

NAVISTAR, INC.		
Material, Parts, and Process Specifications (MPAPS)		NUMBER: MPAPS S-CM-32.101-GS/PL
		Former Designation: ESP-CM-32.101-GS
TITLE: Headless Hex Socket Set Screws – Metric series		CURRENT REV No.: 1506
		DATE: June 2015
WRITTEN/EDITED BY: Materials Engineering	APPROVED BY: Materials Engineering	SUPERSEDES: ESP-CM-32.101-GS - August 2006
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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>		
Change Notice: Changed to New MPAPS format; Combined GS, GI, PP.		

1.0 GENERAL: Implementation of this standard must be in accordance with the policies and procedures outlined in MPAPS S-A-1.101. There may also be supplemental group instructions in regard to use of metric standards that should be taken into account.

This standard may differ in some respects with certain segments of ISO and national standards. In recognition of these differences, the sizes and tolerance ranges used were established in an effort to enable the use of commercially available items, dimensionally interchangeable worldwide.

This specification contains the essentials of the following standards. International Organization for standardization: ISO 2343, 8262, 8888, and 8965/II.

British Standards Institute:	BS 4168
German Institute of Standardization:	DIN 914, DIN 916
Standards Association of Australia:	AS 1421
American National Standards Institute:	ANSI B18.3.6M-1979

The inclusion of dimensional data is not intended to imply that all the set screws described are stock production sizes.

Inch dimensioned standard socket set screws may be found in MPAPS S-C-32.101-GS/PL.

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3.0 DESIGN CONSIDERATION: In order to prevent future proliferation of set screws, one head form (Hex Socket) and two points (Cup and Half Dog) will be considered preferred. The following considerations should be given in selection of a point.

Cup Point: Most widely used and readily available point in the U.S. Allows quick alignment of gears, collars and pulleys on shafts, when the cutting action of the point is not objectionable. Screws in this standard are minimum Rockwell C 45 and can be used on shafts with a surface hardness up to Rockwell C 35 without deforming the point.

Half Dog Point: Recommended for use with hardened members and on hollow tubing provided some locking feature holds screw in place. Requires an additional operation of drilling a hole in a shaft which must match the point diameter to prevent side play. Also applied where permanent location of one part in relation to another is desired.

4.0 METRIC-INCH RELATED SIZES: During the inch to metric design transition period, the following chart of elated sizes can be used for reference. This information is not to be considered as a recommendation for substitutions but only as a means of determining approximate dimensional equivalents.

Metric Series mm	Approximate Inch Series
3	#4, #5
4	#6, #8
5	#10
6	#12, 1/4
8	5/16

Metric Series mm	Approximate Inch Series
10	3/8
12	1/2
16	9/16, 5/8
20	3/4
24	7/8, 1

5.0 THREADS: The ISO basic profile is essentially the same geometric configuration as the unified screw thread basic form. The threads will be coarse series, tolerance class 6g. Thread with tolerance class 5g6g is an acceptable option.

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6.0 THREAD TOLERANCES: The medium class of fit 6H(Int)/6g(Ext) is approximately the same as the 2A(Ext)/2B(Int) allowance in the U.S. unified thread series for comparable size. For example:

<u>Thread</u>	<u>Allowance</u>
M10 x 1.5 - 6H(Int)/6g(Ext)	0.032 mm (.00126 in)
3/8-16 UNC 2A(Ext)/2B(Int)	.0013 in (0.033 mm)

7.0 COLOR CODING: Not recommended, except in cases where adequate insurance is needed to prevent mixing of "metric parts" with look-alike "inch parts". The color blue is standard identifier used in some industries. This must be handled internally at individual plants where needed and is meant to be supplemental to the normal finish and easily deleted when the need for supplemental identification no longer exists. The supplemental blue color should not be used on material such as stainless steel which is specified for cosmetic purposes, or phosphate coating which may cause a loss of color identity.

8.0 METHOD OF DESIGNATION: Hexagon socket set screws will be designated by size, length, description, type of point, material, finish, and part number.

M8 x 25, Hex Socket Screw Set, Cup Point, Steel, Plain, Part Number

The absence of a specification for pitch indicates that coarse thread is required; e.g., a coarse thread of the dimensions M10 x 1.5 is designated as "M10."

9.0 APPLICATION DATA: The following is published as guide only. Because conditions differ widely, it may be necessary to modify seating torques somewhat to suit a particular application conditions. The advisability and the extent of such modifications can best be determined by experiment in the particular assembly environment.

Dimensions in millimeters:

Nominal Size	Recommended Seating Torque*		Tap Drill Size mm
	N.m	Inch-lbs	
M3	0.6	5	2.5
M4	2	18	3.3
M5	4	35	4.2
M6	7	62	5
M8	17	150	6.75

Nominal Size	Recommended Seating Torque*		Tap Drill Size mm
	N.m	Inch-lbs	
M10	34	300	8.5
M12	60	530	10.25
M16	150	1325	14
M20	300	2650	17.5
M24	475	4200	21

* Not applicable to screws with a length equal to or less than the diameter

10.0 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.

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

Nominal Sizes: M3, M4, M5, M6, M8, M10, M12, M16, M20, and M24

Material: Steel

Finish: Plain (PLN) and Phosphate Coating (PHC)

Lengths: See chart below.

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