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JIS Z 3231 : 1999

**Copper and copper alloy
covered electrodes**

ICS 25.160.20

Descriptors : copper, copper alloys, covered electrodes, arc welding

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS Z 3231 : 1989** is replaced with **JIS Z 3231 : 1999**.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

This revision employs **JIS Z 3200 : 1999** *Welding consumables—Technical delivery conditions for welding filler metals—Type of product, dimensions, tolerances and marking* as the normative reference.

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Copper and copper alloy
covered electrodes

- 1 Scope** This Japanese Industrial Standard specifies the covered electrodes used for obtaining deposited metal of copper and copper alloy (hereafter referred to as “electrodes”).
- 2 Normative references** The standards listed in Attached Table 1 contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards shall be applied.
- 3 Classes and types of electrodes** The classes and types of the electrodes shall be as specified in Table 1.

Table 1 Classification of electrodes

Electrode			Kind of current
Class of electrode	Constituent system	Type	
DCu	Copper	DC	DC (+)
		AC	AC or DC (+)
DCuSiA DCuSiB	Silicon bronze	DC	DC (+)
		AC	AC or DC (+)
DCuSnA DCuSnB	Phosphor bronze	DC	DC (+)
		AC	AC or DC (+)
DCuAl	Aluminium bronze	DC	DC (+)
		AC	AC or DC (+)
DCuAlNi	Special aluminium bronze	DC	DC (+)
		AC	AC or DC (+)
DCuNi-1 DCuNi-3	Cupro-nickel	DC	DC (+)
		AC	AC or DC (+)

Remarks : The meaning of the symbols for the kind of current is as follows:

AC: alternating current, DC (+): direct current (electrode positive)

4 Quality

- 4.1 Coating** The coating shall be in accordance with 3 of JIS Z 3200.
- 4.2 Chemical composition** The chemical composition of the deposited metal shall comply with the requirements of Table 2 when tested in accordance with 6.2.

Table 2 Chemical composition of deposited metal

Unit : %

Class of electrode	Chemical composition of deposited metal										
	Cu (including Ag)	Sn	Si	Mn	P	Pb	Al	Fe	Ni	Zn	Total of components ⁽²⁾ marked with sign *
DCu	95.0 min.	—	0.5 max.	3.0 max.	0.30 max.	*0.02 max.	*	*	*	*	0.50 max.
DCuSiA	93.0 min.	—	1.0 to 2.0	3.0 max.	0.30 max.	*0.02 max.	*	—	*	*	0.50 max.
DCuSiB	92.0 min.	—	2.5 to 4.0	3.0 max.	0.30 max.	*0.02 max.	*	—	*	*	0.50 max.
DCuSnA	Remain- der	5.0 to 7.0	*	*	0.30 max.	*0.02 max.	*	*	*	*	0.50 max.
DCuSnB	Remain- der	7.0 to 9.0	*	*	0.30 max.	*0.02 max.	*	*	*	*	0.50 max.
DCuAl	Remain- der	—	1.0 max.	2.0 max.	—	*0.02 max.	7.0 to 10.0	1.5 max.	0.5 max.	*	0.50 max.
DCuAlNi	Remain- der	—	1.0 max.	2.0 max.	—	*0.02 max.	7.0 to 10.0	2.0 to 6.0	2.0 max.	*	0.50 max.
DCuNi-1 (1)	Remain- der	—	0.5 max.	2.5 max.	0.020 max.	*0.02 max.	Ti 0.5 max.	2.5 max.	9.0 to 11.0	*	0.50 max.
DCuNi-3 (1)	Remain- der	—	0.5 max.	2.5 max.	0.020 max.	*0.02 max.	Ti 0.5 max.	2.5 max.	29.0 to 33.0	*	0.50 max.

- Notes (1) S (sulfur) of DCuNi-1 and DCuNi-3 shall be not more than 0.015 %.
- (2) Where it is foreseeable that the amount of the constituent with the sign * is negligible, its analysis may be omitted.

4.3 Hardness The hardness of the deposited metals of DCuAl and DCuAlNi shall be tested in accordance with 6.2 and the results shall comply with the requirements of Table 3.

Table 3 Hardness of deposited metal

Class of electrode	HB
DCuAl	100 min.
DCuAlNi	120 min.

4.4 Mechanical properties The tensile strength and elongation of deposited metal shall be tested in accordance with 6.3 and the results shall comply with the requirements of Table 4.

Table 4 Mechanical properties of deposited metals

Class of electrode	Tensile test	
	Tensile strength N/mm ²	Elongation %
DCu	180 min.	20 min.
DCuSiA	250 min.	22 min.
DCuSiB	270 min.	20 min.
DCuSnA	250 min.	15 min.
DCuSnB	270 min.	12 min.
DCuAl	390 min.	15 min.
DCuAlNi	490 min.	13 min.
DCuNi-1	270 min.	20 min.
DCuNi-3	350 min.	20 min.

4.5 Bendability The bendability of welded joint shall be tested in accordance with 6.4 and the bent outer surface shall be free from cracks exceeding 3.0 mm in length or defects regarded as harmful extending in any direction.

5 Dimensions and tolerances The dimensions and tolerances shall be in accordance with 2 of JIS Z 3200. The representative dimensions are given in Table 5.

Table 5 Representative dimensions of electrodes

Unit : mm

Diameter	Length		
2.6	300	350	
3.2	300	350	
4.0		350	400 450
5.0		350	400 450
6.0			400 450

6 Tests

6.1 Test in general

6.1.1 Test plate The test plate shall be as follows.

- a) The test plate used for chemical analysis test, hardness test and tensile test of the deposited metal shall meet either SS400 of JIS G 3101 or SM400A to C of JIS G 3106.
- b) The test plate used for guide bend test shall have a thickness of 6 mm and shall correspond to the phosphor deoxidized copper plate (C 1201 or C 1220) specified in JIS H 3100 for DCu, to the phosphor bronze plate (C 5101) specified in JIS H 3110 for DCuSnA and DCuSnB, to the cupro-nickel plate (C 7060) specified