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**Stainless steel flux cored wires and
rods for arc welding**

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by The Japan Welding Engineering Society (JWES)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS Z 3323**:2003 is replaced with this Standard.

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Stainless steel flux cored wires and rods for arc welding

Introduction

This Japanese Industrial Standard has been prepared based on the first edition of **ISO 17633** published in 2004 with some modifications of the technical contents. **ISO 17633** contains both of the two different approaches in the global market, that is, **EN 12073** and the standard used around the Pacific Rim, and allows for either or both to be used, to suit a particular market need. Therefore, this Standard gives the requirements corresponding to the Pacific Rim (System B in **ISO 17633**) in the main text, and those in **EN 12073** (System A in **ISO 17633**) in Annex JA (informative).

The portions with continuous sidelines or dotted underlines are the matters in which the contents of the original International Standard have been modified. A list of modifications with explanations is given in Annex JB (informative).

1 Scope

This Standard specifies the following stainless steel flux cored electrodes (hereafter referred to as “electrodes”) and cored rods (hereafter referred to as “rods”) which generate deposited metal of not less than 10.5 % of chromium (mass fraction) and not more than 23 % of nickel (mass fraction).

- Flux cored electrodes for gas shielded arc welding
- Metal cored electrodes for gas shielded arc welding
- Cored rods for self-shielded arc welding
- Cored rods for gas tungsten arc welding

NOTE : The International Standard corresponding to this Standard and the symbol which denotes the degree of correspondence are as follows:

ISO 17633:2004 *Welding consumables—Tubular cored electrodes and rods for gas shielded and non-gas shielded metal arc welding of stainless and heat-resisting steels—Classification (MOD)*

The symbol, (MOD), as defined in **ISO/IEC Guide 21**, indicates that the original International Standard has been modified.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS G 0320 *Standard test methods for heat analysis of steel products*

JIS G 1201 *Iron and steel—General rules for analytical methods*

JIS G 3101 *Rolled steels for general structure*

JIS G 3106 *Rolled steels for welded structure*

JIS G 4304 *Hot-rolled stainless steel plates, sheet and strip*

JIS G 4305 *Cold-rolled stainless steel plate, sheet and strip*

JIS Z 2611 *General rules for photoelectric emission spectrochemical analysis of metal materials*

JIS Z 2615 *General rules for determination of carbon in metallic materials*

JIS Z 3001 *Welding terms*

JIS Z 3011 *Welding position defined by means of angles of slope and rotation*

NOTE : Corresponding International Standard: **ISO 6947** *Welds-Working positions—Definitions of angles of slope and rotation* (MOD)

JIS Z 3111 *Methods of tension and impact tests for deposited metal*

NOTE : Corresponding International Standard: **ISO 15792-1** *Welding consumables—Test methods—Part 1: Test methods for all-weld metal test specimens in steel, nickel and nickel alloys* (MOD)

JIS Z 3181 *Method of fillet weld test for welding consumables*

NOTE : Corresponding International Standard: **ISO 15792-3** *Welding consumables—Test methods—Part 3: Classification testing of positional capacity and root penetration of welding consumables in a fillet weld* (MOD)

JIS Z 3184 *Method of preparing deposited metal pad and samples for chemical analysis*

NOTE : Corresponding International Standard: **ISO 6847** *Welding consumables—Deposition of a weld metal pad for chemical analysis* (MOD)

JIS Z 3200 *Welding consumables—Technical delivery conditions for welding filler materials—Type of product, dimensions, tolerances and markings*

NOTE : Corresponding International Standard: **ISO 544** *Welding consumables—Technical delivery conditions for welding filler materials—Type of product, dimensions, tolerances and markings* (MOD)

JIS Z 3253 *Shielding gases for arc welding and plasma arc cutting*

NOTE : Corresponding International Standard: **ISO 14175** *Welding consumables—Shielding gases for arc welding and cutting* (MOD)

3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in **JIS Z 3001** and **JIS Z 3111** and the following apply.

3.1 flux cored electrodes

electrodes filled with flux which generates slag covering a bead completely or almost completely when welding is performed

3.2 metal cored electrodes

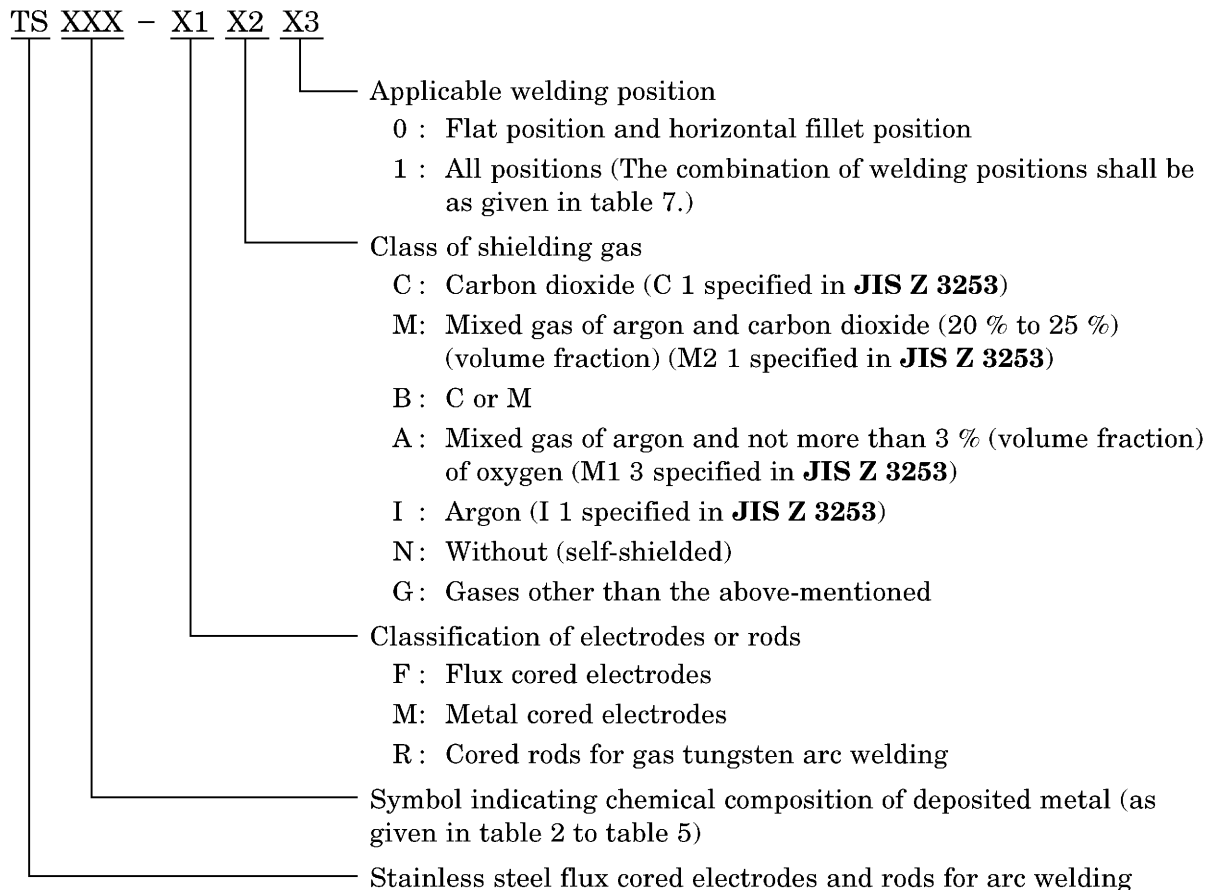
electrodes filled with flux which generates a very small amount of slag when welding is performed

3.3 cored rods for gas tungsten arc welding

rods, filled with flux, intended for gas tungsten arc welding

4 Classification

The electrodes and rods shall be classified with respect to chemical composition of deposited metal, classification of electrodes or rods, class of shielding gas and applicable welding position. The method to attach the symbol indicating the classification of electrodes or rods shall be as follows.



5 Quality

5.1 Dimensions, tolerance and product condition of electrodes and rods

The dimensions, tolerance and product condition of electrodes and rods shall be as follows.

- The dimensions, tolerance and product condition shall be as specified in clause 4 and clause 5 of **JIS Z 3200**.
- The typical diameter and standard mass of electrodes and rods shall be as given in table 1.
- Items other than **a)** and **b)** shall be subjected to the agreement between the parties concerned with delivery.

Table 1 Typical diameter and standard mass of electrodes and rods

Shape	Diameter mm	Standard mass kg
Electrodes	0.8, 0.9, 1.2, 1.4, 1.6, 2.0, 2.4, 3.2	5, 10, 12.5, 20
Rods	2.0, 2.2, 2.4	5

5.2 Chemical composition of deposited metal

The chemical composition of deposited metal, when the test is performed in accordance with the method in **6.2**, shall conform to the requirements specified in table 2 to table 5.

Table 2 Chemical composition of deposited metal (flux cored electrodes for gas shielded arc welding)

Unit: % (mass fraction)

Symbol indicating chemical composition ^{b)}	Classification of electrodes or rods	Class of shielding gas	Chemical composition ^{a)}											
			C	Si	Mn	P	S	Ni	Cr	Mo	Cu	N	Nb+Ta	Ti
307	F	C, M, B, G	0.13 max.	1.0 max.	3.30 to 4.75	0.04 max.	0.03 max.	9.0 to 10.5	18.0 to 20.5	0.5 to 1.5	0.5 max.	—	—	—
308			0.08 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	9.0 to 11.0	18.0 to 21.0	0.5 max.	0.5 max.	—	—	—
308L			0.04 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	9.0 to 12.0	18.0 to 21.0	0.5 max.	0.5 max.	—	—	—
308H			0.04 to 0.08	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	9.0 to 11.0	18.0 to 21.0	0.5 max.	0.5 max.	—	—	—
308N2			0.10 max.	1.0 max.	1.0 to 4.0	0.04 max.	0.03 max.	7.0 to 11.0	20.0 to 25.0	0.5 max.	0.5 max.	0.12 to 0.30	—	—
308Mo			0.08 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	9.0 to 12.0	18.0 to 21.0	2.0 to 3.0	0.5 max.	—	—	—
308MoJ			0.08 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	8.0 to 11.0	17.5 to 20.5	2.0 to 3.0	0.5 max.	—	—	—
308LMo			0.04 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	9.0 to 12.0	18.0 to 21.0	2.0 to 3.0	0.5 max.	—	—	—
309			0.10 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	12.0 to 14.0	22.0 to 25.0	0.5 max.	0.5 max.	—	—	—
309L			0.04 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	12.0 to 14.0	22.0 to 25.0	0.5 max.	0.5 max.	—	—	—

Table 2 (continued)

Unit: % (mass fraction)

Symbol indicating chemical composition ^{b)}	Classification of electrodes or rods	Class of shielding gas	Chemical composition ^{a)}											
			C	Si	Mn	P	S	Ni	Cr	Mo	Cu	N	Nb+Ta	Ti
309J	F	C, M, B, G	0.08 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	12.0 to 14.0	25.0 to 28.0	0.5 max.	0.5 max.	—	—	—
309Mo			0.12 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	12.0 to 16.0	21.0 to 25.0	2.0 to 3.0	0.5 max.	—	—	—
309LMo			0.04 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	12.0 to 16.0	21.0 to 25.0	2.0 to 3.0	0.5 max.	—	—	—
309LNb			0.04 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	12.0 to 14.0	22.0 to 25.0	0.5 max.	0.5 max.	—	0.7 to 1.0	—
310			0.20 max.	1.0 max.	1.0 to 2.5	0.03 max.	0.03 max.	20.0 to 22.5	25.0 to 28.0	0.5 max.	0.5 max.	—	—	—
312			0.15 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	8.0 to 10.5	28.0 to 32.0	0.5 max.	0.5 max.	—	—	—
316			0.08 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	11.0 to 14.0	17.0 to 20.0	2.0 to 3.0	0.5 max.	—	—	—
316L			0.04 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	11.0 to 14.0	17.0 to 20.0	2.0 to 3.0	0.5 max.	—	—	—
316H			0.04 to 0.08	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	11.0 to 14.0	17.0 to 20.0	2.0 to 3.0	0.5 max.	—	—	—
316LCu			0.04 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	11.0 to 16.0	17.0 to 20.0	1.25 to 2.75	1.0 to 2.5	—	—	—
317			0.08 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	12.0 to 14.0	18.0 to 21.0	3.0 to 4.0	0.5 max.	—	—	—
317L			0.04 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	12.0 to 16.0	18.0 to 21.0	3.0 to 4.0	0.5 max.	—	—	—
318			0.08 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	11.0 to 14.0	17.0 to 20.0	2.0 to 3.0	0.5 max.	—	8×C to 1.0	—
329J4L			0.04 max.	1.0 max.	0.5 to 2.0	0.04 max.	0.03 max.	8.0 to 11.0	23.0 to 27.0	2.5 to 4.0	1.0 max.	0.08 to 0.30	—	—

Table 2 (concluded)

Unit: % (mass fraction)

Symbol indicating chemical composition ^{b)}	Classification of electrodes or rods	Class of shielding gas	Chemical composition ^{a)}											
			C	Si	Mn	P	S	Ni	Cr	Mo	Cu	N	Nb+Ta	Ti
347	F	C, M, B, G	0.08 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	9.0 to 11.0	18.0 to 21.0	0.5 max.	0.5 max.	—	8×C to 1.0	—
347L			0.04 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	9.0 to 11.0	18.0 to 21.0	0.5 max.	0.5 max.	—	8×C to 1.0	—
409			0.10 max.	1.0 max.	0.08 max.	0.04 max.	0.03 max.	0.6 max.	10.5 to 13.5	0.5 max.	0.5 max.	—	—	10×C to 1.5
409Nb			0.12 max.	1.0 max.	1.2 max.	0.04 max.	0.03 max.	0.6 max.	10.5 to 14.0	0.5 max.	0.5 max.	—	8×C to 1.5	—
410			0.12 max.	1.0 max.	1.2 max.	0.04 max.	0.03 max.	0.6 max.	11.0 to 13.5	0.5 max.	0.5 max.	—	—	—
410NiMo			0.06 max.	1.0 max.	1.0 max.	0.04 max.	0.03 max.	4.0 to 5.0	11.0 to 12.5	0.4 to 0.7	0.5 max.	—	—	—
430			0.10 max.	1.0 max.	1.2 max.	0.04 max.	0.03 max.	0.6 max.	15.0 to 18.0	0.5 max.	0.5 max.	—	—	—
430Nb			0.10 max.	1.0 max.	1.2 max.	0.04 max.	0.03 max.	0.6 max.	15.0 to 18.0	0.5 max.	0.5 max.	—	0.5 to 1.5	—
16-8-2			0.10 max.	0.75 max.	0.5 to 2.5	0.04 max.	0.03 max.	7.5 to 9.5	14.5 to 16.5	1.0 to 2.0	0.5 max.	—	—	—
2209			0.04 max.	1.0 max.	0.5 to 2.0	0.04 max.	0.03 max.	7.5 to 10.0	21.0 to 24.0	2.5 to 4.0	0.5 max.	0.08 to 0.20	—	—
2553			0.04 max.	0.75 max.	0.5 to 1.5	0.04 max.	0.03 max.	8.5 to 10.5	24.0 to 27.0	2.9 to 3.9	1.5 to 2.5	0.10 to 0.20	—	—

Notes ^{a)} “—” signs in the table are used to indicate that these elements are not required to be analysed.

^{b)} For 308, 308L, 308H, 316H, 347 and 347L, when Bi is specified to be 10 ppm (mass fraction) max. as intended for high-temperature use, the electrode is marked by suffixing BiF to the symbol indicating chemical composition (for example, 308L-BiF). Even for those other than these, when Bi is specified to be 10 ppm (mass fraction) max., the electrode may be marked by suffixing BiF to the symbol in accordance with the agreement between the parties concerned with delivery.

Table 3 Chemical composition of deposited metal (flux cored electrodes for self-shielded arc welding)

Unit: % (mass fraction)

Symbol indicating chemical composition	Classification of electrodes or rods	Class of shielding gas	Chemical composition ^{a)}											
			C	Si	Mn	P	S	Ni	Cr	Mo	Cu	N	Nb+Ta	Ti
307	F	N	0.13 max.	1.0 max.	3.30 to 4.75	0.04 max.	0.03 max.	9.0 to 10.5	19.5 to 22.0	0.5 to 1.5	0.5 max.	—	—	—
308			0.08 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	9.0 to 11.0	19.5 to 22.0	0.5 max.	0.5 max.	—	—	—
308L			0.03 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	9.0 to 12.0	19.5 to 22.0	0.5 max.	0.5 max.	—	—	—
308H			0.04 to 0.08	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	9.0 to 11.0	19.0 to 22.0	0.5 max.	0.5 max.	—	—	—
308Mo			0.08 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	9.0 to 11.0	18.0 to 21.0	2.0 to 3.0	0.5 max.	—	—	—
308LMo			0.03 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	9.0 to 12.0	18.0 to 21.0	2.0 to 3.0	0.5 max.	—	—	—
308HMo			0.07 to 0.12	0.25 to 0.80	1.25 to 2.25	0.04 max.	0.03 max.	9.0 to 10.7	19.0 to 21.5	1.8 to 2.4	0.5 max.	—	—	—
309			0.10 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	12.0 to 14.0	23.0 to 25.5	0.5 max.	0.5 max.	—	—	—
309L			0.03 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	12.0 to 14.0	23.0 to 25.5	0.5 max.	0.5 max.	—	—	—
309Mo			0.12 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	12.0 to 16.0	21.0 to 25.0	2.0 to 3.0	0.5 max.	—	—	—
309LMo			0.04 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	12.0 to 16.0	21.0 to 25.0	2.0 to 3.0	0.5 max.	—	—	—
309LNb			0.03 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	12.0 to 14.0	23.0 to 25.5	0.5 max.	0.5 max.	—	0.7 to 1.0	—
310			0.20 max.	1.0 max.	1.0 to 2.5	0.03 max.	0.03 max.	20.0 to 22.5	25.0 to 28.0	0.5 max.	0.5 max.	—	—	—
312			0.15 max.	1.0 max.	0.5 to 2.5	0.04 max.	0.03 max.	8.0 to 10.5	28.0 to 32.0	0.5 max.	0.5 max.	—	—	—