties are required for sealing function, and how they change before and after installation. The chapter on Manufacture of Seals and 'O'Rings includes approximately 25 workable starting point formulations based on different rubbers, with cure and property data of those formulations as guidelines for technologists and engineers. Emphasis on important areas such as applications of rubber as fluid seals in the nuclear, aviation, oil drilling and automotive industries Includes a chapter on Rubber Expansion Joints as the function of such expansion joints as pipe connectors is indirectly linked with leakage and prevention of fluid flow through the pipes The chapter on Manufacture of Seals and 'O'Rings includes approx. 25 workable starting point formulations based on different rubbers, with cure and property data of those formulations as guidelines for technologists and engineers This specification covers a perfluorocarbon (FFKM) rubber in the form of molded O-rings. This specification covers a fluorocarbon (FKM) rubber in the form of O-rings, compression seals, O-ring cord, and molded-in-place

gaskets. This specification covers a fluorocarbon (FKM) rubber in the form of O-rings, O-ring cord, compression seals, and molded-in-place gaskets for aeronautical and aerospace applications. AMS7259E results from a five year review and update of this specification to align with the O-ring template. This specification covers a butyl rubber in the form of molded rings, compression seals, o-ring cord, and molded-in-place gaskets for aeronautical and aerospace applications. As AMS3238 is no longer valid for O-rings. For O-rings, the requirements of AMS7338 shall be met wherever AMS3238 is specified. AMS7338 is a new specification issued as no AMS7xxx O-ring specification for butyl exists. Seals that provide the containment system interface between the packaging body and closure must function in high and low temperature environments, under dynamic and static loading conditions, and with different types of contained media. It is one of the most critical elements in the container since the container fails to meet regulations if the seal does not function properly. A research and testing program for seal materials was initiated at Sandia in 1988 with the goal of characterizing the behavior of seal materials commonly used in packages conditions as specified in the regulations (NRC IOCFR Part 71) and American National Standards Institute (ANSI) 14.5. The performance of elastomeric seals in undeformed closures at both high and low temperatures has been investigated (Bronowski 1995). Work has begun with this program to determine the response of elastomeric seals to fast acting dynamic deformations'' in the closure. The response of elastomeric o-ring seals during closure movements due to long-term deformations has already been characterized. What has not been well characterized are short-term closure movements with durations of only a few milliseconds that result in the so called ''burp'' release. Methods for generating this type of response in a repeatable manner had not been developed and standard leak detection equipment does not have a fast enough response time to measure these transient events. One factor which affects the length of the burp is the ability of the o-ring to quickly close the gap to prevent a significant leak. The dynamic characteristics of the elastomeric o-ring material including the dynamic spring

modulus and internal damping are directly related to its ability to quickly close the gap. A set of tests designed to determine the dynamic properties for various material types and durometers (hardness) of elastomers that were both lubricated and dry at ambient temperature were conducted. This specification covers a fluorocarbon (FKM) rubber in the form of O-rings, compression seals, O-ring cord, and molded-in-place gaskets for aeronautical and aerospace applications. For sheet, strip, tubing, extrusions, and molded shapes use the AMS3353 specification which is intended for that use. Specification has been revised to change the glass transition testing method from ASTM D3418 to ASTM D7426, as well as a general update of the specification to the latest format. The information presented herein describes the commonly observed patterns of O-ring failure by means of both text and illustration. Possible causes and corrective actions are indicated for alleviating the problem. Elastomeric components are widely used in engineering. Increasing demands are placed on them to withstand hostile conditions such as high temperature and corrosive environments. These demands make it harder to predict likely service life or improve design to ensure their longer-term performance. This important book reviews the wealth of research on understanding fatigue and failure in elastomers, and how this understanding can be used to predict and extend their service life. The first part of the book reviews factors determining ageing behaviour such as heat, corrosive environments, wear and cracking. It also discusses the strengths and weaknesses of current service prediction models. The second part of the book focuses on analysing and improving the design and service life of particular applications such as O-rings, bearings, springs and valves. With its distinguished editor and team of contributors, Elastomers and components: service life prediction; progress and challenges is an invaluable reference for engineers involved in the design and use of elastomers. Looks at the wealth of research on understanding fatigue and failure in elastomers Discusses the strengths and weaknesses of current service prediction models An invaluable reference for engineers This report surveys the main types of seal, static and dynamic as well as those with more

specific applications such as pneumatic and diaphragm seals. It then goes on to look at seal manufacture and the range of polymeric materials available for use in seal design from natural rubber and EPM to fluorosilicone rubbers and PTFE, providing data on their maximum and minimum usage temperatures. An additional indexed section containing several hundred abstracts from the Rapra Polymer Library database provides useful references for further reading. This specification covers high temperature, compression set and fluid resistant fluorocarbon elastomer material to be used in the form of O-rings, compression seals, O-ring cord, and molded-in-place gaskets for aeronautical and aerospace applications. Specification covers a grade of fluoroelastomer capable of meeting a glass transition (Tg) value of 40 °F (40 °C). There are many tests that have been developed to characterize rubber O-rings. Many of these tests are independent of the size of the O-ring being tested. However, there are some tests, specifically, stress/strain properties, that are a function of the O-ring's size. The purpose of this report is to provide guidelines for specifying O-rings that would be considered "suitable for testing" when writing O-ring material specifications. The purpose of this report is to provide guidelines for specifying O-rings that would be considered "suitable for testing" when writing O-ring material specifications. This specification covers a fluorocarbon (FKM) rubber in the form of O-rings, O-ring cord, compression seals and molded-in-place gaskets. This specification covers requirements for the material, design, testing and packaging of straight thread tube fitting boss O-rings. O-rings covered by this specification are acrylonitrile-butadiene rubber. This document has been determined to contain basic and stable technology which is not dynamic in nature. This compact, on-the-job handbook provides all the practical and theoreticalinformation to design elastomeric O-ring seals for the full range of static,reciprocating, and rotary functions.Complete with fully illustrated, detailed examples to guide you step-bystepthrough virtually every seal design situation, Practical Seal Designprovides thorough coverage of ring seal geometry, material-compoundcapability, material performance, and design methods

... detailed designconsiderations including stretch, swell, shrinkage, and blowout prevention,as well as innovations to extend seal life span and minimize systemhysteresis ... unmatched treatment of piston-cylinder seal and shaft sealdesign ... and clearly elucidated specifications for military, aerospace, andindustrial standards.With quick-access features to facilitate prompt, proper, and effective design,Practical Seal Design is an essential single-source reference for mechanical,manufacturing, industrial, automotive, aeronautical, and ocean engineers.Furthermore, this one-of-a-kind work is an excellent reference text forprofessional seminars on hydrodynamic, pneumatic, and mechanicalengineering systems, and undergraduate mechanical design courses. This specification covers requirements for the material, design, testing and packaging of straight thread tube fitting boss O-rings. O-rings covered by this specification are acrylonitrile-butadiene rubber. This standard has been revised to clarify testing methods and to make obsolete references current. The formatting has been updated to bring the specification in line with other CE specifications. This document contains data relative to the chemical nature of aerospace fluids and relates each to its effect upon elastomeric components. Since the compatibilities of elastomers are determined by the compounding as well as the nature of the base polymer, the elastomers considered are limited to finished compounds for which material or performance specifications could be referenced.

- ***Evaluation Of Elastomers As O ring Seals For Liquid Rocket Fuel And Oxidizer Systems***
- ***Fracture And Aging Of Elastomeric O ring Seals***
- ***Prediction Of The Remanent Life Of Elastomer O ring Seals***

- *Elastomer O ring Seals For Static Applications At Low Temperatures*
- *Polymeric Seals And Sealing Technology*
- *Suitable Test Sizes For O ring Specifications*
- *ELASTOMER COMPATIBILITY CONSIDERATIONS RELATIVE TO O RING AND SEALANT SELECTION*
- *Practical Seal Design*
- *Rubber Seals For Fluid And Hydraulic Systems*
- *Evaluation Of O rings Of Various Elastomer Compounds For Service In Hot Water*
- *Composite Elastomer metal O ring Seals*
- *Elastomers And Components*
- *O Ring Preformed Straight Thread Tube Fitting Boss Type I Hydraulic 65 To 160 F*
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- *Rings Sealing Fluorocarbon FKM Rubber High Temperature Fluid Resistant Low Compression Set 70 To 8*
- *Stiffness Determination Of Elastomeric O rings Using The Finite Element Method*
- *Rings Sealing Fluorocarbon FKM Rubber High Temperature Fluid Resistant Low Compression Set 85 To 95*
- *Rubber Fluorocarbon Elastomer High Temperature Fluid And Compression Set Resistant O Rings Class 2 90 Hardness*
- *Determination Of Spring Modulus For Several Types Of Elastomeric Materials O rings And Establishment Of An Open Database For Seals*
- *Color Identification For O ring Seals*
- *Effect Of Temperature And Gap Opening Rate On The Resiliency Of Candidate Solid Rocket Booster O ring Materials*
- *An Investigation Of Leakage Of Large diameter O ring Seals On Spacecraft Air lock Hatches*
- *Minnesota Rubber Fact Book For Selecting And Using Quad ring Seals O rings Kapseals*

- ***Prediction Of Fracture In Unconstrained Elastomeric O ring Seals***
- ***Rubber Fluorocarbon Elastomer FKM Low Temperature Sealing Tg 40 F 40 C 70 To 80 Type A Hardness For Elastomeric Seals In Aircraft Engine Oil Fuel And Hydraulics Systems***
- ***Functionality Of Elastomer Seals At Low Termperatures Using O rings As An Example***
- ***Rubber Butyl IIR Abbreviation Phosphate Ester Resistant 65 To 75 Hardness For Seals In Hydraulic Systems Etc***
- ***RUBBER FLUOROCARBON ELASTOMER IMPROVED PERFORMANCE AT LOW TEMPERATURES O RINGS SIZES AND TOLERANCES***
- ***Stiffness And Damping Characteristics Of Elastomer O rings Secondary Seals Subjected To Reciprocating Twist***
- ***Rings Sealing Perfluorocarbon FFKM Rubber High Temperature Fluid Resistant 70 8***
- ***Engineering Elastomers 2003***
- ***Thermal Stability Evaluation Of Elastomeric Seal Materials***
- ***Practical Seal Design***
- ***Characterization Of Elastomer O rings Failure Used In The LHG 8 Rod Amplifier Assembly***
- ***O RING TENSION TESTING CALCULATIONS***
- ***AEROSPACE SIZE STANDARD FOR O RINGS***
- ***Rubber Fluorocarbon Elastomer FKM 70 To 80 Hardness Low Temperature Sealing Tg 40 F 40 C For Elastomeric Seals In Aircraft Engine Oil Fuel And Hydraulics Systems***
- ***Rubber Fluorocarbon FKM High Temperature Fluid Resistant Low Compression Set 85 To 95 Hardness For Seals In Fuel Systems And Specific Engine Oil Systems***
- ***Patterns Of O ring Failures***
- ***GLAND DESIGN ELASTOMERIC O RING SEALS DYNAMIC RADIAL 1500 PSI MAX***