



<b>AEROSPACE MATERIAL SPECIFICATION</b>	<b>AMS4501</b>	<b>REV. E</b>
	Issued 1967-11 Revised 2000-06 Noncurrent 2008-03 Reaf Nonc 2013-09  Superseding AMS4501D	
Copper Sheet, Strip, and Plate Oxygen-Free, Light Cold Rolled		

#### RATIONALE

AMS4501E has been reaffirmed to comply with the SAE five-year review policy.

#### NONCURRENT NOTICE

This specification has been declared "NONCURRENT" by the Aerospace Materials Division, SAE, as of March, 2008. It is recommended, therefore, that this specification not be specified for new designs.

"NONCURRENT" refers to those specifications which have previously been widely used and which may be required for production or processing of existing designs in the future. The Aerospace Materials Division, however, does not recommend these specifications for future use in new designs. "NONCURRENT" specifications are available from SAE upon request.

Similar but not necessarily identical products are covered in the following specification. However, this is provided for information only and does not constitute authority to substitute this specification for the "NONCURRENT" specification.

ASTM B 152 (UNS 10200), Copper Sheet, Strip, Plate, and Rolled Bar, Temper H00 (eighth hard)

SAENORM.COM : Click to view the full PDF of AMS4501E

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2013 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

**TO PLACE A DOCUMENT ORDER:** Tel: 877-606-7323 (inside USA and Canada)  
Tel: +1 724-776-4970 (outside USA)  
Fax: 724-776-0790  
Email: CustomerService@sae.org  
http://www.sae.org

SAE WEB ADDRESS:

**SAE values your input. To provide feedback on this Technical Report, please visit**  
<http://www.sae.org/technical/standards/AMS4501E>

## 1. SCOPE:

### 1.1 Form:

This specification covers one type of copper in the form of sheet, strip, and plate.

### 1.2 Application:

These products have been used typically for parts requiring high electrical or thermal conductivity, but usage is not limited to such applications.

## 2. APPLICABLE DOCUMENTS:

The issue of the following documents in effect on the date of the purchase order form, a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been canceled and no superseding document has been specified, the last published issue of that document shall apply.

### 2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2222 Tolerances, Copper and Copper Alloy Sheet, Strip, and Plate

MAM 2222 Tolerances, Metric, Copper and Copper Alloy Sheet, Strip, and Plate

SAENORM.COM : Click to view the full PDF of AMS4501E

## 2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM B 193	Resistivity of Electrical Conductor Materials
ASTM B 248	General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar
ASTM B 248M	General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar (Metric)
ASTM E 8	Tension Testing of Metallic Materials
ASTM E 8M	Tension Testing of Metallic Materials (Metric)
ASTM E 53	Chemical Analysis of Copper
ASTM E 290	Semi-Guided Bend Test for Ductility of Metallic Materials

## 3. TECHNICAL REQUIREMENTS:

### 3.1 Material:

Shall be oxygen-free copper containing not less than 99.95% by weight copper (including silver), determined by wet chemical methods in accordance with ASTM E 53, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

### 3.2 Condition:

Cold rolled, light cold rolled (eighth hard (H00)) temper (see 8.2).

### 3.3 Properties:

The product shall conform to the following requirements:

3.3.1 Ultimate Tensile Strength: Shall be 32.0 to 40.0 ksi (221 to 276 MPa), determined in accordance with ASTM E 8 or ASTM E 8M.

3.3.2 Bending: Product 0.188 inch (4.78 mm) and under in nominal thickness shall withstand, without cracking, bending in accordance with ASTM E 290 at room temperature through an angle of 180 degrees around a diameter equal to the nominal thickness of the product with axis of bend parallel to the direction of rolling. Bending requirements for product over 0.188 inch (4.78 mm) in nominal thickness shall be agreed upon by purchaser and vendor.

3.3.3 Electrical Resistivity: Shall be not greater than  $0.15775 \Omega \cdot \text{g}/\text{m}^2$  at  $20 \text{ }^\circ\text{C} \pm 2$  ( $68 \text{ }^\circ\text{F} \pm 4$ ), determined in accordance with ASTM B 193.

3.3.4 Embrittlement: Product 0.188 inch (4.78 mm) and under in nominal thickness, after heating as in 3.3.4.1, shall withstand, without fracture, not less than four 90-degree reverse bends. Product over 0.188 inch (4.78 mm) in nominal thickness shall not show evidence of gassing or open-grain structure characteristic of embrittlement after heating as in 3.3.4.1.

3.3.4.1 Specimens from the product shall be heated to 800 to 875 °C (1472 to 1607 °F) in a furnace containing a hydrogen atmosphere, held at heat for not less than 20 minutes, and cooled to prevent oxygen absorption during cooling. Specimens from product 0.188 inch (4.78 mm) and under in nominal thickness shall be clamped between jaws having edge radii equal to 2.5 times the nominal thickness of the specimen, bent through an angle of 90 degrees over one edge of the jaws, and returned to its original position; this constitutes one bend. Specimens shall then be bent through an angle of 90 degrees in the reverse direction and returned to its original position; this constitutes a second bend. Each successive bend shall be made in the opposite direction from the previous bend. Specimens from product over 0.188 inch (4.78 mm) in nominal thickness shall be polished, etched if desired, and examined at 75 to 200X magnification.

#### 3.4 Quality:

The product, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to usage of the product.

#### 3.5 Tolerances:

Shall conform to AMS 2222 or MAM 2222 as applicable to nonrefractory alloys.

### 4. QUALITY ASSURANCE PROVISIONS:

#### 4.1 Responsibility for Inspection:

The vendor of the product shall supply all samples for vendor's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the specified requirements.

#### 4.2 Classification of Tests:

All technical requirements are acceptance tests and shall be performed on each lot.

#### 4.3 Sampling and Testing:

Shall be in accordance with ASTM B 248 or ASTM B 248M and the following:

4.3.1 Specimens for tensile testing shall be taken with axis of specimen parallel to the direction of rolling.

#### 4.4 Reports:

The vendor of the product shall furnish with each shipment a report showing the results of tests for composition, tensile properties, and electrical resistivity of each lot and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS 4501D, size, and quantity.