

Designation: B283/B283M - 14

StandardSpecification for Copper and Copper-Alloy Die Forgings (Hot-Pressed)¹

This standard is issued under the fixed designation B283/B283M; 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 establishes the requirements for copper and copper alloy die forgings produced by the hot pressing method. The following copper and copper alloys are included:

Copper or Copper Alloy UNS No.	Name	i
0113 110.	Name	
C11000	copper	2
C14500	copper-tellurium	
C14700	copper-sulfur	(
C27450	plumbing brass	
C27451	plumbing brass	0
C35330	leaded brass	1
C36500	leaded Muntz metal	0
C37000	free-cutting Muntz metal	
C37700	forging brass	C
C46400	naval brass	
C48200	medium leaded naval brass	
C48500	leaded naval brass	
C48600	naval brass	
C49250	copper-zinc-bismuth alloy	
C49255	copper-zinc-bismuth-nickel alloy	
C49260	copper-zinc-bismuth alloy	
C49300	copper-zinc-tin-bismuth alloy	
C49340	copper-zinc-tin-bismuth alloy B283/	
C49350	copper-zinc-tin-bismuth alloy	
https://stc493551s.iteh.ai/c	atalobismuth brass S/SISt/ICbC48/1-do	
C61900	aluminum bronze	
C62300	aluminum bronze, 9 %	
C63000	aluminum-nickel bronze	
C63200	aluminum-nickel bronze	
C64200	aluminum-silicon bronze	
C64210	aluminum-silicon bronze, 6.7 %	
C65500	high-silicon bronze (A)	
C67500 C67600	manganese bronze (A)	
C69300		
C70620	copper-zinc-silicon copper-nickel 90-10	
C71520	copper-nickel 70-30	
C77400	nickel silver. 45-10	
C87700	silicon bronze	
C87710	silicon bronze	
00//10		

1.2 Units—The values stated in either SI units or inchpound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

Note 1—Nominal composition and relative forgeability ratings are given in Appendix X1. Copper-nickel alloys C70620 and C71520 are intended for welded applications with seawater exposure.

Note 2—Wrought product intended for hot forging is described in Specification B124/B124M.

1.3 The following safety caveat pertains only to Section 10 of this specification. This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards:²

- B124/B124M Specification for Copper and Copper Alloy Forging Rod, Bar, and Shapes
- B249/B249M Specification for General Requirements for MWrought Copper and Copper-Alloy Rod, Bar, Shapes and

Forgings B846 Terminology for Copper and Copper Alloys

- E8/E8M Test Methods for Tension Testing of Metallic Materials
- 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

E478 Test Methods for Chemical Analysis of Copper Alloys 2.2 *Other Standards:*

ISO 7602 Determination of Tellurium Content (High Content)—Flame Atomic Absorption Spectrometric Method⁴

¹ This specification is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.02 on Rod, Bar, Wire, Shapes and Forgings.

Current edition approved April 1, 2014. Published May 2014. Originally approved in 1953. Last previous edition approved in 2012 as B283/B283M – 12. DOI: 10.1520/B0283_B0283M-14.

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.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

JIS H 1068:2005 Method for Determination of Bismuth in Copper and Copper Alloys⁵ (Japanese Industrial Standards)

2.3 Military Standards:⁶

MIL-STD-792 Identification Marking Requirements for Special Purpose Components

NAVSEA T9074-AS-GIB-010/271 Requirements for Nondestructive Testing Method

3. General Requirements

3.1 The following sections of Specification B249/B249M constitute a part of this specification:

3.1.1 Terminology,

3.1.2 Materials and Manufacture,

3.1.3 Workmanship, Finish and Appearance,

3.1.4 Sampling,

3.1.5 Number of Tests and Retests,

3.1.6 Specimen Preparation,

3.1.7 Test Methods,

3.1.8 Significance of Numerical Limits,

3.1.9 Inspection,

3.1.10 Rejection and Rehearing,

3.1.11 Certification,

3.1.12 Test Reports,

3.1.13 Packaging and Package Marking, and

3.1.14 Supplementary Requirements.

3.1.15 In addition, when a section with a title identical to one of those referenced in 3.1, above, appears in this specification, it contains additional requirements that supplement those appearing in Specification B249/B249M.

4. Terminology

4.1 Definitions:

4.1.1 For definitions of terms related to copper and copper alloys, refer to Terminology B846. and ards/sist/fcbc4871-dc

4.2 Definitions of Terms Specific to This Standard:

4.2.1 *hot pressed forging, n*—a product made by pressing a heated blank or section of wrought or cast copper or copper alloy in a closed impression die.

5. Ordering Information

5.1 Include the following information when placing orders for products to this specification, as applicable:

5.1.1 ASTM designation and year of issue,

5.1.2 Copper or Copper Alloy UNS No. designation (Scope),

5.1.3 Drawing showing the shape dimensions and tolerances (Dimensions and Permissible Variations),

5.1.4 Temper (as specified herein),

5.1.5 Quantity: total weight or number of pieces for each form, temper, and copper or copper alloy,

5.1.6 When product is purchased for agencies of the U.S. government (as specified herein), and

5.1.7 When product must adhere to the requirements of ASME Boiler and Pressure Vessel Code (Mechanical Property Requirements).

5.2 The following requirements are optional and shall be specified in the contract or purchase order.

5.2.1 Certification (as specified herein and Supplementary Requirements),

5.2.2 Mill test report (as specified in B249/B249M), and

5.2.3 Ultrasonic inspection report (Supplementary Requirements).

6. Material and Manufacture

6.1 Materials:

6.1.1 The material of manufacture shall be a form of rods, billets, or blanks cut from cast or wrought material of one of the copper or copper alloys listed in the Scope of this specification and of purity and soundness as to be suitable for processing in to the products prescribed herein.

6.1.2 In the event heat identification or traceability is required, the purchaser shall specify the details desired.

Note 3—Due to the discontinuous nature of the processing of castings into wrought products, it is not always practical to identify specific casting analysis with a specific quantity of finished material.

6.2 Manufacture:

6.2.1 The product shall be manufactured by hot pressing material between the upper and lower sections of a set of dies conforming to the configuration defined by the purchaser's submitted drawings.

6.2.2 Product of Copper Alloy UNS No. C63000 and C63200 shall be heat treated (as specified herein).

7. Chemical Composition

7.1 The material shall conform to the chemical composition requirements in Table 1 for the Copper or Copper Alloy UNS No. designation specified in the ordering information.

7.2 These composition limits do not preclude the presence of other elements. By agreement between manufacturer and purchaser, limits may be established and analysis required for unnamed elements.

7.2.1 For alloys in which copper is listed as "remainder," copper is the difference between the sum of results of all elements determined and 100 %.

7.2.2 For alloys in which zinc is listed as "remainder," either copper or zinc may be taken as the difference between the sum of results of all other elements determined and 100 %.

7.3 When all elements in Table 1 are determined for Copper Alloy UNS No. C36500, C37000, C46400, C48200, C48500, C48600, the sum of results shall be 99.6 % min, for all other alloys the sum of results shall be 99.5 % min.

8. Temper

8.1 The standard tempers for products described in this specification are as follows:

- 8.1.1 As hot forged-air cooled M10,
- 8.1.2 As forged-quenched M11,
- 8.1.3 Hot forged and annealed O20.

⁵ Available from Japanese Standards Organization (JSA), 4-1-24 Akasaka Minato-Ku, Tokyo 107-8440, Japan, http://www.jsa.or.jp.

⁶ Available from DLA Document Services, Building 4D, 700 Robbins Ave., Philadelphia, PA 19111-5094, http://quicksearch.dla.mil/.

Opplication Copper Lead Tn Ion Neich Silton Magnese Zinc Blantin Prosphous Arenic Blantin 011000 990 ⁴ min 000-660 000-600 000-000	Zinc Suffur Tellurium Phosphorus Arsenic 0.200-0.50 0.40-0.7 0.002-0.0050 emainder 0.200-0.50 0.002-0.0050 emainder 0.002-0.0050 0.002-0.205 emainder 0.005-0.20 0.02-25 emainder 0.005-0.20 emainder 0.005-0.15 emainder 0.005-0.15 emainder 0.005-0.15 emainder 0.005-0.15 emainder 0.005-0.15 emainder 0.005-0.15 emainder <th>1 Leat Tin (mod) Auminum Silor Manual Presphores Zen Sulur Presphores Areanization 0 0.55 max 0.55 max</th> <th>Alloy B</th> <th>Copper</th> <th></th> <th></th> <th></th> <th>d</th> <th></th> <th>പാണ്ണാം 🕫</th> <th>0/ 11/11/</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>	1 Leat Tin (mod) Auminum Silor Manual Presphores Zen Sulur Presphores Areanization 0 0.55 max	Alloy B	Copper				d		പാണ്ണാം 🕫	0/ 11/11/						
III III III IIII IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	0.40-0.7 0.004-0.012 ^D emainder 0.002-0.005 ^D 0.002-0.005 ^D emainder 0.002-0.005 ^D 0.002-0.20 emainder 0.002-0.20 0.02-25 emainder 0.005-0.20 0.20-25 emainder 0.005-0.20 0.20-25 emainder 0.005-0.10 0.20-25 emainder 0.005-0.15 0.20-25 emainder 0.005-0.15 0.20-25 emainder 0.005-0.15 0.20-25 emainder 0.005-0.15 0.005-0.15 emainder 0.005-0.15 0.005-0.15 emainder 0.005-0.15 0.005-0.15 emainder 0.005-0.15 0.005-0.15 emainder 0.005-0.15 0.006-0.15 emainder 0.005-0.15 0.006 emainder		<u>a</u> a		Lead	Tin	Iron	Nickel (incl Co)	Aluminum	Silicon	Manganese	Zinc	Sulfur	Tellurium	Phosphorus	Arsenic	Bismuth
Min Min <td> 0.40-0.7 0.004-0.012^D emainder 0.20-0.50 0.002-0.005^D emainder 0.002-0.005^D 0.025-0.20 emainder 0.002-0.005^D 0.025-0.20 emainder 0.002-0.005^D 0.025-0.20 emainder 0.01 0.025-0.20 emainder 0.01 0.025-0.20 emainder 0.010 0.025-0.25 emainder 0.010 emainder 0.010 0.025-0.25 emainder 0.010 0.025-0.15 emainder 0.005-0.15 0.025-0.15 emainder 0.005-0.15 0.005-0.15 emainder 0.005-0.15 0.025-0.15 emainder 0.005-0.15 0.025-0.15 emainder 0.005-0.15 0.025-0.15 emainder 0.005-0.15 0.00</td> <td> 0.22-0.012 emainder 0.002-0.005^D emainder 0.002-0.005^D emainder 0.002-0.005^D emainder 0.05-0.20 emainder 0.05-0.20 emainder 0.05-0.15 emainder 0.05-0.15 emainder 0.05-0.15 emainder 0.05-0.15 emainder 0.010 max 0.30 max 0.04-0.15 0.31 max 0.04-0.15 0.30 max 0.04-0.15 0.31 max 0.04-0.15 0.32 max 0.30 max 0.31 max 0.04-0.15 0.32 max</td> <td></td> <td>9.90^A min</td> <td></td> <td>· · · ·</td> <td>:</td> <td>i. 1t :</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td> <td></td> <td>:</td> <td>:</td> <td></td>	0.40-0.7 0.004-0.012 ^D emainder 0.20-0.50 0.002-0.005 ^D emainder 0.002-0.005 ^D 0.025-0.20 emainder 0.002-0.005 ^D 0.025-0.20 emainder 0.002-0.005 ^D 0.025-0.20 emainder 0.01 0.025-0.20 emainder 0.01 0.025-0.20 emainder 0.010 0.025-0.25 emainder 0.010 emainder 0.010 0.025-0.25 emainder 0.010 0.025-0.15 emainder 0.005-0.15 0.025-0.15 emainder 0.005-0.15 0.005-0.15 emainder 0.005-0.15 0.025-0.15 emainder 0.005-0.15 0.025-0.15 emainder 0.005-0.15 0.025-0.15 emainder 0.005-0.15 0.00	0.22-0.012 emainder 0.002-0.005 ^D emainder 0.002-0.005 ^D emainder 0.002-0.005 ^D emainder 0.05-0.20 emainder 0.05-0.20 emainder 0.05-0.15 emainder 0.05-0.15 emainder 0.05-0.15 emainder 0.05-0.15 emainder 0.010 max 0.30 max 0.04-0.15 0.31 max 0.04-0.15 0.30 max 0.04-0.15 0.31 max 0.04-0.15 0.32 max 0.30 max 0.31 max 0.04-0.15 0.32 max		9.90 ^A min		· · · ·	:	i. 1t :	:	:	:	:	:		:	:	
Min Column Colum Colum Colum	0.20-0.50 0.002-0.005P emainder 0.35-0.20 emainder 0.35-0.20 emainder 0.35-0.20 emainder 0.35-0.20 emainder 0.35-0.20 emainder 0.35-0.25 emainder 0.02-0.25 emainder 0.02-25 emainder 0.00-0.15 emain	0.20-0.50 0.002-0.005 emainder emai		9.90 ^c min	:	:	:	eh :		:	:	:	:	0.40-0.7	0.004–0.012 ^D	:	:
0 0.25 max 0.35 max 0.	emainder 0.05-0.20 emainder 0.05-0.20 emainder 0.05-0.20 emainder 0.05-0.20 emainder 0.05-0.20 emainder 0.05-0.20 emainder 0.02-25 emainder 0.02-015 emainder 0.00-015	emainder 0.05-0.20 emainder 0.05-0.20 emainder 0.05-0.20 emainder 0.05-0.20 emainder 0.05-0.15 emainder 0.10 max emainder 0.05-0.15 emainder 0.005-0.15 emainder <t< td=""><td></td><td>)9.90^E min</td><td>:</td><td>:</td><td>:</td><td>i.a</td><td>:</td><td>:</td><td>:</td><td>:</td><td>0.20-0.50</td><td>:</td><td>0.002-0.005^D</td><td>:</td><td>:</td></t<>)9.90 ^E min	:	:	:	i.a	:	:	:	:	0.20-0.50	:	0.002-0.005 ^D	:	:
0 0.25 max 0.35 max 0.	emainder 0.05-0.20 0.22-25 emainder 0.05-0.20 0.2-25 emainder 0.05-0.15 0.02-25 emainder 0.05-0.15 0.02-25 emainder 0.05-0.15 0.02-25 emainder 0.005-0.15 0.02-25 emainder 0.005-0.15 0.02-0.15 emainder 0.005-0.15 0.005-0.15 emainder 0.002-0.15 0.006-0.15 emainder 0.002-0.15 0.006-0.15 emainder 0.002-0.15 0.006-0.15 emainder 0.002-0.15	emainder		60.0-65.0	0.25 max	:	0.35 max	:1/0	:	:	:	remainder	:	:	:	:	:
0 15-31 <td>emainder </td> <td>emainder</td> <td></td> <td>61.0-65.0</td> <td>0.25 max</td> <td>:</td> <td>0.35 max</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td> <td>remainder</td> <td>:</td> <td>:</td> <td>0.05-0.20</td> <td>:</td> <td>:</td>	emainder	emainder		61.0-65.0	0.25 max	:	0.35 max	:	:	:	:	remainder	:	:	0.05-0.20	:	:
0 025-07 0.25 max 0.15 max 0.10	emainder	emainder		59.5-64.0	1.5-3.5	:	:	ta	:	: .	:	remainder	:	:	:	.02–.25	:
0 0.8-1.5 0.15 max 0.10 max </td <td>emainder</td> <td>emainder </td> <td></td> <td>58.0-61.0</td> <td>0.25-0.7</td> <td>0.25 max</td> <td>0.15 max</td> <td>0 :</td> <td>:</td> <td>(</td> <td>:</td> <td>remainder</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td>	emainder	emainder		58.0-61.0	0.25-0.7	0.25 max	0.15 max	0 :	:	(:	remainder	:	:	:	:	:
0 15-25 0.030 max 0.030 max 0.010 max<	emainder	emainder		59.0-62.0	0.8-1.5		0.15 max	g/ :	::	h		remainder					
0 0.20 max 0.30-10 0.10 max 0.30-15 0.10 max 0.30-15 0.10 max 0.10 max<	emainder	emainder emainder emainder emainder emainder emainder emainder 0.10 max emainder 0.05-0.15 emainder 0.04-0.15 27.0-35.0 0.04-0.15 27.0-35.0 0.04-0.15 27.0-35.0 0.04-0.15 27.0-35.0 0.09 max 0.30 max 0.09 max 0.50 max 0.02 max 0.15 max 0.15 max 0.110		58.0-61.0	1.5–2.5	:	0.30 max	sta :	:	ţ	:	remainder	:	:	:	:	:
0 0.40-1.0 0.10 max 0.30-1.6 0.10 max 0.30-1.6 0.10 max 0.30 max 0.	emainder	emainder		59.0-62.0	0.20 max	0.50-1.0	0.10 max	an :	:		:	remainder	:	:	:	:	:
0 1.3-2.2 300-1.0 0.10 max 0.05 max	emainder	emainder		59.0-62.0	0.40-1.0	0.50-1.0	0.10 max	ida :		ļ D	:	remainder	:	:	:	:	:
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	emainder	emainder		59.0-62.0	1.3-2.2	0.50-1.0	0.10 max	ar	:		:	remainder	:	:	:		:
0.000 max 0.000 max 0.10 max 0.05 max <	entantider	emainder		59.0-62.0	3.2–0.1 2.00 mov			:		S		remainder	:	:	:	9220.	· c · o
0 0.00 max 0.50 max 0.50 max 0.00 m	emainder 0.05-0.15 emainder 0.05-0.15 emainder 0.05-0.15 emainder 0.05-0.15 emainder 0.05-0.15 27.0-35.0 0.05-0.15 0.35.0 0.04-0.15 0.30 max 0.30 max 0.30 0.04-0.15 0.50 0.04-0.15 0.50 0.09 0.50 0.09 0.50 0.09 0.50 0.09 0.50 0.09 0.50 0.09 0.50 0.09 0.50 0.09 0.50 0.09 0.50 0.09 0.50 0.09 0.50 0.00 0.50 0.02 0.50 0.02 0.50 0.02 0.50 0.02 0.50 0.02 0.50 0.02 0.50 0.02 0.50 0.02 0.50 0.02 0.50 0.02 <t< td=""><td>and and er 0.05-0.15 0.05-0.15 emainder 0.05-0.15 0.05-0.15 emainder 0.04-0.15 0.05-0.15 27.0-35.0 0.05-0.15 0.05-0.15 27.0-35.0 0.05-0.15 0.05-0.15 27.0-35.0 0.05-0.15 0.05-0.15 27.0-35.0 0.05-0.15 0.05-0.15 27.0-35.0 0.05-0.15 0.05-0.15 27.0-35.0 0.02 0.04-0.15 0.50 max 0.09 max 0.50 max 0.02 0.02 0.50 max 0.02 0.04 0.50 0.02 0.02 0.02 <td< td=""><td></td><td></td><td></td><td>0.50 max</td><td>0.10 max</td><td>S1 05 010</td><td>:</td><td>0 10 max</td><td>:</td><td>ramainder</td><td>:</td><td>:</td><td>0.10 max</td><td>:</td><td>1.2-0-1</td></td<></td></t<>	and and er 0.05-0.15 0.05-0.15 emainder 0.05-0.15 0.05-0.15 emainder 0.04-0.15 0.05-0.15 27.0-35.0 0.05-0.15 0.05-0.15 27.0-35.0 0.05-0.15 0.05-0.15 27.0-35.0 0.05-0.15 0.05-0.15 27.0-35.0 0.05-0.15 0.05-0.15 27.0-35.0 0.05-0.15 0.05-0.15 27.0-35.0 0.02 0.04-0.15 0.50 max 0.09 max 0.50 max 0.02 0.02 0.50 max 0.02 0.04 0.50 0.02 0.02 0.02 <td< td=""><td></td><td></td><td></td><td>0.50 max</td><td>0.10 max</td><td>S1 05 010</td><td>:</td><td>0 10 max</td><td>:</td><td>ramainder</td><td>:</td><td>:</td><td>0.10 max</td><td>:</td><td>1.2-0-1</td></td<>				0.50 max	0.10 max	S1 05 010	:	0 10 max	:	ramainder	:	:	0.10 max	:	1.2-0-1
0 0.01 max 1.0-1.8 0.10 max 1.5 max 0.50 max 1.0 max 1.5 max 0.10 max 1.5 max 0.20 max 1.5 max 0.20 max 1.5 max 0.20 max 1.5 max 0.20 max 0.00 max 0.00 max </td <td>emainder 0.20 max erwänder 0.05-0.15 27.0-35.0 0.04-0.15 27.0-35.0 0.04-0.15 0.30 max 0.04-0.15 0.30 max 0.09 max 0.50 max 0.004-0.15 0.50 max 0.02 max 0.50 max 0.04-0.15 0.50 max 0.02 max 0.50 max 0.15 max 0.50 max 0.15 max</td> <td>emainder</td> <td></td> <td>580-630</td> <td>0.00 max</td> <td>0 50 may</td> <td>0.50 may</td> <td>st/</td> <td>A</td> <td>0.10 max</td> <td>e</td> <td>remainder</td> <td></td> <td>:</td> <td>0.05-0.15</td> <td>:</td> <td>050-18</td>	emainder 0.20 max erwänder 0.05-0.15 27.0-35.0 0.04-0.15 27.0-35.0 0.04-0.15 0.30 max 0.04-0.15 0.30 max 0.09 max 0.50 max 0.004-0.15 0.50 max 0.02 max 0.50 max 0.04-0.15 0.50 max 0.02 max 0.50 max 0.15 max 0.50 max 0.15 max	emainder		580-630	0.00 max	0 50 may	0.50 may	st/	A	0.10 max	e	remainder		:	0.05-0.15	:	050-18
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	emainder	emainder		58 0-62 0	0.03 max	1 0-1 8	0.10 max	10 15 max	0.50 max	0.10 max	0.03 max	remainder		•	0.20-00-00 0.20 max		0.50-2.0
0 0.09 max 15-3.0 0.12 max 0.30	emainder	emainder		50.0-63.0	0.09 max	0.50-1.5	0.12 max			0.10 max	2000 2000	remainder			0.05-0.15		0.50-2.2
0 0.09 mx 0.50-2.0 0.10 max 1.0-2.0 0.10 max 27.0-35.0 0.10 max 0.25 max 0.85-10.00 0.25 max 0.8 max 0.0.8 max 0.0.9 max	27.0-35.0	27.0-35.0		51.0-63.0	0.09 max	1.5 - 3.0	0.12 max	:4	1	0.30 max		remainder			0.04-0.15		0.50-2.5
er 0.02 max 0.6 max 3.0-4.5 k 85-10.00 max 0.50 max 0.50 max 0.8 max 0.50 max 0.009 max	0.8 max 0.18 max 0.08 max 0.09 max 0.00 max 0.00 max 0.09 max 0.09 max 0.00 max 0.00 max 0.015 max 0.015 max 0.15	0.8 max 0.8 max 0.8 max 0.8 max 0.30 max 0.09 max 0.09 max 0.50 max 0.09 max 0.00 max 0 0.00 max 0.00 max 0.00 max		63.0-69.0	0.09 max	0.50-2.0	0.10 max	87	B2	1.0-2.0	0.10 max	27.0-35.0			-		0.50-1.5
er 0.6 max 2.0-4.0 1.0 max 0.55 max 1.5 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max	0.30 max 0.50 max 0.50 max 0.50 max 1.5 max 1.5 max 0.50 max 1.5 max 1.5 max 0.50 max 0.50 max 0.02 max 0.50 max 0.02 max 0.02 max 0.50 max 0.02 max 0.02 max 0.70-0 0.15 max 0.70-11.0 0.15 max	0.30 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 1.5 max 1.5 max 0.50 max 0.02 max 0.50 max 0.02 max 0.02 max 0.50 max 0.02 max 0.02 max 0.002 max 0.02 max 0.02 max 0.011.0 0.15 max		remainder	0.02 max	0.6 max	$3.0-4.5^{K}$:	8.5-10.00			0.8 max	:		:	:	:
er 0.20 max 2.0-4.0 4.0-5.5 9.0-11.0 0.25 max 1.5 max 0.30 max er 0.02 max 3.5-4.3 ⁴ 4.0-4.8 9.70 1.5-2.2 0.10 max 1.2-2.0 er 0.05 max 0.26 max 0.50 max 0.50 max 0.50 max 0.50 max er 0.05 max 0.20 max 0.30 max 0.50 max 0.50 max 0.50 max <	0.30 max 0.30 max 0.50 max	0.30 max 0.30 max		remainder		0.6 max	2.0-4.0	1.0 max	8.5-10.0	0.25 max	0.50 max		:				
er 0.02 max 3.5-4.3 ^L 4.0-4.8 8.7-9.5 0.10 max 1.2-2.0 er 0.05 max 0.20 max 0.25 max 0.25 max 6.3-7.6 1.5-2.2 0.10 max 0.50 max er 0.05 max 0.20 max 0.25 max 6.3-7.6 1.5-2.2 0.10 max 0.50 max <td< td=""><td>0.50 max</td><td>0.50 max 0.50 max 0.50 max 1.5 max emainder 0.02 max 0.02 max 0.50 max 0.02 max 0.02 max 0.15 max 0.15 max</td><td></td><td>remainder</td><td>:</td><td>0.20 max</td><td>2.0-4.0</td><td>4.0-5.5</td><td>9.0-11.0</td><td>0.25 max</td><td>1.5 max</td><td>0.30 max</td><td>:</td><td>:</td><td>:</td><td>:</td><td>:</td></td<>	0.50 max	0.50 max 0.50 max 0.50 max 1.5 max emainder 0.02 max 0.02 max 0.50 max 0.02 max 0.02 max 0.15 max 0.15 max		remainder	:	0.20 max	2.0-4.0	4.0-5.5	9.0-11.0	0.25 max	1.5 max	0.30 max	:	:	:	:	:
er 0.05 max 0.20 max 0.30 max 0.25 max 0.25 max 0.50 max 0.50 max 0.50 max 0.50 max 0.30 max 0.25 max 0.6 max 0.20 max 0.50 max 0.00 max 0.20 max 0.10 max 0.10 max 0.10 max 0.10 max 0.10 max 0.50 max 0.50 max 0.00 max 0	0.50 max 0.50 max 0.50 max	0.50 max		remainder	0.02 max	:	$3.5-4.3^{L}$	4.0-4.8	8.7–9.5	0.10 max	1.2-2.0	:	:	:	:	:	:
er 0.05 max 0.20 max 0.30 max 0.25 max 0.26 max 0.50 max 0.50 max 0.50 max 0.50 max 0.30 max 0.6 max 0.6 max 0.5 max 0.0 0.0 max 0.5 m	0.50 max 0.50 max 1.5 max	0.50 max 0.50 max 1.5 max		remainder	0.05 max	0.20 max	0.30 max	0.25 max	6.3-7.6	1.5-2.2	0.10 max	0.50 max		: :	: :	0.09 max	: :
er 0.050 max 0.50-15 0.8-2.0 0.055 max 0.50-15 0.8-2.0 0.055 max 0.50 remainder 0.055-0.50 remainder 0.04-0.15 0.02	1.5 max emainder emainder 0.04-0.15 emainder 0.02 max 0.50 max 0.02 max 0.02 max 0.50 max 0.02 max 0.02 max 0.50 max 0.02 max 0.02 max 0.90 max 0.02 max 0.05 max 0.015 max 0.02 max 0.05 max 0.02 max 0.02 max 0.05 max 0.02 max 0.02 max 0.05 max 0.02 max 0.02 max 0.05 max	1.5 max emainder emainder 0.02 max 0.02 max 0.02 max 0.50 max 0.02 max 0.05 max 0.50 max 0.02 max 0.05 max 0.50 max 0.02 max 0.05 max 0.02 max 0.02 max 0.05 max 0.015 max 0.05 max 0.05 max 0.015 max 0.15 max 0.15 max		remainder	0.05 max	0.20 max	0.30 max	0.25 max	6.3-7.0	1.50-2.0	0.10 max	0.50 max	:	:	:	0.09 max	:
0 0.50-11.5 0.43-2.0 0.10 max 0.05-0.50 remainder 0.09-0.15 0 0.50-11.5 0.40-11.3 0.10 max 0.10 max 0.09-0.15 0.04-0.15 0 0.00 max 0.10 max 0.10 max 0.10 max 0.00-0.15 remainder 0.04-0.15 1 0.00 max 0.10 max 0.10 max 0.10 max 0.00 max 0.00 max 0.00 max 1 0.02 max 0.10 max 0.10 max 0.10 max 0.00 max 0.00 max 0.00 max 0.00 max 1 0.02 max 0.00 max 0.00 max 0.50 max 0.02 max 0.02 max 0.02 max 0 0.00 max 0.10 max 0.50 max 0.50 max 0.02 max 0.02 max 0 0.00 max 0.00 max 0.50 max 0.50 max 0.02 max 0.02 max 0 0.00 max 0.00 max 0.50 max 0.50 max 0.02 max 0.02 max 0 0.00 max 0.00 max 0.20 max 0.20 max 0.00 max 0.01 max 0.01 max 0 0.00 max 0.00 max	emainder emainder 0.04–0.15 emainder 0.02 max 0.50 max 0.02 max 0.015 max 0.015 max	emainder 0.04–0.15 emainder 0.02 max 0.50 max 0.02 max 0.02 max 0.50 max 0.02 max 0.02 max emainder 0.15 max 9.0–11.0 0.15 max		remainder	0.05 max	 	0.8 max	0.6 max		2.8-3.8	0.50-1.3	1.5 max	:	:	:	:	:
0.030-1.30 0.30-1.30 0.430-1.30 0.430-1.30 0.430-1.30 0.430-1.30 10 0.020 max 0.200 max 0.100 max 0.100 max 0.100 max 0.100 max 10 0.020 max 0.200 max 0.100 max 0.100 max 0.020 max </td <td>emainder</td> <td>emainder</td> <td></td> <td>0.00-0.73</td> <td>0.20 max</td> <td>C. L-0C.0</td> <td>0.8-2.0</td> <td>-9</td> <td>0.25 max</td> <td>: : V</td> <td>0.0-0.0</td> <td>remainder</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td>	emainder	emainder		0.00-0.73	0.20 max	C. L-0C.0	0.8-2.0	-9	0.25 max	: : V	0.0-0.0	remainder	:	:	:	:	:
0.03 max 0.01 max 0.10 max 0.02 max 0.10 max 0.02 max 0.00 max 0.02 max 0.01 max 0.02 max 0.01 max 0.02 max 0.01 max 0.02 max 0.01 max 0.03	0.50 max 0.02 max 0.50 max 0.02 max emainder 7.0-9.0 9.0-11.0	5.0 max 0.02 max 5.0 max 0.02 max emainder 7.0–9.0 9.0–11.0		0.00-0.10	0.1-06.0	C.1-0C.0	0.40-1.3	· · · · · · ·	:		00.0-00.0	remainder	:	:		:	:
in 0.02 max 0.40-1.0 29.0-33.0 1.0 max 0.50 max 0.50 max 0.50 max 0.50 max 0.50 max 0.02 max 0.009 max 2.0 max 0.50 max 0.25 max	0.50 max 0.02 max 0.50 max 0.02 max 0.6mainder 7.0–9.0 9.0–11.0	0.50 mix, 0.02 max emainder		10.0-11.0		0.20 IIIax				2.1-0.4							:
0.009 max 0.011.0 <	emainer	emainder		85.0 ⁴ min	0.02 may		0 40-1 0	20 0-33 0 0		e		0 50 may	0.02 may		0.02 may		
n 0.09 max 2.0 max 0.50 max 0.25 max 2.5–3.5 0.8 max 7.0–9.0	7.0–9.0 9.0–11.0	9.0-11.0		43.0-47.0	0.09 max		001-0	9 0-11 0 C	•	h	1.0	remainder	20.0		20.0		
n 0.09 max 2.0 max 0.50 max 0.25 max 2.1 3.0-5.0 0.8 max 9.0-11.0	9.0-11.0	0-11-0		87.5 min	0.00 max	2 0 may	0 50 may	0.05 may		о п 1 о 1 о	0.8 may	7 0-0 0			0.15 may		
	a Silver counting as copper.	A Silver counting as copper. Includes coyper plus silver plus silver plus tellurium plus phosphorus, boron, lithium, or others) in amount agreed upon. This includes copper plus silver	C87710 ^N	84.0 min	0.09 max	2.0 max	0.50 max	0.25 max	: :	3.0-5.0	0.8 max	9.0-11.0	: :	: :	0.15 max	: :	: :
A Gilvar countring as conner		^B Includes copper plus silver plus tellurium plus phosphorus. ^B Includes copper plus silver plus silver plus tellurium plus phosphorus. ^C This includes copper plus silver plus suffur plus phosphorus. ^C This includes copper plus silver plus suffur plus phosphorus. ^E This includes copper plus silver plus suffur plus phosphorus. ^E This includes compare plus silver plus suffur plus phosphorus. ^E This includes compare plus silver plus suffur plus phosphorus. ^E This includes compare plus silver plus suffur plus phosphorus. ^E This includes compare plus silver plus suffur plus phosphorus. ^E This includes compare plus silver plus suffur plus phosphorus. ^E Includes compare plus silver plus suffur plus phosphorus. ^E This includes compare plus silver plus suffur plus phosphorus. ^E This includes compare plus silver plus suffur plus phosphorus. ^E Includes compare plus silver plus suffur plus phosphorus. ^E Includes compare plus suffur plus phosphorus. ^E Includes compare plus suffur plus phosphorus. ^E Includes compare plus suffur plus phosphorus. ^E Includes antimony 0.02–0.07.% ^E Includes antimony 0.02–0.10 %. ^E Includes antimony 0.02–0.10 %. ^E Includes antimony 0.02–0.10 %. ^E Includes compare plus antimony 0.02–0.10 %. ^E Includes application maximum iron content shall be 4.0 %. ^E Includes application maximum iron content shall be 0.05 % max. ^{Mathimory shall be 0.05 % max.}	A Silver counting as	connar	0.00	2.0 11144	0.00		:	0.0	0.0	0.1	:	:	0.10	:	:
This includes to devolute gradentation as prosprinted, and in a prosprinted as prosprinted and a prosprinted a		F This includes copper plus sulfur plus phosphorus. F F Includes cadmium 0.001 % max. Includes cadmium 0.001 % max. Includes antimony 0.50 % max, and selenium 0.20 % max. Includes antimony 0.50 % max. Includes antimony 0.50 % max, and selenium 0.20 % max. Includes antimony 0.50 % max. Includes antimony 0.50 % max. Includes antimony 0.50 % max. Includes antimony 0.50 % max. Includes antimony 0.20 % max. Includes antimony 0.50 % max. Includes antimony 0.20 % max. Includes antimony 0.50 % max. Includes antimony 0.20 % max. Includes antimony 0.02 -0.10 %. Includes antimony 0.02 -0.10 %. Includes antimony 0.02 -0.10 %. Includes antimony 0.02 -0.10 %. Includes antimony 0.02 % max. Includes antimony 0.02 % max. Includes antimony 0.02 % max. Includes antimony 0.02 % max. Includes antimony ontext shall be 0.10 Max. Includes antimony ontext shall be 0.10 Max.	^D Other deoxidizers	may be used	l as agreed u	tpon, in which	וומיומ: case phosphi	orus need not	be present.								
ווטוטטט איז	^D Otther deoxidizers may be used as agreed upon, in which case phosphorus need not be present.	^a Includes cardimum 0.001 % max. ^b Includes antimony 0.50 % max. and selenium 0.20 % max. ¹ Includes antimony 0.02-0.10 %. ¹ Includes Boron 0.001 % max. ¹ For boiler code application maximum iron content shall be 4.0 %. ¹ Eron content shall be 0.005 % max. ¹ For about the exceed nickel content. ¹ Antimon shall be 0.005 % max.	E This includes copp	er plus silver	plus sulfur p	ins phosphor	rus.		-								
C This includes copper plus silver plus tellurium plus phosphorus.	^D Other deoxidizers may be used as agreed upon, in which case phosphorus need not be present. ^E This includes copper plus silver plus sulfur plus phosphorus.	^H Includes antimony 0.50% max, and selenium 0.20% max. ¹ Includes antimony 0.02–0.10%. ^J Includes Boron 0.001 % max. ^H For boiler code application maximum iron content shall be 4.0 %. ^H For boiler code application maximum iron content shall be 4.0 %. ^M Carbon shall be 0.10 % max.	^G Includes cadmium	0.001 % ma.	X. Jenium 0 02-	-0.07											
This includes copper plus silver plus tellurium plus phosphorus. Dottor, numuri, or outers) in announ agreed apon. Other deoxidizers may be used as agreed upon, in which case phosphorus need not be present. Finciudes copper plus silver plus sulfur plus phosphorus.	Dother deoxidizers may be used as agreed upon, in which case phosphorus need not be present. E This includes copper plus silver plus suffur plus phosphorus.	Includes antimony 0.02–0.10 %. Includes Boron 0.001 % max. K For boiler code application maximum iron content shall be 4.0 %. A for content shall not exceed nickel content. M carbon shall be 0.10 % max.	^H Includes antimony	0.50 % max, 3	and seleniu	m 0.20 % ma	×.										
This includes copper plus silver plus tellurium plus phosphorus.	^D Other deoxidizers may be used as agreed upon, in which case phosphorus need not be present. ^E This includes copper plus sulfur plus phosphorus. ^F Includes cadmium 0.001 % max. ^G Includes cadmium 0.01 max, selenium 0.20% max.	² Includes Boron 0.001 % max. For boiler code application maximum iron content shall be 4.0 %. Inconcent shall be 0.0 % max. Mathimony shall be 0.10 Max.	Includes antimony	0.02-0.10 %.													
^C This includes copper plus silver plus tellurium plus phosphorus. ^C This includes copper plus silver plus sulfur plus phosphorus. ^D Other deoxidizers may be used as agreed upon, in which case phosphorus need not be present. ^F Includes cadmium 0.001 % max. ^H Includes cadmium 0.01 max, selenium 0.20 % max. ^H Includes antimony 0.02–0.01 %.	^D Other deoxidizers may be used as agreed upon, in which case phosphorus need not be present. ^E This includes copper plus sulfur plus phosphorus. ⁶ Includes cadmium 0.001 % max. ⁹ Includes antimony 0.50 % max, and selenium 0.20 % max.	r For boiler code application maximum from content shall be 4.0 %. 8. Iron content shall not exceed nickel content. 8. Antimon shall be 0.10 % max.	ر Includes Boron 0.0	01 % max.													
⁷ This includes copper plus silver plus tellurium plus phosphorus. ⁸ This includes copper plus silver plus sulfur plus phosphorus. ⁹ Other deoxidizers may be used upon, in which case phosphorus need not be present. ⁶ Includes cadmium 0.01 % max. ⁹ Includes cadmium 0.050 % max, and selenium 0.20 % max. ¹ Includes antimony 0.50 % max.	^D Other deoxidizers may be used as agreed upon, in which case phosphorus need not be present. ^E This includes copper plus sulfur plus phosphorus. ^F Includes cadmium 0.01 % max, and selenium 0.20 % max. ^H Includes antimony 0.50 % max, and selenium 0.20 % max. ^I Includes Boron 0.001 % max.	Montoniant statutes content. Mathemore shall be 0.10 Max.	^A For boiler code ap	plication max	ckal contant	ontent shall bu	e 4.0 %.										
This includes copper plus silver plus allurium plus phosphorus. ^C This includes copper plus silver plus sulfur plus phosphorus. ^D Other according may be used as agreed upon, in which case phosphorus need not be present. ^E This includes cadmium 0.001 % max. ^H Includes antimony 0.50 % max, and selenium 0.20 % max. ^I Includes antimony 0.001 % max. ^I Includes Boron 0.001 % max. ^I Includes Boron 0.001 % max. ^I For pointer codel approximum iron content shall be 4.0 %. ^I For content codel and proceed nickel content.	^D Other deoxidizers may be used as agreed upon, in which case phosphorus need not be present. ^E This includes copper plus sulfur plus phosphorus. ^F Includes cadmium 0.001 % max. ^H Includes antimony 0.50 % max. ^H	Mantimonv shall be 0.10 Max.	^M Carbon shall be 0.	05 % max.													
^C This includes coper plus silver plus sulfur mus accorates a prosphorus. ^C This includes coper plus silver plus sulfur plus phosphorus. ^D Ottres includes coper plus silver plus sulfur plus phosphorus. ^E This includes coper plus silver plus sulfur plus phosphorus. ^E Includes commun 0.01 % max. ^H Includes antimony 0.50 % max. ^H Includes antimony 0.50 % max. ^H Includes antimony 0.02 -0.10 %. ^H Cludes antimony 0.02 -0.10 %. ^H Corboiler code application maximum iron content shall be 4.0 %. ^M Carbon shall be 0.05 % max.	 ^D Other deoxidizers may be used as agreed upon, in which case phosphorus need not be present. ^E This includes copper plus silver plus sulfur plus phosphorus. ^F Includes cadmium 0.01 % max, selenium 0.20 % max. ^H Includes antimony 0.50 % max. ^H Includes Boron 0.001 % max. ^H Includes Boron 0.001 % max. ^H Carbon shall be 0.05 % max. 		^N Antimony shall be (0.10 Max.													

₩ B283/B283M - 14

8.2 UNS Alloy Nos. C63000 and C63200 shall be furnished as:

8.2.1 Quench hardened and temper annealed, TQ50.

8.3 Alloys C70620 and C71520 shall be furnished in the following tempers:

8.3.1 As hot forged-air cooled M10, unless,

8.3.2 Hot forged and annealed O20 is specified.

8.4 Other tempers, shall be subjected to agreement between the manufacturer and the purchaser.

9. Mechanical Property Requirements

9.1 Mechanical property requirements are subject to agreement between the manufacturer and the purchaser.

9.2 Product furnished to this specification for UNS Alloy No. C70620 and C71520 and specified to meet the requirements of the *ASME Boiler and Pressure Vessel Code* shall conform to the tensile requirements prescribed in Table 2, when tested in accordance with Test Methods E8/E8M.

9.2.1 Acceptance or rejection based upon mechanical properties for UNS Alloy No. C70620 and C71520 shall depend only on tensile strength.

10. Heat Treatment

10.1 Product produced from Copper Alloy UNS No. C63200 shall be heat treated as follows:

10.1.1 Heat to 1550°F [843°C] minimum for 1 h minimum and quench in water or other suitable medium.

10.1.2 Temper Anneal at 1300 \pm 25°F [704 \pm 14°C] for 3 to 9 h as required to meet mechanical properties.

11. Special Government Requirements

11.1 Product purchased for agencies of the U.S. government shall conform to the additional requirements prescribed in the Supplementary Requirements section of this specification.

12. Dimensions and Permissible Variations

12.1 The dimensions and tolerances for forgings shall be those agreed upon between the manufacturer and the purchaser, and such dimensions and tolerances shall be specified on the drawings which form a part of the contract or purchase order.

Note 4—Typical tolerances commonly used for forgings are shown in Table X2.1.

13. Test Methods

13.1 Chemical Analysis:

13.1.1 In case of disagreement, determine the composition using the following methods:

Element		ASTM Test Method
Aluminum Arsenic		E478 E62
Bismuth		JIS H 1068:2005
Copper		E478
Iron	<1.3 %	E478, E75 for CuNi
	>1.3 %	E478, E75 for CuNi
Lead		E478 (AA)
Manganese		E62, E75 for CuNi
Nickel	<5 %	E478 (photometric)
	>5 %	E478 (gravimetric)
Phosphorus		E62
Silicon		E62 (perchloric acid)

TABLE 2 Tensile Requirements

	TABLE 2	Tensile F	Requirements			
Diameter or Section Thickness,	Temper Designation	Tensile	Strength, min	Yield Strength at 0.5 % Extension Under Load, min		Elongation in 4 × Diameter or
https://stand.in [mm]eh.ai/catalo	g star Standard Former DC48-	ksi	[MPa] ^A	s-bo _{ksi} le	4Cac [MPa] ^{ASUII}	Thickness of Specimen, min, %
	Copper Alloy	UNS No.	C27450, C2745	1		

		0110 110. 0	21430, 021431			
All Sizes	M10 As Hot Forged–Air Cooled	50	[345]	18	[124]	25
	Copper Alloy UI	IS Nos Ca	35330 and C377	'00		
Up to 11/2 [38.1], incl	M10 As Hot Forged–Air Cooled	50	[345]	18	[124]	25
Over 11/2 [38.1]	M10 As Hot Forged–Air Cooled	46	[317]	15	[103]	30
01011/2[00.1]	Copper Alloy UNS Nos. C46400, C48200, C					00
All sizes	M10 As Hot Forged–Air Cooled	52	[358]	22	[152]	25
	Copper Alloy UN	-	F 1		[]	
All sizes	M10 As Hot Forged-Air Cooled	50	[345]	20	[140]	20
		NIOV UNS N	No. C49355	-		
All Sizes	M10 As Hot Forged-Air Cooled	50	[345]	20	[140]	15
All Sizes	O20 Hot Forged and Annealed	50	[345]	20	[140]	15
	Copper A	Alloy UNS N	No. C64200			
Up to 11/2 [38.1], incl	M10 As Hot Forged–Air Cooled	70	[483]	25	[172]	30
Over 11/2 [38.1]	M10 As Hot Forged–Air Cooled	68	[469]	23	[156]	35
	Copper A	Alloy UNS N	No. C69300			
All sizes	M10 As Hot Forged-Air Cooled	65	[450]	26	[180]	15
	Copper A	Alloy UNS N	No. C70620			
Up to 6 [152], incl	M10 As Hot Forged–Air Cooled	45	[310]	18	[124]	30
Over 6 [152]	M10 As Hot Forged–Air Cooled	40	[276]	15	[103]	30
All sizes	O20 Hot Forged and Annealed	40	[276]	15	[103]	30
		Alloy UNS N	No. C71520			
Up to 6 [152], incl	M10 As Hot Forged – Air Cooled	50	[345]	20	[138]	30
Over 6 [152]	M10 As Hot Forged – Air Cooled	45	[310]	18	[124]	30
All sizes	O20 Hot Forged and Annealed	45	[310]	18	[124]	30
			7700 and C877			
All sizes	M10 as Hot Forged-Air Cooled	40	[310]	15	[103]	15

^A See Appendix X4.

B283/B283M – 14

Tin	<1.3 %	E478
	>1.3 %	E478
Zinc	<2 %	E478 (AA)
	>2 %	E478 (titrimetric)
		ISO Test Method 7602

Tellurium

NOTE— < = less than: > = greater than

13.1.2 Test method(s) to be followed for the determination of element(s) resulting from contractual or purchase order agreement shall be as agreed upon between the manufacturer or supplier and purchaser.

14. Certification

14.1 Certification to this specification is mandatory for product purchased for *ASME Boiler and Pressure Vessel* applications.

15. Keywords

15.1 copper and copper alloy die forgings (hot pressed); die forgings (hot pressed); UNS No. C11000; UNS No. C14500; UNS No. C14700; UNS No. C27450; UNS No. C27451; UNS No. C35330; UNS No. C36500; UNS No. C37000; UNS No. C37700; UNS No. C46400; UNS No. C48200; UNS No. C48500; UNS No. C48200; UNS No. C48500; UNS No. C49250; UNS No. C49255; UNS No. C49260; UNS No. C49300; UNS No. C49340; UNS No. C49350; UNS No. C49340; UNS No. C62300; UNS No. C63200; UNS No. C64200; UNS No. C65500; UNS No. C67500; UNS No. C67600; UNS No. C69300; UNS No. C70620; UNS No. C71520; UNS No. C77400; UNS No. C87700; UNS No. C87710

SUPPLEMENTARY REQUIREMENTS

The following supplementary requirements shall apply only when specified by the purchaser in the inquiry, contract or order, for agencies of the U.S. government.

S1. Supplementary Requirements S1, S2, and S4 of ASTM B249/B249M shall apply.

S2. **Identification Marking**—Individual forgings shall be marked with the producer's name or trademark, this ASTM specification number, the UNS number, and the heat number or serial number. The method and location of marking shall be in accordance with MIL-STD-792. If approved by the purchaser, the forgings may be bundled or boxed and each bundle or box provided with a metal or oil-proof tag showing the above information.

S2.1 **Sampling**—The lot size, portion size, and selection of sample pieces shall be as follows:

1. Lot Size—For forgings weighing 250 lbs [114 kg] or less, a lot shall be 2000 lbs [909 kg] or less, and shall consist of forgings of the same design and alloy forged from the same material heat and heat treated at the same time. For forgings exceeding 250 lbs [114 kg], each individual forging shall constitute a lot.

S2.2 *Portion Size*—For forgings less than 250 lbs [114 kg], two forgings per lot shall be selected for tensile testing. Tensile tests shall be performed on each forging over 250 lbs [114 kg].

S2.3 *Chemical Analysis*—If heat identification is required, one sample for chemical analysis shall be taken for each heat at the time of pouring or from semifinished or finished product.

S2.4 *Tensile Testing*—The tensile specimens shall be taken from integral forging prolongations or shall be removed from the forgings by trepanning. Alternatively, samples may be taken from separately forged test bars of the same heat as the forgings in the lot provided the wall thickness and amount of working for the test bar are equivalent to those for the forgings. The axis of the tensile specimen shall be located at any point midway between the center and the surface of solid forgings and at any point midway between the inner and outer surfaces of the wall of hollow forgings, and shall be parallel to the direction of greatest grain flow to the greatest extent possible.

S2.5 Liquid Penetrant Inspection—When specified by the purchaser, each piece of each lot shall be inspected in accordance with NAVSEA T9074-AS-GIB-101/271.

S2.6 **Ultrasonic Inspection**—When specified by the purchaser, each piece of each lot shall be inspected.

1. General Requirements—Ultrasonic testing shall be performed in accordance with NAVSEA T9074-AS-GIB-101/271. Acoustic compatibility between the production material and the calibration standard material shall be within 75 %. If the acoustic compatibility is within 25 %, no gain compensation is required for the examination. If acoustic compatibility difference is between 25 and 75 %, a change in the gain or dB controls shall be accomplished to compensate for the differences in acoustic compatibility. This method cannot be used if the ultrasonic noise level exceeds 50 % of the rejection value.

S3. Calibration:

S3.1 Shear Wave—The shear wave test shall be calibrated on two notches, one notch cut into the inside and one into the outside surface. The notches shall be cut axially and shall have a depth of 5 % of the material thickness or $\frac{1}{4}$ in. [6.4 mm], whichever is less. Notch length shall not exceed 1 in. [25.4 mm]. Notches shall be made either in the piece to be examined or in a separate defect-free specimen of the same size (within $\pm \frac{1}{8}$ in. [3.2 mm]), shape, material, and condition, or acoustically similar material. The position and amplitude of the response from each notch shall be marked on the instrument screen or a transparent overlay, and these marks shall be used as the evaluation reference. Indications that appear between these points shall be evaluated on the basis of a straight line joining the two peak amplitudes.

S3.2 Longitudinal Wave—The longitudinal wave test shall be calibrated on a flat-bottomed reference hole of a given diameter in accordance with Table S5.1 for specified material thickness drilled either into the piece to be tested or into a separate defect-free specimen of the same size (within $\pm \frac{1}{8}$ in.

TABLE S5.1 Ultrasonic Testing Reference Hole for Rod, Bar, Disk
Pancake Forgings, and Forgings

Material Thickness, in. [mm]	Hole Diameter, in. [mm]
Up to and including 6 [152]	1⁄8 [3.2]
Over 6 [152] and including 16 [406]	1⁄4 [6.4]
Over 16 [406]	As agreed upon

[3.2 mm]), shape, material, and condition or acoustically similar material. Holes are to be drilled to midsection and the bottom of the hole shall be parallel to the entrant surface. The ultrasonic test instrument shall be adjusted so that the response from the reference hole shall not be less than 25 % and not more than 75 % of screen height.

S3.3 *Recalibration*—During quality conformance inspection, any realignment of the search unit that will cause a decrease in the calibrated sensitivity and resolution, or both, or any change in search unit, couplant, instrument settings, or scanning speed from that used for calibration shall require recalibration. Recalibration shall be performed at least once per 8-h shift.

S4. *Procedure:*

S4.1 *Ring and Hollow Round Products*—Rings and other hollow cylindrical products shall be tested using the shear wave method by the contact or immersion technique. The shear wave entrant angle shall be such to ensure reflection from the notch or notches used in calibration. For contact testing, the

search unit shall be fitted with a wedge or shoe machined to fit the curvature of the piece being inspected. The product also shall be inspected with a longitudinal wave test from the external circumferential and end surfaces.

S4.2 *Disk or Pancake Forgings*—Disk or pancake forgings shall be inspected with a longitudinal wave technique from both parallel surfaces.

S5. Acceptance Criteria:

S5.1 *Shear Wave*—Any material that produces indications equal to or larger than the response from the reference notch or higher than the straight line joining the two peak amplitudes shall be rejected.

S5.2 Longitudinal Wave—Any material that produces indications equal to or larger than the response from the reference hole or that produces a complete loss of back reflection shall be rejected. Material shall be tested using a square, rectangular, or circular transducer having an effective area of 1 in.² or less, but no dimension shall be smaller than the diameter of the reference hole. In the event of disagreement on the degree of back reflection loss, it shall be determined by the contact method using a 1- to 1 $\frac{1}{8}$ -in. [25.4- to 28.6-mm] diameter transducer or one whose area falls within this range.

S5.3 *Reference Notch Removal*—If reference notches or flat-bottomed holes are made in the material to be tested, they shall be so located that their subsequent removal will not impair the suitability of the material for its intended use.

https://standards.iteh.ai Document Preview

ASTM B283/B283M-14

https://standards.iteh.ai/catalog/standards/sist/fcbc4871-dc67-4f27-96f8-bbade4cac0f3/astm-b283-b283m-14