IFI 521 1982

METRIC STRUCTURAL SELF PLUGGING PULL MANDREL BLIND RIVETS — TYPE 2B

BLIND RIVETS

1. Scope.

1.1 Scope. This Standard establishes the dimensional, mechanical, and performance requirements of metric Type 2B structural self plugging pull mandrel blind rivets suitable for use in engineering assemblies where load transmitting capability by the rivet is a design requirement.

1.2 Definitions.

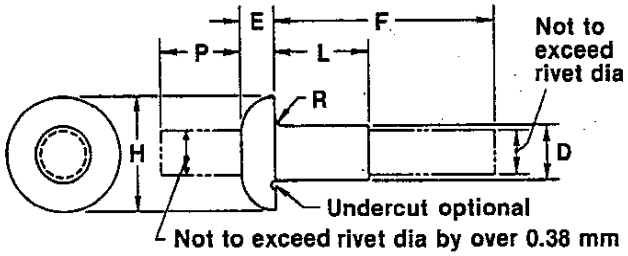
1.2.1 Blind Rivet. A blind rivet is a blind fastener which has a self-contained mechanical, chemical or other feature which permits the formation of an upset on the blind end of the rivet and expansion of the rivet shank during rivet setting to join the component parts of an assembly.

1.2.2 A structural self plugging pull mandrel blind rivet is a two piece assembly consisting of a rivet body and a mandrel. 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 with the entrapped length of the mandrel being retained in the rivet body.

1.2.3 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 styles of Type 2B rivets are designated as protruding head and 100 deg flush head.



NOTE: Mandrel design and configuration at both ends is optional with the manufacturer providing mandrel conforms to specified max diameter and protrusion limits.

Table 1 Dimensions of Type 2B Protruding Head Structural Self Plugging Pull Mandrel Blind Rivets

Rivet Series No.	Nom Rivet Size	D		H		E		R		P	F
		Body Diameter		Head Diameter		Head Height		Radius of Fillet, Max		Mandrel Protrusion	Blind Side Protrusion
								For Grades 13, 14	For Grades 30, 41		
		Max	Min	Max	Min	Max	Min			Min	Max
4	3.2	3.25	3.15	6.65	6.05	1.63	1.37	0.3	0.6	19	2L + 4.3
5	4.0	4.04	3.94	8.33	7.52	1.96	1.70	0.3	0.6	19	2L + 5.2
6	4.8	4.83	4.72	10.01	9.04	2.29	2.03	0.3	0.6	19	2L + 6.1
8	6.3	6.43	6.32	13.33	12.07	2.97	2.72	0.3	0.6	19	2L + 5.1
See Note		3, 4									5

NOTES:

1. All dimensions are in millimeters.
2. For application data see Table 2.
3. Maximum body diameter may be increased by 0.03 mm within 2.5 mm of underside of head.
4. Maximum body diameter of Grade 30 rivets may be increased by 0.03 mm when rivets are plated or coated.
5. When computing the blind side protrusion (F), the maximum 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 2L + 5.2 — G, which is 2 × 9.4 + 5.2 — 5.0, and equals 19.0 mm).

METRIC STRUCTURAL SELF PLUGGING PULL MANDREL BLIND RIVETS — TYPE 2B

Table 2 Application Data for Type 2B Protruding Head Structural Self Plugging Pull 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
4	3.2	3.3	3.38	3.28	41	to 1.6	4.4
					42	1.7 to 3.2	5.9
					43	3.3 to 4.8	7.5
					44	4.9 to 6.4	9.1
					45	6.5 to 7.9	10.7
					46	8.0 to 9.5	12.3
					47	9.6 to 11.1	13.9
					48	11.2 to 12.7	15.5
5	4.0	4.1	4.16	4.06	51	to 1.6	4.9
					52	1.7 to 3.2	6.5
					53	3.3 to 4.8	8.1
					54	4.9 to 6.4	9.7
					55	6.5 to 7.9	11.3
					56	8.0 to 9.5	12.9
					57	9.6 to 11.1	14.4
					58	11.2 to 12.7	16.0
6	4.8	4.9	4.98	4.88	61	to 1.6	5.5
					62	1.7 to 3.2	7.1
					63	3.3 to 4.8	8.7
					64	4.9 to 6.4	10.2
					65	6.5 to 7.9	11.8
					66	8.0 to 9.5	13.4
					67	9.6 to 11.1	15.0
					68	11.2 to 12.7	16.6
					69	12.8 to 14.3	18.2
					610	14.4 to 15.9	19.4
					611	16.0 to 17.5	21.4
					612	17.6 to 19.1	22.9
8	6.3	6.5	6.63	6.53	83	3.2 to 4.8	9.8
					84	4.9 to 6.4	11.4
					85	6.5 to 7.9	13.0
					86	8.0 to 9.5	14.6
					87	9.6 to 11.1	16.2
					88	11.2 to 12.7	17.7
					89	12.8 to 14.3	19.3
					810	14.4 to 15.9	20.9
					811	16.0 to 17.5	22.5
					812	17.6 to 19.1	24.1
					813	19.2 to 20.6	25.7
					814	20.7 to 22.2	27.3
See Note		2					

NOTES:

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

2.2 Grades. The material combinations of Type 2B rivets are designated as grades with each grade representing a different combination of rivet body material and mandrel material as given in Table 5.

2.3 Design. The design of Type 2B 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.

3.1.2 Heat Treatment. Rivet components shall

METRIC STRUCTURAL SELF PLUGGING PULL MANDREL BLIND RIVETS — TYPE 2B

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. Unless otherwise specified, rivet bodies and mandrels of Grades 13 and 14 shall be anodized in accordance with the requirements of MIL-A-8625, or chemically treated in accordance with the requirements of MIL-C-5541.

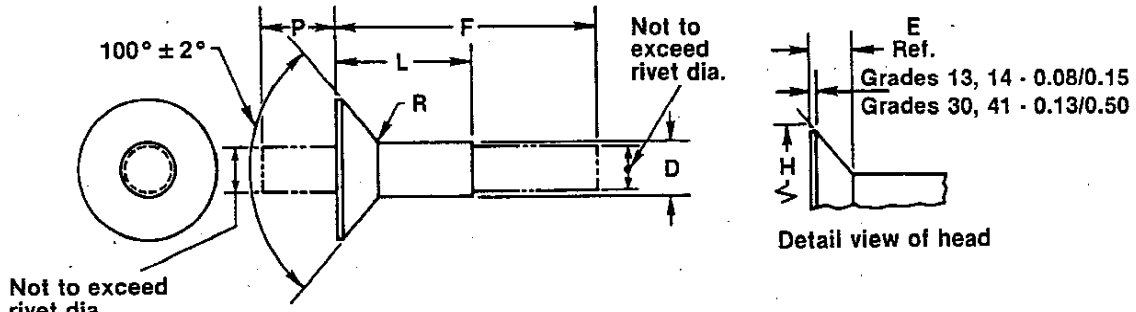
Unless otherwise specified, Grade 30 rivet bodies shall be either zinc or cadmium plated with a minimum plating thickness of 4μm. Grade 30 mandrels may be furnished plain or with a protective coating at the option of the manufacturer.

Unless otherwise specified, Grade 41 rivet bodies and mandrels shall be furnished plain (non-coated and/or unplated).

3.2 Dimensional Requirements.

3.2.1 Rivet Dimensions. Protruding and 100 deg 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



NOTE: Mandrel design and configuration at both ends is optional with the manufacturer providing mandrel conforms to specified max diameter and protrusion limits.

Table 3 Dimensions of Type 2B 100 Deg Flush Head Structural Self Plugging Pull Mandrel Blind Rivets

Rivet Series No.	Nom Rivet Size	D		H		E	R		P	F
		Body Diameter		Head Diameter		Head Height	Radius of Fillet, Max		Mandrel Protrusion	Blind Side Protrusion
							For Grades 13, 14	For Grades 30, 41		
		Max	Min	Max	Min	Ref			Min	Max
4	3.2	3.25	3.15	5.82	5.23	1.07	0.3	0.6	19	2L + 4.3
5	4.0	4.04	3.94	7.37	6.73	1.40	0.3	0.6	19	2L + 5.2
6	4.8	4.83	4.72	9.07	8.36	1.78	0.3	0.6	19	2L + 6.1
8	6.3	6.43	6.32	12.19	11.35	2.41	0.3	0.6	19	2L + 5.1
See Notes		5		3		4				6

NOTES:

1. All dimensions are in millimeters.
2. For application data see Table 4.
3. Maximum head diameter is calculated on nominal rivet diameter and nominal head angle extended to sharp corner. Minimum 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. Maximum body diameter of Grade 30 rivets may be increased by 0.03 mm when rivets are plated or coated.
6. When computing the blind side protrusion (F), the maximum 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 2L + 6.1 — G, which is 2 × 13.4 + 6.1 — 9.4, which equals 23.5 mm).

METRIC STRUCTURAL SELF PLUGGING PULL MANDREL BLIND RIVETS — TYPE 2B

Table 4 Application Data for Type 2B 100 Deg Flush Head Structural Self Plugging Pull 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
4	3.2	3.3	3.38	3.28	41	to 1.6	4.4
					42	1.7 to 3.2	5.9
					43	3.3 to 4.8	7.5
					44	4.9 to 6.4	9.1
					45	6.5 to 7.9	10.7
					46	8.0 to 9.5	12.3
					47	9.6 to 11.1	13.9
					48	11.2 to 12.7	15.5
5	4.0	4.1	4.16	4.06	52	1.6 to 3.2	6.5
					53	3.3 to 4.8	8.1
					54	4.9 to 6.4	9.7
					55	6.5 to 7.9	11.3
					56	8.0 to 9.5	12.9
					57	9.6 to 11.1	14.4
					58	11.2 to 12.7	16.0
6	4.8	4.9	4.98	4.88	62	1.6 to 3.2	7.1
					63	3.3 to 4.8	8.7
					64	4.9 to 6.4	10.2
					65	6.5 to 7.9	11.8
					66	8.0 to 9.5	13.4
					67	9.6 to 11.1	15.0
					68	11.2 to 12.7	16.6
					69	12.8 to 14.3	18.2
					610	14.4 to 15.9	19.4
					611	16.0 to 17.5	21.4
					612	17.6 to 19.1	22.9
8	6.3	6.5	6.63	6.53	83	3.2 to 4.8	9.8
					84	4.9 to 6.4	11.4
					85	6.5 to 7.9	13.0
					86	8.0 to 9.5	14.6
					87	9.6 to 11.1	16.2
					88	11.2 to 12.7	17.7
					89	12.8 to 14.3	19.3
					810	14.4 to 15.9	20.9
					811	16.0 to 17.5	22.5
					812	17.6 to 19.1	24.1
					813	19.2 to 20.6	25.7
					814	20.7 to 22.2	27.3
See Note		2					

NOTES:

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

and 100 deg 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 specified for the applicable 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 3.3.3, shall have ultimate tensile strengths not less than the minimum specified for the applicable size and grade given in Table 6 when tested in accordance with 2.2 of IFI-522.

METRIC STRUCTURAL SELF PLUGGING PULL MANDREL BLIND RIVETS — TYPE 2B

Table 5 Grades of Type 2B Structural Self Plugging Pull Mandrel Blind Rivets

Grade Designation	Rivet Body Material	Mandrel Material
13	Aluminum Alloy 5056	Aluminum Alloy 2017
14	Aluminum Alloy 2117	Aluminum Alloy 2017
30	Low Carbon Steel	Carbon Steel
41	Nickel-Copper Alloy	Nickel-Copper Alloy

Table 6 Ultimate Shear and Tensile Strengths of Type 2B Structural Self Plugging Break Mandrel Blind Rivets

Nom Rivet Size mm	Ultimate Shear Strength newtons, min				Ultimate Tensile Strength newtons, min			
	Grade 13	Grade 14	Grade 30	Grade 41	Grade 13	Grade 14	Grade 30	Grade 41
3.2	1510	1560	2180	2800	1020	1070	1250	2400
4.0	2450	2540	3340	4310	1670	1730	2180	3830
4.8	3380	3510	4850	6230	2400	2540	3110	5520
6.3	6140	6400	8760	11100	4360	4580	5560	10200

Table 7 Mandrel Retention Loads of Type 2B Structural Self Plugging Break Mandrel Blind Rivets

Nom Rivet Size mm	Mandrel Retention Load, newtons, min		
	For Rivets with Specified Min Grip Length, mm		
	3.2 and less	over 3.2 to 4.7	over 4.7
3.2	45	65	65
4.0	65	90	110
4.8	90	110	155
6.3	130	155	220

3.3.3 Protruding head rivets with specified maximum grip lengths shorter than 1.5 times the nominal rivet diameter, and flush head rivets with specified maximum grip lengths shorter than 2.0 times the nominal rivet diameter shall not be subject to either shear or tensile testing.

3.3.4 Mandrel Retention. Mandrels of properly set rivets shall withstand, without apparent movement of the mandrel in the rivet body, the axial push-out loads specified for the applicable size and grip length in Table 7 when tested in accordance with 2.5 of IFI-522.

3.3.5 Expansion. Any axial separation(s) occurring in the rivet body due to expansion caused by rivet setting shall not extend beyond the blind side surface of the joined material into the gripped length.

4. Marking.

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

5. Inspection.

Rivets shall be inspected to determine conformance with dimensional and mechanical 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.