

BLIND RIVETS

STRUCTURAL FLUSH BREAK PULL MANDREL SELF-PLUGGING BLIND RIVETS

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1. Scope.

1.1 Scope. This standard establishes the dimensional, mechanical and performance requirements of structural flush break pull mandrel self-plugging blind rivets suitable for use in joining the component parts of an assembly.

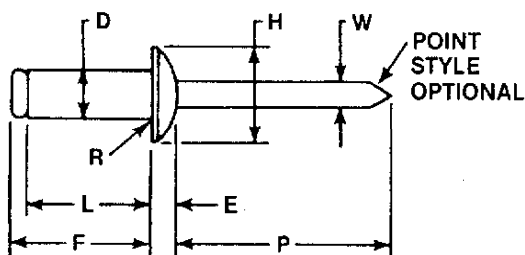
1.2 Definitions.

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 Structural flush break pull mandrel self-plugging blind rivets are pull mandrel type blind rivets where during the setting operation the mandrel is pulled into or against the rivet body and breaks at a point within or above the rivet head. Flush break means that the break plane of the mandrel occurs above the junction of rivet shank and head, thus the shear plane(s) of the joints will occur through rivet shank and mandrel.

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.

Table 1 Dimensions of Regular and Large Protruding Head Style Structural Flush Break Pull Mandrel Self-Plugging Blind Rivets

Rivet Series No.	Nom Rivet Size	D		H		E	H		E	R	W	P	F	L
		Body Dia		Style 1 - Regular Head		Head Height	Style 2 - Large Head		Head Height	Radius of Fillet	Mandrel Dia	Mandrel Protrusion	Blind Side Protrusion	Rivet Body Length
		Max	Min	Max	Min		Max	Min						
4	1/8 0.1250	0.128	0.122	0.262	0.238	0.040	0.390	0.360	0.065	0.020	0.076	1.00	L + .187	See Table 2
5	5/32 0.1562	0.159	0.153	0.328	0.296	0.050	0.468	0.448	0.075	0.020	0.095	1.00	L + .203	
6	3/16 0.1875	0.191	0.183	0.394	0.356	0.060	0.650	0.600	0.092	0.025	0.114	1.00	L + .218	
8	1/4 0.2500	0.255	0.246	0.525	0.475	0.080	0.780	0.720	0.107	0.030	0.151	1.00	L + .250	
See Notes 3										4			5	

NOTES:

- All dimensions are in inches.
- For application data see Table 2.
- Rivet series numbers represent the nominal size of rivets in 1/32 inch.
- The junction of head and shank shall have a fillet with a max radius as shown. For Grades 40, 50, 51 and 52 rivets, the max fillet radius for 3/16 in. rivets shall be 0.035 in., and for 1/4 in., rivet shall be 0.060 in.
- When computing the blind side protrusion (F), the max 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 in. thick, with a 5/32 in. rivet, a No. 53 rivet would be used. Minimum blind side clearance necessary to permit proper rivet setting would be L + .203 - G, which is .362 + .203 - .200, and equals .365 in.).



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Table 2 Application Data For Protruding Head Style Structural Flush Break Pull Mandrel Self-Plugging Blind Rivets

Rivet Series No.	Nom Rivet Size	Recommended Drill Size	Recommended Hole Size		Rivet No.	Grip Range		Rivet Body Length L
			Max	Min		Min	Max	Max
4	1/8 0.1250	#30	0.133	0.129	41	0.047	0.078	0.212
					41.5	0.078	0.109	0.275
					42	0.109	0.141	0.275
					42.5	0.141	0.172	0.337
					43	0.172	0.203	0.337
					43.5	0.203	0.234	0.400
					44	0.234	0.266	0.400
					44.5	0.266	0.297	0.462
					45	0.297	0.328	0.462
					45.5	0.328	0.359	0.525
					46	0.359	0.391	0.525
					46.5	0.391	0.422	0.587
					47	0.422	0.453	0.587
					47.5	0.453	0.484	0.650
					48	0.484	0.515	0.650
					5	5/32 0.1562	#20	0.164
49	0.546	0.578	0.712					
49.5	0.578	0.609	0.775					
50	0.609	0.640	0.775					
52	0.109	0.141	0.300					
52.5	0.141	0.172	0.362					
53	0.172	0.203	0.362					
53.5	0.203	0.234	0.425					
54	0.234	0.266	0.425					
54.5	0.266	0.297	0.487					
55	0.297	0.328	0.487					
55.5	0.328	0.359	0.550					
56	0.359	0.391	0.550					
56.5	0.391	0.422	0.613					
57	0.422	0.453	0.613					
57.5	0.453	0.484	0.675					
6	3/16 0.1875	#11	0.196	0.192	58	0.484	0.515	0.675
					58.5	0.515	0.546	0.737
					59	0.546	0.578	0.737
					59.5	0.578	0.609	0.800
					60	0.609	0.640	0.800
					61	0.046	0.078	0.325
					62	0.093	0.156	0.325
					63	0.156	0.218	0.450
					64	0.218	0.281	0.450
					65	0.281	0.343	0.575
					66	0.343	0.406	0.575
					67	0.406	0.468	0.700
					68	0.468	0.531	0.700
					69	0.531	0.593	0.825
					610	0.593	0.656	0.825
					611	0.656	0.719	0.950
612	0.719	0.781	0.950					
613	0.781	0.843	1.075					
8	1/4 0.2500	F	0.261	0.257	614	0.843	0.906	1.075
					615	0.906	0.968	1.200
					616	0.968	1.032	1.200
					82	0.093	0.156	0.375
					83	0.156	0.218	0.500
					84	0.218	0.281	0.500
					85	0.281	0.343	0.625
					86	0.343	0.406	0.625
					87	0.406	0.468	0.750
					88	0.468	0.531	0.750
					89	0.531	0.593	0.875
					810	0.593	0.656	0.875
					811	0.656	0.719	1.000
					812	0.719	0.781	1.000
					813	0.781	0.843	1.125
					814	0.843	0.906	1.125
815	0.906	0.968	1.250					
816	0.968	1.032	1.250					
See Notes		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 nominal grip in 1/16 in. which the rivet is capable of joining.
3. Recommended drill sizes are those which normally produce holes within the specified hole size limits.
4. The mean grip between specified min and max grips will give a mandrel break plane closest to being flush with the top surface of rivet head.



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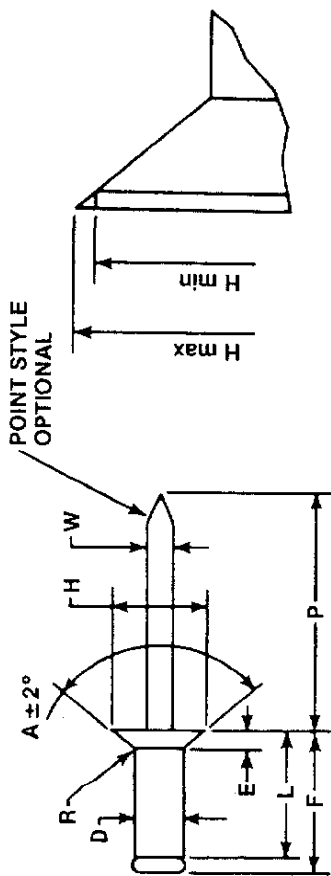


Table 3 Dimensions of 100 and 120 Deg Flush Head Style Structural Flush Break Pull Mandrel Self-Plugging Blind Rivets

Rivet Series No.	Nom Rivet Size	D		A		H		E		A		H		E		R		W		P		F		L	
		Body Dia		Head Angle		Head Dia		Head Height		Head Angle		Head Dia		Head Height		Radius of Fillet		Mandrel Dia		Mandrel Protru-sion		Blind Side Protru-sion		Rivet Body Length	
		Max	Min	Deg Nom	Deg Nom	Max	Min	Ref	Ref	Deg Nom	Deg Nom	Max	Min	Max	Min	Max	Max	Max	Min	Min	Max	Max	Max	Max	
4	1/8 0.1250	0.128	0.122	100	120	0.233	0.207	0.045	0.045	120	120	0.233	0.207	0.031	0.031	0.025	0.076	1.00	1.00	L + .187	L + .187	See Table 4			
5	5/32 0.1562	0.159	0.153	100	120	0.294	0.268	0.058	0.058	120	120	0.294	0.268	0.040	0.040	0.030	0.095	1.00	1.00	L + .203	L + .203				
6	3/16 0.1875	0.191	0.183	100	120	0.361	0.335	0.073	0.073	120	120	0.361	0.335	0.050	0.050	0.035	0.114	1.00	1.00	L + .218	L + .218				
See Notes 3							4		5			4		5								6			

NOTES:

- All dimensions are in inches.
- For application data see Table 4.
- Rivet series numbers represent the nominal sizes of rivets in 1/32 in.
- Max head diameter is calculated on nominal rivet diameter and nominal head angle extended to sharp corner. Min head diameter is absolute.
- 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. When computing the blind side protrusion (F), the max 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 in. thick, with a 3/16 in. rivet, a No. 66 rivet would be used. Minimum blind side clearance necessary to permit proper rivet setting would be L + .218 - G, which is .575 + .218 - .374 which equals .419 in.).



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2.1 Styles. The two basic styles of structural flush break pull mandrel self-plugging blind rivets are designated as protruding head and flush head. Protruding head rivets are available in two styles designated as regular head and large head. Flush head rivets are available in

two styles designated as 100 deg countersunk head and 120 deg countersunk head.

2.2 Grades. The material combinations of structural flush break pull mandrel self-plugging blind rivets are designated as grades, with each

**Table 4 Application Data for Flush Head Style Structural
Flush Break Pull Mandrel Self-Plugging Blind Rivets**

Rivet Series No.	Nom Rivet Size	Recom- mended Drill Size	Recommended Hole Size		Rivet No.	Grip Range		Rivet Body Length L					
			Max	Min		Min	Max						
4	1/8 0.1250	#30	0.133	0.129	42	0.109	0.141	0.275					
					42.5	0.141	0.172	0.337					
					43	0.172	0.203	0.337					
					43.5	0.203	0.234	0.400					
					44	0.234	0.266	0.400					
					44.5	0.266	0.297	0.462					
					45	0.297	0.328	0.462					
					45.5	0.328	0.359	0.525					
					46	0.359	0.391	0.525					
					46.5	0.391	0.422	0.587					
					47	0.422	0.453	0.587					
					47.5	0.453	0.484	0.650					
					48	0.484	0.516	0.650					
					5	5/32 0.1562	#20	0.164	0.160	53	0.172	0.203	0.362
53.5	0.203	0.234	0.425										
54	0.234	0.266	0.425										
54.5	0.266	0.297	0.487										
55	0.297	0.328	0.487										
55.5	0.328	0.359	0.550										
56	0.359	0.391	0.550										
56.5	0.391	0.422	0.613										
57	0.422	0.453	0.613										
57.5	0.453	0.484	0.675										
6	3/16 0.1875	#11	0.196	0.192	63	0.156	0.218	0.450					
					64	0.218	0.281	0.450					
					65	0.281	0.343	0.575					
					66	0.343	0.406	0.575					
					67	0.406	0.468	0.700					
					68	0.468	0.531	0.700					
					69	0.531	0.593	0.825					
					610	0.593	0.656	0.825					
					See Notes		3			2	4		

NOTES:

- All dimensions are in inches.
- The first numeral in the rivet number designates the rivet series number, the last one or two numerals give the nominal grip in 1/16 in. which the rivet is capable of joining.
- Recommended drill sizes are those which normally produce holes within the specified hole size limits.
- The mean grip between specified min and max grips will give a mandrel break plane closest to being flush with the top surface of rivet head.



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Self-Plugging Blind Rivets**

Grade Designation	Rivet Body Material	Mandrel Material
11	Aluminum Alloy 5052	Aluminum Alloy
12	Aluminum Alloy 5056	Aluminum Alloy
19	Aluminum Alloy 5056	Carbon Steel
30	Low Carbon Steel	Carbon Steel
40	Nickel-Copper Alloy	Carbon Steel
42	Nickel-Copper Alloy	Stainless Steel (300 series)
50	Stainless Steel (300 Series)	Carbon Steel
51	Stainless Steel (300 Series)	Stainless Steel (300 Series; A286 or equivalent)
52	Stainless Steel (300 Series)	Stainless Steel (400 Series)

material combination representing a different combination of rivet body material and mandrel material as given in Table 5.

2.3 Design. The design of structural flush break pull mandrel self-plugging 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 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. Grade 30 mandrels may be either zinc or cadmium plated or 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 flush head 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 flush head 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 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.

3.3.4 Mandrel Break Load. While the rivet is being set, the axially applied load necessary to break the mandrel shall be within the limits specified for the applicable rivet size and grade



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**Table 6 Ultimate Shear and Tensile Strengths of Structural
Flush Break Pull Mandrel Self-Plugging Blind Rivets**

No.	Ultimate Shear Strength min lbs.						
	Grade 11	Grade 12	Grade 19	Grade 30	Grade 40	Grade 42	Grade 50, 51, 52
4	220	220	340	450	525	475	550
5	340	340	520	525	700	630	850
6	480	480	650	900	1200	1080	1325
8	900	900	1200	1750	2000	1800	2250

No.	Ultimate Tensile Strength min lbs.						
	Grade 11	Grade 12	Grade 19	Grade 30	Grade 40	Grade 42	Grade 50, 51, 52
4	180	180	275	350	450	400	530
5	300	300	425	500	700	630	820
6	400	400	600	700	1000	900	1200
8	650	650	1000	1400	2000	1800	2100

**Table 7 Mandrel Break Loads of Structural Flush Break
Pull Mandrel Self-Plugging Blind Rivets**

Grade		11	12	19	30	40, 42	50	51, 52
Nom Rivet Size	Riv Body Material	Aluminum	Aluminum	Aluminum	Steel	Monel	Stainless Steel	Stainless Steel
	Mandrel Material	Aluminum	Aluminum	Steel	Steel	Steel	Steel	Stainless Steel
1/8	Min	250	400	400	600	650	650	650
	Max	400	600	600	800	850	950	950
5/32	Min	425	600	600	750	950	1150	1150
	Max	600	850	850	1000	1200	1450	1450
3/16	Min	625	750	750	1150	1450	1400	1400
	Max	825	1050	1050	1450	1750	1900	1900
1/4	Min	1100	1450	1450	1950	2500	3000	3000
	Max	1400	1850	1850	2350	2900	3600	3600

NOTES:

- All loads in pounds.
- Mandrel break load is defined as the load in pounds necessary to break the mandrel when setting blind rivets.



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**Table 8 Mandrel Retention Loads of Structural Flush Break
Pull Mandrel Self-Plugging Blind Rivets**

NOM RIVET SIZE		MANDREL RETENTION LOAD, lbs min
1/8	0.1250	10
5/32	0.1562	15
3/16	0.1875	20
1/4	0.2500	30

in Table 7, when tested in accordance with 2.3 of IFI-135.

3.3.5 Blind Head Formation. The axially applied load necessary to upset the end of the rivet body, i.e. form the blind side head, shall not exceed 80 percent of the actual mandrel break load, when tested in accordance with 2.4 of IFI-135.

3.3.6 Mandrel Retention. Mandrels of properly set rivets shall withstand the axial pushout loads specified for the applicable size in Table 8 when tested in accordance with 2.5 of IFI-135.

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 the procedures given in IFI-137, page K-93.