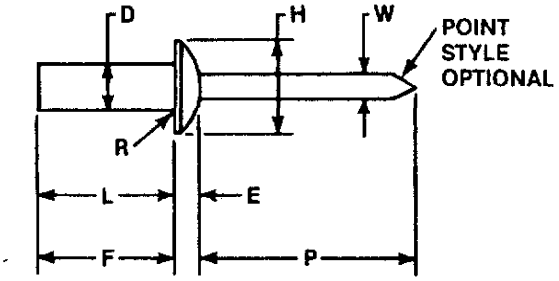
BREAK MANDREL CLOSED END BLIND RIVETS

1. Scope.

1.1 Scope. This standard establishes the dimensional, mechanical, and performance requirements of 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 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 K-40.

2. Designations.

2.1 Styles. The two basic styles of break mandrel closed end blind rivets are designated as

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	L
		Body Dia		Style 1 — Regular Head			Radius of Fillet	Mandrel Dia	Mandrel Protrusion	Blind Side Protrusion	Rivet Body Length
				Head Dia		Head Height					
		Max	Min	Max	Min	Max	Max	Max	Min	Max	Max
4	1/8 0.1250	0.128	0.122	0.252	0.224	0.050	0.025	0.073	1.00	Equal To "L" Rivet Body Length	See Table 2
5	5/32 0.1562	0.159	0.153	0.328	0.296	0.065	0.025	0.091	1.00		
6	3/16 0.1875	0.191	0.183	0.394	0.356	0.080	0.025	0.109	1.00		
8	1/4 0.2500	0.255	0.246	0.525	0.475	0.100	0.025	0.146	1.00		
See Notes 3							4			5	

NOTES:

1. All dimensions are in inches.
2. For application data see Table 2.
3. Rivet series numbers represent the nominal sizes of rivets in 1/32 in.
4. The junction of head and shank shall have a fillet with a max radius as shown.
5. The blind side protrusion (F) equals the max length of rivet body (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 .100 in. thick with a 5/32 in. rivet, a No. 54 rivet would be used. Minimum blind side clearance necessary to permit proper rivet setting would be L-G, which is .500 − .200 and equals .300 in.).

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Table 2 Application Data For Protruding Head Style Break Mandrel Closed End Blind Rivets

Rivet Series No.	Nom Rivet Size	Recommended Drill Size	Recommended Hole Size		Rivet No.	Grip Range	Rivet Body Length
			Max	Min			Max
4	1/8 0.1250	#30	0.133	0.129	41	.020 – .062	0.297
					42	.063 – .125	0.360
					43	.126 – .187	0.422
					44	.188 – .250	0.485
					45	.251 – .312	0.547
					46	.313 – .375	0.610
					48	.376 – .500	0.735
5	5/32 0.1562	#20	0.164	0.160	52	.020 – .125	0.375
					53	.126 – .187	0.437
					54	.188 – .250	0.500
					55	.251 – .312	0.562
					56	.313 – .375	0.625
					58	.376 – .500	0.750
6	3/16 0.1875	#11	0.196	0.192	62	.020 – .125	0.406
					63	.126 – .187	0.468
					64	.188 – .250	0.531
					66	.251 – .375	0.656
					68	.376 – .500	0.781
					610	.501 – .625	0.906
					612	.626 – .750	1.026
8	1/4 0.2500	F	0.261	0.257	82	.020 – .125	0.445
					84	.126 – .250	0.570
					86	.251 – .375	0.695
					88	.376 – .500	0.820
					810	.501 – .625	0.945
					812	.626 – .750	1.070
					814	.751 – .875	1.195
					816	.876 – 1.000	1.320
See Notes		3			2		

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 numbers give the maximum 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.

protruding head and flush head. Flush head rivets are available only in the 120° 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.

3.1.2 *Heat Treatment.* Rivet components may be heat treated as necessary to meet the me-

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chanical 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.

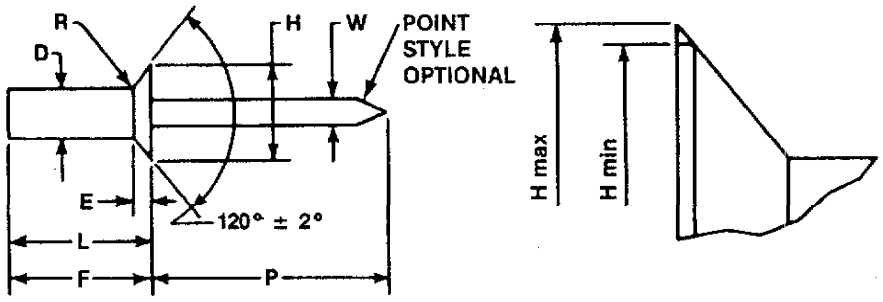

Table 3 Dimensions of 120 Degree Flush Head Style Break Mandrel Closed End Blind Rivets

Rivet Series No.	Nom Rivet Size	D		H		E	R	W	P	F	L
		Body Dia		Style 4 — 120 Deg Head			Radius of Fillet	Mandrel Dia	Mandrel Protrusion	Blind Side Protrusion	Rivet Body Length
				Head Dia		Head Height					
		Max	Min	Max	Min	Max	Max	Max	Min	Max	Max
4	1/8 0.1250	0.128	0.122	0.245	0.221	0.042	0.025	0.073	1.00	Equal To "L" Rivet Body Length	See Table 4
5	5/32 0.1562	0.159	0.153	0.328	0.296	0.051	0.025	0.091	1.00		
6	3/16 0.1875	0.191	0.183	0.394	0.356	0.060	0.025	0.109	1.00		
8	1/4 0.2500	0.255	0.246	0.525	0.475	0.080	0.025	0.146	1.00		
See Notes 3				4		5				6	

NOTES:

1. All dimensions are in inches.
2. For application data see Table 4.
3. Rivet series numbers represent the nominal sizes of rivets in 1/32 in.
4. Max. head diameter is calculated on nominal rivet diameter and nominal head angle extended to sharp corner. Min. 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. The blind side protrusion (F) equals the max length of rivet body (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 .100 in. thick with a 5/32 in. rivet, a No. 54 rivet would be used. Minimum blind side clearance necessary to permit proper rivet setting would be L-G, which is .550 − .200 and equals .350 in.).

Table 4 Application Data For Flush Head Style Break Mandrel Closed End Blind Rivets

Rivet Series No.	Nom Rivet Size	Recommended Drill Size	Recommended Hole Size		Rivet No.	Grip Range	Rivet Body Length L
			Max	Min			Max
4	1/8 0.1250	#30	0.133	0.129	41	.031 – .062	0.332
					42	.063 – .125	0.395
					43	.126 – .187	0.457
					44	.188 – .250	0.520
					45	.251 – .312	0.582
					46	.313 – .375	0.645
					48	.376 – .500	0.770
5	5/32 0.1562	#20	0.164	0.160	52	.063 – .125	0.425
					53	.126 – .187	0.487
					54	.188 – .250	0.550
					55	.251 – .312	0.612
					56	.313 – .375	0.675
					58	.376 – .500	0.800
6	3/16 0.1875	#11	0.196	0.192	62	.063 – .125	0.471
					63	.126 – .187	0.538
					64	.188 – .250	0.601
					66	.251 – .375	0.736
					68	.376 – .500	0.851
					610	.501 – .625	1.026
					612	.626 – .750	1.101
See Notes		3			2		

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 in. which the rivet is capable of joining.
3. Recommended drill sizes are those which normally produce holes within the specified hole size limits.

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

Table 5 Grades of Break Mandrel Closed End Blind Rivets

GRADE DESIGNATION	RIVET BODY MATERIAL	MANDREL MATERIAL
15	Aluminum Alloy 1100	Aluminum Alloy 7178 or 2024
19	Aluminum Alloy 5056	Carbon Steel
20	Copper Alloy No. 110	Carbon Steel

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

Nom Rivet Size in.	ULTIMATE SHEAR STRENGTH Min lbs			ULTIMATE TENSILE STRENGTH Min lbs		
	GRADE 15	GRADE 19	GRADE 20	GRADE 15	GRADE 19	GRADE 20
1/8 0.1250	100	240	220	110	280	300
5/32 0.1562	130	350	—	160	480	—
3/16 0.1875	210	500	—	250	690	—
1/4 0.2500	—	900	—	—	1100	—

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

GRADE		15	19	20
Nom Rivet Size In.	Rivet Body Material	Aluminum	Aluminum	Copper
	Mandrel Material	Aluminum	Steel	Steel
1/8	Min	250	550	550
	Max	400	750	750
5/32	Min	425	700	—
	Max	600	1100	—
3/16	Min	600	900	—
	Max	800	1425	—
1/4	Min	—	1900	—
	Max	—	2300	—

NOTES:

1. All loads in pounds.
2. Mandrel break load is defined as the load in pounds necessary to break the mandrel when setting break mandrel closed end blind rivets.

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-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.