

NAVISTAR, INC.		
Material, Parts, and Process Specifications (MPAPS)		NUMBER: MPAPS K15-5003
		Former Designation: EMS D15-5003
TITLE: Fluorocarbon (FKM) Seal Material	CURRENT REV No.: 1402	DATE: February 2014
	SUPERSEDES: EMS D15-5003 – April 2000	
WRITTEN/EDITED BY: Materials Engineering	APPROVED BY: Materials Engineering	
PRINTED COPIES OF THIS DOCUMENT MUST BE VERIFIED FOR CURRENT REVISION		
<i>This specification may involve hazardous materials, equipment, and procedures. This specification does not purport to address all of the safety issues associated with its use. The user is responsible to consult appropriate safety and health practices and to determine the applicability of regulatory limits prior to use.</i>		
Change Notice: Reformatted to new MPAPS, added Types 6 Thru 16, editorial changes.		

1.0 APPLICATION

This specification covers molded fluorocarbon seals intended for use in diesel fuel, oil and air applications. The use of this material for coolant applications must be verified by test in the specific application prior to approval.

2.0 SCOPE

This specification covers a molded fluoroelastomer sealing element.

2.1 Restricted Chemical Substances

Effective January 1, 2007, all product supplied to the requirements of this specification must comply with the requirements of the MPAPS B-50 specification.

3.0 REFERENCE DOCUMENTS

Unless otherwise specified, the latest issue of all referenced standards shall apply. The following Specifications, Standards, and Regulations are referenced in this specification.

Quality System Standard ISO 9001 or TS-16949	ASTM D2000
CFR Title 29, Part 1910	
NAVISTAR Manufacturing Std. MS-D-13	
NAVISTAR Engineering Design Std A-16	
NAVISTAR MPAPS B-50	

4.0 REQUIREMENTS

Physical Properties and Specifications below:

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TYPE O-RING CROSS- SECTIONAL DIA. (NOM.)	1 (Obsolete)					2				
	0.070	0.103	0.139	0.210	Button	0.070	0.103	0.139	0.210	Button
ASTM D2000 Line Callout						M2HK710A1-10B38EF31Z1 Z1=75±5 Orig Hdns				
Original Properties										
Hardness, Points Shore A	---	---	75±5	---		---	---	75±5	---	
Tensile Strength, psi, min.	---	---	900	---		1200	---	1450	---	
MPa, min.	---	---	6.2	---		8.27	---	10	---	
Ultimate Elongation, % min.	---	---	100	---		110	---	125	---	
Modulus @ 100% Elongation										
psi, min.	---	---	550	---		500	---	600	---	
MPa, min.	---	---	3.8	---		3.44	---	4.13	---	
Specific Gravity	---	---	1.85±.02	---		---	---	1.85±.02	---	
Compression Set 70 Hrs. @ 175°C (347°F), % max.	---	---	15	---		30	25	18	15	
Air Age 70 hrs. @ 250°C (482°F) ASTM D573										
Hardness Change, Points Shore A max	---	---	±6	---		---	---	±5	---	
Tensile Change, % max.	---	---	-30	---		---	---	-25	---	
Elongation Change, % max.	---	---	-30	---		---	---	-30	---	
Oil Immersion, IRM 901 70 hrs. @ 150°C (302°F) ASTM D471										
Hardness Change, Points Shore A	---	---	---	---		---	---	---	---	
Tensile Change, % max.	---	---	---	---		---	---	---	---	
Elongation Change, %, max.	---	---	---	---		---	---	---	---	
Volume Change, %	---	---	---	---		---	---	---	---	
Oil Immersion, ASTM #3 Oil 70 hrs @ 150°C (302°F) ASTM D471										
Hardness Change,										
Shore A	---	---	±6	---		---	---	±5	---	
Tensile Change, % max.	---	---	-30	---		---	---	-20	---	
Elongation Change, %, max.	---	---	-30	---		---	---	-20	---	
Volume Change, %	---	---	0 to +5	---		---	---	0 to +5	---	
Oil Immersion, SF 105, 336 hrs @ 150°C (302°F) per ASTM D471										
Hardness Change, Shore A	---	---	---	---		---	---	-3	---	
Tensile Change, % max.	---	---	---	---		---	---	-5	---	
Elongation Change, %, max.	---	---	---	---		---	---	+1	---	
Volume Change, %	---	---	---	---		---	---	+2	---	
Oil Immersion, IRM 903, 70 hrs @ 150°C (302°F) per ASTM D471										
Hardness Change, Shore A	---	---	---	---	---	---	---	±5	---	
Tensile Change, % max.	---	---	---	---	---	---	---	-20	---	
Elongation Change, %, max.	---	---	---	---	---	---	---	-20	---	
Volume Change, %	---	---	---	---	---	---	---	0 to +5	---	

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TYPE O-RING CROSS- SECTIONAL DIA. (NOM.)	1					2				
	0.070	0.103	0.139	0.210	Button	0.070	0.103	0.139	0.210	Button
Water Immersion, 70 Hrs @ 100°C (212°F) per ASTM D471 Hardness Change, Points Shore A Tensile Change, % max. Elongation Change, %, max. Volume Change, %	---	---	±6	---		---	---	±5	---	
Water/ Glycol and O.A.T and non O.A.T (Hybrid) Coolants Immersion (1:1 by Vol) 70 Hrs. @ 100°C (212°F) per ASTM D471 Hardness Change, Shore A Tensile Change, % max. Elongation Change, %, max. Volume Change, %	---	---	±6	---		---	---	±5	---	
Low Temperature Compression, Age, 22 hrs. @ -40°C (- 40°F) ASTM D-1229 (Modified) Compress section of ring 25% diametrically (orig. approval only)	---	---	No Cracks	---		---	---	No Cracks	---	
TR-10, Low Temperature Retraction 10% Return, ASTM D-1329 (original approval only)	---	---	-14C (+7F)	---		---	---	-14C (+7F)	---	
Tear Strength ASTM D624 DIE B lbs/in, min KN/m, min	---	---	---	---		---	---	---	---	

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TYPE O-RING CROSS- SECTIONAL DIA. (NOM.)	1					2				
	0.070	0.103	0.139	0.210	Button	0.070	0.103	0.139	0.210	Button
CSR -Report Air: Original approval 150C Retained Load= % @500 Hrs Retained Load= @1000 Hrs Retained Load= @1500 Hrs Retained Load= @2000 Hrs Retained Load= @2500 Hrs Retained Load= @3000 Hrs Oil: Mobil 1, 10W30, 150C Retained Load= % @500 Hrs Retained Load= @1000 Hrs Retained Load= @1500 Hrs Retained Load= @2000 Hrs Retained Load= @2500 Hrs Retained Load= @3000 Hrs Oil: MPAPS B-21, Grade 10W30, 150C Retained Load= % @500 Hrs Retained Load= @1000 Hrs Retained Load= @1500 Hrs Retained Load= @2000 Hrs Retained Load= @2500 Hrs Retained Load= @3000 Hrs Coolant: MPAPS B-1 Type 3 (135degC) Retained Load= % @500 Hrs Retained Load= @1000 Hrs Retained Load= @1500 Hrs Retained Load= @2000 Hrs Retained Load= @2500 Hrs Retained Load= @3000 Hrs										

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TYPE O-RING CROSS- SECTIONAL DIA. (NOM.)	3					4				
	.070(2)	0.103	0.139	0.210	Button	0.070	0.103	0.139	0.210	Button
ASTM D2000 Line Callout										
Original Properties										
Hardness, Points Shore A	---	---	90±5	---						70±5
Tensile Strength, psi, min.	1200	---	1450	---						1015
MPa, min.	8.27	---	9.99	---						7.0
Ultimate Elongation, % min.	90	100	110	---						200
Modulus @ 100% Elongation	---	---	---	---						
psi, min.	N/A	N/A	800	---						363
MPa, min.	---	---	5.51	---						2.5
Specific Gravity	---	---	1.85+/- 0.03	---						1.82+/- 0.03
Compression Set 70 Hrs. @ 175°C (347°F), % max.	45	30	25	35						15
Air Age 70 hrs. @ 250°C (482°F) ASTM D573										
Hardness Change, Shore A max	---	---	±5	---						+10
Tensile Change, % max.	---	---	-25	---						-20
Elongation Change, % max.	---	---	-30	---						-50
Oil Immersion, IRM 901 70 hrs. @ 150°C (302°F) ASTM D471										
Hardness Change, Shore A	---	---	---	---						
Tensile Change, % max.	---	---	---	---						
Elongation Change, %, max.	---	---	---	---						
Volume Change, %	---	---	---	---						
Oil Immersion, ASTM #3 Oil 70 hrs @ 150°C (302°F) ASTM D471										
Hardness Change, Shore A	---	---	±5	---						-5
Tensile Change, % max.	---	---	-20	---						-20
Elongation Change, %, max.	---	---	-20	---						-20
Volume Change, %	---	---	0 to +5	---						+25
Oil Immersion, SF 105, 336 hrs @ 150°C (302°F) per ASTM D471										
Hardness Change, Shore A	---	---	---	---						
Tensile Change, % max.	---	---	---	---						
Elongation Change, %, max.	---	---	---	---						
Volume Change, %	---	---	---	---						
Oil Immersion, IRM 903, 70 hrs @ 150°C (302°F) per ASTM D471										
Hardness Change, Shore A	---	---	---	---						
Tensile Change, % max.	---	---	---	---						
Elongation Change, %, max.	---	---	---	---						

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Volume Change, %	---	---	---	---						
TYPE O-RING CROSS- SECTIONAL DIA. (NOM.)	3					4				
	0.070	0.103	0.139	0.210	Button	0.070	0.103	0.139	0.210	Button
Water Immersion, 70 Hrs @ 100°C (212°F) per ASTM D471										N/A
Hardness Change, Points Shore A	---	---	±5	---						
Tensile Change, % max.	---	---	-20	---						
Elongation Change, %, max.	---	---	-20	---						
Volume Change, %	---	---	0 to +5	---						
Water/ Glycol and O.A.T and non O.A.T (Hybrid) Coolants Immersion (1:1 by Vol) 70 Hrs. @ 100°C (212°F) per ASTM D471										N/A
Hardness Change, Points Shore A	---	---	±5	---						
Tensile Change, % max.	---	---	-20	---						
Elongation Change, %, max.	---	---	-20	---						
Volume Change, %	---	---	0 to +5	---						
Low Temperature Compression, Age, 22 hrs. @ - 40°C (- 40°F) ASTM D-1229 (Modified) Compress section of ring 25% diametrically (orig. approval only)	---	---	No Cracks	---						No Cracks
TR-10, Low Temperature Retraction 10% Return, ASTM D-1329 (original approval only)	---	---	-14C (+7F)	---						N/A
Tear Strength ASTM D624 DIE B										
lbs/in, min	---	---	---	---						
KN/m, min	---	---	---	---						

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TYPE O-RING CROSS- SECTIONAL DIA. (NOM.)	3					4				
	0.070	0.103	0.139	0.210	Button	0.070	0.103	0.139	0.210	Button
CSR – Original Approval Only (150degC) Air: Retained Load= % @500 Hrs Retained Load= @1000 Hrs Retained Load= @1500 Hrs Retained Load= @2000 Hrs Retained Load= @2500 Hrs Retained Load= @3000 Hrs Oil: Mobil 1, 10W30, 150C Retained Load= % @500 Hrs Retained Load= @1000 Hrs Retained Load= @1500 Hrs Retained Load= @2000 Hrs Retained Load= @2500 Hrs Retained Load= @3000 Hrs Oil: MPAPS B-21, Grade 10W30, 150C Retained Load= % @500 Hrs Retained Load= @1000 Hrs Retained Load= @1500 Hrs Retained Load= @2000 Hrs Retained Load= @2500 Hrs Retained Load= @3000 Hrs Coolant: MPAPS B-1 Type 3 (135degC) Retained Load= % @500 Hrs Retained Load= @1000 Hrs Retained Load= @1500 Hrs Retained Load= @2000 Hrs Retained Load= @2500 Hrs Retained Load= @3000 Hrs										

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TYPE O-RING CROSS- SECTIONAL DIA. (NOM.)	5					6				
	0.070	0.103	0.139	0.210	Button	0.070	0.103	0.139	0.210	Button
ASTM D2000 Line Callout										
Original Properties										
Hardness, Points Shore A	---	---		---	95±5	---	---		---	75±5
Tensile Strength, psi, min.	---	---		---	1800	---	---		---	1600
MPa, min.	---	---		---	12.4	---	---		---	10.0
Ultimate Elongation, % min.	---	---		---	60	---	---		---	150
Modulus @ 100% Elongation	---	---		---	---	---	---		---	---
psi, min.	---	---		---	1200	---	---		---	---
MPa, min.	---	---		---	8.3	---	---		---	4.0
Specific Gravity	---	---		---	1.77±0.03	---	---		---	1.80+/-0.03
Compression Set 70 Hrs. @ 175°C (347°F), % max.	---	40	35	25	25	---	25	20	15	15
Air Age 70 hrs. @ 250°C (482°F) ASTM D573								(@ 528F)		
Hardness Change, Points Shore A max	---	---		---	±5	---	---	±5	---	+/-5
Tensile Change, % max.	---	---		---	-25	---	---	35	---	-25
Elongation Change, % max.	---	---		---	-40	---	---	10	---	-30
Oil Immersion, IRM 901 70 hrs. @ 150°C (302°F) ASTM D471										
Hardness Change, Shore A	---	---	---	---		---	---	---	---	
Tensile Change, % max.	---	---	---	---		---	---	---	---	
Elongation Change, %, max.	---	---	---	---		---	---	---	---	
Volume Change, %	---	---	---	---		---	---	---	---	
Oil Immersion, ASTM #3 Oil 70 hrs @ 150°C (302°F) ASTM D471										
Hardness Change, Shore A	---	---	±5	---		---	---	---	---	
Tensile Change, % max.	---	---	-20	---		---	---	---	---	
Elongation Change, %, max.	---	---	-20	---		---	---	---	---	
Volume Change, %	---	---	0 to +5	---		---	---	---	---	
Oil Immersion, SF 105, 336 hrs @ 150°C (302°F) per ASTM D471										
Hardness Change, Shore A	---	---	---	---	+/-5	---	---	---	---	+/-5
Tensile Change, % max.	---	---	---	---	-65	---	---	---	---	-55
Elongation Change, %, max.	---	---	---	---	-75	---	---	---	---	-55
Volume Change, %	---	---	---	---	0 to +5	---	---	---	---	0 to +5
Oil Immersion, IRM 903, 70 hrs @ 150°C (302°F) per ASTM D471										
Hardness Change, Shore A	---	---	---	---	+/-5	---	---	---	---	+/-5
Tensile Change, % max.	---	---	---	---	-20	---	---	---	---	-20
Elongation Change, %, max.	---	---	---	---	-20	---	---	---	---	-20

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Volume Change, %	---	---	---	---	0 to +5	---	---	---	---	0 to +5
TYPE	5					6				
O-RING CROSS-SECTIONAL DIA. (NOM.)	0.070	0.103	0.139	0.210	Button	0.070	0.103	0.139	0.210	Button
Water Immersion, 70 Hrs @ 100°C (212°F) per ASTM D471	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hardness Change, Points Shore A	---	---	---	---		---	---	---	---	
Tensile Change, % max.	---	---	---	---		---	---	---	---	
Elongation Change, %, max.	---	---	---	---		---	---	---	---	
Volume Change, %	---	---	---	---		---	---	---	---	
Water/ Glycol and O.A.T and non O.A.T (Hybrid) Coolants Immersion (1:1 by Vol) 70 Hrs. @ 100°C (212°F) per ASTM D471	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hardness Change, Shore A	---	---	---	---	---	---	---	---	---	---
Tensile Change, % max.	---	---	---	---	---	---	---	---	---	---
Elongation Change, %, max.	---	---	---	---	---	---	---	---	---	---
Volume Change, %	---	---	---	---	---	---	---	---	---	---
Low Temperature Compression, Age, 22 hrs. @ -40°C (- 40°F) ASTM D-1229 (Modified) Compress section of ring 25% diametrically (orig. approval only)	---	---	No Cracks	---	TBD	---	---	---	---	TBD
TR-10, Low Temperature Retraction 10% Return, ASTM D-1329 (original approval only)	---	---	---	---	-15C (+5F)	---	---	---	---	-29C (-20F)
Tear Strength ASTM D624 DIE B										
lbs/in, min	---	---	---	---	---	---	---	---	---	---
KN/m, min	---	---	---	---	---	---	---	---	---	---

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