AN AMERICAN NATIONAL STANDARD

Metric Small Solid Rivets

ANSI/ASME B18.1.3M - 1983

12 mm Nominal Diameter and Smaller

REAFFIRMED 1995

FOR CURRENT COMMITTEE PERSONNEL
PLEASE SEE ASME MANUAL AS-11

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ERRATA

to

ANSI/ASME B18.1.3M-1983
METRIC SMALL SOLID RIVETS

Page 4, Table 3 — *Under* Main dimension 12.0 *for* Ds Min, *correct* 12.80 *to read* 11.80

Page 5, Table 4 —

(1) *Under* Main dimension 12.0 *for* Ds Min, *correct* 12.80 *to read* 11.80

(2) *Under* Main dimension 4.0 *for* Head (DK) Basic (K) Min, *correct* 2.35 *to read* 2.25

M0131E

OCTOBER 1985

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
345 East 47th Street, New York, N.Y. 10017

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FOREWORD

(This Foreword is not a part of ANSI/ASME B18.1.3M-1983, Metric Small Solid Rivets.)

American National Standards Committee B18 for the standardization of bolts, screws, nuts, rivets, and similar fasteners was organized in March 1922 as Sectional Committee B18 under the aegis of the American Engineering Standards Committee (later the American Standards Association, then the United States of America Standards Institute and, as of October 6, 1969, the American National Standards Institute, Inc.), with the Society of Automotive Engineers and the American Society of Mechanical Engineers as joint sponsors. Subcommittee 1 was subsequently established and charged with the responsibility for technical content of standards covering solid rivets.

At its meeting on December 4, 1974, Committee B18 authorized preparation of a series of standards for metric fasteners. Subcommittee 1 was assigned responsibility for developing standards for metric solid rivets.

In February 1978, Committee B18 established a cooperative program with the Department of Defense to draft American National Standards for metric fasteners in such a way that they could be used directly by the Government for procurement purposes. The Department of Defense requested that each product be covered in separate standards, and Subcommittee 1 accepted this approach.

This Standard was approved by letter ballot of Committee B18 on February 4, 1983, and was subsequently approved by the sponsor and submitted to the American National Standards Institute for designation as an American National Standard. This was granted on September 8, 1983.

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AN AMERICAN NATIONAL STANDARD

METRIC SMALL SOLID RIVETS
12 mm Nominal Diameter and Smaller

1 INTRODUCTORY NOTES

1.1 Scope

1.1.1 This Standard covers complete general and dimensional data for those types of metric small solid rivets recognized as American National Standard. Included is an appendix covering formulas on which dimensional data are based. It should be understood, however, that where questions arise concerning acceptance of a product, the dimensions in the tables shall govern over recalculation by formula.

1.1.2 The inclusion of dimensional data in this Standard is not intended to imply that all of the products described are stock production sizes. Consumers should consult with manufacturers concerning the availability of products. For recommended diameter–length combinations, refer to Table 7.

1.1.3 Metric small solid rivets purchased for Government use shall conform to this Standard and additionally to the requirements of Appendix II.

1.2 Comparison With ISO Standards

Except for the inclusion of the 9 mm and 11 mm diameters as nonpreferred sizes and the relegating of the 1 mm and 1.2 mm to the secondary series, the basic rivet diameters shown in this Standard are in conformance with the ISO Recommendation, Rivet Shank Diameters, ISO R1051-1969E for sizes up to and including 12 mm. At present, there are no ISO Standards for commercial small solid rivets nor are any contemplated at this time.

1.3 Rivet Diameters

The nominal sizes of metric small rivets from 1 mm through 12 mm are given in Table 1 and shall be considered American National Standard. This, however, does not preclude the manufacture or use of rivets having other diameters which shall be considered special.

1.4 Rivet Head Styles

This Standard covers specifications for flat head rivets as given in Table 3, round head rivets as given in Table 4, and flat 90° countersunk head rivets as shown in Table 5.

The proportions for heads of rivets indicated in the respective tables shall be standard; other proportions shall be considered special. Where nonstandard diameter rivets are required for special applications, the proportions of heads and points, if pointed, should preferably be based on the formulations given in Appendix I.

1.5 Dimensions

All dimensions in this Standard are given in millimeters (mm) unless otherwise stated. Symbols specifying geometric characteristics are in accordance with American National Standard, Dimensioning and Tolerancing, ANSI Y14.5.

1.6 Terminology

For definitions of terms relating to fasteners or component features thereof used in this Standard, refer to American National Standard, Glossary of Terms for Mechanical Fasteners, ANSI B18.12.

1.7 Related Standards

It should be noted that Standards for large rivets, tubular and split rivets, and other related fasteners are published under separate cover.

1.8 Referenced Standards

Copies of referenced ASTM Standards may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

Copies of referenced SAE Standards may be obtained from the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pennsylvania 15096.

Copies of referenced ANSI Standards may be obtained from the American National Standards Institute, 1430 Broadway, New York, New York 10018, or from The American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, New York 10017.

Copies of referenced ISO Standards may be obtained from the American National Standards Institute, 1430 Broadway, New York, New York 10018.

1.9 Designation

Metric small solid rivets shall be designated by the following data in the sequence shown: nominal size; nominal length; product name, including head style; pointed (where other than plain point is desired); material; and protective finish, if required. See examples below:

(*a*) 6 × 50 Plated Metric Flat Head Rivet, Solid, Steel, Zinc

(*b*) 8 × 25 Pointed, Brass Metric Round Head Rivet, Solid

1.10 Part Numbering System

The Government Part Numbering System for metric small solid rivets is given in Appendix II. This system may be used by any user needing a definitive part numbering system.

2 GENERAL DATA

2.1 Head Information

2.1.1 Head Dimensions. The head dimensions tabulated in the respective dimensional tables are applicable to rivets produced by the normal cold heading process. Tolerances applicable to rivets made by the hot heading or forging process shall be as agreed upon between the manufacturer and purchaser. On countersunk heads, the junction of the conical bearing surface with the nominal rivet diameter may not be the same as the actual junction of head with shank, so the head height delineating the conical bearing surface is a reference dimension.

2.1.2 Head True Position. The axis of the head shall be located at true position relative to the axis of the rivet shank within a tolerance zone having a diameter equivalent to 6% of the specified maximum head diameter.

TABLE 1 RIVET DIAMETERS, mm

Nominal Diameter	
Main Series	Secondary Series
	(1.0)
	(1.2)
	(1.4)
1.6	
2.0	
2.5	
3.0	
	(3.5)
4.0	
5.0	
6.0	
	(7.0)
8.0	
	(9.0)
10.0	
	(11.0)
12.0	

GENERAL NOTE:
Sizes in parentheses ( ) are nonpreferred.

2.1.3 Bearing Surface. The bearing surface on round and flat head rivets shall be perpendicular to the axis of the rivet shank within 2°.

2.2 Underhead Fillets

Rivets shall be furnished with a definite fillet (R) under the head. Except for 1, 1.2, and 1.4 mm sizes, the radius of the fillet shall not exceed 10% of the maximum shank diameter or 0.80 mm, whichever is smaller. Fillet limits are shown on product dimensional tables.

2.3 Length

2.3.1 Measurement. The length of rivet shall be measured, parallel to the axis of the rivet, from the extreme end to the plane of the bearing surface for rivets having flat bearing surface type heads, and to

TABLE 2 TOLERANCE ON LENGTH, mm

Nominal Rivet Diameter	Nominal Rivet Diameter	Tolerance on Length Plus
1 to 3	to 25 incl.	0.50
	over 25	0.75
3.5 to 5	to 25 incl.	0.50
	from 25 to 50 incl.	0.75
	over 50	0.90
6 to 10	to 25 incl.	0.70
	from 25 to 75 incl.	0.80
	over 75	1.00
11 to 12	to 75 incl.	0.80
	from 75 to 150 incl.	1.00
	over 150	1.20

the top of the head for rivets having countersunk type heads.

2.3.2 Tolerance on Length. The tolerance on the length of rivets shall be as shown in Table 2.

2.3.3 Standard Lengths. The standard rivet diameter–length combinations shall be as depicted in Table 7.

2.4 Straightness

Straightness: the shank of the rivet shall be straight within a maximum camber of 0.006 mm/mm of rivet length.

2.5 Points

Unless otherwise specified, rivets shall have plain sheared ends. The end shall be perpendicular within 2° to the axis of the rivet and reasonably flat, sufficient for the purposes of driving that end satisfactorily. Where so specified by the user, rivets having standard header points as shown in Table 6 shall be furnished.

2.6 Materials and Mechanical Properties

2.6.1 Steel. Suitable material for solid steel rivets is covered by the American Society for Testing and Materials, ASTM Standard A 31, Grade A; or SAE Recommended Practice, Mechanical and Chemical Requirements for Nonthreaded Fasteners, SAE J430, Grade 0.

2.6.2 Other Materials. Where so specified, rivets may also be made from corrosion resistant steel, brass, aluminum, or other materials having properties as agreed upon between the manufacturer and purchaser.

2.6.3 Hardness Testing. When hardness tests are required for rivets larger than 4 mm nominal diameter, they shall be made at the midradius of a cross section of the rivet body, one diameter from the end of the rivet.

When hardness tests are required for rivets with nominal diameters of 4 mm or less, they shall be tested in the core at a distance of one diameter from the end of the rivet and using an appropriate hardness test method with hardness readings which will convert to the equivalent hardness scale or reading of the reference standard.

2.7 Finish

Unless otherwise specified, rivets shall be supplied with a natural (as annealed processed) finish, unplated or uncoated.

2.8 Workmanship

The finished rivets shall be free from defects affecting their serviceability. Bursts or shear bursts at the periphery of the head shall be acceptable, provided that if two or more bursts are present, then only one may have a width greater than 0.040D, and this one burst shall not have a width exceeding 0.080D, where D is the actual part diameter. A definition of bursts and shear bursts may be found in SAE Recommended Practice J-1061a (or latest issue).

2.9 Marking Practice

Unless specified on the inquiry or order, the heads of rivets produced to this Standard are not required to be identified as being metric series product. Manufacturer's identification symbol and location are at producer's option. Markings may be raised or depressed and shall not be considered part of the head height.

2.10 Hole Sizes

Due to the many variables in the application of rivets, such as materials, grip length, sandwich elements, etc., this Standard does not offer a table of recommended hole sizes and tolerances. However, as a guide, the hole size should be from 105% to 108% of the nominal rivet diameter, using the lower end of the range for short grip lengths and the upper end of the range for long grip lengths.

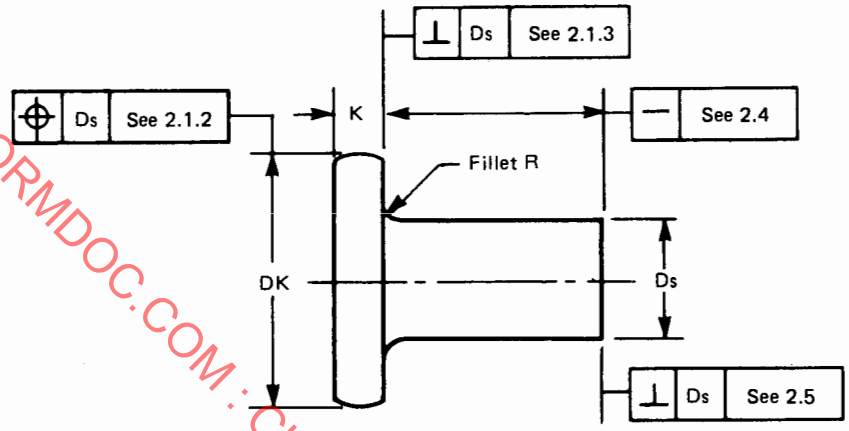

TABLE 3 DIMENSIONS OF FLAT HEAD RIVETS, mm

Main				1.6	2.0	2.5	3.0		4.0	5.0	6.0		8.0		10.0		12.0
Secondary	(1.0)	(1.2)	(1.4)					(3.5)				(7.0)		(9.0)		(11.0)	
Ds																	
Max	1.05	1.25	1.45	1.65	2.05	2.55	3.06	3.56	4.06	5.08	6.08	7.10	8.10	9.10	10.12	11.12	12.12
Min	0.95	1.15	1.35	1.52	1.92	2.42	2.90	3.40	3.90	4.88	5.88	6.85	7.85	8.85	9.80	10.80	12.80
Head (DK)																	
Basic	2.00	2.40	2.80	3.20	4.00	5.00	6.00	7.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00	24.00
Max	2.20	2.60	3.00	3.40	4.20	5.20	6.25	7.25	8.25	10.25	12.35	14.35	16.40	18.40	20.40	22.45	24.45
Min	1.80	2.20	2.60	3.00	3.80	4.80	5.75	6.75	7.75	9.75	11.65	13.65	15.60	17.60	19.60	21.55	23.55
Basic (K)	0.33	0.40	0.46	0.53	0.66	0.83	0.99	1.16	1.32	1.65	1.98	2.31	2.64	2.97	3.30	3.63	3.96
Max	0.45	0.52	0.48	0.68	0.81	0.98	1.14	1.31	1.50	1.83	2.18	2.51	2.89	3.22	3.55	3.88	4.24
Min	0.21	0.28	0.34	0.38	0.51	0.68	0.84	1.01	1.14	1.47	1.78	2.11	2.39	2.72	3.05	3.38	3.68
Fillet (R)																	
Max	0.15	0.15	0.15	0.15	0.20	0.25	0.30	0.35	0.40	0.50	0.60	0.70	0.80	0.80	0.80	0.80	0.80
Min	0.05	0.05	0.05	0.05	0.10	0.15	0.15	0.15	0.20	0.25	0.30	0.40	0.40	0.40	0.40	0.45	0.50

GENERAL NOTES:
(a) Sizes in parentheses ( ) are nonpreferred.
(b) For additional requirements refer to Section 2, General Data

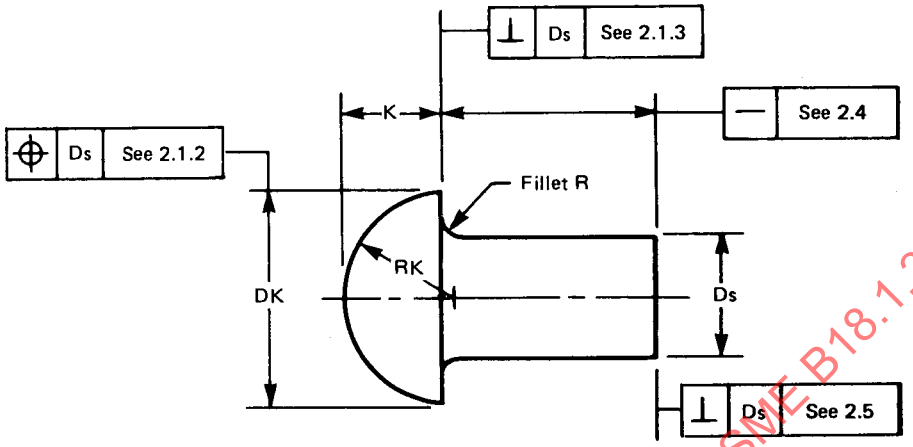

TABLE 4 DIMENSIONS OF ROUND HEAD RIVETS, mm

Main				1.6	2.0	2.5	3.0		4.0	5.0	6.0		8.0		10.0		12.0
Secondary	(1.0)	(1.2)	(1.4)					(3.5)				(7.0)		(9.0)		(11.0)	
Ds																	
Max	1.05	1.25	1.45	1.65	2.05	2.55	3.06	3.56	4.06	5.08	6.08	7.10	8.10	9.10	10.12	11.12	12.12
Min	0.95	1.15	1.35	1.55	1.92	2.42	2.90	3.40	3.90	4.88	5.88	6.85	7.85	8.85	9.80	10.80	12.80
Head (DK)																	
Basic	1.75	2.10	2.45	2.80	3.50	4.38	5.25	6.13	7.00	8.75	10.50	12.25	14.00	15.75	17.50	19.25	21.00
Max	1.95	2.30	2.65	3.05	3.75	4.63	5.50	6.38	7.28	9.03	10.80	12.55	14.40	16.15	17.95	19.70	21.50
Min	1.55	1.90	2.25	2.55	3.25	4.13	5.00	5.88	6.72	8.47	10.20	11.95	13.60	15.35	17.05	18.80	20.50
Basic (K)	0.60	0.72	0.84	0.96	1.20	1.50	1.80	2.10	2.40	3.00	3.60	4.20	4.80	5.40	6.00	6.60	7.20
Max	0.72	0.84	0.96	1.08	1.32	1.62	1.92	2.25	2.55	3.15	3.75	4.38	4.98	5.58	6.20	6.80	7.40
Min	0.48	0.60	0.72	0.84	1.08	1.38	1.68	1.95	2.35	2.85	3.45	4.02	4.62	5.22	5.80	6.40	7.00
RK Approx.	0.94	1.13	1.31	1.50	1.88	2.35	2.81	3.29	3.75	4.69	5.63	6.57	7.50	8.44	9.38	10.32	11.26
Fillet (R)																	
Max	0.15	0.15	0.15	0.20	0.20	0.25	0.30	0.35	0.40	0.50	0.60	0.70	0.80	0.80	0.80	0.80	0.80
Min	0.05	0.05	0.05	0.10	0.10	0.15	0.15	0.15	0.20	0.25	0.30	0.40	0.40	0.40	0.40	0.45	0.50

GENERAL NOTES:
(a) Sizes in parentheses ( ) are nonpreferred.
(b) For additional requirements refer to Section 2, General Data

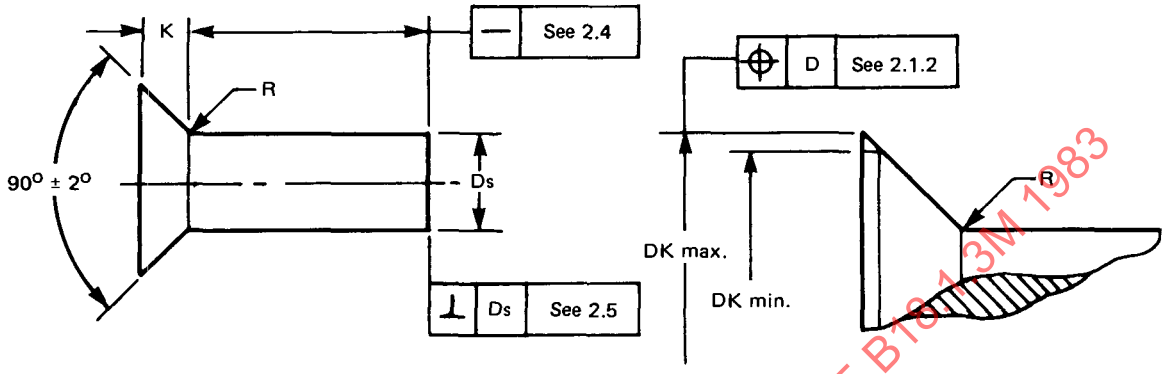

TABLE 5 DIMENSIONS OF FLAT COUNTERSUNK HEAD RIVETS, mm

D		Ds		DK		K	R	
Body Diameter		Shank Diameter		Head Diameter		Head Height	Underhead Fillet Radius	
Main Series	Secondary Series	Max	Min	Max (2)	Min (3)	Ref (1)	Max	Min
	(1.0)	1.05	0.95	1.93	1.68	0.43	0.15	0.05
	(1.2)	1.25	1.15	2.31	2.03	0.51	0.15	0.05
	(1.4)	1.45	1.35	2.68	2.38	0.60	0.15	0.05
1.6		1.65	1.52	3.06	2.72	0.68	0.15	0.05
2.0		2.05	1.92	3.81	3.38	0.85	0.20	0.10
2.5		2.55	2.42	4.75	4.25	1.06	0.25	0.15
3.0		3.06	2.90	5.70	5.09	1.28	0.30	0.15
	(3.5)	3.56	3.40	6.64	5.96	1.49	0.35	0.15
4.0		4.06	3.90	7.58	6.82	1.70	0.40	0.20
5.0		5.08	4.88	9.48	8.53	2.13	0.50	0.25
6.0		6.08	5.88	11.36	10.27	2.55	0.60	0.30
	(7.0)	7.10	6.85	13.26	11.97	2.98	0.70	0.40
8.0		8.10	7.85	15.14	13.70	3.40	0.80	0.50
	(9.0)	9.10	8.85	17.02	15.43	3.83	0.80	0.50
10.0		10.12	9.80	18.92	17.11	4.25	0.80	0.50
	(11.0)	11.12	10.80	20.80	18.84	4.68	0.80	0.50
12.0		12.12	11.80	22.68	20.57	5.10	0.80	0.50

GENERAL NOTES:
(a) Sizes in parentheses ( ) are nonpreferred.
(b) For additional requirements refer to Section 2, General Data

NOTES:
(1) Head height (K) is given for reference purposes only. Variations in this dimension are controlled by the head and shank diameters and the included angle of the head.
(2) Sharp edged head. Tabulated maximum values calculated on nominal head height, maximum shank diameter, and 92° included angle extended to a sharp edge.
(3) Rounded or flat edged irregularly shaped head. Tabulated values calculated from nominal head height, minimum shank diameter, and 88° included angle.

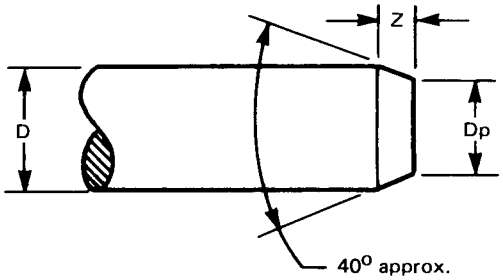

TABLE 6 DIMENSIONS OF STANDARD HEADER POINTS FOR METRIC SMALL SOLID RIVETS, mm

D Nominal	Pt. Length Z Approx.	Pt. Dia Dp Approx.	Nom. Rivet Length (1)
(1.0)	0.25	0.80	6
(1.2)	0.30	1.00	7
(1.4)	0.35	1.15	9
1.6	0.40	1.30	10
2.0	0.50	1.65	10
2.5	0.65	2.05	15
3.0	0.75	2.45	20
(3.5)	0.90	2.85	20
4.0	1.0	3.25	25
5.0	1.25	4.10	30
6.0	1.50	4.90	40
(7.0)	1.75	5.70	40
8.0	2.00	6.55	40
(9.0)	2.25	7.35	50
10.0	2.50	8.20	50
(11.0)	2.75	9.00	60
12.0	3.00	9.80	75

GENERAL NOTES:
(a) Sizes in parentheses ( ) are nonpreferred.
(b) No standard tolerances for point dimensions are contemplated.

NOTE:
(1) Header points normally apply to these nominal shank lengths or shorter. The pointing of longer shank lengths may require machining to the dimensions specified.

TABLE 7 RECOMMENDED RIVET LENGTHS, mm

Nominal Rivet Length	Nominal Rivet Size																
	(1.0)	(1.2)	(1.4)	1.6	2.0	2.5	3.0	(3.5)	4.0	5.0	6.0	(7.0)	8.0	(9.0)	10.0	(11.0)	12.0
2	FR	FR															
3	A	A	FR	FR	FR												
4	A	A	A	A	A	FR	FR										
5	A	A	A	A	A	A	A	FR	FR								
6	A	A	A	A	A	A	A	A	A	FR							
8	A	A	A	A	A	A	A	A	A	A	A	FR	FR				
10		A	A	A	A	A	A	A	A	A	A	A	A	FR	FR		
12			A	A	A	A	A	A	A	A	A	A	A	A	A	FR	FR
15				A	A	A	A	A	A	A	A	A	A	A	A	A	A
18					A	A	A	A	A	A	A	A	A	A	A	A	A
20					A	A	A	A	A	A	A	A	A	A	A	A	A
22						A	A	A	A	A	A	A	A	A	A	A	A
25						A	A	A	A	A	A	A	A	A	A	A	A
28							A	A	A	A	A	A	A	A	A	A	A
30							A	A	A	A	A	A	A	A	A	A	A
32								A	A	A	A	A	A	A	A	A	A
35								A	A	A	A	A	A	A	A	A	A
38									A	A	A	A	A	A	A	A	A
40									A	A	A	A	A	A	A	A	A
45										A	A	A	A	A	A	A	A
50										A	A	A	A	A	A	A	A
55											A	A	A	A	A	A	A
60											A	A	A	A	A	A	A
65												A	A	A	A	A	A
70												A	A	A	A	A	A
75													A	A	A	A	A
80													A	A	A	A	A
85														A	A	A	A
90														A	A	A	A
95															A	A	A
100															A	A	A
110																A	A
120																	A

GENERAL NOTE:
Lengths between heavy lines are recommended for the applicable rivet size and head style where A denotes all head styles, F denotes flat head style, and R denotes round head style.

APPENDIX I

TABLES AND FORMULAS FOR RIVET DIMENSIONS

SHANK DIAMETER, mm

D = nominal diameter of rivet shank

Nominal Diameter (D)		Shank Diameter (Ds)			
		Tolerances		Diameter	
Main Series	Secondary Series	Plus	Minus	Max.	Min.
	(1.0)	0.05	0.05	1.05	0.95
	(1.2)	0.05	0.05	1.25	1.15
	(1.4)	0.05	0.05	1.45	1.35
1.6		0.05	0.08	1.65	1.52
2.0		0.05	0.08	2.05	1.92
2.5		0.05	0.08	2.55	2.42
3.0		0.06	0.10	3.06	2.90
	(3.5)	0.06	0.10	3.56	3.40
4.0		0.06	0.10	4.06	3.90
5.0		0.08	0.12	5.08	4.88
6.0		0.08	0.12	6.08	5.88
	(7.0)	0.10	0.15	7.10	6.85
8.0		0.10	0.15	8.10	7.85
	(9.0)	0.10	0.15	9.10	8.85
10.0		0.12	0.20	10.12	9.80
	(11.0)	0.12	0.20	11.12	10.80
12.0		0.12	0.20	12.12	11.80

GENERAL NOTE:
Sizes in parentheses ( ) are nonpreferred.

FLAT HEAD RIVET, mm
D = nominal diameter of rivet shank

Nominal Rivet Size	Head Diameter (DK)			Head Height (K)		
		Tolerance			Tolerance	
	Basic	Plus	Minus		Plus	Minus
(1.0)	DK = 2.00D	0.20	0.20	K = 0.33D	0.12	0.12
(1.2)		0.20	0.20		0.12	0.12
(1.4)		0.20	0.20		0.12	0.12
1.6		0.20	0.20		0.15	0.15
2.0		0.20	0.20		0.15	0.15
2.5		0.20	0.20		0.15	0.15
3.0		0.25	0.25		0.15	0.15
(3.5)		0.25	0.25		0.15	0.15
4.0		0.25	0.25		0.18	0.18
5.0		0.25	0.25		0.18	0.18
6.0		0.35	0.35		0.20	0.20
(7.0)		0.35	0.35		0.20	0.20
8.0		0.40	0.40		0.25	0.25
(9.0)		0.40	0.40		0.25	0.25
10.0		0.40	0.40		0.25	0.25
(11.0)		0.45	0.45		0.25	0.25
12.0		0.45	0.45		0.28	0.28

GENERAL NOTE:
Sizes in parentheses ( ) are nonpreferred.

ROUND HEAD RIVET, mm
D = nominal diameter of rivet shank

Nominal Rivet Size	Head Diameter (DK)			Head Height (K)			Head Radius (Rk) Basic Approx.
		Tolerance			Tolerance		
	Basic	Plus	Minus		Plus	Minus	
(1.0)	DK = 1.75D	0.20	0.20	K = 0.60 D	0.12	0.12	RK = 0.938 D
(1.2)		0.20	0.20		0.12	0.12	
(1.4)		0.20	0.20		0.12	0.12	
1.6		0.25	0.25		0.12	0.12	
2.0		0.25	0.25		0.12	0.12	
2.5		0.25	0.25		0.12	0.12	
3.0		0.25	0.25		0.12	0.12	
(3.5)		0.25	0.25		0.15	0.15	
4.0		0.28	0.28		0.15	0.15	
5.0		0.28	0.28		0.15	0.15	
6.0		0.30	0.30		0.15	0.15	
(7.0)		0.30	0.30		0.18	0.18	
8.0		0.40	0.40		0.18	0.18	
(9.0)		0.40	0.40		0.18	0.18	
10.0		0.45	0.45		0.20	0.20	
(11.0)		0.45	0.45		0.20	0.20	
12.0		0.50	0.50		0.20	0.20	

GENERAL NOTE:
Sizes in parentheses ( ) are nonpreferred.