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Fluorocarbon O-ring Compatibility with Aircraft Engine Lubricating Oils, per MIL-PRF-23699 (Supersedes MIL-L-23699) and MIL-PRF-7808 (Supersedes MIL-L-7808)

The majority of all MAGSEALS were designed and approved with our standard aerospace fluorocarbon (FKM) o-ring elastomer. Our o-ring part number identifies these elastomers with any one of the following suffixes: 507, 517, 527, and 537. These o-ring elastomers are compatible with the MIL-PRF-23699 Class STD (NATO 0-156) and Class C/I (NATO 0-156/0-152), MIL-PRF-7808 Grade 3 (NATO 0-148), and AS5780 SPC Class oils. However, they are **NOT** compatible with the newer high thermal stability oils per MIL-PRF-23699 Class HTS (NATO 0-156/0-154), MIL-PRF-7808 Grade 4 (NATO 0-163), and AS5780 HPC Class oils that contain amine oxidants and dispersants additives which causes embrittlement of this elastomer. This is true for all FKM-A o-rings per AMS7276 (AS3209-size) and AMS-R-83248 (formerly MIL-R-83248) Type I Class 1 (M83248/1-size) that are exposed to the HTS oils.

Our standard o-ring elastomer will degrade over time when exposed at temperatures above 250° F [121° C] to the following high thermal stability oils listed in QPL-23699, QPL-7808, and PRI-QPL-AS5780: *Mobil Jet Oils 254, 291 and 387, Royco Turbine Oil 560, BP (Exxon) Turbo Oil 2197, AeroShell Ascender, and Turbine Oil 560, Mobil RM 284A, NYCO S.A. Turbonycoil 400 and Hexagon Enterprises Metrex AF Oil 04.*

SAE Technical Papers 2001-01-2974, Fluoroelastomer Compatibility with Advanced Jet Engine Oils, and 2003-01-3029, Fluoroelastomer and Perfluoroelastomer Compatibility with Advanced Gas Turbine Lubricants, explain the technical details of this compatibility issue.

The FKM-GLT o-ring elastomer is the original commercially available elastomer that is compatible with all of the MIL-PRF-23699 and MIL-PRF-7808 oils up to a maximum operating temperature of 350° F [177° C]. It meets our MSC-547 specification that is similar to AMS-R-83485 for the Improved Performance at Low Temperatures Fluorocarbon Elastomer. Our o-ring part number identifies this elastomer with the 547 suffix. Either a revision to the MAGSEAL design or a new part number will be required to change from the original FKM-A aerospace fluorocarbon o-ring to the FKM-GLT o-ring elastomer.

The SAE AMS-CE committee issued a new o-ring elastomer specification during the third quarter of 2008 for an elastomer that is HTS oil resistant. The specification is AMS7379, Rubber: Fluorocarbon Elastomer (FKM), 70 to 80 Hardness, Low Temperature Sealing Tg -40 °F (-40 °C), For Elastomer Seals in Aircraft Engine Oil, Fuel and Hydraulic Systems. This elastomer is resistant to a variety of gas turbine oils, including high thermal stability (HTS) oils, fuels, and hydraulic fluids and it has a service temperature range of -60 °F to +400 °F (-51 °C to +204 °C) in air. MSC specification MSC-567 was issued during the fourth quarter of 2008 for this elastomer that is the preferred elastomer for all HTS oils. Either a revision to the MAGSEAL design or a new part number will be required to change from either the original FKM-A aerospace fluorocarbon o-ring elastomer or the FKM-GLT elastomer to this preferred O-ring elastomer that will provide the best service life no matter the fluid or the temperature range.

Therefore for maximum service life when operating in the HTS oils, the standard aerospace fluorocarbon (FKM) O-ring elastomers, with the following suffixes: 507, 517, 527, and 537 will perform satisfactory up to a maximum operating temperature of 250° F [121° C], MSC-547 (FKM-GLT) O-rings will perform satisfactory up to a maximum operating range of 350° F [177° C] and MSC-567 O-rings will perform satisfactory up to a maximum operating range of 450° F [268° C].

Direct any further questions regarding this issue to Paul Ryan at Magnetic Seal Corp. Telephone No. 401-247-2800 extension 123 Fax. No. 401-247-2805 e-mail: pryan@magseal.com

Reference Documents:

SAE Documents available from SAE 400 Commonwealth Drive, Warrendale, PA 15096-0001
<http://www.sae.org>

AMS7276G Rings, Sealing, Fluorocarbon (FKM) Rubber, High-Temperature-Fluid Resistant, Low Compression Set, 70 to 80

AMS7379 Rubber: Fluorocarbon Elastomer (FKM), 70 to 80 Hardness, Low Temperature Sealing Tg -40 °F (-40 °C), For Elastomer Seals in Aircraft Engine Oil, Fuel and Hydraulic Systems

AMS-R-83485 Rubber, Fluorocarbon Elastomer, Improved Performance at Low Temperatures

AS5780 Specification for Aero and Aero-Derived Gas Turbine Engine Lubricants

2001-01-2974 Fluoroelastomer Compatibility with Advanced Jet Engine Oils

2003-01-3029 Fluoroelastomer and Perfluoroelastomer Compatibility with Advanced Gas Turbine Lubricants

Us Government Documents available from DODSSP, Subscription Services Desk, Building 4D, 700 Robins Avenue, Philadelphia, PA 19111-5094.

<https://assist.daps.dla.mil>

MIL-PRF-23699F Performance Specification, Lubricating Oil, Aircraft Turbine Engine Synthetic Base, NATO Code Number 0-156

QPL-23699-19 Qualified Products List of Products Qualified Under Performance Specification MIL-PRF-23699

MIL-PRF-7808L Performance Specification, Lubricating Oil, Aircraft Turbine Engine, Synthetic Base

QPL-7808-38 Qualified Products List of Products Qualified Under Performance Specification MIL-PRF-7808

MIL-R-83248C Rubber, Fluorocarbon Elastomer, High Temperature, Fluid and Compression Set Resistant (Superseded by AMS7276)