Designation: F 467M – 03a

METRIC

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

This standard is issued under the fixed designation F 467M; 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 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 F 468M.

NOTE 1—This specification is the metric companion of Specification F 467.

2. Referenced Documents

2.1 *ASTM Standards:*

B 154 Test Method for Mercurous Nitrate Test for Copper and Copper Alloys[2]

B 446 Specification for Nickel-Chromium-Molybdenum-Columbium-Alloy (UNS N06625), Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219), and Nickel-Chromium-Molybdenum-Tungsten Alloy (UNS N06650) Rod and Bar[3]

D 3951 Practice for Commercial Packaging[4]

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials[5]

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications[6]

E 34 Test Methods for Chemical Analysis of Aluminum and Aluminum Base Alloys[7]

E 38 Methods for Chemical Analysis of Nickel-Chromium and Nickel-Chromium-Iron Alloys[8]

E 53 Test Methods for Determination of Copper in Unalloyed Copper by Gravimetry[7]

E 54 Test Methods for Chemical Analysis of Special Brasses and Bronzes[9]

E 55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition[7]

E 62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods)[7]

E 75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys[7]

E 76 Test Methods for Chemical Analysis of Nickel–Copper Alloys[7]

E 92 Test Method for Vickers Hardness of Metallic Materials[5]

E 101 Test Method for Spectrographic Analysis of Aluminum and Aluminum Alloys by the Point-to-Plane Technique[10]

E 120 Test Methods for Chemical Analysis of Titanium and Titanium Alloys[7]

E 165 Practice for Liquid Penetrant Examination[11]

E 227 Test Method for Optical Emission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Point-to-Plane Technique[9]

E 354 Test Methods for Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys[7]

E 478 Test Methods for Chemical Analysis of Copper Alloys[7]

[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.

Current edition approved Oct. 1, 2003. Published October 2003. Originally approved in 1979. Last previous edition approved in 2003 as F 467M – 03.

[2] *Annual Book of ASTM Standards*, Vol 02.01.

[3] *Annual Book of ASTM Standards*, Vol 02.04.

[4] *Annual Book of ASTM Standards*, Vol 15.09.

[5] *Annual Book of ASTM Standards*, Vol 03.01.

[6] *Annual Book of ASTM Standards*, Vol 14.02.

[7] *Annual Book of ASTM Standards*, Vol 03.05.

[8] Discontinued; see *1988 Annual Book of ASTM Standards*, Vol 03.05. Replaced by E 350.

[9] Discontinued; see *2001 Annual Book of ASTM Standards*, Vol 03.05.

[10] Discontinued; see *1995 Annual Book of ASTM Standards*, Vol 03.05.

[11] *Annual Book of ASTM Standards*, Vol 03.03.

E 1409 Test Method for Determination of Oxygen in Titanium and Titanium Alloys by the Inert Gas Fusion Technique[3]
F 468M Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use [Metric][12]
F 606M Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, and Rivets [Metric][12]
F 1470 Guide for Fastener Sampling for Specified Mechanical Properties and Performance Inspection[12]
2.2 *ASME Standards:*
B 1.13M Metric Screw Threads[13]
B 18.2.4.1MMetric Hex Nuts, Style 1[13]

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 F 467M – 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.

[12] *Annual Book of ASTM Standards*, Vol 01.08.
[13] Available from Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112.

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.

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									
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*

Nickel and Nickel-Base Alloys

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
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		
N06625	625[C]	Ni-Cr-Mo-Cb	0.40 max	0.010	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).