Designation: F3329 – 18

Standard Specification for Carbon and Alloy Steel Metric Rivets[1]

This standard is issued under the fixed designation F3329; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers chemical and mechanical requirements for nine property classes of carbon and alloy steel metric rivets in nominal diameters M01 through M36 suited for use in general engineering applications.

1.2 This specification does not cover dimensional requirements for rivets of any property class. When referencing this specification for procurement purposes, it is mandatory that size, type, style, and any special dimensions of the product be additionally specified.

1.2.1 In case of any conflict in requirements, the requirements of the individual product specification shall take precedence over those of this general specification.

1.2.2 The purchaser may specify additional requirements which do not negate any of the provisions of this general specification or of the individual product specification. Such additional requirements, the acceptance of which are subject to negotiation with the supplier, must be included in the order information (see Section 3).

1.3 When agreed on by the purchaser, Class 5.8 fasteners may be supplied when either Classes 4.6 or 4.8 are ordered; Class 4.8 may be supplied when Class 4.6 is ordered;

1.4 The product size range for which each property class is applicable is given in Table 1 on chemical composition requirements, and the mechanical requirements table (see Table 2).

1.5 Appendix X1 explains the significance of the property class designation numerals.

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A153/A153M Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

A588/A588M Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance

A751 Test Methods and Practices for Chemical Analysis of Steel Products

B695 Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

F606/F606M Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets

F788/F788M Specification for Surface Discontinuities of Bolts, Screws, Studs, and Rivets, Inch and Metric Series

F1470 Practice for Fastener Sampling for Specified Mechanical Properties and Performance Inspection

3. Ordering Information

3.1 Orders for products referencing this specification shall include the following:

3.1.1 Quantity (number of pieces),

3.1.2 Name of product rivet,

3.1.3 Dimensions, including nominal diameter, and length (see Section 7),

3.1.4 Property class,

3.1.5 *Zinc Coating*—Specify the zinc coating process required, for example, hot dip, mechanically deposited, or no preference (see 4.4),

3.1.6 *Other Finishes*—Specify other protective finish, if required,

3.1.7 ASTM designation and year of issue, and

3.1.8 Any special.

3.1.9 Test reports if required, see Section 14.

4. Materials and Manufacture

4.1 Steel for rivets shall be made by the open-hearth, basic-oxygen, or electric-furnace process.

[1] This test method is under the jurisdiction of ASTM Committee F16 on Fasteners and is the direct responsibility of Subcommittee F16.06 on Steel Washers and Rivets.

Current edition approved Nov. 15, 2018. Published January 2019. DOI: 10.1520/F3329-18

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

TABLE 1 Chemical Composition Requirements

Property Class	Material and heat treatment	Product Analysis Element (% by weight) C		P	S	B[A]	Tempering Temperature, °C
		min	max	max	max	max	min
3.6		...	0.20	0.050	0.060	0.003	...
4.6[B]		...	0.55	0.050	0.060	0.003	...
4.8		...	0.55	0.050	0.060	0.003	...
5.6[B]	Carbon steel or carbon steel with additives	0.13	0.55	0.050	0.060	0.003	...
5.8		...	0.55	0.050	0.060	0.003	...
6.8		...	0.55	0.050	0.060	0.003	...
	Carbon steel with additives (for example, Boron or Mn or Cr) quenched and tempered	0.15[C]	0.40	0.025	0.025	0.003	...
8.8[D]	Carbon steel quenched and tempered	0.25	0.55	0.025	0.025	0.003	425
	Alloy steel quenched and tempered[E]	0.20	0.55	0.025	0.025	0.003	425
	Carbon steel with additives (for example, Boron or Mn or Cr) quenched and tempered	0.15[C]	0.40	0.025	0.025	0.003	425
9.8[D]	Carbon steel quenched and tempered	0.25	0.55	0.025	0.025	0.003	425
	Alloy steel quenched and tempered[E]	0.20	0.55	0.025	0.025	0.003	425
	Carbon steel with additives (for example, Boron or Mn or Cr) quenched and tempered	0.20[C]	0.55	0.025	0.025	0.003	425
10.9[D]	Carbon steel quenched and tempered	0.25	0.55	0.025	0.025	0.003	425
	Alloy steel quenched and tempered[E]	0.20	0.55	0.025	0.025	0.003	425

[A] Boron content can reach 0,005 %, provided non-effective boron is controlled by the addition of titanium or aluminum, or both.
[B] For cold forged fasteners of property classes 4.6 and 5.6, heat treatment of the wire used for cold forging or of the cold forged fastener itself may be necessary to achieve required ductility.
[C] In case of plain carbon boron steel with a carbon content below 0,25 % (cast analysis), the minimum manganese content shall be 0,6 % for property class 8.8 and 0,7 % for property classes 9.8 and 10.9
[D] For the materials of these property classes, there shall be a sufficient hardenability to ensure a structure consisting of approximately 90 % martensite in the core of the shaft of the rivet in the "as-hardened" condition before tempering.
[E] This alloy steel shall contain at least one of the following elements in the minimum quantity given: chromium 0,30 %, nickel 0,30 %, molybdenum 0,20 %, vanadium 0,10 %. Where elements are specified in combinations of two, three or four and have alloy contents less than those given above, the limit value to be applied for steel class determination is 70 % of the sum of the individual limit values specified above for the two, three or four elements concerned.

TABLE 2 Mechanical Requirements for Rivets

Property Class	Machined Test Specimens of Rivets				Surface Hardness	Product Hardness			
	Yield Strength, MPa	Tensile Strength, MPa	Elonga-tion, %	Reduction of Area, %	Vickers HV 0.3	Rockwell		Vickers HV	
	min	min	min	min	max	min	max	min	max
3.6	190	330	25	...	...	B52	B95	95	220
4.6	240	400	22	...	...	B67	B95	120	220
4.8	340	420	...	...	...	B71	B95	130	220
5.6	300	500	20	...	...	B79	B95	155	220
5.8	420	520	...	...	...	B82	B95	160	220
6.8	480	600	...	...	...	B89	B99.5	190	250
8.8	640	800	12	52	...	C22	C32	250	320
9.8	720	900	10	48	...	C28	C37	290	360
10.9	940	1040	9	48	390	C32	C39	320	380

4.2 *Heading Practice:*

4.2.1 Methods other than upsetting or extrusion, or both, are permitted only by special agreement between purchaser and producer.

4.3 *Heat Treatment:*

4.3.1 Class 3.6, 4.6, 4.8, 5.6 and 5.8 rivets need not be heat treated.

4.3.2 Classes 4.8, 5.6 and 5.8 rivets shall be stress relieved if necessary to assure the soundness of the head to shank junction. When stress relieving is specified by the purchaser, Class 5.8 rivets shall be stress relieved at a minimum stress-relief temperature of 470 °C. Where higher stress-relief temperatures are necessary to relieve stresses in severely upset heads, mechanical requirements shall be agreed upon between the purchaser and producer.

4.3.3 Classes 8.8, and 9.8 rivets shall be heat treated by quenching in a liquid medium from above the transformation temperature and reheating to the tempering temperature given in Table 1.

4.3.4 Classes 10.9, rivets shall be heat treated by quenching in oil from above the transformation temperature and reheating to the tempering temperature given in Table 1.

4.4 *Zinc Coatings, Hot-Dip, and Mechanically Deposited:*

4.4.1 When zinc-coated fasteners are required, the purchaser shall specify the zinc coating process, for example, hot dip, mechanically deposited, or no preference.