

NAVISTAR, INC.		
Material, Parts, and Process Specifications (MPAPS)		NUMBER: MPAPS S-DM-1.101-GS/PL
		Former Designation: ESP-DM-1.101-GS
TITLE: Tapping Screws – Metric Series	CURRENT REV No.: 1506	DATE: June 2015
WRITTEN/EDITED BY: Materials Engineering	APPROVED BY: Materials Engineering	SUPERSEDES: ESP-DM-1.101-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: This standard may differ in some respects with certain segments of 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.

Implementation of this standard must be in accordance with the policies and procedures outlined in MPAPS S-A-0.101. There may also be supplemental group instructions in regard to use of metric standards that should be taken into account.

This standard covers requirements for metric series steel, self-drilling, tapping screws and contains the essentials of inch dimensioned SAE J78 and following standards:

International Organization for
Standardization:
ISO 261, 965, 1478, 1479, 4757, 7045, 7047, 7049, 7051 and 7721

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

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3.0 DESIGN CONSIDERATIONS: Two drives, ISO Type H recess and hex washer head, will be considered as part of this standard for standardization purposes and manufacturing advantages. Type H recess is preferred over slotted because of improved driving characteristics. Hexagon washer heads, in addition to greater bearing area, provide a shoulder for the socket, thus protecting the assembly surface from socket disfigurement.

Type C point is preferred in most thread forming applications for rapid assembly. Blunt points are specified where damage to hose, wire damage or customer operator injury is possible.

Thread cutting screws are not generally recommended in cast metals having a thickness less than three thread pitches or in metal parts with thread engagement greater than 10 pitches. Thicker materials can be fastened by counterboring to give the proper length of thread engagement.

Short screw applications may require a hole size smaller than the recommended hole size. Generally two full threads above the slot should be engaged, particularly when using Type T.

For best results with plastic applications, all holes should be counterbored to prevent fracturing the plastic.

Type BSD spaced threads are essentially a direct conversion of present inch standards. Inch data in MPAPS S-D-40.101-GS/PL will apply in cases where metric series is a direct conversion.

Self-drilling and tapping screws should be considered for use in attachments which will require drilling of holes at the point of screw installation. For such usage to be practical, however, the application must have good accessibility for the power tool to drive as near to perpendicular to the work surface as possible and permit the operator to apply adequate end pressure without undue fatigue. Self-drilling and tapping screws should not be used in thermoplastic materials or in blind holes.

4.0 METRIC-INCH RELATED SIZES: During the inch to metric design transition period, the following chart of related 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 equivalents.

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Spaced Thread Screws (Types BSD)		Spaced Thread Screws (Types C and F)		Machine Screw Threads (Types D, F, and T)	
Metric Series mm	Approximate Inch Series	Metric Series mm	Approximate Inch Series	Metric Series mm	Approximate Inch Series
3.5	#6	3.5	#6	3	#4, #5
4.2	#8	4.2	#8	4	#6, #8
4.8	#10	4.8	#10	5	#10
6.3	1/4	6.3	1/4	8	#12, 1/4
		8	5/16	10	3/8

5.0 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 a 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 finishes such as chromium bright which are specified for cosmetic purposes or phosphate coating which may cause a loss of color identity.

6.0 METHOD OF DESIGNATION:

Metric tapping screws will be designated on purchase orders by nominal size, pitch, length, point type, product name, including head type and driving provision, material, finish, and part number as shown in the following examples:

6.3 x 1.8 x 20 mm, Type H Recess, Pan Head Tapping Screw, Type C, STL, PHC, Part Number
 4.2 x 1.4 x 10 mm, Hex Washer Head Tapping Screw, Type F, STL, PHC, Part Number
 4 x 0.7 x 8 mm, Type H Recess, Pan Head Tapping Screw, Type D, STL, ZN6A, Part Number
 10 x 1.5 x 25 mm, Hex Washer Head Tapping Screw, Type T, STL, ZN6A, Part Number

Metric self-drilling tapping screws will be designated on purchase orders by size, pitch, length, type, word description, (product name, including head, point style), material, finish, and part number as shown in the following example:

6.3 x 1.81 x 20 mm, Type BSD, Type 1A Recess Pan Head. Style 2 point, Self-Drilling Tapping Screw, STL, PHC
 4.2 x 1.41 x 10 mm, Type BSD, Hex Washer Head, Style 2 point, Self-Drilling Tapping Screw, STL, PHC

7.0 MINIMUM PRACTICAL SCREW LENGTH: Lengths shown below are theoretical minimum. Refer to section 12.0 for recommended diameter - length combinations. These values are to assist the user in the selection of proper screw lengths and will not be subject to inspection.

Nominal Size	Minimum Practical Screw Lengths Types C and F Pan and Hex Washer Heads
3.5	8.7
4.2	8.7
4.8	8.7
6.3	12.2
8	15.2

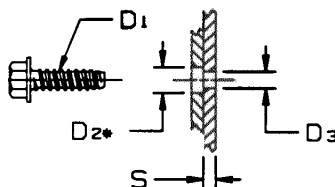
Nominal Size	Minimum Practical Screw Lengths Types D, F, and T Pan and Hex Washer Heads
3	5
4	6
5	8
6	10
8	12
10	15

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- 8.0 APPLICATION DATA FOR SPACED THREAD SCREWS (Types C and F):** The following is published as a guide only. Because conditions differ widely, it may be necessary to modify the hole size to suit a particular application. The advisability and the extent of such modifications can best be determined by experiment in the particular assembly environment. Refer to MPAPS S-D-200.101-GS/PL & MPAPS S-D-200.102-GS/PL for more comprehensive data concerning holes.
- Drilled or Clean-Punched Holes in Sheet Metal



Dimensions in millimeters:

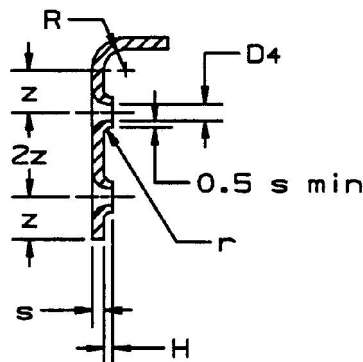
Dimensions in millimeters.

D1 Nominal Size		3.5		4.2		4.8		6.3		
D2 Clearance Hole *		4		4.8		5.4		7		
S		D3 Hole Size ± 0.1 -0								
Thickness Range Sheet Metal		Aluminum	Brass Steel	Aluminum	Brass Steel	Aluminum	Brass Steel	Aluminum	Brass Steel	Material
Over 0.6	To 0.8 mm		2.7		3.2		3.7			
Over 0.8	To 1.2 mm	2.65	2.8	3	3.2	3.7	3.7		4.9	
Over 1.2	To 1.4 mm	2.65	2.8	3.2	3.3	3.7	3.9		4.9	
Over 1.4	To 1.6 mm	2.7	2.9	3.5	3.5	3.7	3.9	5	5	
Over 1.6	To 1.8 mm	2.8	3	3.5	3.5	3.7	3.9	5	5	
Over 1.8	To 2 mm	2.8	3	3.5	3.5	3.8	4	5	5.2	
Over 2	To 2.5 mm	2.8	3	3.5	3.5	3.8	4	5.2	5.3	
Over 2.5	To 3mm	2.9	3.2	3.7	3.8	3.8	4.1	5.2	5.3	
Over 3	To 3.2 mm	3		3.7	3.8	3.9	4.3	5.2	5.8	
Over 3.2	To 3.5 mm	3		3.8	3.9	3.9	4.3	5.3	5.8	
Over 3.5	To 4mm	3		3.9		3.9	4.3	5.3	5.8	
Over 4	To 4.8 mm	3		3.9		4	4.4	5.4	5.9	
Over 4.8	To 5 mm	3		3.9		4.2		5.6	5.9	
Over 5	To 6 mm	3		3.9		4.2		5.8		
Over 6	To 10 mm			3.9		4.2		5.8		

*As thickness of the member to be tapped becomes greater it is recommended that a clearance hole be placed in the upper sheet to relieve the torque strain required and it insure against wedging of threads which would tend to keep sections apart.

9.0 APPLICATION DATA FOR SPACED THREAD SCREWS (Types C and F):

Pierced or Extruded Holes in Sheet Metal



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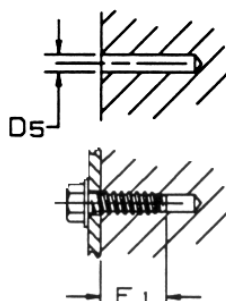
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Dimensions to millimeters:

Dimensions in millimeters.

D1 Nominal Size	3.5		4.2		4.8		6.3	
S	Materials							
Sheet Metal Thickness Range All Over 0.7 to 1.4 mm	Aluminum	Brass Steel	Aluminum	Brass Steel	Aluminum	Brass Steel	Aluminum	Brass Steel
D4 Hole Size +0. 1 0	2.8		3.5		4		5.3	
H Hole Extrusion Min	1.2		1.3		1.5		1.8	
r Extrusion Radius Max	0.25		0.25		0.25		0.25	
z Spacing Min	7		7.4		7.6		8.3	

Blind Holes in Nonferrous Castings or Plastics



Dimensions in millimeters:

Dimensions in millimeters:

D1 Nominal Size	3.5		4.2		4.8		6.3	
Material	Nonferrous Castings							
D5 Hole Size	3.2		3.9		4.5		6	
F1 Thread En a Engagement Min	6.4		6.4		6.4		8	
Material	Plastics							
	Acrylic Cellulosic Styrene	Phenolic	Acrylic Cellulosic Styrene	Phenolic	Acrylic Cellulosic Styrene	Phenolic	Acrylic Cellulosic Styrene	Phenolic
D5 Hole Size Nom	3	3.2	3.7	3.8	4.3	4.5	5.6	6
F1 Thread Engagement Min	6.4		8		8		9.5	

10.0 APPLICATION DATA FOR THREAD CUTTING SCREWS (Types D, F, & T):

The following is published as a guide only. Because conditions differ widely, it may be necessary to modify the hole size to suit a particular application. The advisability and the extent of such modifications can best be determined by experiment in the particular assembly environment. Refer to MPAPS S-D-200.101-GS/PL for more comprehensive data concerning holes.

* Values listed are for 410 SST screws in high tensile stainless steel. Parenthesis indicate Type D screw which is recommended for steel parts with thickness less than $1/2$ of the screw diameter. Type T screws are recommended for all other applications in metal because of the wide cutting slot with addition chip clearance.

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Drilled or Clean-Punched Holes in Sheet Metal

Dimensions in millimeters:

Dimensions in millimeters:																		
	3			4			5			6			8			10		
	Materials																	
	CST	SST*	AL	CST	SST*	AL	CST	SST*	AL	CST	SST*	AL	CST	SST*	AL	CST	SST*	AL
	Hole Sizes																	
1 up to 1.4	(2.55)	(2.6)	2.5	(3.3)	(3.4)	3.3	(4.3)	(4.3)	4.2	(5.1)	(5.2)	5	(6.8)	(6.9)	6.8	(8.6)	(8.7)	8.5
1.5 up to 1.9	2.55	2.6	2.55	(3.4)	(3.5)	3.4	(4.3)	(4.4)	4.3	(5.1)	(5.2)	5.1	(6.9)	(7)	6.8	(8.7)	(8.8)	8.6
2 up to 2.4	2.6	2.6	2.55	3.4	3.5	3.4	(4.4)	(4.4)	4.3	(5.2)	(5.3)	5.1	(7)	(7.1)	6.9	(8.8)	(8.9)	8.7
2.5 up to 2.9	2.6	2.7	2.6	3.5	3.6	3.4	4.4	4.5	4.3	(5.3)	(5.4)	5.2	(7.1)	(7.2)	7	(8.9)	(9.1)	8.8
3 up to 3.9	2.7	2.7	2.6	3.5	3.6	3.5	4.5	4.5	4.4	(5.3)	(5.4)	5.2	(7.2)	(7.3)	7	(9)	(9.1)	8.8
4 up to 4.9	2.7	2.8	2.7	3.6	3.7	3.5	4.6	4.6	4.5	5.5	5.6	5.3	7.3	7.4	7.2	9.2	9.3	9
5 up to 6.4	2.8	2.8	2.7	3.7	3.8	3.6	4.7	4.8	4.5	5.6	5.7	5.4	7.5	7.6	7.3	9.4	9.5	9.2
6.5 up to 7.9	2.8	2.9	2.8	3.8	3.8	3.7	4.7	4.8	4.7	5.7	5.7	5.6	7.6	7.7	7.5	9.5	9.6	9.4
8 and over	2.8	2.9	2.8	3.8	3.8	3.8	4.7	4.8	4.7	5.7	5.7	5.7	7.6	7.7	7.6	9.5	9.6	9.5

Holes in Castings

Dimensions in millimeters:

Dimensions in millimeters:

Nominal Size	3		4		5		6		8		10	
Casting Thickness Range *	Casting Materials											
	AL & ZN	IRN	AL & ZN	IRN	AL & ZN	IRN	AL & ZN	IRN	AL & ZN	IRN	AL & ZN	IRN
Hole Size												
3 up to 3.9	2.7	2.8	3.6	3.7	4.5	4.7	5.4	5.6	7.3	7.5	9.1	9.4
4 up to 4.9	2.7	2.8	3.6	3.8	4.5	4.7	5.4	5.6	7.3	7.6	9.2	9.5
5 up to 6.4	2.7	2.8	3.6	3.8	4.6	4.8	5.5	5.7	7.3	7.6	9.2	9.5
6.5 up to 8	2.8	2.9	3.7	3.8	4.6	4.8	5.5	5.7	7.4	7.6	9.3	9.6
8 up to 9.9	2.8	2.9	3.7	3.8	4.6	4.8	5.6	5.7	7.5	7.6	9.3	9.6
10 and over	2.8	2.9	3.7	3.8	4.7	4.8	5.6	5.7	7.5	7.6	9.4	9.6

* Not recommended for thicknesses less than 3 mm.

11.0 REFERENCES: General Specifications pertaining to this product are printed in MPAPS S-D-1.101-GS/PL, inch series tapping screws and in MPAPS S-D-40.101-GS/PL, inch series self-drilling tapping screws. Essential data for design layout and detailing purposes is provided in the following paragraphs.

12.0 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.

Material: Carbon Steel (CST)
 Finishes: Phosphate Coating (PHC) and
 Zinc Trivalent (ZN6A)

Nominal Sizes and Length Incrementation: See charts below.

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