BLIND RIVETS

METRIC PULL THROUGH MANDREL BLIND RIVETS

IFI 520 1982

1. Scope.

1.1 Scope. This standard establishes the dimensional, mechanical, and performance requirements of metric pull through mandrel blind rivets suitable for use in engineering assemblies where load transmitting capability by the rivet is a design requirement.

1.2 Definitions.

1.2.1 Blind Rivet. A blind rivet is a blind fastener which has a self-contained mechanical, chemical or other feature which permits the formation of an upset on the blind end of the rivet and expansion of the rivet shank during rivet setting to join the component parts of an assembly.

1.2.2 A pull through mandrel blind rivet is a two piece assembly consisting of a rivet body and a mandrel. During the setting operation, the mandrel is pulled into and completely through the rivet body without mandrel breakage and leaving the body of the installed rivet hollow.

1.2.3 Definitions of other terms used in this standard are given in IFI-110, "Glossary of Terms Relating to Blind Rivets," page H—1.

2. Designations.

2.1 Styles. The two basic styles of pull through mandrel blind rivets are designated as protruding head and 100 deg flush head. Protruding head rivets are available in two styles designated as regular head and large head.

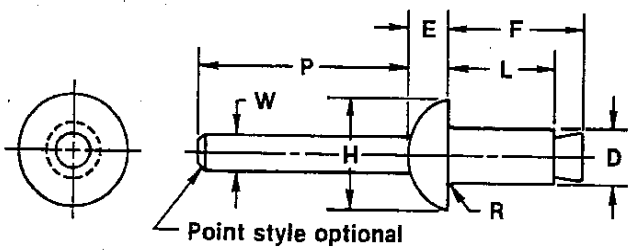

Table 1 Dimensions of Regular and Large Protruding Head Pull Through Mandrel Blind Rivets

Rivet Series No.	Nom Rivet Size	D		H		E	H		E	R	W	P	F
		Body Dia		Style 1 — Regular Head			Style 2 — Large Head			Radius of Fillet	Mandrel Dia	Mandrel Protrusion	Blind Side Protrusion
				Head Dia		Head Height	Head Dia		Head Height				
		Max	Min	Max	Min	Max	Max	Min	Max	Max	Nom	Min	Max
4	3.2	3.25	3.10	6.65	6.05	1.63	9.91	9.14	1.65	0.7	2.16	19	L + 2.4
5	4.0	4.04	3.89	8.33	7.52	1.96	12.40	11.38	1.90	0.7	2.72	19	L + 3.2
6	4.8	4.83	4.67	10.01	9.04	2.29	16.51	15.24	2.34	0.8	3.20	19	L + 3.6
8	6.3	6.43	6.27	13.33	12.07	2.97	19.81	18.29	2.72	0.9	4.29	19	L + 4.0
See Notes		3, 4								5			6

NOTES:

1. All dimensions are in millimeters.
2. For application data see Table 2.
3. Maximum body diameter may be increased by 0.03 mm within 2.5 mm of underside of head.
4. Maximum body diameter of Grade 30 rivets may be increased by 0.03 mm when rivets are plated or coated.
5. For Grade 40 rivets, the maximum fillet radius for No. 6 rivets may be 0.9 mm, and for No. 8 rivets may be 1.5 mm.
6. When computing the blind side protrusion (F), the maximum length of rivet (L) as given in Table 2 for the applicable grip shall be used. Minimum blind side clearance may be calculated by subtracting the actual grip (G), (i.e., total thickness of the material to be joined), from the specified blind side protrusion (F). (Example: To join two plates, each 2.5 mm thick, with a No. 5 rivet, a No. 54 rivet would be used. Minimum blind side clearance necessary to permit proper rivet setting would be L + 3.2 — G, which is 9.7 + 3.2 — 5.0, and equals 7.9 mm).

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Table 2 Application Data for Protruding Head Pull Through Mandrel Blind Rivets

Rivet Series No.	Nom Rivet Size	Recommended Metric Drill Size	Recommended Hole Size		Rivet No.	Grip Range	Rivet Length L
			Max	Min			Max
4	3.2	3.3	3.38	3.28	41	to 1.6	4.4
					42	1.7 to 3.2	5.9
					43	3.3 to 4.8	7.5
					44	4.9 to 6.4	9.1
					45	6.5 to 7.9	10.7
					46	8.0 to 9.5	12.3
					47	9.6 to 11.1	13.9
					48	11.2 to 12.7	15.5
					49	12.8 to 14.3	17.0
					410	14.4 to 15.9	18.6
5	4.0	4.1	4.16	4.06	51	to 1.6	4.9
					52	1.7 to 3.2	6.5
					53	3.3 to 4.8	8.1
					54	4.9 to 6.4	9.7
					55	6.5 to 7.9	11.3
					56	8.0 to 9.5	12.9
					57	9.6 to 11.1	14.4
					58	11.2 to 12.7	16.0
					59	12.8 to 14.3	17.6
					510	14.4 to 15.9	19.2
6	4.8	4.9	4.98	4.88	61	to 1.6	5.5
					62	1.7 to 3.2	7.1
					63	3.3 to 4.8	8.7
					64	4.9 to 6.4	10.2
					65	6.5 to 7.9	11.8
					66	8.0 to 9.5	13.4
					67	9.6 to 11.1	15.0
					68	11.2 to 12.7	16.6
					69	12.8 to 14.3	18.2
					610	14.4 to 15.9	19.4
					611	16.0 to 17.5	21.4
					612	17.6 to 19.1	22.9
					613	19.2 to 20.6	24.5
					614	20.7 to 22.2	26.1
					615	22.3 to 23.8	27.7
					616	23.9 to 25.4	29.3
8	6.3	6.5	6.63	6.53	82	1.6 to 3.2	8.2
					83	3.3 to 4.8	9.8
					84	4.9 to 6.4	11.4
					85	6.5 to 7.9	13.0
					86	8.0 to 9.5	14.6
					87	9.6 to 11.1	16.2
					88	11.2 to 12.7	17.7
					89	12.8 to 14.3	19.3
					810	14.4 to 15.9	20.9
					811	16.0 to 17.5	22.5
					812	17.6 to 19.1	24.1
					813	19.2 to 20.6	25.7
					814	20.7 to 22.2	27.3
See Notes		2				3	

NOTES:

1. All dimensions are in millimeters.
2. Recommended drill sizes are those which normally produce holes within the specified hole size limits.
3. If economically feasible, and if blind side clearances permit, rivets with lengths longer than those recommended for a given grip may be substituted. In this way, the number of different inventory items may be reduced.

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2.2 Grades. The material combinations of pull through mandrel blind rivets are designated as grades, with each material combination representing a different combination of rivet body material and mandrel material as given in Table 5.

2.3 Design. The design of pull through mandrel blind rivets shall be in accordance with the practice of the manufacturer.

3. Requirements.

3.1 Materials and Processes.

3.1.1 Material. Rivet bodies and mandrels shall be made of the material specified for the grade in Table 5. When the specific material analysis is not given, the analysis shall be selected by the manufacturer and shall be such to assure that rivets meet the mechanical and performance requirements specified in 3.3.

3.1.2 Heat Treatment. Rivet components may be heat treated as necessary to meet the mechanical and performance requirements specified for the grade. Heat treatment shall be in accordance with good commercial practice.

3.1.3 Finish. Grade 30 rivet bodies are either zinc or cadmium plated with a minimum plating thickness of 4μm. Rivet bodies of all other grades are furnished plain (bare metal) unless

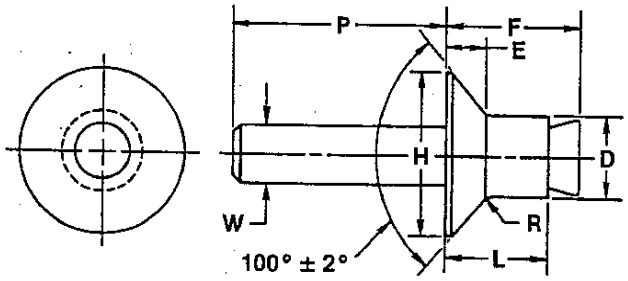

Table 3 Dimensions of 100 Deg Flush Head Pull Through Mandrel Blind Rivets

Rivet Series No.	Nom Rivet Size	D		H		E	R	W	P	F
		Body Dia		Head Dia		Head Height	Radius of Fillet	Mandrel Dia	Mandrel Protrusion	Blind Side Protrusion
		Max	Min	Max	Min	Ref	Max	Nom	Min	Max
4	3.2	3.25	3.10	5.92	5.23	1.14	0.7	2.16	19	L + 2.4
5	4.0	4.04	3.89	7.47	6.73	1.47	0.8	2.72	19	L + 3.2
6	4.8	4.83	4.67	9.17	8.36	1.85	0.9	3.20	19	L + 3.6
8	6.3	6.43	6.27	12.29	11.35	2.49	1.0	4.29	19	L + 4.0
See Notes		5		3		4				6

NOTES:

1. All dimensions are in millimeters.
2. For application data see Table 4.
3. Maximum head diameter is calculated on nominal rivet diameter and nominal head angle extended to sharp corner. Minimum head diameter is absolute.
4. Head height is given for reference purposes only. Variations in this dimension are controlled by the diameters (H) and (D) and the included angle of the head.
5. Maximum body diameter of Grade 30 rivets may be increased by 0.03 mm when rivets are plated or coated.
6. When computing the blind side protrusion (F), the maximum length of rivet (L) as given in Table 4 for the applicable grip shall be used. Minimum blind side clearance may be calculated by subtracting the actual grip (G), (i.e., the total thickness of the material to be joined), from the specified blind side protrusion (F). (Example: To join two plates, each 4.7 mm thick with a No. 6 rivet, a No. 66 rivet would be used. Minimum blind side clearance necessary to permit proper rivet setting would be L + 3.6 — G, which is 13.4 + 3.6 — 9.4 which equals 7.6 mm).

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Table 4 Application Data for 100 Deg Flush Head Pull Through Mandrel Blind Rivets

Rivet Series No.	Nom Rivet Size	Recommended Metric Drill Size	Recommended Hole Size		Rivet No.	Grip Range	Rivet Length L
			Max	Min			Max
4	3.2	3.3	3.38	3.28	41	to 1.6	4.4
					42	1.7 to 3.2	5.9
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					53	3.3 to 4.8	8.1
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					65	6.5 to 7.9	11.8
					66	8.0 to 9.5	13.4
					67	9.6 to 11.1	15.0
					68	11.2 to 12.7	16.6
					69	12.8 to 14.3	18.2
					610	14.4 to 15.9	19.4
					611	16.0 to 17.5	21.4
					612	17.6 to 19.1	22.9
					613	19.2 to 20.6	24.5
					614	20.7 to 22.2	26.1
					615	22.3 to 23.8	27.7
					616	23.9 to 25.4	29.3
8	6.3	6.5	6.63	6.53	82	1.6 to 3.2	8.2
					83	3.3 to 4.8	9.8
					84	4.9 to 6.4	11.4
					85	6.5 to 7.9	13.0
					86	8.0 to 9.5	14.6
					87	9.6 to 11.1	16.2
					88	11.2 to 12.7	17.7
					89	12.8 to 14.3	19.3
					810	14.4 to 15.9	20.9
					811	16.0 to 17.5	22.5
					812	17.6 to 19.1	24.1
					813	19.2 to 20.6	25.7
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See Notes		2				3	

NOTES:

1. All dimensions are in millimeters.
2. Recommended drill sizes are those which normally produce holes within the specified hole size limits.
3. If economically feasible, and if blind side clearances permit, rivets with lengths longer than those recommended for a given grip may be substituted. In this way, the number of different inventory items may be reduced.

Table 5 Grades of Pull Through Mandrel Blind Rivets

Grade Designation	Rivet Body Material	Mandrel Material
17	Aluminum Alloy 2117	Carbon Steel
18	Aluminum Alloy 5052	Carbon Steel
19	Aluminum Alloy 5056	Carbon Steel
25	Aluminum Alloy 2017	Carbon Steel
30	Low Carbon Steel	Carbon Steel
40	Nickel-Copper Alloy (Monel)	Carbon Steel

otherwise specified. Because mandrels are discarded following rivet setting, mandrels of all materials may be furnished plain or with a protective coating at the option of the manufacturer.

3.2 Dimensional Requirements.

3.2.1 Rivet Dimensions. Protruding and 100 deg flush head pull through mandrel blind rivets shall conform to the dimensions given in Tables 1 and 3, respectively.

3.2.2 Application Data. Recommendations on the selection and application of protruding and 100 deg flush head pull through mandrel blind rivets are given in Tables 2 and 4, respectively.

3.3 Mechanical and Performance Requirements.

3.3.1 Shear Strength. Rivets, except those described in 3.3.3, shall have ultimate shear strengths not less than the minimum ultimate shear strengths specified for the applicable size and grade given in Table 6 when tested in accordance with 2.1 of IFI-522, page H—29.

3.3.2 Tensile Strength. Rivets, except those described in 3.3.3, shall have ultimate tensile strengths not less than the minimum ultimate tensile strengths specified for the applicable size and grade given in Table 6 when tested in accordance with 2.2 of IFI-522.

3.3.3 Protruding head rivets with specified maximum grip lengths shorter than 1.0 times the nominal rivet diameter, and 100 deg flush head rivets with specified maximum grip lengths shorter than 1.5 times the nominal rivet diameter shall not be subject to either shear or tensile testing.

4. Marking.

Rivets need not be marked to identify either grade or source of manufacture.

5. Inspection.

Rivets shall be inspected to determine conformance with dimensional, mechanical and performance requirements. Inspection should be performed in accordance with sampling plans given in MIL-STD-105. Alternate inspection procedures may be specified by the purchaser on the purchase order or engineering drawings.

Table 6 Ultimate Shear and Tensile Strength of Pull Through Mandrel Blind Rivets

Nom Rivet Size mm	Ultimate Shear Strength newtons, min						Ultimate Tensile Strength newtons, min					
	Grade 17	Grade 18	Grade 19	Grade 25	Grade 30	Grade 40	Grade 17	Grade 18	Grade 19	Grade 25	Grade 30	Grade 40
3.2	620	580	530	1100	890	1110	980	930	800	1700	1330	1780
4.0	980	930	840	2080	1510	1780	1560	1510	1290	3200	2270	2890
4.8	1470	1380	1200	2600	2220	2760	2230	2230	1870	4000	2980	4670
6.3	2670	—	2180	—	4000	5120	4270	—	3470	—	5780	8450