

NAVISTAR, INC.		
Material, Parts, and Process Specifications (MPAPS)		NUMBER: MPAPS S-C-10.101-GS/PL
		Former Designation: ESP-C-10.101-GS
TITLE: Machine Screws and Lock Washer Assemblies – English Series-Not Recommended (Noun Code 7450)		CURRENT REV No.: 1506
		DATE: June 2015
WRITTEN/EDITED BY: Materials Engineering	APPROVED BY: Materials Engineering	SUPERSEDES: ESP-C-10.101-GS - August 2006
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: Changed to New MPAPS format; Combined GS, PP, NPP.		

- 1.0 GENERAL:** Machine screw and tooth lock washer assemblies are general purpose fasteners for mass production and other operations where speed and convenience are paramount factors.
- 2.0 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 CONTENTS:**

	Page
General	1
Restricted Chemical Substances	2
Machine Screw Specifications	2
Body Diameter	2
Washer Manufacturing Detail	2
Spring Lock Washer Manufacturing Detail	2
Assembly Detail	2
Flushness	2
Washer Material	2
Washer Temper Test	3
Washer Spread Test	3
Finishes	3
Defects	3
Policy for Selecting Parts for New Design	3
Flat Head Cross Recess Machine Screws External Tooth Lock Washer Assemblies	4
Pan Head Cross Recess Machine Screws and External Tooth Lock Washer	5
Hexagon Head Machine Screws and External Tooth Lock Washer Assemblies	6
Pan Head Cross Recess Machine Screws and Spring Lock Washer Assemblies	7
Fillister Head Machine Screws and Spring Lock Washer Assemblies	8
Hexagon Head Machine Screws and Spring Lock Washer Assemblies	10
Technical Information	11

This document is restricted and may not be sent outside Navistar, Inc. or reproduced without permission from Corporate Technical Standards. Suppliers are required to assume all patent liability. ©2015 by Navistar, Inc.

JUNE 2015

NUMBER: MPAPS S-C-10.101-GS/PL	TITLE: Machine Screws and Lock Washer Assemblies	REVISION: 1506
--	---	--------------------------

4.0 MACHINE SCREW SPECIFICATIONS: The General Specifications in MPAPS S-C-1.101-GS/PL will apply with additional requirements as indicated below.

5.0 BODY DIAMETER: The minimum limit for unthreaded shank diameter will be the minimum pitch diameter specified in dimensional tables. The maximum limit will be as described in the paragraph covering assembly detail.

6.0 WASHER MANUFACTURING DETAIL: At purchaser's option, the external and internal tooth lock washers may be either of the two types illustrated in the cuts. The number of teeth, the length of teeth, the width of rim and the thickness over the teeth (free height) will be optional with the manufacturer, with the provision, however, that the washers are symmetrical in shape and that the projection of the teeth on both sides of the washer is uniform within a tolerance equal to one-half of the projection on one side. The extrusion of a slight collar at the inside diameter of the countersunk external tooth lock washers will also be optional with the manufacturer.

7.0 SPRING LOCK WASHER MANUFACTURING DETAIL: The section of finished washers will be slightly trapezoidal in shape with the thickness at the inner periphery greater than the thickness at outer periphery by an amount varying from a minimum of .0005 inch to a maximum of .001 inch per .0156 (1/64) inch of minimum section width. The minimum washer thickness specified in the dimensional tables represents the nominal mean thickness of the trapezoid. The tolerance on the nominal mean thickness of the trapezoid will be plus .006 inch for size #12 and smaller and plus .010 inch for sizes 1/4 through 3/8.

Washers will be coiled so that the free height is approximately twice the thickness of washer section. The gap and relationship of severed ends will be such as to insure that washers will compress flat. The flat faces and the inner washers will compress flat. The flat faces and the inner and outer peripheries will be smooth and free from knurling, serrations, die marks, deep scratches, etc., although slight feed roll marks will be permissible.

8.0 ASSEMBLY DETAIL: Washers will be assembled on headed screw blanks before the threads are rolled, - the inside diameter of the washers and the diameter of the unthreaded portion of the screws being of a size which will permit free rotation of the washers and yet prevent their disassembly from the screws.

9.0 FLUSHNESS: The value for "V" specified in the dimensional tables for flat and oval head screw and washer assemblies will apply when the assembly is seated. These dimensions can be checked by screwing a screw and washer assembly into a hardened steel block having an 80-82 degree countersunk hole.

10.0 WASHER MATERIAL: Tooth lock washers will be fabricated from SAE 1050-1066 steel and heat treated to a Rockwell hardness of 40-50 C scale or equivalent. It is recommended, however, that the lighter, more sensitive depth reading Rockwell A scale be used when testing hardness of washers having thin section. Precautions must be taken to avoid the effects of decarburization when making hardness tests. Washers will meet the test requirements of this standard. Spring lock washers will be fabricated from SAE 1060 steel or equivalent, 5-7 grain size, capable of being hardened in oil, free from surface defects, and not below average in cleanliness. The wire will meet the decarburization limits specified in the following table:

This document is restricted and may not be sent outside Navistar, Inc. or reproduced without permission from Corporate Technical Standards. Suppliers are required to assume all patent liability. ©2015 by Navistar, Inc.

JUNE 2015

NUMBER: MPAPS S-C-10.101-GS/PL	TITLE: <i>Machine Screws and Lock Washer Assemblies</i>	REVISION: 1506
---	---	---------------------------------

Diameter of Round Wire (Or Sections of Equivalent Area)	Average Depth of Total Decarburization Max (Free ferrite)	Av. Total Affected Depth Max (Free ferrite plus partial decarburization)
Up to .140 incl	.002	.006
Over .140 to .250, incl	.003	.008

11.0 WASHERS TEMPER TEST: Washers will be set down or deflected a distance equivalent to 1/3 turn of a coarse thread nut of corresponding size. The free height of the washer on release will be at least 5/6 of original free height.

12.0 WASHER SPREAD TEST: Washers will be removed from screw and the rim of the washer will be cut or severed with a cold chisel or cutting pliers. The severed ends will be gripped by pliers or vise and pliers. Separation of the ends in the form of a helix, to a distance equal to the inside diameter of the washer, will not result in fracture. When the ends are separated a greater distance and the washer fractures, the fracture at the point of fracture will show a fine grain, and the washer up to the instant of fracture will deliver a tough, springy reaction.

13.0 FINISHES: Finish specifications in MPAPS S-C-1.101-GS/PL will apply.

14.0 DEFECTS: Screw and washer assemblies will be free from all defects which might affect their serviceability.

15.0 POLICY FOR SELECTING PARTS FOR NEW DESIGN: Approved parts are so designated to reduce variety of parts and assure maximum availability, interchangeability and cost savings in volume buying.

For new design, parts shall be selected from "Approved" part list only.

Head Types:	Flat, Oval, Pan, Hex
Drive:	Cross Recess, ANSI Type 1 (Phillips) and Hex
Diameters:	6, 8, 10, 1/4, 5/16, 3/8
Threads:	Coarse
Finishes:	Zinc Trivalent, Class 6A (ZN6A), Phosphate Coated (PHC)
Lengths:	As shown below:

Nominal Size						
Length	6	8	10	1/4	5/16	3/8
1/8	APPROVED PARTS					
1/4						
3/8						
1/2						
5/8						
3/4						
7/8						
1						
1-1/4						
1-1/2						
1-3/4						
2						
2-1/4						
2-1/2						
3						

Length

Up to 1 Inch
Over 1 Inch to 1-1/2 Inches
Over 2-1/2 Inches to 3 Inches

Preferred Sizes

1/8 Inch Increments
1/4 Inch Increments
1/2 Inch Increments

This document is restricted and may not be sent outside Navistar, Inc. or reproduced without permission from Corporate Technical Standards. Suppliers are required to assume all patent liability. ©2015 by Navistar, Inc.

JUNE 2015

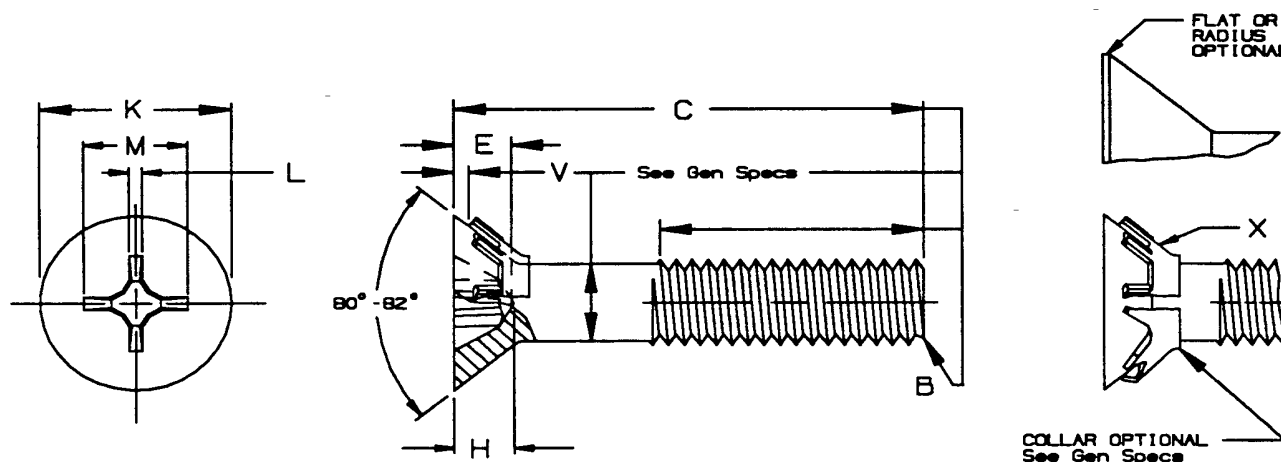


Documents

Page 3 of 11
Document Sharing Hub

NUMBER: MPAPS S-C-10.101-GS/PL	TITLE: Machine Screws and Lock Washer Assemblies	REVISION: 1506
--	---	--------------------------

16.0 FLAT HEAD CROSS RECESS MACHINE SCREWS EXTERNAL TOOTH LOCK WASHER ASSEMBLIES:



Dimensions in inches:

Dimensions in inches.																				
Nominal Size	B	K			E	M		L	H					V	X	THREAD DETAIL			Driver Size	
	Threads Per Inch	Head Diameter			Head Height	Recess Diameter		Recess Width	Recess Depth		Penetration Gaging Depth		Radius Under Head	Flush with Minus Tolerance of	Washer Thickness		Pitch Diameter (See Gen Specs)			
		Max Sharp	Min Sharp	Abs Min	Max Ref	Min	Max	Min	Min	Max	Min	Max	Max		Max	Max	Min	Max		Min
* 6	32	.279	.257	.244	.083	.161	.174	.029	.083	.106	.072	.095	.055	.026	.020	.016	.1169	.1141	.1177	2
6	40	.279	.257	.244	.083	.161	.174	.029	.083	.106	.072	.095	.055	.026	.020	.016	.1210	.1184	.1218	2
* 8	32	.332	.308	.292	.100	.176	.189	.030	.098	.121	.087	.110	.066	.030	.020	.016	.1428	.1399	.1437	2
8	36	.332	.308	.292	.100	.176	.189	.030	.098	.121	.087	.110	.066	.030	.020	.016	.1452	.1424	.1460	2
* 10	24	.385	.359	.340	.116	.191	.204	.032	.113	.136	.102	.125	.076	.036	.025	.019	.1619	.1586	.1629	2
10	32	.385	.359	.340	.116	.191	.204	.032	.113	.136	.102	.125	.076	.036	.025	.019	.1688	.1658	.1697	2
* 12	24	.438	.410	.389	.132	.255	.268	.035	.133	.156	.116	.139	.086	.041	.025	.019	.1879	.1845	.1889	3
12	28	.438	.410	.389	.132	.255	.268	.035	.133	.156	.116	.139	.086	.041	.025	.019	.1918	.1886	.1928	3
* 1/4	20	.507	.477	.452	.153	.270	.283	.036	.148	.171	.131	.154	.100	.047	.025	.019	.2164	.2127	.2175	3
1/4	28	.507	.477	.452	.153	.270	.283	.036	.148	.171	.131	.154	.100	.047	.025	.019	.2258	.2225	.2268	3
* 5/16	18	.635	.600	.568	.191	.352	.365	.061	.194	.216	.174	.196	.125	.060	.028	.023	.2752	.2712	.2764	4
5/16	24	.635	.600	.568	.191	.352	.365	.061	.194	.216	.174	.196	.125	.060	.028	.023	.2843	.2806	.2854	4
* 3/8	16	.762	.722	.685	.230	.380	.393	.065	.223	.245	.203	.226	.150	.072	.034	.028	.3331	.3287	.3344	4
3/8	24	.762	.722	.685	.230	.380	.393	.065	.223	.245	.203	.226	.150	.072	.034	.028	.3468	.3430	.3479	4

* Non-Preferred Sizes and Threads

16.1 Part List:

16.1.1 Approved:

Nominal Size-TPI	Length	Finish	Material	Part Number
1/4 -20	5/8	ZN6A	CST	191983
* 3/8 -16	1	ZN6A	CST	24668R1

* Header Point

This document is restricted and may not be sent outside Navistar, Inc. or reproduced without permission from Corporate Technical Standards. Suppliers are required to assume all patent liability. ©2015 by Navistar, Inc

JUNE 2015