

INCH-POUND

MIL-DTL-32373

27 January 2011

SUPERSEDING

MS35844D

23 February 1978

## DETAIL SPECIFICATION

## PLUG, MACHINE THREAD, MAGNETIC: DRAIN

This specification is approved for use by all Departments and Agencies of the Department of Defense.

## 1. SCOPE

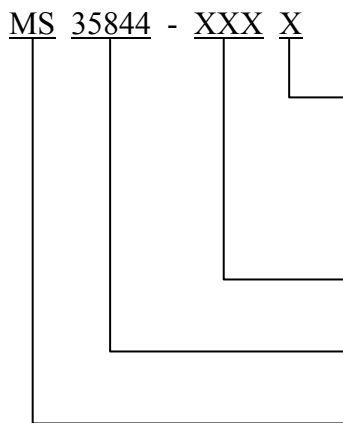
1.1 Scope. This specification covers two types of machine thread magnetic drain plugs used to seal engine oil lubrication systems and to capture ferrous contaminants in engine oil.

1.2 Classification. The machine thread magnetic drain plugs are of the following types as specified below:

Type I - External hexagonal (hex) head

Type II - External hex head with 3/4-inch square drive

1.3 Part or identifying number (PIN). The PIN to be used for drain plugs acquired to this specification is created as follows (see [6.2](#)):



Example of reference part number: MS35844-83A

Protective finish: A - Zinc

B - Cadmium, when required by the contract (see [6.2](#))

C - Anodized

Dash number (see [tables I and II](#))

Specification number

MS prefix (retaining MS part number)

Comments, suggestions, or questions on this document should be addressed to Defense Logistics Agency Aviation VEB, 8000 Jefferson Davis Highway, Richmond, VA 23297-5616, or e-mailed to [STDZNMGT@dla.mil](mailto:STDZNMGT@dla.mil). Since contact information can change, you may want to verify the currency of this address information using the ASSIST database at <https://assist.daps.dla.mil/>.

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## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of the documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specification and standards. The following specification and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

## FEDERAL STANDARD

FED-STD-H28 - Screw-Thread Standards for Federal Services

## DEPARTMENT OF DEFENSE SPECIFICATION

MIL-A-8625 - Anodic Coatings for Aluminum and Aluminum Alloys

## DEPARTMENT OF DEFENSE STANDARD

MIL-STD-130 - Identification Marking of U.S. Military Property

(Copies of these documents are available online at <https://assist.daps.dla.mil/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

## AMERICAN SOCIETY FOR QUALITY

ASQ Z1.4 - Sampling Procedures and Tables for Inspection by Attributes

(Copies of this document are available online at <http://www.asq.org> or from the American Society for Quality, 600 North Plankinton Avenue, Milwaukee, WI 53023.)

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### AMERICAN SOCIETY OF MECHANICAL ENGINEERS

- |            |  |
|------------|--|
| ASME B46.1 | - Surface Texture (Surface Roughness, Waviness, and Lay) |
|------------|--|

(Copies of this document are available online at <http://www.asme.org> or from the American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990.)

### ASTM INTERNATIONAL

- |               |  |
|---------------|--|
| ASTM A29/A29M | - Standard Specification for Steel Bars, Carbon and Alloy, Hot-Wrought, General Requirements for |
| ASTM A47/A47M | - Standard Specification for Ferritic Malleable Iron Castings                                    |
| ASTM A108     | - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished                          |
| ASTM B211     | - Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire                      |
| ASTM B633     | - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel                 |

(Copies of these documents are available online at <http://www.astm.org> or from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.)

### INTERNATIONAL MAGNETICS ASSOCIATION

- |           |   |
|-----------|---|
| MMPA 0100 | - Standard Specification for Permanent Magnet Materials |
|-----------|---|

(Copies of this document are available online at <http://www.intl-magnetics.org> or from the International Magnetics Association, 8 South Michigan Avenue, Suite 1000, Chicago, IL 60603-3452.)

### SAE INTERNATIONAL

- |                  |   |
|------------------|---|
| SAE AMS-QQ-P-416 | - Plating, Cadmium (Electrodeposited)               |
| SAE AS35769      | - Gasket, Metallic, Encased, Annular, Copper        |
| SAE J532         | - Automotive Straight Thread Filler and Drain Plugs |

(Copies of these documents are available online at <http://www.sae.org> or from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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## 3. REQUIREMENTS

3.1 Materials.

3.1.1 Machine thread drain plug body. Materials used in the manufacture of the machine thread drain plug body shall be as specified in [3.1.1.1](#) through [3.1.1.3](#).

3.1.1.1 Carbon steel. Carbon steel shall conform to compositional grade designations 1011 through 1025 in accordance with ASTM A29/A29M. Dimensional requirements for steel stock shall conform to ASTM A108.

3.1.1.2 Aluminum alloy. Aluminum alloy shall conform to chemical composition 2011, temper T3, or composition 2017, temper T4, in accordance with ASTM B211.

3.1.1.3 Malleable iron. Malleable iron shall conform to grade 32510 in accordance with ASTM A47/A47M.

3.1.2 Protective finishes.

3.1.2.1 Carbon steel and malleable iron. Drain plugs produced from carbon steel or malleable iron shall be one of the following:

- a. Zinc plated in accordance with ASTM B633, class Fe/Zn 13, type II.
- b. When required by contract (see [6.2](#)), cadmium plated in accordance with SAE AMS-QQ-P-416, type II, class 2; class 3 cadmium plating is permissible for thread sizes of 1/2-inch or less.

3.1.2.2 Aluminum alloys. Drain plugs produced from aluminum alloys shall be anodized using type IC or IIB coatings in accordance with MIL-A-8625.

3.1.3 Magnet types. Magnets shall be of the permanent magnet type and materials shall be of the Alnico 5 or the ceramic type conforming to MMPA 0100.

3.2 Dimensions. Dimensions shall conform to those shown in [figure 1](#) and [tables I](#) and [II](#). Dimensions and features not described herein shall be in accordance with SAE J532.

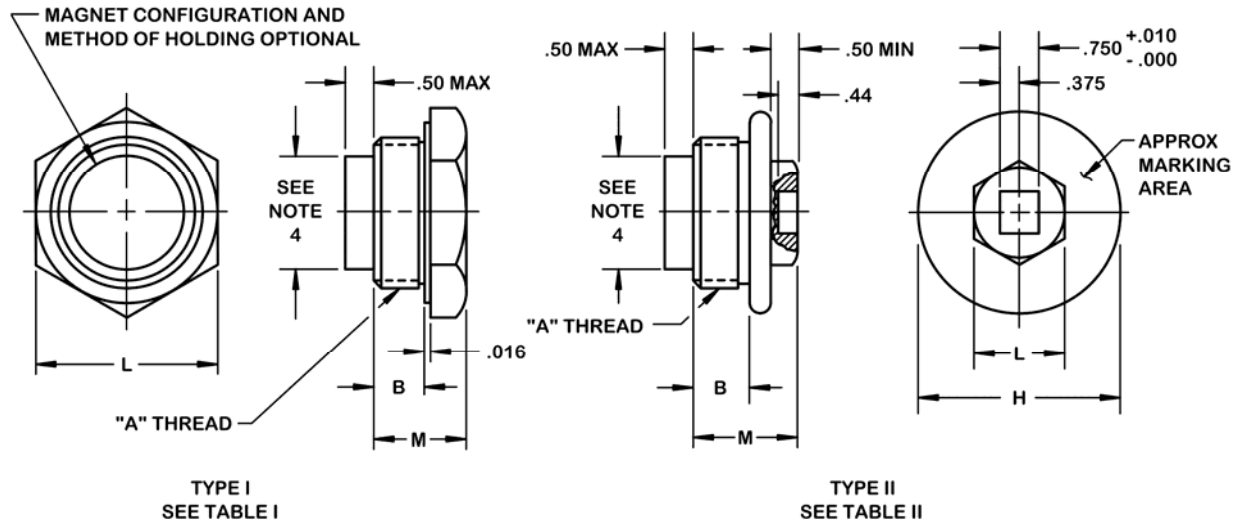
3.3 Magnets.

3.3.1 Magnetic lift. Magnets shall lift a minimum of 6 ounces of soft steel after being installed into the drain plug (see [4.4.2.1](#)).

3.3.2 Temperature. Magnets shall be firmly retained in the drain plug at temperatures up to 500 °F (260 °C) (see [4.4.2.2](#)).

3.4 Threads. Threads shall be in accordance with FED-STD-H28 (see [tables I](#) and [II](#)).

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## NOTES:

1. All dimensions are in inches. Dimensions are shown in [tables I and II](#). Unless otherwise specified, tolerances are  $\pm 0.010$  on machined surfaces.
2. All machined surfaces shall have a surface texture not greater than 125 micrometers ( $\mu\text{m}$ ) from the nominal; and all unmachined surfaces shall have a surface texture not greater than 500  $\mu\text{m}$  from the nominal in accordance with ASME B46.1.
3. Across-corner dimensions of the hexagonal heads shall be a minimum of 1.092 times larger than the nominal across-flats width of the hexagonal heads (dimension "L").
4. The maximum magnet diameter shall be not less than 0.100 less than the thread pitch diameter.

FIGURE 1. Machine thread magnetic drain plugs.TABLE I. Type I machine thread magnetic drain plug dash numbers.

MS dash number (steel)	MS dash number (aluminum)	"A" thread size	"B"	"L" (nominal)	"M"	Gasket dash number <sup>1</sup>
-1	-2	3/8-24 UNF-2A	0.31	0.625	0.50	6
-49	-50	1/2-20 UNF-2A	0.34	0.750	0.53	9
-3	-4	5/8-18 UNF-2A	0.38	0.875	0.62	11
-83	-84	3/4-16 UNF-2A	0.38	1.000	0.62	15
-5	-6	7/8-14 UNF-2A	0.41	1.125	0.66	18
-99	-100	7/8-18 UNS-2A	0.41	1.125	0.66	18
-111	-112	1-18 UNS-2A	0.44	1.250	0.75	21
-7	-8	1-1/4-12 UNF-2A	0.47	1.500	0.78	31
-133	-134	1-1/4-18 UNEF-2A	0.47	1.500	0.78	31
-149	-150	1-1/2-18 UNEF-2A	0.50	1.750	0.88	48

<sup>1</sup> In accordance with SAE AS35769 (see [3.5](#)).

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TABLE II. Type II machine thread magnetic drain plug dash numbers.

MS dash number (iron)	MS dash number (aluminum)	"A" thread size	"B"	"H" flange diameter	"L" (nominal)	"M"	Gasket dash number <sup>1</sup>
-9	-10	2-12 UN-2A	0.56	2.25	1.500	1.37	55
-167	-168	2-16 UN-2A	0.56	2.25	1.500	1.37	55
-11	-12	3-12 UN-2A	0.56	3.25	1.500	1.37	76

<sup>1</sup> In accordance with SAE AS35769 (see 3.5).

3.5 Gaskets. Gaskets shall conform to SAE AS35769 and shall be appropriately sized to the drain plug (see tables I and II).

3.6 Markings. Markings shall consist of the MS part number (see 1.3) and the manufacturer commercial and government entity (CAGE) code in accordance with MIL-STD-130 (see figure 1).

3.7 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

#### 4. VERIFICATION

4.1 Classification of tests. All inspections required herein for the testing of drain plugs are classified as conformance tests and shall be conducted in accordance with the sampling techniques and methods of testing specified herein.

4.2 Sampling for inspection. A random sample of drain plugs for visual inspection and testing shall be selected from each lot in accordance with ASQ Z1.4, inspection level 2. The acceptance quality limit (AQL) shall as specified in the contract (see 6.2).

4.3 Lot. A lot shall consist of drain plugs of the same type, materials, and construction produced continuously by one machine or one series of progressive processing machines.

4.3.1 Rejection. The failure of any specimen shall be cause for rejection of the lot represented by the sample.

4.3.2 Certified test report. If specified (see 6.2), the manufacturer shall furnish a certified test report showing that the manufacturer's product satisfactorily conforms to this specification. The test report shall include, as a minimum, actual results of the tests specified herein.

4.4 Tests. Unless otherwise specified, all tests described herein shall be conducted at ambient room temperature.

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4.4.1 Examination of product. All drain plug samples shall be examined for conformance to the requirements as shown in [table III](#).

TABLE III. Conformance test requirements.

Test requirement	Requirement paragraph	Requirement standard
Materials		
Machine thread magnetic drain plug		
Carbon steel - composition	<a href="#">3.1.1.1</a>	ASTM A29/A29M
- stock dimensions	<a href="#">3.1.1.1</a>	ASTM A108
Aluminum alloy	<a href="#">3.1.1.2</a>	ASTM B211
Malleable iron	<a href="#">3.1.1.3</a>	ASTM A47/A47M
Protective finish		
Zinc plating (steel or iron)	<a href="#">3.1.2.1</a>	ASTM B633
Cadmium plating (steel or iron)	<a href="#">3.1.2.1</a>	SAE AMS-QQ-P-416
Anodization (aluminum alloy)	<a href="#">3.1.2.2</a>	MIL-A-8625
Magnets	<a href="#">3.1.3</a>	MMPA 0100
Dimensions	<a href="#">3.2</a>	<a href="#">Figure 1, tables I and II</a>
Machine tolerances	<a href="#">3.2</a>	<a href="#">Figure 1</a>
Surface texture	<a href="#">3.2</a>	ASME B46.1
Plug threads	<a href="#">3.4</a>	FED-STD-H28
Gasket	<a href="#">3.5</a>	SAE AS35769

4.4.1.1 Rejects. Failure of any sample to meet the stated requirements shall be cause for rejection of the entire lot.

4.4.2 Magnets. Machine thread drain plugs with installed magnets shall be tested as described in [4.4.2.1](#) and [4.4.2.2](#).

4.4.2.1 Magnet lift. Using a drain plug with magnet installed, lift a solid piece of soft steel weighing not less than six ounces. Apply the magnet to the steel piece and manually raise the drain plug so that only the magnet lifts the steel piece. Hold the drain plug and steel in a suspended position for not less than five seconds. Failure of the magnet to hold the steel piece in suspension for five seconds shall be cause for rejection (see [3.3.1](#)).

4.4.2.1.1 Rejects. Samples failing the magnet retention test shall result in rejection of the entire lot.

4.4.2.2 Magnet retention. Using an oven with thermostat control, heat the sample drain plug with installed magnet to 500 °F (260 °C). Once the test sample is at temperature, remove the sample from the oven using tongs and insulated gloves (Warning: The test sample will be very hot.). Use pliers to grasp and apply light torque to the magnet to verify that the magnet is firmly affixed to the drain plug. Do not overtorque. Failure of the magnet to remain firmly retained in the drain plug at temperature shall be cause for rejection (see [3.3.2](#)).

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4.4.2.2.1 Rejects. Samples failing the magnet temperature test shall result in rejection of the entire lot.

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The machine thread magnetic drain plugs covered by this specification are intended for use in engine oil lubrication systems as a means to seal and access the engine oil reservoir and to magnetically attract and capture ferrous contaminants in the engine oil that could result in accelerated engine wear.

6.1.1 Type I. Type I machine thread magnetic drain plugs feature an external hexagonal head that provides the surfaces against which torque is applied when loosening or tightening the drain plug (see [figure 1](#)).

6.1.2 Type II. Type II machine thread magnetic drain plugs feature a circular flange with an integral hexagonal head into which a 3/4-inch square drive slot has been incorporated (see [figure 1](#)). Either the hexagonal head or the square drive slot may be used to apply torque when loosening or tightening the drain plug.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. PIN (see [1.3](#)).
- c. Cadmium plating, when required by the contract (see [1.3](#) and [3.1.2.1](#)).
- d. AQL (see [4.2](#)).
- e. Test report, if required (see [4.3.2](#)).
- f. Packaging requirements (see [5.1](#)).



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6.3 Subject term (key word) listing.

Alnico  
Cadmium  
Contaminant  
Engine wear  
External head  
Ferrous  
Motor oil  
Oil pan  
Seal  
Shaving  
Square drive  
Trap

6.4 Changes from previous issue. Marginal notations are not used in this revision to identify changes due to this being the initial issue.

Custodians:

Army - AT  
Navy - YD  
Air Force - 99  
DLA - GS

Preparing Activity:

DLA - GS4

(Project 5365-2010-003)

Review Activities:

Army - CR4  
Navy - MC, OS  
DLA - CC

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST database at <https://assist.daps.dla.mil/>.