Designation: F467M – 06a (Reapproved 2018)

Standard Specification for Nonferrous Nuts for General Use (Metric)[1]

This standard is issued under the fixed designation F467M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This specification covers the requirements for commercial wrought nonferrous nuts in nominal thread diameters M6 to M36 inclusive in a number of alloys in common use and intended for general service applications.

1.2 Applicable bolts, cap screws, and studs for use with nuts covered by this specification are covered by Specification F468M.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

NOTE 1—This specification is the metric companion of Specification F467.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

B154 Test Method for Mercurous Nitrate Test for Copper Alloys

B574 Specification for Low-Carbon Nickel-Chromium-Molybdenum, Low-Carbon Nickel-Molybdenum-Chromium, Low-Carbon Nickel-Molybdenum-Chromium-Tantalum, Low-Carbon Nickel-Chromium-Molybdenum-Copper, and Low-Carbon Nickel-Chromium-Molybdenum-Tungsten Alloy Rod

D3951 Practice for Commercial Packaging

E18 Test Methods for Rockwell Hardness of Metallic Materials

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E34 Test Methods for Chemical Analysis of Aluminum and Aluminum-Base Alloys (Withdrawn 2017)[3]

E38 Methods for Chemical Analysis of Nickel-Chromium and Nickel-Chromium-Iron Alloys (Withdrawn 1989)[3]

E53 Test Method for Determination of Copper in Unalloyed Copper by Gravimetry

E54 Test Methods for Chemical Analysis of Special Brasses and Bronzes (Withdrawn 2002)[3]

E55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition

E62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods) (Withdrawn 2010)[3]

E75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys (Withdrawn 2010)[3]

E76 Test Methods for Chemical Analysis of Nickel-Copper Alloys (Withdrawn 2003)[3]

E92 Test Methods for Vickers Hardness and Knoop Hardness of Metallic Materials

E101 Test Method for Spectrographic Analysis of Aluminum and Aluminum Alloys by the Point-to-Plane Technique (Withdrawn 1996)[3]

E120 Test Methods for Chemical Analysis of Titanium and Titanium Alloys (Withdrawn 2003)[3]

E165 Practice for Liquid Penetrant Examination for General Industry

E227 Test Method for Optical Emission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Point-to-Plane Technique (Withdrawn 2002)[3]

E354 Test Methods for Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys

E478 Test Methods for Chemical Analysis of Copper Alloys

E1409 Test Method for Determination of Oxygen and Nitrogen in Titanium and Titanium Alloys by Inert Gas Fusion

F468M Specification for Nonferrous Bolts, Hex Cap Screws,

[1] This specification is under the jurisdiction of ASTM Committee F16 on Fasteners and is the direct responsibility of Subcommittee F16.04 on Nonferrous Fasteners.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

***A Summary of Changes section appears at the end of this standard**

and Studs for General Use (Metric)
F606/F606M Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets
F1470 Practice for Fastener Sampling for Specified Mechanical Properties and Performance Inspection

2.2 *ASME Standards:*[4]
B 1.13M Metric Screw Threads
B 18.2.4.1M Metric Hex Nuts, Style 1

3. Ordering Information

3.1 Orders for nuts under this specification shall include the following information:

3.1.1 Quantity (numbers of pieces of each item and size);
3.1.2 Name of item;
3.1.3 Nominal thread diameter and thread pitch;
3.1.4 Alloy number (Table 1);
3.1.5 Stress relieving, if required (4.2.3);
3.1.6 "Shipment lot" testing, as required (Section 9);
3.1.7 Source inspection, if required (Section 14);
3.1.8 Certificate of compliance or test report, if required (Section 16);
3.1.9 Additional requirements, if any, to be specified on the purchase order (4.2.1, 7.2, 8.2, 11.1, and 12.1),
3.1.10 Supplementary requirements, if any; and
3.1.11 ASTM specification and year of issue.

NOTE 2—A typical ordering description is as follows: 10 000 pieces, Hex Nut, M8 × 1.25 Alloy 270, Furnish Certificate of Compliance, Supplementary Requirement S1, ASTM Specification F467M – XX.

4. Materials and Manufacture

4.1 *Materials:*

4.1.1 The nuts shall be manufactured from material having a chemical composition conforming to the requirements in Table 1 and capable of developing the required mechanical properties for the specified alloy in the nut. See Specification B574 for nickel alloys.

4.1.2 The starting condition of the raw material shall be at the discretion of the fastener manufacturer but shall be such that the nuts conform to all the specified requirements.

4.2 *Manufacture:*

4.2.1 *Forming*—Unless otherwise specified, the nuts shall be hot pressed, cold formed, or machined from suitable material at the option of the manufacturer.

4.2.2 *Condition*—Except as provided in 4.2.3, the nuts shall be furnished in the condition specified below:

Alloy	Condition
Copper (all alloys)	As formed or stress relieved at manufacturer's option
Nickel alloys 400 and 405	As formed or stress relieved at manufacturer's option
Nickel alloy 500	Solution annealed and aged
Aluminum alloys:	
2024-T4	Solution treated and naturally aged
6061-T6	Solution treated and artificially aged
6262-T9	Solution treated, artificially aged, and cold worked
Titanium	As formed

4.2.3 *Stress Relieving*—When required, stress relieving shall be specified by the purchaser for all copper alloys and nickel alloys 400 and 405.

5. Chemical Composition

5.1 *Chemical Composition*—The nuts shall conform to the chemical composition specified in Table 1 for the specified alloy.

5.2 *Manufacturer's Analysis:*

5.2.1 Except as provided in 5.2.2, when test reports are required on the inquiry or purchase order (3.1.8), the manufacturer shall make individual analyses of randomly selected nuts from the product to be shipped and report the results to the purchaser. Alternatively, if heat and lot identities have been maintained, the analysis of the raw material from which the nuts have been manufactured may be reported instead of product analysis.

5.2.2 For aluminum nuts, instead of 5.2.1, the manufacturer may furnish a certificate of conformance certifying compliance with the chemical composition specified in Table 1.

5.3 *Product Analysis:*

5.3.1 Product analyses may be made by the purchaser from nuts representing each lot. The chemical composition thus determined shall conform to the requirements in Table 1.

5.3.2 In the event of disagreement, a referee chemical analysis of samples from each lot shall be made in accordance with 11.1 and 12.1.

6. Mechanical Properties

6.1 The nuts shall be tested in accordance with the mechanical testing requirements for the applicable type and shall meet the mechanical requirements in Table 2 for the specified alloy.

6.2 Where both proof load and hardness tests are performed, the proof load test results shall take precedence for acceptance purposes.

7. Dimensions

7.1 *Nuts*—Unless otherwise specified, the dimensions of nuts shall be in accordance with the requirements of ASME B18.2.4.1M.

7.2 *Threads*—Unless otherwise specified, the nuts shall have threads in accordance with ASME B1.13M, tolerance Class 6H.

8. Workmanship, Finish, and Appearance

8.1 *Workmanship*—Nuts shall have a workmanlike finish free of injurious burrs, seams, laps, irregular surfaces, and other imperfections affecting serviceability.

8.2 *Finish*—Unless otherwise specified, the nuts shall be furnished without any additive chemical or metallic finish.

9. Sampling

9.1 A lot, for the purposes of selecting test specimens, shall consist of not more than 100 000 pieces offered for inspection at one time having the following common characteristics:

9.1.1 One type of item,

[4] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, http://www.asme.org.

TABLE 1 Chemical Requirements

UNS Designation Number	Composition, %												
	Copper and Copper-Base Alloys												
	Alloy	General Name	Aluminum	Copper, min	Iron, max	Manganese, max	Nickel, max	Phosphorus	Silicon	Zinc, max[A]	Lead, max	Tin	Arsenic, max
C11000	110	ETP copper		99.9									
C26000	260	brass		68.5–71.5	0.05					balance	0.07		
C27000	270	brass		63.0–68.5	0.07					balance	0.10		
C46200	462	naval brass		62.0–65.0	0.10					balance	0.20	0.5–1.0	
C46400	464	naval brass		59.0–62.0	0.10					balance	0.20	0.5–1.0	
C51000	510	phosphor bronze		balance[A]	0.10			0.03–0.35		0.30	0.05	4.2–5.8	
C61400	614	aluminum bronze	6.0–8.0	88.0[B]	1.5–3.5	1.0							
C63000	630	aluminum bronze	9.0–11.0	78.0[B]	2.0–4.0	1.5	4.0–5.5		0.25 max			0.20 max	
C64200	642	aluminum silicon bronze	6.3–7.6	88.65[B]	0.30	0.10	0.25		1.5–2.2[C]	0.50	0.05	0.20 max	0.15
C65100	651	silicon bronze		96.0[B]	0.8	0.7			0.8–2.0	1.5	0.05		
C65500	655	silicon bronze		94.8[B]	0.8	1.5	0.6		2.8–3.8	1.5	0.05		
C66100	661	silicon bronze		94.0[B]	0.25	1.5			2.8–3.5	1.5	0.20–0.8	0.5–1.5	
C67500	675	manganese bronze	0.25 max	57.0–60.0	0.8–2.0	0.05–0.5				balance	0.20		
C71000	710	cupro-nickel		74.0[B]	0.60	1.00	19.0–23.0[A]			1.00	0.05		
C71500	715	cupro-nickel		65.0[B]	0.40–0.7	1.00	29.0–33.0[A]			1.00	0.05		

[A] Elements shown as balance shall be arithmetically computed by deducting the sum of the other named elements from 100.
[B] Minimum content of copper plus all other elements with specified limits shall be 99.5 %.
[C] An alloy containing as high as 2.6 % silicon is acceptable provided the sum of all the elements other than copper, silicon, and iron does not exceed 0.30 %.

TABLE 1 *Continued*

UNS Designation Number	Alloy	General Name	Aluminum	Carbon, max	Chromium	Copper[A]	Iron, max	Manganese, max	Nickel[A]	Phosphorus, max	Silicon, max	Titanium	Cobalt, max	Molybdenum	Sulfur, max	Vanadium	Tungsten	Niobium[†]
Nickel and Nickel-Base Alloys																		
N10001	335	Ni-Mo		0.05	1.0 max		4.0–6.0	1.0	balance	0.025	1.00		2.50	26.0–30.0	0.030	0.2–0.4		
N10276	276	Ni-Mo-Cr		0.02	14.5–16.5		4.0–7.0	1.00	balance	0.040	0.08		2.50	15.0–17.0	0.030	0.35 max	3.0–4.5	
N04400	400	Ni-Cu Class A		0.3		balance	2.5	2.0	63.0–70.0		0.5		[B]		0.024			
N04405	405	Ni-Cu Class B		0.3		balance	2.5	2.0	63.0–70.0		0.5		[B]		0.025–0.060			
N05500	500	Ni-Cu-Al	2.30–3.15	0.25		balance	2.0	1.5	63.0–70.0		0.5	0.35–0.85	[B]		0.01			
N06059	59	Ni-Cr-Mo	0.1–0.4	0.010 max	22.0–24.0	0.5 max	1.5 max	0.5 max	balance	0.015 max	0.010 max		0.3 max	15.0–16.5	0.010 max			
N06625	625[C]	Ni-Cr-Mo-Cb	0.40 max	0.10	20.0–23.0		5.0 max	0.50	58.0 min	0.015	0.50 max	0.40 max	1.00 max	8.0–10.0	0.015			3.2–4.2
N06686	686	Ni-Cr-Mo-W		0.010 max	19.0–23.0		5.0 max	0.75 max	balance	0.04 max	0.08 max	0.02–0.25		15.0–17.0	0.02 max		3.0–4.4	

[A] Elements shown as balance shall be arithmetically computed by deducting the sum of the other named elements from 100.
[B] Cobalt is to be counted as nickel.
[C] Alloy 625 material shall be refined using the electroslag remelting process (ESR), or the vacuum arc remelting process (VAR).