



AEROSPACE MATERIAL SPECIFICATION

AMS2251

REV. H

Issued 1945-05

Revised 2006-09

Reaffirmed 2013-11

Superseding AMS2251G

Tolerances Low-Alloy Steel Bars

RATIONALE

AMS2251H has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE

This specification covers established inch/pound manufacturing tolerances applicable to low-alloy steel bars ordered to inch/pound dimensions. These tolerances apply to all conditions, unless otherwise noted. The term "exclusive" is used to apply only to the higher figure of the specified range.

1.1 No clear cut demarcation is available to differentiate between bar and wire products, so no definitions of these products are included.

2. DIAMETER OR THICKNESS

2.1 Cold Finished

2.1.1 Cold Drawn

Table 1 includes tolerances for bars that have been annealed, spheroidize annealed, normalized, normalized and tempered, or quenched and tempered before cold finishing. This table does not include tolerances for bars that are spheroidize annealed, normalized, normalized and tempered, or quenched and tempered after cold finishing.

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/AMS2251H>

2.1.1.1 Width governs the tolerances for both width and thickness of flats. For example, when the maximum of carbon range is up to 0.28, inclusive, for a flat 2.000 inches wide and 1.000 inch thick, the width tolerance is 0.006 inch and the thickness tolerance is the same, namely, 0.006 inch.

TABLE 1 - TOLERANCES, INCH, MINUS ONLY; MAXIMUM OF CARBON RANGE, %

Specified Diameter of Thickness Inches	Over 0.55, Carbon, With or Without Stress Relieving or Annealing After Cold Finishing, and All Carbons				
	Up to 0.28 Carbon, incl	Over 0.28 to 0.55 Carbon, incl	Up to 0.55 Carbon, incl, Stress Relieved or Annealed After Cold Finishing	Quenched and Tempered or Normalized and Tempered Before Cold Finishing	
ROUNDS					
Up to 1.000, incl, in coils	0.002	0.003	0.004	0.005	
Up to 1.500, incl	0.003	0.004	0.005	0.006	
Over 1.500 to 2.500, incl	0.004	0.005	0.006	0.007	
Over 2.500 to 4.000, incl	0.005	0.006	0.007	0.008	
HEXAGONS					
Up to 0.750, incl	0.003	0.004	0.005	0.007	
Over 0.750 to 1.500, incl	0.004	0.005	0.006	0.008	
Over 1.500 to 2.500, incl	0.005	0.006	0.007	0.009	
Over 2.500 to 3.125, incl	0.006	0.007	0.008	0.010	
Over 3.125 to 4.000, incl	0.006	-	-	-	
SQUARES					
Up to 0.750, incl	0.003	0.005	0.006	0.008	
Over 0.750 to 1.500, incl	0.004	0.006	0.007	0.009	
Over 1.500 to 2.500, incl	0.005	0.007	0.008	0.010	
Over 2.500 to 4.000, incl	0.007	0.009	0.010	0.012	
Over 4.000 to 5.000, incl	0.011	-	-	-	
FLATS					
Specified Width, Inches					
Up to 0.750, incl	0.004	0.005	0.007	0.009	
Over 0.750 to 1.500, incl	0.005	0.006	0.009	0.011	
Over 1.500 to 3.000, incl	0.006	0.007	0.011	0.013	
Over 3.000 to 4.000, incl	0.007	0.009	0.012	0.017	
Over 4.000 to 6.000, incl	0.009	0.011	0.013	0.021	
Over 6.000	0.014	-	-	-	

2.1.1.2 When rough turned round bars are permitted, the tolerances in Table 1 shall be doubled.

2.1.1.3 The tolerances for flats apply to both width and thickness.

2.1.1.4 Tolerances in the column headed "Over 0.28 to 0.55 carbon, inclusive" also apply to all carbons up to 0.55 maximum, annealed or normalized before cold finishing.

2.1.2 Machined Bars

Tolerances for machined bars 0.375 inch and over in specified diameter or thickness are shown in Table 2. Bars up to 0.375 inch, exclusive, in specified diameter or thickness are supplied centerless ground.

TABLE 2 - TOLERANCES, MACHINED BARS

Specified Diameter or Thickness Inches	Tolerance plus only Inch	Out of Round Inch
0.375 to 2.000, incl	0.016	0.008
Over 2.000 to 4.000, incl	0.031	0.016
Over 4.000	0.031	0.016

2.1.3 Centerless Ground Bars

Tolerances for centerless ground bars 0.125 to 4.062 inches, inclusive, in specified diameter are shown in Table 3. Bars over 4.062 inches specified diameter are supplied machined.

TABLE 3 - TOLERANCES, CENTERLESS-GROUND BARS

Specified Diameter Inches	Tolerance plus or minus Inch	Out of Round Inch
0.125 to 0.3125, excl	0.001	0.001
0.3125 to 0.500, excl	0.0015	0.0015
0.500 to 1.000, excl	0.002	0.002
1.000 to 1.500, incl	0.0025	0.0025
Over 1.500 to 3.250, incl	0.003	0.003
Over 3.250 to 4.062	0.005	0.005

2.1.4 Ground and Polished Rounds

See Table 4.

TABLE 4 - TOLERANCES, GROUND AND POLISHED ROUNDS

Specified Diameter Inches	Tolerance Inch Minus only
Up to 1.500, incl	0.001
Over 1.500 to 2.500, excl	0.0015
2.500 to 3.000, incl	0.002
Over 3.000 to 4.000, incl	0.003

2.2 Hot Finished

2.2.1 Rounds and Squares

See Table 5.

2.2.1.1 Out-of-round is the difference between the maximum and minimum diameters of the bar, measured at the same cross-section. Out-of-square is the difference in the two dimensions at the same cross-section of a square bar between opposite faces.

TABLE 5 - TOLERANCES, HOT FINISHED ROUNDS AND SQUARES

Specified Diameter or Thickness Inches		Tolerance Inch Plus	Tolerance Inch Minus	Out-of-Round or Out-of-Square Inch
Up to 0.3125, incl		0.005	0.005	0.008
Over 0.3125 to 0.4375, incl		0.006	0.006	0.009
Over 0.4375 to 0.625, incl		0.007	0.007	0.010
Over 0.625 to 0.875, incl		0.008	0.008	0.012
Over 0.875 to 1.000, incl		0.009	0.009	0.013
Over 1.000 to 1.125, incl		0.010	0.010	0.015
Over 1.125 to 1.250, incl		0.011	0.011	0.016
Over 1.250 to 1.375, incl		0.012	0.012	0.018
Over 1.375 to 1.500, incl		0.014	0.014	0.021
Over 1.500 to 2.000, incl		0.016	0.016	0.023
Over 2.000 to 2.500, incl		0.031	0	0.023
Over 2.500 to 3.500, incl		0.047	0	0.035
Over 3.500 to 4.500, incl		0.063	0	0.046
Over 4.500 to 5.500, incl		0.078	0	0.058
Over 5.500 to 6.500, incl		0.125	0	0.070
Over 6.500 to 8.250, incl		0.156	0	0.085
Over 8.250 to 9.500, incl		0.188	0	0.100
Over 9.500 to 10.000, incl		0.250	0	0.120

2.2.2 Hexagons and Octagons

See Table 6.

TABLE 6 - TOLERANCES, HOT FINISHED HEXAGONS AND OCTAGONS

Specified Distance Between Parallel Sides, Inches	Tolerance Inch Plus	Tolerance Inch Minus	Maximum Difference, Inch, 3 Measurements, For Hexagons Only
Up to 0.500, incl	0.007	0.007	0.011
Over 0.500 to 1.000, incl	0.010	0.010	0.015
Over 1.000 to 1.500, incl	0.021	0.013	0.025
Over 1.500 to 2.000, incl	0.031	0.016	0.031
Over 2.000 to 2.500, incl	0.047	0.016	0.047
Over 2.500 to 3.500, incl	0.063	0.016	0.063

2.2.3 Square-Edged and Round-Edged Flats

See Table 7.

2.2.3.1 Flats over 6.000 to 8.000 inches, inclusive, in specified width, are not available as hot rolled alloy steel bars in thicknesses under 0.230 inch.

2.2.3.2 Tolerances shall be negotiated for flats over 6.000 to 8.000 inches, inclusive, in specified width and over 3.000 inches in specified thickness.

TABLE 7 - THICKNESS TOLERANCES, INCH, PLUS AND MINUS; THICKNESS RANGES, INCH

Specified Width Inches	0.230		Over 0.500	Over 1.000 to 2.000	Over 2.000, to 3.000, Over 3.00	Width Tolerance Inch Plus	Width Tolerance Inch Minus
	0.203 to 0.230, excl	0.250 to 0.250, excl					
Up to 1.000, incl	0.007	0.007	0.008	0.010	-	-	0.016
Over 1.000 to 2.000, incl	0.007	0.007	0.012	0.015	0.031	-	0.031
Over 2.000 to 4.000, incl	0.008	0.008	0.015	0.020	0.031	0.047	0.063
Over 4.000 to 6.000, incl	0.009	0.009	0.015	0.020	0.031	0.047	0.094
Over 6.000 to 8.000, incl	-	0.015	0.016	0.025	0.031	0.047	0.125

3. WIDTH

Included in Section 2.

4. LENGTH

4.1 Cold Finished

No requirements specified.

4.2 Hot Finished

4.2.1 Hot Sheared

4.2.1.1 Rounds, Squares, Hexagons, and Octagons

See Table 8.

TABLE 8 - TOLERANCES, INCHES, PLUS ONLY; LENGTH RANGES, FEET

Specified Diameter or Distance Between Parallel Sides Inches	5 to 10, excl	10 to 20, excl	20 to 30, excl	30 to 40, excl	40 to 60, excl
Up to 1.000, incl	0.500	0.750	1.250	1.750	2.250
Over 1.000 to 2.000, incl	0.625	1.000	1.500	2.000	2.500
Over 2.000 to 5.000, incl	1.000	1.500	1.750	2.250	2.750
Over 5.000 to 9.500, incl	2.000	2.500	2.750	3.000	3.250