

BLIND RIVETS

METRIC BREAK MANDREL BLIND RIVETS

IFI-505
1999

IFI NOTES:

1. This specification is under the jurisdiction of the IFI Standards and Technical Practices Committee and directly under the Technical Committee of IFI's Division I. First published in 1982, it has been revised and reissued in 1999. Sizes in this document are based on a "soft" conversion from inch practice and reflect the needs of major users.
2. SAE J1200, "Blind Rivets – Break Mandrel Type", covers both inch and metric series of blind rivets. The requirements of SAE J1200, as they relate to metric rivets, are essentially identical to those in IFI-505. Copies of SAE J1200 are available from the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

1. Scope

1.1 Scope. This standard establishes the dimensional, mechanical, and performance requirements of metric break mandrel blind rivets suitable for use in joining the component parts of an assembly.

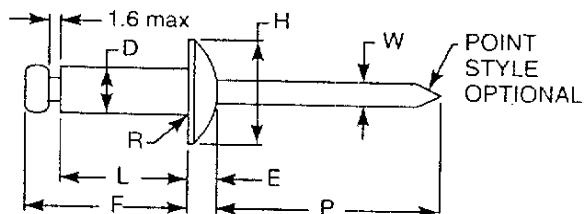


Table 1 Dimensions of Regular and Large Protruding Head Style Break Mandrel Blind Rivets

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	Norm	Min	Max
3	2.4	2.44	2.29	5.03	4.52	0.81	7.44	6.83	1.02	0.4	1.45	25	L + 2.5
4	3.2	3.25	3.10	6.65	6.05	1.02	9.91	9.14	1.65	0.5	1.93	25	L + 3.0
5	4.0	4.04	3.89	8.33	7.52	1.27	12.40	11.38	1.90	0.5	2.41	27	L + 3.5
6	4.8	4.85	4.65	10.01	9.04	1.52	16.51	15.24	2.34	0.7	2.90	27	L + 4.0
8	6.3	6.48	6.25	13.33	12.07	2.03	19.81	18.29	2.72	0.8	3.84	31	L + 4.5
See Notes										3			4

NOTES:

1. All dimensions are in millimeters.
2. For application data see Table 2.
3. The junction of head and shank shall have a fillet with a max radius as shown. For Grades 40, 50, and 51 rivets, the max fillet radius for No. 6 rivets shall be 0.9 mm, and for No. 8 rivets shall be 1.5 mm.
4. When computing the blind side protrusion (F), the max 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 + 3.5 – G, which is 10.8 + 3.5 – 5.0, and equals 9.3 mm.)



IFI-505
1999

METRIC BREAK MANDREL BLIND RIVETS

BLIND
RIVETS

Table 2 Application Data for Protruding Head Style Break Mandrel Blind Rivets

Rivet Series No.	Nom Rivet Size	Recom- mended Metric Drill Size	Recommended Hole Size		Rivet No.	Grip Range	Rivet Length L
			Max	Min			Max
3	2.4	2.5	2.54	2.46	32	0.5 to 3.2	6.4
					34	3.3 to 6.4	9.5
					36	6.5 to 9.5	12.7
					38	9.6 to 12.7	15.97
					310	12.8 to 15.9	19.11
4	3.2	3.3	3.38	3.28	41	0.5 to 1.6	5.4
					42	1.7 to 3.2	7.0
					43	3.3 to 4.8	8.6
					44	4.9 to 6.4	10.2
					45	6.5 to 7.9	11.7
					46	8.0 to 9.5	13.4
					48	9.6 to 12.7	16.5
					410	12.8 to 15.9	19.7
					412	16.0 to 19.1	22.9
					414	19.2 to 22.2	26.0
5	4.0	4.1	4.16	4.06	52	0.5 to 3.2	7.6
					53	3.3 to 4.8	9.2
					54	4.9 to 6.4	10.8
					56	6.5 to 9.5	14.0
					58	9.6 to 12.7	17.2
					510	12.8 to 15.9	20.3
					512	16.0 to 19.1	23.5
					514	19.2 to 22.2	26.7
					516	22.3 to 25.4	29.8
					518	25.5 to 28.5	33.0
6	4.8	4.9	4.98	4.88	62	0.5 to 3.2	8.3
					63	3.3 to 4.8	9.8
					64	4.9 to 6.4	11.5
					66	6.5 to 9.5	14.6
					68	9.6 to 12.7	17.8
					610	12.8 to 15.9	21.0
					612	16.0 to 19.1	24.2
					614	19.2 to 22.2	27.3
					616	22.3 to 25.4	30.5
					618	25.5 to 28.6	33.7
					620	28.7 to 31.8	36.8
					622	31.9 to 34.8	40.0
8	6.3	6.5	6.63	6.53	82	0.5 to 3.2	9.5
					84	3.3 to 6.4	12.7
					86	6.5 to 9.5	15.9
					88	9.6 to 12.7	19.1
					810	12.8 to 15.9	22.2
					812	16.0 to 19.1	25.4
					814	19.2 to 22.2	28.6
					816	22.3 to 25.4	31.8
					818	25.5 to 28.6	34.9
					820	28.7 to 31.8	38.1
					822	31.9 to 34.8	41.3
					824	34.9 to 38.0	44.5
See Notes		2					

NOTES:

1. All dimensions are in millimeters.
2. Recommended drill sizes are those which normally produce holes within the specified hole size limits.



BLIND
RIVETS

METRIC BREAK MANDREL BLIND RIVETS

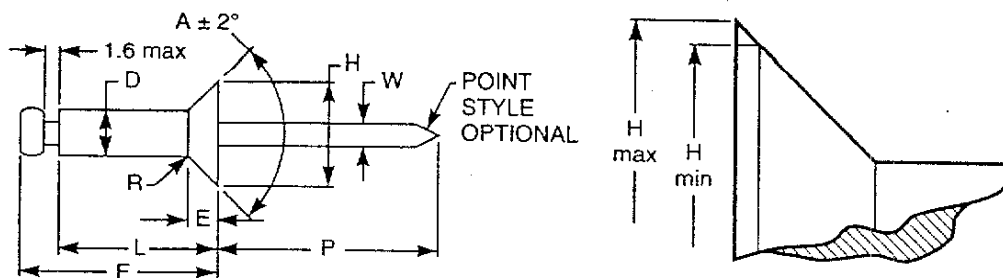
IFI-505
1999

Table 3 Dimensions of 100 Deg and 120 Deg Flush Head Style Break Mandrel Blind Rivets

Rivet Series No.	Nom Rivet Size	D		A	H			E	A	H			E	R	W	P	F		
		Body Dia		Style 3 — 100 Deg Head						Style 4 — 120 Deg Head						Radius of Fillet	Mandrel Dia	Mandrel Protrusion	Blind Side Protrusion
		Max	Min	Head Angle	Head Dia		Head Height	Head Angle	Head Dia		Head Height								
					Deg Nom	Max			Min	Ref		Deg Nom	Max	Min	Ref				
3	2.4	2.44	2.29	100	4.75	4.09	0.99	120	4.75	4.09	0.69	0.5	1.45	25	L + 2.5				
4	3.2	3.25	3.10	100	5.92	5.26	1.14	120	5.92	5.26	0.79	0.7	1.93	25	L + 3.0				
5	4.0	4.04	3.89	100	7.47	6.81	1.47	120	7.47	6.81	1.02	0.8	2.41	27	L + 3.5				
6	4.8	4.85	4.65	100	9.17	8.51	1.85	120	9.17	8.51	1.27	0.9	2.90	27	L + 4.0				
8	6.3	6.48	6.25	100	12.3	11.6	2.5	120	12.3	11.6	1.5	1.0	3.84	31	L + 4.5				
See Notes		1			1, 3		1, 4		1, 3		1, 4		1		1, 5				

NOTES:

- All dimensions are in millimeters.
- For application data see Table 4.
- 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 (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 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 $L + 4.0 - G$, which is $14.6 + 4.0 - 9.4$ which equals 9.2 mm).

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 Break mandrel 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 or near the junction of the mandrel shank and its upset end.

1.2.3 Definitions of other terms used in this standard are given in IFI-110/550, "Glossary of Terms Relating to Blind Rivets," page 1-3.

IFI-505
1999

METRIC BREAK MANDREL BLIND RIVETS

BLIND
RIVETS

Table 4 Application Data for Flush Head Style Break 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
3	2.4	2.5	2.54	2.46	32	2.0 to 3.2	6.4
					34	3.3 to 6.4	9.5
4	3.2	3.3	3.38	3.28	42	2.3 to 3.2	7.0
					43	3.3 to 4.9	8.6
					44	4.9 to 6.4	10.2
					45	6.5 to 7.9	11.7
					46	8.0 to 9.5	13.4
					48	9.6 to 12.7	16.5
5	4.0	4.1	4.16	4.06	53	3.0 to 4.8	9.2
					54	4.9 to 6.4	10.8
					56	6.5 to 9.5	14.0
					58	9.6 to 12.7	17.2
6	4.8	4.9	4.98	4.88	63	3.8 to 4.8	9.8
					64	4.9 to 6.4	11.5
					66	6.5 to 9.5	14.6
					68	9.6 to 12.7	17.8
					610	12.8 to 15.9	21.0
8	6.3	6.5	6.63	6.53	84	3.3 to 6.4	12.7
					86	6.5 to 9.5	15.9
					88	9.6 to 12.7	19.1
See Notes	1	1, 2	1		1	1	1

NOTES:

1. All dimensions are in millimeters.
2. Recommended drill sizes are those which normally produce holes within the specified hole size limits.

2. Designations

2.1 Styles. The two basic styles of break mandrel 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 break mandrel blind rivets are designated as grades, with each material combination repre-

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

2.3 Design. The design of break 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



METRIC BREAK MANDREL BLIND RIVETSIFI-505
1999**Table 5 Grades of Break Mandrel Blind Rivets**

Grade Designation	Rivet Body Material	Mandrel Material
10	Aluminum Alloy 5050	Aluminum Alloy
11	Aluminum Alloy 5052	Aluminum Alloy
16	Aluminum Alloy 5154	Carbon Steel
18	Aluminum Alloy 5052	Carbon Steel
19	Aluminum Alloy 5056	Carbon Steel
20	Copper Alloy No. 110	Carbon Steel
26	Aluminum Alloy 5052	Stainless Steel (400 Series)
30	Low Carbon Steel	Carbon Steel
40	Nickel-Copper Alloy (Monel)	Carbon Steel
50	Stainless Steel (300 Series)	Carbon Steel
51	Stainless Steel (300 Series)	Stainless Steel (300 Series, A286 or equivalent)

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 4 μm . Rivet bodies of all other grades are furnished plain (bare metal) unless 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 flush head break 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 flush head break 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 I-27.

IFI-505
1999

METRIC BREAK MANDREL BLIND RIVETS

BLIND
RIVETS

Table 6 Ultimate Shear and Tensile Strengths of Break Mandrel Blind Rivets

Nom Rivet Size mm	Ultimate Shear Strength Newtons, min						Ultimate Tensile Strength Newtons, min					
	Grades 10, 11, 18	Grades 16, 19	Grade 26	Grade 30	Grade 40	Grades 50, 51	Grades 10, 11, 18	Grades 16, 19	Grade 26	Grade 30	Grade 40	Grades 50, 51
2.4	310	400	—	580	890	1020	360	530	—	760	1110	1250
3.2	530	760	690	1160	1560	1870	670	980	940	1380	2000	2360
4.0	850	1160	1160	1650	2450	2890	1020	1560	1510	2090	3110	3650
4.8	1160	1690	1340	2400	3560	4230	1420	2220	2070	3020	4450	5340
6.3	2050	3110	—	4450	6230	7560	2490	4090	—	5520	8230	9340

NOTE: Grade 20 rivets are not subject to shear and tensile testing.

Table 7 Mandrel Break Loads of Break Mandrel Blind Rivets

Nom Rivet Size mm	Grade	10, 11	16, 18, 19	20, 21	26	30	40	50	51
	Rivet Body Material	Aluminum	Aluminum	Copper	Aluminum	Steel	Monel	Stainless Steel	Stainless Steel
	Mandrel Material	Aluminum	Steel	Steel	Stainless Steel	Steel	Steel	Steel	Stainless Steel
2.4	Min	620	780	780	—	1160	1330	1330	1330
	Max	1070	1220	1220	—	1600	2000	2220	2220
3.2	Min	1110	1780	1780	2290	2670	2890	2890	2890
	Max	1780	2670	2670	2690	3560	3780	4230	4230
4.0	Min	1890	2670	2670	3200	3340	4230	5120	5120
	Max	2670	3780	3780	3780	4450	5340	6450	6450
4.8	Min	2446	3340	3340	4620	5120	6450	6230	6230
	Max	3670	4670	4670	5380	6450	7780	8450	8450
6.3	Min	4004	6450	6450	—	8670	11100	13300	13300
	Max	6230	8230	8230	—	10500	12900	16000	16000

NOTES:

1. All loads in newtons.
2. Mandrel break load is defined as the load in newtons necessary to break the mandrel when setting the rivet.



METRIC BREAK MANDREL BLIND RIVETSIFI-505
1999

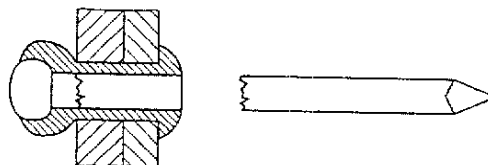
3.3.2 Tensile Strength. Rivets, except those described in 3.3.3, shall have ultimate tensile strengths not less than the minimum ultimate tensile strengths specified for the applicable size and grade given in Table 6 when tested in accordance with 2.2 of IFI-522.

3.3.3 Grade 20 rivets are not subject to either shear or tensile testing. For all other grades, 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 in Table 7, when tested in accordance with 2.3 of IFI-522.

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-522.

Properly set rivet



4. Inspection

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