IFI 509 1982

METRIC BREAK MANDREL CLOSED END BLIND RIVETS

BLIND RIVETS

1. Scope.

1.1 Scope. This Standard establishes the dimensional, mechanical, and performance requirements of metric break mandrel closed end 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, 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 closed end blind rivets are pull mandrel type blind rivets where during the setting operation the mandrel is pulled within the rivet body and breaks at or near the junction of the mandrel shank and its upset end.

1.2.3 Closed End. The end of the rivet, as manufactured, is solid and remains closed on the blind side after setting.

1.2.4 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 break mandrel closed end blind rivets are designated as protruding head and flush head.

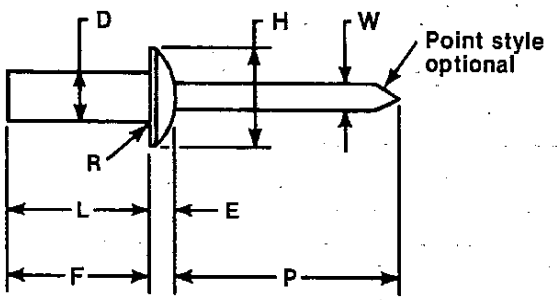

Table 1 Dimensions of Protruding Head Style Break Mandrel Closed End Blind Rivets

Rivet Series No.	Nom Rivet Size	D		H		E	R	W	P	F
		Body Dia		Style 1 — Regular Head			Radius of Fillet	Mandrel Dia	Mandrel Protrusion	Blind Side Protrusion
				Head Dia		Head Height				
		Max	Min	Max	Min	Max	Max	Max	Min	Max
4	3.2	3.25	3.10	6.40	5.69	1.27	0.7	1.85	25	Equal to
5	4.0	4.04	3.89	8.33	7.52	1.65	0.7	2.31	27	"L"
6	4.8	4.85	4.65	10.01	9.04	2.03	0.7	2.77	27	Rivet
8	6.3	6.48	6.25	13.33	12.07	2.54	0.7	3.71	27	Length
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.
4. The blind side protrusion (F) equals the max length of rivet (L) as given in Table 2 for the applicable grip. 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 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-G, which is 12.7 − 5.0, and equals 7.7 mm).

METRIC BREAK MANDREL CLOSED END BLIND RIVETS

Table 2 Application Data for Protruding Head Style Break Mandrel Closed End 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	0.5 to 1.6	7.5
					42	1.7 to 3.2	9.1
					43	3.3 to 4.8	10.7
					44	4.9 to 6.4	12.3
					45	6.5 to 7.9	13.9
					46	8.0 to 9.5	15.5
					48	9.6 to 12.7	16.7
5	4.0	4.1	4.16	4.06	52	0.5 to 3.2	9.5
					53	3.3 to 4.8	11.1
					54	4.9 to 6.4	12.7
					55	6.5 to 7.9	14.3
					56	8.0 to 9.5	15.9
					58	9.6 to 12.7	19.1
6	4.8	4.9	4.98	4.88	62	0.5 to 3.2	10.3
					63	3.3 to 4.8	11.9
					64	4.9 to 6.4	13.5
					66	6.5 to 9.5	16.7
					68	9.6 to 12.7	19.8
					610	12.8 to 15.9	23.0
					612	16.0 to 19.1	26.1
8	6.3	6.5	6.63	6.53	82	0.5 to 3.2	11.3
					84	3.3 to 6.4	14.5
					86	6.5 to 9.5	17.7
					88	9.6 to 12.7	20.8
					810	12.8 to 15.9	24.0
					812	16.0 to 19.1	27.2
					814	19.2 to 22.2	30.4
					816	22.3 to 25.4	33.5
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.

Flush head rivets are available only in the 120 deg countersunk head style.

2.2 Grades. The material combinations of break mandrel closed end 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 break mandrel closed end 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.

METRIC BREAK MANDREL CLOSED END BLIND RIVETS

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. Rivet bodies and mandrels of all grades may be furnished plain (bare metal) 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 closed end 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 closed end 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 3.3.4, shall have ultimate shear strengths not less than the minimum ultimate shear strengths specified for the applicable

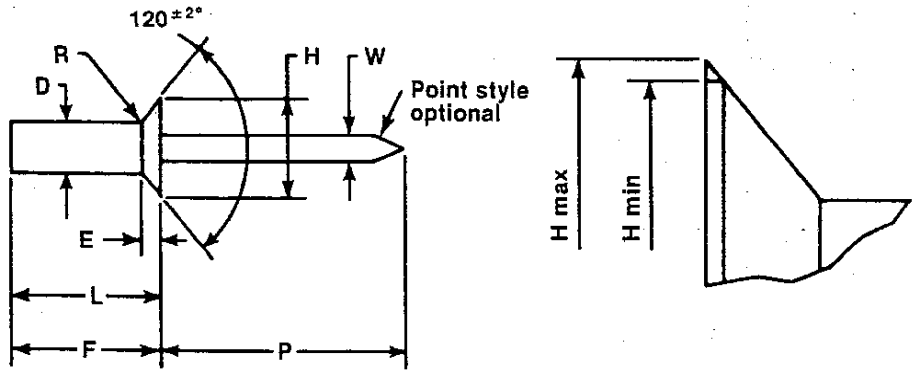

Table 3 Dimensions of 120 Deg Flush Head Style Break Mandrel Closed End Blind Rivets

Rivet Series No.	Nom Rivet Size	D		H		E	R	W	P	F
		Body Dia		Style 4 — 120 Deg Head			Radius of Fillet	Mandrel Dia	Mandrel Protrusion	Blind Side Protrusion
				Head Dia		Head Height				
		Max	Min	Max	Min	Ref	Max	Max	Min	Max
4	3.2	3.25	3.10	6.22	5.61	1.07	0.7	1.85	25	Equal to
5	4.0	4.04	3.89	8.33	7.52	1.30	0.7	2.31	27	"L"
6	4.8	4.85	4.65	10.01	9.04	1.52	0.7	2.77	27	Rivet
8	6.3	6.48	6.25	13.33	12.07	2.03	0.7	3.71	27	Length
See Notes				3		4				5

NOTES:

1. All dimensions are in millimeters.
2. For application data see Table 4.
3. Max head diameter is calculated on nominal rivet diameter and nominal head angle extended to sharp corner. Min 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. The blind side protrusion (F) equals the max length of rivet (L) as given in Table 4 for the applicable grip. 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 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 — G which is 14.0 — 5.0 and equals 9.0 mm).

METRIC BREAK MANDREL CLOSED END BLIND RIVETS

Table 4 Application Data for Flush Head Style Break Mandrel Closed End 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	0.9 to 1.6	8.4
					42	1.7 to 3.2	10.0
					43	3.3 to 4.8	11.6
					44	4.9 to 6.4	13.2
					45	6.5 to 7.9	14.8
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					53	3.3 to 4.8	12.4
					54	4.9 to 6.4	14.0
					55	6.5 to 7.9	15.5
					56	8.0 to 9.5	17.1
					58	9.6 to 12.7	20.3
6	4.8	4.9	4.98	4.88	62	1.6 to 3.2	12.0
					63	3.3 to 4.8	13.7
					64	4.9 to 6.4	15.3
					66	6.5 to 7.9	18.7
					68	8.0 to 12.7	21.6
					610	12.8 to 15.9	26.1
					612	16.0 to 19.1	28.0
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.

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 3.3.4, 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 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.

3.3.4 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.

4. Marking.

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

5. Inspection.

Break mandrel closed end blind 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.

METRIC BREAK MANDREL CLOSED END BLIND RIVETS

Table 5 Grades of Break Mandrel Closed End Blind Rivets

Grade Designation	Rivet Body Material	Mandrel Material
15	Aluminum Alloy 1100	Aluminum Alloy
19	Aluminum Alloy 5056	Carbon Steel
20	Copper Alloy No. 110	Carbon Steel

Table 6 Ultimate Shear & Tensile Strength of Break Mandrel Closed End Blind Rivets

Nom Rivet Size mm	Ultimate Shear Strength newtons, min			Ultimate Tensile Strength newtons, min		
	Grade 15	Grade 19	Grade 20	Grade 15	Grade 19	Grade 20
3.2	440	1070	980	490	1240	1330
4.0	580	1560	—	710	2130	—
4.8	930	2220	—	1110	3070	—
6.3	—	4000	—	—	4890	—

Table 7 Mandrel Break Loads of Break Mandrel Closed End Blind Rivets

Nom Rivet Size mm	Grade	15	19	20
	Rivet Body Material	Aluminum	Aluminum	Copper
	Mandrel Material	Aluminum	Steel	Steel
3.2	Min	1110	2450	2450
	Max	1780	3340	3340
4.0	Min	1890	3110	—
	Max	2670	4890	—
4.8	Min	2670	4000	—
	Max	3560	6340	—
6.3	Min	—	8450	—
	Max	—	10230	—

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.