BLIND RIVETS

PULL THROUGH MANDREL BLIND RIVETS

IFI 117 1986

1. Scope.

1.1 Scope. This standard establishes the dimensional, mechanical, and performance requirements for 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 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 (also known as a hollow blind rivet) is a two piece assembly consisting of a rivet body and a man-

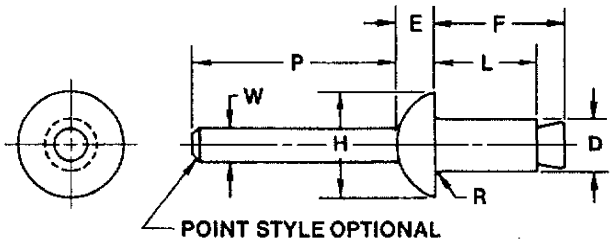

Table 1 Dimensions of Regular and Large Protruding Head Pull Through Mandrel Blind Rivets

Rivet Series No.	Nom Rivet Size	D		H		E	H		E	R	W	P	F	L
		Body Diameter		Style 1 Regular Head			Style 2 Large Head			Radius of Fillet	Mandrel Dia	Mandrel Protrusion	Blind Side Protrusion	Rivet Body Length Length L
				Head Diameter		Head Height	Head Diameter		Head Height					
		Max	Min	Max	Min	Max	Max	Min	Max	Max	Nom	Min	Max	Max
4	1/8 0.1250	0.128	0.122	0.262	0.238	0.064	0.390	0.360	0.065	0.025	0.085	1.00	L + .093	See Table 2
5	5/32 0.1562	0.159	0.153	0.328	0.296	0.077	0.488	0.448	0.075	0.025	0.107	1.00	L + .125	
6	3/16 0.1875	0.190	0.184	0.394	0.356	0.090	0.650	0.600	0.092	0.030	0.126	1.00	L + .141	
8	1/4 0.2500	0.253	0.247	0.525	0.475	0.117	0.780	0.720	0.107	0.035	0.169	1.00	L + .156	
See Note 3		4, 5								6			7	

NOTES:

1. All dimensions are in inches.
2. For application data see Table 2.
3. Rivet series numbers represent the nominal size in 1/32 inch.
4. Maximum body diameter may be increased by 0.001 inch within 0.100 inch of underside of head.
5. Maximum body diameter of Grade 30 rivets may be increased by 0.001 inch when rivets are plated or coated.
6. For Grade 40 rivets, the maximum fillet radius for 3/16 inch rivets may be 0.035 inch, and for 1/4 inch rivets may be 0.060 inch.
7. When computing the blind side protrusion (F), the maximum length of rivet body (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 .100 inch thick, with a 5/32 inch rivet, a No. 54 rivet would be used. Minimum blind side clearance necessary to permit proper rivet setting would be L + .125 − G, which is .380 + .125 − .200, and equals .305 inch.)

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

Rivet Series No.	Nom Rivet Size	Recommended Drill Size	Recommended Hole Size		Rivet No.	Recommended Grip Range	Rivet Body Length L
			Max	Min			Max
4	1/8 0.1250	#30	0.133	0.129	41	To .062	.170
					42	.063 - .125	.232
					43	.126 - .187	.295
					44	.188 - .250	.357
					45	.251 - .312	.420
					46	.313 - .375	.482
					47	.376 - .437	.545
					48	.438 - .500	.607
					49	.501 - .562	.670
					410	.563 - .625	.732
5	5/32 0.1562	#20	0.164	0.160	51	To .062	.192
					52	.063 - .125	.255
					53	.126 - .187	.317
					54	.188 - .250	.380
					55	.251 - .312	.442
					56	.313 - .375	.505
					57	.376 - .437	.567
					58	.438 - .500	.630
					59	.501 - .562	.692
					510	.563 - .625	.755
6	3/16 0.1875	#11	0.196	0.192	61	To .062	.215
					62	.063 - .125	.277
					63	.126 - .187	.340
					64	.188 - .250	.402
					65	.251 - .312	.465
					66	.313 - .375	.527
					67	.376 - .437	.590
					68	.438 - .500	.652
					69	.501 - .562	.715
					610	.563 - .625	.777
					611	.626 - .687	.840
					612	.688 - .750	.902
					613	.751 - .812	.965
					614	.813 - .875	1.027
					615	.876 - .937	1.090
					616	.938 - 1.000	1.152
8	1/4 0.2500	F	0.261	0.257	82	.063 - .125	.322
					83	.126 - .187	.385
					84	.188 - .250	.447
					85	.251 - .312	.510
					86	.313 - .375	.572
					87	.376 - .437	.635
					88	.438 - .500	.697
					89	.501 - .562	.760
					810	.563 - .625	.822
					811	.626 - .687	.885
					812	.688 - .750	.947
					813	.751 - .812	1.010
					814	.813 - .875	1.072
See Note		3			2	4	

NOTES:

1. All dimensions are in inches.
2. The first numeral in the rivet number designates the rivet series number, the last one or two numerals give the maximum grip in 1/16 inch which the rivet is capable of joining.
3. Recommended drill sizes are those which normally produce holes within the specified hole size limits.
4. 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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drel. 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 K-40.

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.

2.2 **Grades.** The material combinations of pull through mandrel blind rivets are designated as grades, with each material combina-

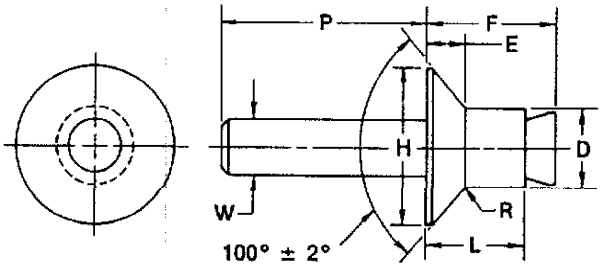

Table 3 Dimensions of 100 Deg Flush Head Pull Through Mandrel Blind Rivets

Rivet Series No.	Nom Rivet Size	D		H		E	R	W	P	F	L
		Body Diameter		Head Diameter		Head Height	Radius of Fillet	Mandrel Dia	Mandrel Protrusion	Blind Side Protrusion	Rivet Body Length
		Max	Min	Max	Min	Ref	Max	Nom	Min	Max	Max
4	1/8 0.1250	0.128	0.122	0.233	0.206	0.045	0.025	0.085	1.00	L + .093	See Table 4
5	5/32 0.1562	0.159	0.153	0.294	0.265	0.058	0.030	0.107	1.00	L + .125	
6	3/16 0.1875	0.190	0.184	0.361	0.329	0.073	0.035	0.126	1.00	L + .141	
8	1/4 0.2500	0.253	0.247	0.484	0.447	0.098	0.040	0.169	1.00	L + .156	
See Note 3		6		4		5				7	

NOTES:

1. All dimensions are in inches.
2. For application data see Table 4.
3. Rivet series numbers represent the nominal size in 1/32 inch.
4. Maximum head diameter is calculated on nominal rivet diameter and nominal head angle extended to sharp corner. Minimum head diameter is absolute.
5. 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.
6. Maximum body diameter of Grade 30 rivets may be increased by 0.001 inch when rivets are plated or coated.
7. When computing the blind side protrusion (F), the maximum length of rivet body (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., total thickness of the material to be joined), from the specified blind side protrusion (F). (Example: To join two plates, each .187 inch thick with a 3/16 inch rivet, a No. 66 rivet would be used. Minimum blind side clearance necessary to permit proper rivet setting would be L + .141 − G, which is .527 + .141 − .374 which equals .294 inch.)

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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 Drill Size	Recommended Hole Size		Rivet No.	Recommended Grip Range	Rivet Body Length L
			Max	Min			Max
4	1/8 0.1250	#30	0.133	0.129	41	To .062	.170
					42	.063 - .125	.232
					43	.126 - .187	.295
					44	.188 - .250	.357
					45	.251 - .312	.420
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					611	.626 - .687	.840
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					613	.751 - .812	.965
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					616	.938 - 1.000	1.152
8	1/4 0.2500	F	0.261	0.257	82	.063 - .125	.322
					83	.126 - .187	.385
					84	.188 - .250	.447
					85	.251 - .312	.510
					86	.313 - .375	.572
					87	.376 - .437	.635
					88	.438 - .500	.697
					89	.501 - .562	.760
					810	.563 - .625	.822
					811	.626 - .687	.885
					812	.688 - .750	.947
					813	.751 - .812	1.010
					814	.813 - .875	1.072
See Note		3			2	4	

NOTES:

1. All dimensions are in inches.
2. The first numeral in the rivet number designates the rivet series number, the last one or two numerals give the maximum grip in 1/16 inch which the rivet is capable of joining.
3. Recommended drill sizes are those which normally produce holes within the specified hole size limits.
4. 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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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

tion 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 *Materials.* 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 0.00015 in. Rivet bodies of all other grades are furnished plain (bare metal) unless otherwise specified. Because mandrels are discarded following rivet setting, mandrels of all grades 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

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

Nom Rivet Size In.	ULTIMATE SHEAR STRENGTH min lbs						ULTIMATE TENSILE STRENGTH min lbs					
	GRADE 17	GRADE 18	GRADE 19	GRADE 25	GRADE 30	GRADE 40	GRADE 17	GRADE 18	GRADE 19	GRADE 25	GRADE 30	GRADE 40
1/8 0.1250	140	130	120	250	200	250	220	210	180	380	300	400
5/32 0.1562	220	210	190	470	340	400	350	340	290	720	510	650
3/16 0.1875	330	310	270	580	500	620	530	500	420	900	670	1050
1/4 0.2500	600	—	490	—	900	1150	960	—	780	—	1300	1900

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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-135.

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-135.

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. Test Methods.

Tests shall be conducted in accordance with the test methods specified in IFI-135, page K-89.

5. Inspection.

Rivets shall be inspected to determine conformance with dimensional, mechanical, and performance requirements. Inspection shall be as agreed upon between manufacturer and purchaser.

In case of dispute following shipment of rivets, acceptability shall be determined in accordance with procedures given in IFI-137, page K-93.