JIS G3472 Electric Resistance Welded Carbon Steel Tubes for Automobile Structural Purposes

1. Scope

This Japanese Industrial Standard specifies the electric resistance welded carbon steel tubes, hereinafter referred to as the "tubes", used for automobiles. The applicable range of dimensions of the tubes shall be as follows

Outside diameter: 15.0mm and over, up to and including 127.0mm

wall thickness: 1.0mm and over, up to and including 7.0mm

Remarks

1.With a previous agreement of the manufacturer, the purchaser may designate either part or all of the special quality requirements Z 3, Z 4 and Z 11 specified in Appendix, in addition to those specified in this text.

Appendix Z 3 Ultrasonic Examination

Appendix Z 4 Eddy Current Examination

Appendix Z 11 Bending Test and Flattening Test for Tubes of Grade G

2.The units and numerical values given in { } in this s\Standard are based on the International System of Units (SI) and are appended for informative reference. Further, the traditional units accompanied by numerical values in this Standard shall be converted to the SI units and numerical values on January 1. 1991.

2. Grade and Designation

The Grade and Designation of the tubes shall be as given in Table 1.

Table 1 Grade and Designation

Grade	Designation	(Reference Traditional symbol	Remark
Grade G	STAM 290GA	STAM 30GA	Tubes used for general parts of automobile structures
	STAM 290GB	STAM 30GB	
	STAM 340G	STAM 35G	
	STAM 390G	STAM 40G	
	STAM 440G	STAM 45G	
	STAM 470G	STAM 48G	
	STAM 500G	STAM 51G	
Grade H	STAM 440H	STAM 45H	Tubes used for, among parts of automobile structures, those of which yield strength is particularly
	STAM 470H	STAM 48H	
	STAM 500H	STAM 51H	

	STAM 540H	STAM 55H	required

Remark

When rimmed steel is designated, the letter symbol "R" shall be suffixed to each of the designations.

World Standard Comparative Table

	KS		JIS		ASTM
Grade Number	D 3598		G3472		A 513
	-		Designation of Grade	(Reference) Traditional symbol	-
Designation of Grade	Grade G	STAM 30GA	STAM 290GA	STAM 30GA	ASE MT1010
		STAM 30GB	STAM 290GB	STAM 30GB	ASE MT1010
		STAM 35G	STAM 340G	STAM 35G	ASE MT1015
		STAM 40G	STAM 390G	STAM 40G	ASE1021
		STAM 45G	STAM 440G	STAM 45G	ASE1021
		STAM 48G	STAM 470G	STAM 48G	ASE1025, ASE1026
		STAM 51G	STAM 500G	STAM 51G	ASE1025, ASE1026
	Grade H	STAM 45H	STAM 440H	STAM 45H	ASE1021
		STAM 48H	STAM 470H	STAM 48H	ASE1021
		STAM 51H	STAM 500H	STAM 51H	ASE1025, ASE1026
		STAM 55H	STAM 540H	STAM 55H	ASE1025, ASE 1026
	-	-	-	-	ASEMTX1015 ASE1020 ASE1040 ASEMT1020 ASE1022 ASE1050 ASEMTX1020 ASE1023 ASE1060 ASE1008 ASE1024 ASE1340 ASE1010 ASE1027 ASE1524 ASE1012 ASE1028 ASE4118 ASE1015 ASE1029 ASE4130 ASE1017 ASE1030 ASE4140 ASE1018 ASE1033 ASE 5130 ASE1019 ASE1035 ASE 8620 ASE8630

3. Method of Manufacture

3.1 The tube shall, as a rule, be manufactured from hot rolled or cold rolled carbon steel sheet coil of killed steel by electric resistance welding process.

3.2 The tube shall be delivered either as manufactured, or properly heat treated or else properly heat-treated after cold-finished.

4. Chemical Composition

The tube shall be tested in accordance with 8.1 and the resulting ladle analysis values obtained shall conform to Table 2.

Table 2 Chemical Composition

Designation	Chemical Composition %				
	C	Si	Mn	P	S
STAM 290GA STAM 290GB	0.12 max.	0.35 max.	0.60 max.	0.035 max.	0.035 max.
STAM 340G	0.20 max.	0.35 max.	0.60 max.	0.035 max.	0.035 max.
STAM 390G	0.25 max.	0.35 max.	0.30~0.90	0.035 max.	0.035 max.
STAM 440G STAM 440H	0.25 max.	0.35 max.	0.30~0.90	0.035 max.	0.035 max.
STAM 470G STAM 470 H	0.25 max.	0.35 max.	0.30~0.90	0.035 max.	0.035 max.
STAM 500G STAM 500 H	0.30 max.	0.35 max.	0.30~1.00	0.035 max.	0.035 max.
STAM 540H	0.30 max.	0.35 max.	0.30~1.00	0.035 max.	0.035 max.

Remarks

1. By agreement with the purchaser, the manufacturer may add either Nb or V or both to the extent of 0.15 %, if necessary.

2. The purchaser may agree with the manufacturer on the lower limit of carbon content, if necessary.

3. For the tubes of STAM 470G, STAM 500G and STAM 470H to STAM 540H, the upper limit of Mn may be increased by 0.06% with a decrease of each 0.01% of carbon content from the upper limit given in the above Table. In this case, however, the upper limit of Mn shall not exceed 1.50%

4. When the tube is made of killed steel and also product analysis is required by the purchaser, the tolerances for the values given above should, as a rule, conform to Table 2 specified in JIS G 0321.

5. Mechanical Properties

Tensile Strength, Yield Point or Proof Stress and Elongation

The tube shall be tested in accordance with 8.2 and the resulting tensile strength, yield point or proof stress, and elongation shall comply with Table 3.

Table 3 Mechanical Properties

Grade	Designation				Flaring test (2)
		Tensile strength kgf/Π {N/Π}	Yield point or proof stress kgf/Π {N/Π}	Elongation (1)% No.1 test piece No.2 Test piece Longitudinal direction	Size of flared bell portion (D: outside diameter of tube)
Grade G	STAM 290GA	30 min. {294} min.	18 min. {177} min.	40 min.	1.25 D
	STAM 290GB	30 min. {294} min.	18 min. {177} min.	35 min.	1.20 D
	STAM 340G	35 min. {343} min.	20 min. {196} min.	35 min.	1.20 D
	STAM 390G	40 min. {392} min.	24 min. {235} min.	30 min.	1.20 D
	STAM 440G	45 min. {441} min.	31 min. {304} min.	25 min.	1.15 D
	STAM 470G	48 min. {471} min.	33 min. {324} min.	22 min.	1.15 D
	STAM 500G	51 min. {500} min.	36 min. {353} min.	18 min.	1.15 D
Grade H	STAM 440H	45 min. {441} min.	36 min. {353} min.	20 min.	1.15 D
	STAM 470H	48 min. {471} min.	42 min. {412} min.	18 min.	1.10 D
	STAM 500H	51 min. {500} min.	44 min. {431} min.	16 min.	1.10 D
	STAM 540H	55 min. {539} min.	49 min. {481} min.	13 min.	1.05 D

Notes (1) and (2) For the tubes as cold-finished, the elongation value shall be 10% or over and flaring test shall not be applied.

Remarks

1. When the tube under 8mm in thickness is subjected to tensile test by using No. 12 test piece, the minimum value of elongation shall be calculated by subtracting 1.5% from the value of elongation given in Table 3 for each decrease of 1mm and founding off the result to a whole number according to JIS Z 8401. Examples of calculation are shown in Reference Table 1.
2. The elongation values given above shall not be applied to the tubes 40mm or under in outside diameter. When especially necessary, agreement shall be made between the purchaser and the manufacturer.
3. In the case of sampling a tensile test piece, No. 12 test piece shall be taken from a seamless portion.

6.Appearance

6.1 The tubes shall be practically straight, and its both ends shall be at right angles to its axis.

6.2 The tube shall be free from defects detrimental to practical use.

6.3 Incase of removing surface defects from a tube, it shall be conducted smoothly , and the depth of the removed portion shall be within the dimensional tolerances.

7. Dimensional Tolerances

7.1 The tolerances on the outside diameter of the tube shall be as specified in Table 4.

Table 4 Tolerances on Outside Diameter

Division	Tolerances on Outside Diameter
No. 1	Up to 50mm 【0.25mm
	50mm and over 【0.5%
No. 2	Up to 50mm 【0.20mm
	50mm and over, up to 80mm 【0.25
	80mm and over, up to 100mm 【0.30mm
	100mm and over 【0.40
No. 3	up to 25mm 【0.12mm
	25mm and over, up to 50mm 【0.15mm
	50mm and over by agreement

Remarks

1. The values specified in the above Table shall not be applied to the ends of a tube.
2. (1) No. 1 shall be applied to the tolerances for the tubes as welded.
   (2) No. 2 shall be applied to the tolerances for tubes either as welded or cold-finished. The preference shall be agreed upon by the purchaser and the manufacturer.

(3) No. 3 shall be applied to the tolerances for cold-finished tubes.

7.2 The tolerances on the wall thickness of the tube shall be as specified in Table 5.

Table 5 Tolerances on Wall Thickness

Division	Tolerances on wall thickness
No. 1	Up to 3mm 【0.30mm
	3mm and over 【10%
No. 2	Up to 1.6mm +0.20mm -0.15mm
	1.6mm and over, up to 2.3mm 【0.20mm
	2.3mm and over, up to 3.0mm 【0.25mm
	3.0mm and over 【8%
No. 3	Up to 2mm
	2 mm and over 【5%

Remarks

1. No. 3 shall be applied, as a rule, to the tolerances for cold-finished tubes (by mandrel process).

2. The values specified in the above Table shall not be applied to the welded portion.

7.3 The tolerances on the thickness deviation (excluding the welded portion) shall be within 50% of the tolerances on wall thickness.

7.4 The tolerances on the height of inner surface bead for the tubes shall be as specified in Table 6.

Table 6 Tolerances on Height of Inner Surface Bend

Division		Tolerances on height of inner surface bead
No. 1	As welded	Minus side tolerances are not allowed
No. 2	Squashing	Not specified
No. 3	Cutting	+0.45mm 0
No. 4		+0.25mm 0
No. 5		+0.20mm 0.10mm

No. 6		【0.20mm

7.5 The purchaser may specify the tolerances on length and straightness by agreement with the manufacturer, if necessary.

8. Test

8.1 Chemical Analysis

8.1.1 Chemical Analysis General matters of chemical analysis and method of sampling specimens for analysis shall be in accordance with 3. in JIS G 0303.

JIS G 1211

JIS G 1215

JIS G 1256

JIS G 1212

JIS G 1221

JIS G 1257

JIS G 1213

JIS G 1237

JIS G 1214

JIS G 1253

8.2 Tensile Test

8.2.1 Test piece

The test piece shall be No. 11, No. 12 A or No. 12 B test piece specified in JIS Z 2201 and shall be cut off from the tube.

8.2.2 Test Method

The test method shall be in accordance with JIS Z 2241.

8.3 Flaring Test

8.3.1 Test Piece

A suitable length shall be cut off from one end of the tube to serve as a test piece

8.3.2 Test Method

The tubular test piece shall be flared, at ordinary temperature, at one end into a bell shape to the specified size with a conical tool having a 60x included angle, and checked for the occurrence of flaws or other defects.

9. Inspection

9.1 General matters of inspection shall be as specified in JIS G 0303.

9.2 The test results of chemical composition, mechanical pro parties, dimensions and appearance shall conform to the requirements specified in 3., 4., 5. and.

Further, when the special quality requirements given in Appendix are specified by agreement between the purchaser and the manufacturer, the results of inspection shall conform

to the relevant designated requirements specified in Z 3, Z 4 and Z 11.

9.3 The method of sampling specimens for tensile test and flaring test shall be as follows. Take one specimen from each length of 500m (1000m for tubes 100mm or under in outside diameter) or its fraction of the tubes of the same dimensions, and then from this specimen take one tensile test piece and one flaring test piece.

9.4 The number of specimens for product analysis shall be agreed upon by the purchaser and the manufacturer.

10. Reinspection

The tube is entitled to a retest specified in 4.4 in JIS G 0303 for final acceptance.

11.Marking

Each tube having passed the inspection shall be legibly marked with the following items. The order of arranging the items is not specified. However, in the case of either smaller tubes or a request from the purchaser, the tubes may be bundled together and marked for each bundle by suitable means.

When approved by the purchaser, part of the items may be omitted

(1) Designation of grade

(2) Letter symbol indicating the manufacturing process(3)

(3) Dimensions

(4) Manufacturer's name or its identifying brand

(5) The letter symbol indicating the special quality requirement, Z

Note(^{3}) The letter symbol indicating the process of manufacture shall be as follows. However, the dash may be replaced by a blank.

Electric resistance welded steel tube other than hot finished or cold finished: -E-G

Hot finished electric resistance welded steel tube: -E-H

Cold finished electric resistance welded steel tube:-E-C

12. Report

The manufacturer shall, as a rule, submit to the purchaser a report of the test results, method of manufacture, ordered dimensions, quantity and work lot number to the history of manufacture, etc.

Reference

1. Designation of Products

The designation system of the tube is on the basis of grade designation, outside diameter, wall thickness and length.

Example: STAM 30 GA-R 65 × 1.6 × 5000

Designation of grade Outside diameter Wall thickness Length

(for rimmed steel) (mm) (mm) (mm)

Reference Table 1

Calculation Examples of Elongation Values Applied to No. 12 Test Piece for Tubes under 8 mm in Wall Thickness

Grade	Designation	Elongation relating to wall thickness %							
		Over 7mm up to 8mm	Over 6mm, up to and incl.7mm	Over 5mm, up to and incl.6mm	Over 4mm,up to and incl.5mm	Over 3mm, up to and incl.4mm	Over 2mm, up to and incl.3mm	Over 1mm, up to and incl.2mm	Up to and incl, 1mm
Grade C	STAM 290GA	40	38	37	36	34	32	31	30
	STAM 290GB	35	34	32	30	29	28	26	24
	STAM 340G	35	34	32	30	29	28	26	24
	STAM 390G	30	28	27	26	24	22	21	20
	STAM 440G	25	24	22	20	19	18	16	14
	STAM 470G	22	20	19	18	16	14	13	12
	STAM 500G	18	16	15	14	12	10	9	8
Grade H	STAM 440H	20	18	17	16	14	12	11	10
	STAM 470H	18	16	15	14	12	10	9	8
	STAM 500H	16	14	13	12	10	8	7	6
	STAM 540H	13	12	10	8	7	6	4	2
As cold finished		10	8	7	6	4	2	1	-

Reference Table 2

Standard Dimensions and mass

Specified outside dia. (mm)	Specified wall thickness (mm)	1.0	1.2	1.6	2.0	2.3	2.6	2.8	2.9	3.2	3.4	3.5	4.0	4.5	5.0	6.0
15.9		-	0.435	0.564	0.686	-	-	-	-	-	-	-	-	-	-	-
17.3		-	-	-	0.755	0.851	-	-	-	-	-	-	-	-	-	-
19.1		0.446	0.530	0.690	0.843	0.953	-	-	-	-	-	-	-	-	-	-
22.2		0.523	0.621	0.813	0.996	1.13	-	-	-	-	-	-	-	-	-	-
25.4		-	0.716	0.939	1.15	-	1.50	-	1.61	-	-	-	-	-	-	-

28.6	-	0.811	1.07	1.31	-	1.67	-	-	-	-	-	-	-	-	-
31.8	0.760	0.906	1.19	1.47	1.67	-	-	-	2.26	-	-	-	-	-	-
34.0	-	-	1.28	-	1.80	-	-	-	2.43	-	-	2.97	-	-	-
35.0	-	1.00	1.32	1.63	-	-	2.22	2.32	-	-	-	-	-	-	-
38.1	0.915	1.09	1.44	1.78	2.03	-	-	-	-	-	-	-	-	-	-
42.7	-	1.23	1.62	2.01	2.29	2.57	-	-	3.12	-	3.38	-	-	4.65	-
45.0	1.08	1.30	1.71	2.12	2.42	2.71	-	3.01	3.30	-	-	-	4.49	4.93	5.77
47.6	-	1.37	1.81	-	2.57	-	-	3.20	-	-	-	-	-	-	-
48.6	-	1.40	1.85	2.30	2.63	-	-	3.27	3.58	-	-	-	4.89	5.38	6.30
50.8	-	1.47	1.94	2.41	2.75	3.08	3.31	3.43	-	3.97	4.08	4.63	-	-	6.63
54.0	-	1.56	2.07	-	2.93	3.29	3.54	3.65	-	4.24	4.36	4.95	-	-	-
57.0	-	-	2.19	-	3.10	3.48	3.74	3.87	4.25	4.49	4.62	-	-	-	-
60.5	-	-	2.32	-	3.30	3.71	-	4.12	4.52	-	-	5.59	-	-	-
63.5	-	-	2.44	-	-	3.90	-	-	-	-	-	-	-	-	-
65.0	-	-	2.50	-	-	-	-	-	4.88	-	5.31	-	-	-	-
68.9	-	-	2.66	-	3.78	-	-	-	-	-	-	-	-	-	-
70.0	-	-	2.70	-	-	-	-	-	5.27	-	5.74	-	-	-	-
75.0	-	-	2.90	-	4.12	4.63	-	5.16	5.67	-					

Appendix Supplementary Quality Requirements

The supplementary quality requirements shall apply only when requested by the purchaser, and the manufacturer shall perform the designated items.

Z3 Ultrasonic Examination

Z3.1 The criteria of the working sensitivity in the ultrasonic examination shall be the division UD specified in JIS G 0582, and there shall be no signal equal to or greater than those produced by the artificial defects of the reference test block.

Z3.2 The test method of the ultrasonic examination shall be as specified in JIS G 0582.

Z3.3 The ultrasonic examination shall be performed for each tube and the results shall conform to the requirements specified in.

Z 4 Eddy Current Examination

Z4.1 The criteria of the working sensitivity in the eddy current examination shall be the division EY, specified in JIS G 0583, and there shall be no signal equal to or greater than

those produced by the artificial defects of the reference test block.

Z4.2 The test method of the eddy current examination shall be as specified in JIS G 0583.

Z4.3 The eddy current examination shall be performed for each tube and the results shall conform to the requirements specified in.

Z11 Bend Test and Flattening Test for Tubes of Grade G

Z11.1 The tubes 50mm or under in outside diameter shall be subjected to either the bend test or the flattening test, and the tubes over 50mm in outside diameter shall be subjected to the flattening test, under the test conditions given in Appendix Table 1-1 or Appendix Table 1-2, and the tubes shall be free from flaws or cracks on the wall surfaces.

Appendix Table 1 Test Conditions for Bend Test and Flattening Test

Grade	Designation	Bend test		Flattening test
		Bend angle	Inside radius (D is outside diameter of tube)	Distance between flat plates (H) (D is outside diameter of tube)
Grade G	STAM 290GA	180∑	4 D	1/2 D
	STAM 290GB			
	STAM 340G	90∑	6 D	2/3 D
	STAM 390G	90∑	6 D	2/3 D
	STAM 440G	90∑	6 D	3/4 D
	STAM 470G	90∑	8 D	7/8 D
	STAM 500G	90∑	8 D	7/8 D

Z11.2 The test piece, test method, method of sampling specimens and number of test pieces shall be as specified in Appendix Table 2.

Appendix Table 2 Test piece, Test Method, Method of Sampling Specimens and Number of Test Pieces

Division	Test piece	Test method	Sampling method of specimen and number of test pieces
Bend test	A suitable length shall be cut off from one end of the tube to serve as a test piece.	The test piece shall be bent, at ordinary temperature, around a cylinder with the specified bend angle and inside radius and then checked for the occurrence of flaws or cracks. In the case, the weld shall be placed in the outermost part of the bent portion.	Take one specimen from each 500m (1000m for the tube 100mm or under in outside diameter) or its fraction of the specimen take one flattening test piece or one bending test piece for the tubes 50mm or under in outside diameter, and one flattening test piece for the tubes over 50mm in outside diameter.
Flattening test	A length 50mm and over shall be cut off from one end of the tube to serve as a test piece.	The test piece shall be placed between two flattening plates, at ordinary temperature, flattened by compression until the distance between the plates comes to the specified value, and shall be checked for the occurrence of flaws or cracks on the wall surface the tube. In this case, the weld shall be placed at right angles to the direction of compression	

Z11.3 The test results of bending test and flattening test shall conform to the requirements of.

Z11.4 Reinspection

The tubes are entitled to a retest specified in 4.4 in JIS G 0303 for final acceptance.

JIS Number and Corresponding Foreign Standards

JIS			ASTM			BS			DIN			NF			ISO			Index Number
Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	
G3472	STAM	C				6323	ERW1	C	2393	St28					3305	R28	C	C021
	290GA					"	43/36	C	"	USt28								
	(30GA)								"	RSt28								
	STAM	C				6323			2394	St28					3305	R28	C	
	290GB								"	USt28								
	(30GB)								"	RSt28								
	STAM	C				6323	HFW2	C							3305	R33	C	
	340G					"	HFW3	C										
	(35G)					"	CEW2	C										
						"	CEW3	C										
	STAM	C				6323	HFW4	C	2393	St44-2					3305	R37	C	
	390G					"	HWF4	C	2394	St44-2								
	(40G)																	
	STAM	C				6323	ERW4	C										
	440G					"	CEW4	C										
	(45G)																	
	STAM	C				6323	ERW5	C										
	470G																	
	(48G)																	
	STAM	C				6323	HFW5	C										

	500G					"	ERW5	C										
	(51G)					"	CEW5	C										
	STAM	C				6323	ERW4	C										
	440H					"	CEW4	C										
	(45H)																	
	STAM	C				6323	ERW5	C										
	470H																	
	(48H)																	
	STAM	C																
	500H																	
	(51H)																	
	STAM	C																
	540H																	
	(55H)																	