

NAVISTAR, INC.		
Material, Parts, and Process Specifications (MPAPS)		NUMBER: MPAPS F-2
		Former Designation:
TITLE: Fluid System Cleanliness Requirements	CURRENT Rev. No.: 1709	DATE: Sep. 2017
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<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>		

1.0 APPLICATION

This specification defines test procedures and cleanliness requirements of finished components ready for assembly. Components ready for assembly have been thoroughly cleaned to remove foreign debris remaining on or inside the parts after manufacture and/or parts as-received at the assembly plant.

1.1 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.

2.0 SCOPE

This specification covers general requirements, property and performance requirements, identification, quality, packing and shipping, and source approval and quality control requirements.

3.0 CONTENTS

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4.0 REFERENCE DOCUMENTS

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

Quality System Standard ISO 9001 or TS-16949	EMD 991	ISO 16232-7
NAVISTAR Supplier Packing and Shipping Std. D-13	ISO 4406	ISO 16232-10
NAVISTAR Engineering Design Std. A-16	ISO 4407	SAE J1726
NAVISTAR MPAPS B-50	ISO 16232-3	SAE J2064
CFR Title 29, Part 1910	ISO 16232-6	

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5.0 REQUIREMENTS

5.1 Components

The five levels of component cleanliness defined below are generally specified for the following types of applications and components:

Level I: Component surfaces in contact with high pressure fuel or oil system (EMD 991 Level AA)

Level II: Component surfaces in contact with filtered lubricating oil or filtered fuel (EMD 991 Level A)

Level III: Internal surfaces of Intercoolers, Intake piping and component surfaces in contact with lubricating oil, inlet air, and exhaust gas (EMD 991 Level B)

Level IV: HVAC A/C Hose Assemblies

Level V: Component surfaces in contact with cooling water (EMD 991 Level C)

Specified applications will appear as a noted requirement on individual part drawings.

Finished components shall meet the following cleanliness requirements as shown in the table below when tested according to the procedure defined in this specification. Components containing ferrous material shall exhibit maximum residual magnetism of 0.0005 Tesla (5 Gauss). This is low enough to preclude the adherence of fine metallic particles.

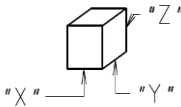
Cleanliness Level		Level I	Level II	Level III	Level IV	Level V
Max containment weight per unit surface area		2.0 mg per 15.5 in ² (0.01 m ²) up to 15 mg max per passage	2.5 mg per 15.5 in ² (0.01 m ²) up to 15 mg max per passage	3.0 mg per 15.5 in ² (0.01 m ²) up to 25 mg max per passage	3.0 mg per 15.5 in ² (0.01 m ²) up to 25 mg max per passage for	5.0 mg per 15.5 in ² (0.01 m ²) up to 50 mg max per passage
PARTICLE SIZE BY DIMENSION: 	X	0.012 in (300 Micron)	0.048 in (1200 Micron)	0.048 in (1200 Micron)	0.048 in (1200 Micron)	0.08 in (2000 Micron)
	Y	0.006 in (150 Micron)	0.02 in (500 Micron)	0.048 in (1200 Micron)	0.048 in (1200 Micron)	0.08 in (2000 Micron)
	Z	0.006 in (150 Micron)	0.006 in (150 Micron)	0.008 in (200 Micron)	0.008 in (200 Micron)	0.008 in (200 Micron)
	Levels I, II III and V: Up to 4 particles* max per passage may exceed "X" dimension Level IV No particle* may exceed any dimension shown All Levels: No particle* may exceed the Y or Z dimensions shown.					

TABLE 1: COMPONENT PARTICLE SIZE REQUIREMENTS

* Particles for dimensional analysis include abrasive particles such as sand, scale, cleaning shot, weld slag and spatter, machining chips, or particles not easily broken with a probe. Maximum particle size applies to length, width, or thickness.

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5.2 Method of Test

The procedure and apparatus used are described in SAE J1726. A basic procedure based upon the SAE method is listed below and may be used for convenience.

5.2.1 Apparatus

5.2.1.1 Millipore Filter Assembly

5.2.1.2 Vacuum Filtering Flask

5.2.1.3 5-micron and 0.5-micron Millipore Filter paper.

5.2.1.4 Suitable Solvent, such as n-pentane, hexane, petroleum ether, or a clean wash solution at same concentration as washer using deionized water.

5.2.1.5 Pressure tank with filter (similar to Millipore Model # XX6700L05)

5.2.2 Procedure: Method 1

5.2.2.1 Wash all apparatus carefully to avoid introducing extraneous contaminants.

5.2.2.2 Clean the exterior of test components as necessary to avoid introducing extraneous contaminants.

5.2.2.3 Pre-filter the solvent to be used through a 0.5 micron Millipore filter paper. Store the filtered solvent in a clean container until it is used.

5.2.2.4 Dry a 5 micron Millipore filter (with grid) in an oven at 100 °C (212 °F) for 15 minutes. Cool to room temperature and weigh to the nearest 0.1 mg.

5.2.2.5 Thoroughly flush the designated test surfaces with the filtered solvent, carefully collecting the solvent and debris into a clean beaker or container.

5.2.2.6 Pass this collected mixture through the 5-micron filter from Step 4, using the Millipore filter assembly, the vacuum filtering flask, and a vacuum source. The used solvent may be discarded or refiltered through a 0.5 micron Millipore filter for reuse.

5.2.2.7 Remove the filter paper from the filter assembly. Dry in an oven at 100 °C (212 °F) for 15 minutes, cool in a desiccator, and reweigh to the nearest 0.1 mg to determine if the contaminant weight requirement is met.

5.2.2.8 Using optical magnification equipment, examine the recovered debris to determine if the particle size limitation has been met.

5.2.3 Procedure: Method 2 (ISO 16232-3)

5.2.3.1 Equip the test liquid dispenser with one or more spray nozzle(s), suitable for the surfaces to be pressure rinsed.

5.2.3.2 Adjust the pressure of the test liquid to obtain a jet of sufficient power to remove and transport the particles from the controlled surfaces without degrading or dissolving the surface material of the component.

5.2.3.3 Rinse the controlled surfaces carefully with test liquid sprayed on through the nozzle, ensuring that the whole controlled surface has been swept by the jet in order to extract the particles from the component(s). Collect the extraction liquid in either a single or several sampling containers.

5.2.3.4 Collect all recovered extraction liquids and particles. Carefully rinse the collection equipment and collect all of the accumulated particles in a clean sampling container.

5.2.3.5 Analyze the extraction liquid in accordance with ISO 16232-6 (gravimetric analysis) or (particle sizing and counting) ISO 16232-7 and label the result obtained as S1.

5.2.3.6 Repeat 5.2.3.3 to 5.2.3.5 twice more on the same component, using, when necessary, a different container for each extraction liquid volume and label the result obtained as S2 and S3.

NOTE: The extractions should be made directly one after the other.

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