



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 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.

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

- E38 Methods for Chemical Analysis of Nickel-Chromium and Nickel-Chromium-Iron Alloys (Withdrawn 1989)³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- E54 Test Methods for Chemical Analysis of Special Brasses and Bronzes (Withdrawn 2002)³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- E62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods) (Withdrawn 2010)³
- E75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys (Withdrawn 2010)³
- E76 Test Methods for Chemical Analysis of Nickel-Copper Alloys (Withdrawn 2003)³
- E92 Test Method for Vickers Hardness of Metallic Materials (Withdrawn 2010)³
- 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 the Inert Gas Fusion Technique
- F468M Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use (Metric)
- F606M Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, and Rivets (Metric)
- F1470 Practice for Fastener Sampling for Specified Mechanical Properties and Performance Inspection

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 April 1, 2012. Published May 2012. Originally approved in 1979. Last previous edition approved in 2006 as F467M – 06a ^{ε2}. DOI: 10.1520/F0467M-06R12.

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

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.

⁴ Available from Global Engineering Documents, 15 Inverness Way, East Englewood, CO 80112-5704, <http://global.ihs.com>.

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,

9.1.2 Same alloy and temper, and

9.1.3 One nominal diameter and thread pitch.

10. Number of Tests and Retests

10.1 *Normal Testing*—The requirements of this specification shall be met in continuous mass production for stock (see **Table 3**). The manufacturer shall make sample inspections as specified below to ensure that the product conforms to the

TABLE 1 Chemical Requirements

Composition, %													
UNS Designation Number	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

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	Niobium [†]
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).

TABLE 1 Continued

Composition, %

Aluminum-Base Alloys^A

UNS Designation Number	Alloy	General Name	Aluminum ^A	Chromium	Copper	Iron, max	Manganese, max	Silicon, max	Titanium, max	Zinc, max	Magnesium	Other Elements, max	
												Each	Total
A92024	2024	Aluminum 2024	balance	0.10 max	3.8–4.9	0.50	0.30–0.9	0.50	0.15 ^B	0.25	1.2–1.8	0.05	0.15
A96061	6061	Aluminum 6061	balance	0.04–0.35	0.15–0.40	0.7	0.15	0.40–0.8	0.15	0.25	0.8–1.2	0.05	0.15
A96262	6262	Aluminum 6262	balance	0.04–0.14	0.15–0.40	0.7	0.15	0.40–0.8	0.15	0.25	0.8–1.2	^C	

^A Analysis shall regularly be made only for the elements specified in this table. If, however, the presence of other elements is suspected or indicated in amounts greater than the specified limits, further analysis shall be made to determine that these elements are not present in excess of the specified limits.

^B Titanium + zirconium 0.20 %, max.

^C Lead 0.4–0.7 %; bismuth 0.4–0.7 %.

TABLE 1 Continued

Titanium and Titanium-Base Alloys^A

UNS Designation Number	Alloy	General Name	Aluminum, Al	Carbon, C	Iron, Fe	Titanium, Ti	Hydrogen, H	Nitrogen, N	Oxygen, O	Palladium, Pd	Vanadium, V	Chromium, Cr	Molybdenum, Mo	Zirconium, Zr	Tin, Sn	Silicon, Si	Ruthenium, Ru	Residuals ^B	
																		each, max	total, max
R50250	1	Titanium Gr 1		0.10	0.20	balance	0.0125	0.05	0.18									0.1	0.4
R50400	2	Titanium Gr 2		0.10	0.30	balance	0.0125	0.05	0.25									0.1	0.4
R50700	4	Titanium Gr 4		0.10	0.50	balance	0.0125	0.07	0.40									0.1	0.4
R56400	5	Titanium Gr 5	5.5–6.75	0.10	0.40	balance	0.0125	0.05	0.20		3.5–4.5							0.1	0.4
R56401	23	Titanium Ti-6Al-4V ELI	5.5–6.5	0.08	0.25	balance	0.0125	0.05	0.13		3.5–4.5							0.1	0.4
R52400	7	Titanium Gr 7		0.10	0.30	balance	0.0125	0.05	0.25	0.12–0.25								0.1	0.4
R58640	19	Titanium Ti-38-6-44	3.0–4.0	0.05	0.30	balance	0.0200	0.03	0.12	0.10 ^C	7.5–8.5	5.5–6.5	3.5–4.5	3.5–4.5			0.10 ^B	0.15	0.4
R55111	32	Titanium Ti-5-1-1-1	4.5–5.5	0.08	0.25	balance	0.0125	0.03	0.11		0.6–1.4		0.6–1.2	0.6–1.4	0.6–1.4	0.06–0.14		0.1	0.4

^A All reported values are maximums, unless a range is specified.

^B A residual is an element present in a metal or an alloy in small quantities inherent to the manufacturing process but not added intentionally. Residual elements need not be reported unless a report is specifically required by the purchaser.

^C Ruthenium and Palladium, or both, may be added to Grade 19 for enhanced corrosion resistance as negotiated between purchaser and vendor. Chemical analysis is not required unless specifically negotiated.

TABLE 2 Mechanical Property Requirements

Alloy	Mechanical Property Marking	Hardness, min ^A	Proof Stress, MPa	Acceptance Criteria		
				Number of Pieces in lot	No. of Tests	Rejection No.
Cu 110	F 467MA	65 HRF	205	50 and under	2	0
Cu 260	F 467MAB	55 HRF	415	51 to 500	3	0
Cu 270	F 467MB	55 HRF	415	501 to 35 000	5	0
Cu 462	F 467MC	65 HRB	345	35 001 to 100 000	8	0
Cu 464	F 467MD	55 HRB	345			
Cu 510	F 467ME	60 HRB	415			
Cu 614	F 467MG	70 HRB	520			
Cu 630	F 467MH	85 HRB	690			
Cu 642	F 467MJ	75 HRB	520			
Cu 651	F 467MK	75 HRB	485			
Cu 655	F 467ML	60 HRB	345			
Cu 661	F 467MM	75 HRB	485			
Cu 675	F 467MN	60 HRB	380			
Cu 710	F 467MP	50 HRB	310			
Cu 715	F 467MR	60 HRB	380			
Ni 59 Grade 1	F 467FN	21HRC	825			
Ni 59 Grade 2	F 467GN	23HRC	930			
Ni 59 Grade 3	F 467HN	25HRC	1100			
Ni 59 Grade 4	F 467JN	80HRB	690			
Ni 335	F 467MS	20 HRC	790			
Ni 276	F 467MT	20 HRC	760			
Ni 400	F 467MU	75 HRB	550			
Ni 405	F 467MV	60 HRB	485			
Ni 500	F 467MW	24 HRC	900			
Ni 625	F 467AC [†]	85 HRB-35 HRC	415			
Ni 686 Grade 1	F 467MBN	21 HRC	825			
Ni 686 Grade 2	F 467MCN	23 HRC	930			
Ni 686 Grade 3	F 467MDN	25 HRC	1100			
Ni 686 Grade 4	F 467MEN	65 HRB-25 HRC	690			
Al 2024-T4 ^B	F 467MX	70 HRB	380			
Al 6061-T6	F 467MY	40 HRB	275			
Al 6262-T9	F 467MZ	60 HRB	360			
Ti 1	F 467MAT	140 HV	275			
Ti 2	F 467MBT	150 HV	380			
Ti 4	F 467MCT	200 HV	585			
Ti 5	F 467MDT	30 HRC	930			
Ti 7	F 467MET	160 HV	380			
Ti 19	F 467MFT	24 HRC	825			
Ti 23	F 467MGT	25 HRC	860			
Ti-5-1-1-1	F 467MHT	24 HRC	725			

^A For aluminum and titanium alloys hardness values are for information only.

^B Aluminum alloy 2024-T4 shall be supplied in naturally aged condition. This material is not recommended for nuts in nominal thread diameter larger than M6.

[†]Editorially corrected in September 2008. Typographical error, should be F467AC both F467AC or 647AC are acceptable Mechanical Property Mark.

TABLE 3 Mechanical Test Requirements on Nuts

Product	Proof Load, kN ^A	Tests Conducted Using Full-Size Product	
		Hardness	Proof Load
Jam, slotted, and castle nuts	all	<i>B</i>	...
All other nuts	up to 530	...	<i>B</i>
	over 530	<i>B</i>	...
Tests in accordance with section		11.2.2	12.2.1

^A Proof load of nut equals proof stress (MPa) multiplied by stress area (mm²).

^B Mandatory tests.

specified requirements. When tests of individual shipments are required, Supplementary Requirement S1 shall be specified.

Number of Pieces in lot	No. of Tests	Acceptance Criteria	
		Acceptance No.	Rejection No.
50 and under	2	0	1
51 to 500	3	0	1
501 to 35 000	5	0	1
35 001 to 100 000	8	0	1

10.2 Retests:

10.2.1 When tested in accordance with the required sampling plan, a lot shall be subject to rejection if any of the test specimens fails to meet the applicable test requirements.

10.2.2 If the failure of a test specimen is due to improper preparation of the specimen or to incorrect testing technique, the specimen shall be discarded and another specimen substituted.

11. Significance of Numerical Limits

11.1 For purposes of determining compliance with the specified limits for requirements of the properties listed in this specification, an observed value or calculated value shall be rounded in accordance with Practice E29.

12. Test Specimens

12.1 *Chemical Tests*—When required, samples for chemical analysis shall be taken in accordance with Practice E55 by drilling, sawing, milling, turning, clipping, or such other methods capable of producing representative samples.

12.2 Mechanical Tests:

12.2.1 Nuts shall be proof load tested in full section.

12.2.2 The hardness shall be determined on the top or bottom face of the nut.

13. Test Methods

13.1 *Chemical Analysis*—When required, the chemical composition shall be determined by any recognized commercial test method. In the event of disagreement, the following test methods shall be used for referee purposes.

Alloy	Test Method
Copper	E53, E54, E62, E75, E478
Aluminum	E34, E101, E227
Nickel	E38, E76, E354
Titanium	E120, E1409

13.2 Mechanical:

13.2.1 The proof load test shall be conducted in accordance with the appropriate methods of Test Methods F606M. Loads to be determined using Table 2 and Table 4.

13.2.2 The hardness shall be determined in accordance with Test Methods E18 and E92. For nominal thread diameters M6 to M10, one reading shall be taken. For diameters M12 and larger, the hardness shall be the average of four readings located 90° to one another.

14. Inspection

14.1 When specified on the inquiry or purchase order, the product shall be subject to inspection by the purchaser at the place of manufacture prior to shipment. The inspector representing the purchaser shall have controlled entry only to those

TABLE 4 Tensile Stress Areas

Nominal Nut Diameter and Thread Pitch	Stress Area, ^A mm ²	Nominal Nut Diameter and Thread Pitch	Stress Area, ^A mm ²
M6 × 1	20.1	M16 × 2	157
M8 × 1.25	36.6	M20 × 2.5	245
M10 × 1.5	58.0	M24 × 3	353
M12 × 1.75	84.3	M30 × 3.5	561
M14 × 2	115	M36 × 4	817

^A Tensile stress areas are computed using the following formula:
 $A_s = 0.7854 (D - 0.9382P)^2$

where:

A_s = stress area, mm²,
 D = nominal nut diameter (basic major diameter), mm, and
 P = thread pitch, mm.

parts of the manufacturer's operations that concern the manufacture of the ordered product and only when and where work on the contract of the purchaser is being performed. The manufacturer shall afford the inspector all reasonable facilities to satisfy him that the product is being furnished in accordance with this specification. All inspections and tests shall be conducted so as not to interfere unnecessarily with the operations of the manufacturer.

15. Rejection and Rehearing

15.1 Unless otherwise specified, any rejection based on tests specified herein and made by the purchaser shall be reported to the manufacturer as soon as practical after receipt of the product by the purchaser.

16. Certification and Test Reports

16.1 *Certificate of Compliance*—When specified in the contract or purchase order, the manufacturer shall furnish certifi-

cation that the product was manufactured and tested in accordance with this specification and conforms to all specified requirements.

16.2 *Test Reports*—When “Shipment Lot Testing” in accordance with Supplementary Requirement S2 is specified in the contract or purchase order, the manufacturer shall furnish a test report showing the results of the mechanical tests for each lot shipped.

17. Product, Packaging, and Package Marking

17.1 *Individual Nuts*—All products shall be marked with a symbol identifying the manufacturer. In addition, they shall be marked with the alloy/mechanical property marking specified in **Table 2**. The markings shall be raised or depressed at the option of the manufacturer.

17.2 Packaging:

17.2.1 Unless otherwise specified, packaging shall be in accordance with Practice **D3951**.

17.2.2 When special packaging requirements are required by the purchaser, they shall be defined at the time of inquiry and order.

17.3 *Package Marking*—Each shipping unit shall include or be plainly marked with the following:

- 17.3.1 ASTM specification,
- 17.3.2 Alloy number,
- 17.3.3 Alloy/mechanical property marking,
- 17.3.4 Size,
- 17.3.5 Name and brand or trademark of the manufacturer,
- 17.3.6 Number of pieces,
- 17.3.7 Country of origin, and
- 17.3.8 Purchase order number.

18. Keywords

- 18.1 general use; nonferrous; nuts

SUPPLEMENTARY REQUIREMENTS

One or more of the following supplementary requirements shall be applied only when specified by the purchaser in the inquiry, contract, or order. Supplementary requirements shall in no way negate any requirement of the specification itself.

S1. Stress Corrosion Requirements, Copper Alloys

S1.1 Copper alloy nuts shall exhibit no evidence of cracking after immersion for 30 min in an aqueous solution of mercurous nitrate when tested in accordance with Test Method **B154**.

S1.1.1 **Warning**—Mercury is a definite health hazard and equipment for the detection and removal of mercury vapor produced in volatilization is recommended. The use of rubber gloves in testing is advisable.

S2. Shipment Lot Testing

S2.1 When Supplementary Requirement S2 is specified on the order (**3.1.6**), the manufacturer shall make sample tests on the individual lots for shipment to ensure that the product conforms to the specified requirements.

S2.2 The manufacturer shall make an analysis of a randomly selected finished nut from each lot of product to be shipped. Heat or lot control shall be maintained. The analysis of the starting material from which the nuts have been manufactured may be reported in place of the product analysis.

S2.3 The manufacturer shall perform mechanical property tests in accordance with this specification and Guide **F1470** on the individual lots for shipment.

S2.4 The manufacturer shall furnish a test report for each lot in the shipment showing the actual results of the chemical analysis and mechanical property tests performed in accordance with Supplementary Requirement S2.

S3. Dye Penetrant Inspection

S3.1 When dye penetrant inspection is specified on the purchase order, the nuts shall be tested in accordance with Practice **E165** or other mutually acceptable procedures and shall conform to acceptance criteria as mutually agreed upon between the purchaser and the manufacturer.

S4.2 When Supplementary Requirement S4 is specified on the inquiry and order, Supplementary Requirement S2 shall be considered automatically invoked with the addition that the heat analysis shall be reported to the purchaser on the test reports.

S4. Heat Control (Alloys 400, 405, and 500 Only)

S4.1 When Supplementary Requirement S4 is specified on the inquiry or order, the manufacturer shall control the product by heat analysis and identify the finished product in each shipment by the actual heat number.

SUMMARY OF CHANGES

Committee F16 has identified the location of selected changes to this standard since the last issue (F467M – 06) that may impact the use of this standard. (Approved Aug. 1, 2006.)

(1) Revised proof stress for Ni 686 in **Table 2**.

Committee F16 has identified the location of selected changes to this standard since the last issue (F467M – 05) that may impact the use of this standard. (Approved May 1, 2006.)

(1) Added new alloys UNS N06059 and UNS C26000 in **Table 1**.
(2) Added alloys Ni 59 and Cu 260 in **Table 2**.

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org). Permission rights to photocopy the standard may also be secured from the ASTM website (www.astm.org/COPYRIGHT).