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(JCBA/JSA)

**Copper beryllium alloy, copper
titanium alloy, phosphor bronze,
copper-nickel-tin alloy and nickel
silver sheets, plates and strips for
springs**

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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 Japan Copper and Brass Association (JCBA)/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 H 3130:2006** is replaced with this Standard.

However, **JIS H 3130:2006** may be applied in the **JIS** mark certification based on the relevant provisions of Article 19 Clause 1, etc. of the Industrial Standardization Law until October 21, 2013.

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Copper beryllium alloy, copper titanium alloy, phosphor bronze, copper-nickel-tin alloy and nickel silver sheets, plates and strips for springs

1 Scope

This Japanese Industrial Standard specifies the rolled copper beryllium alloy, copper titanium alloy, phosphor bronze, copper-nickel-tin alloy and nickel silver sheets, plates (hereafter referred to as “plates”) and strips (hereafter referred to as “strips”) for springs.

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 H 0321 *General rules for inspection of non-ferrous metal materials*
- JIS H 0500 *Glossary of terms used in wrought copper and copper alloys*
- JIS H 1051 *Methods for determination of copper in copper and copper alloys*
- JIS H 1052 *Methods for determination of tin in copper and copper alloys*
- JIS H 1053 *Methods for determination of lead in copper and copper alloys*
- JIS H 1054 *Methods for determination of iron in copper and copper alloys*
- JIS H 1055 *Methods for determination of manganese in copper and copper alloys*
- JIS H 1056 *Methods for determination of nickel in copper and copper alloys*
- JIS H 1058 *Methods for determination of phosphorus in copper and copper alloys*
- JIS H 1060 *Methods for determination of cobalt in copper and copper alloys*
- JIS H 1062 *Methods for determination of zinc in copper and copper alloys*
- JIS H 1063 *Methods for determination of beryllium in copper alloys*
- JIS H 1073 *Methods for determination of titanium in copper alloys*
- JIS H 1292 *Methods for X-ray fluorescence spectrometric analysis of copper alloys*
- JIS Z 2241 *Metallic materials—Tensile testing—Method of test at room temperature*
- JIS Z 2244 *Vickers hardness test—Test method*
- JIS Z 2248 *Metallic materials—Bend test*

3 Terms and definitions

For the purposes of this Standard, the terms and definitions given in **JIS H 0500** apply.

4 Grade and designation

The grade and designation of plates and strips shall be in accordance with table 1. A product designation shall consist of the designation symbol given in table 1 and the symbol of temper grade suffixed to it (see table 3 to table 9).

Table 1 Grade and designation of plates and strips

Grade		Designation	Informative	
Alloy No.	Shape		Name	Characteristics and application examples
C 1700	Plate	C 1700 P	Copper beryllium alloy for spring	Good corrosion resistance, high workability before age-hardening treatment, improved fatigue endurance and electric conductivity after age-hardening treatment. Hardening treatment shall be given after forming process except in the cases of mill-hardened materials. Applicable to high quality springs, springs for relays and other electrical apparatuses, microswitches, diaphragms, bellows, fuse-clips, connectors, sockets, etc.
	Strip	C 1700 R		
C 1720	Plate	C 1720 P		
	Strip	C 1720 R		
C 1751	Plate	C 1751 P	Low copper beryllium alloy for spring	Good corrosion resistance, improved fatigue endurance and electric conductivity after age-hardening treatment. Especially excellent in electric conductivity which is more than half that of pure copper. Applicable to springs of switches, relays, electrodes, etc.
	Strip	C 1751 R		
C 1990	Plate	C 1990 P	Copper titanium alloy for spring	The mill-hardened materials of age-hardened type copper alloy, having high workability, corrosion resistance, abrasion resistance and fatigue resistance and especially excellent stress relaxation characteristics and thermal resistance. Applicable to springs of switches, connectors, jacks, relays, etc., for electronic, communication, information, electric and measuring instruments and apparatus.
	Strip	C 1990 R		
C 5210	Plate	C 5210 P	Phosphor bronze for spring	Good workability, fatigue endurance and corrosion resistance. Low temperature annealed, and therefore especially suitable for high quality springs. Temper grades ESH and XSH are used for leaf springs which are seldom processed by bending. Applicable to springs of switches, connectors, relays, etc., for electronic, communication, information, electric or measuring instruments and apparatus.
	Strip	C 5210 R		
C 5240	Plate	C 5240 P		
	Strip	C 5240 R		
C 7270	Plate	C 7270 P	Copper-nickel-tin alloy for springs	Good thermal and corrosion resistance, excellent workability before age-hardening treatment, improved stress relaxation characteristics, fatigue endurance and electric conductivity after age-hardening treatment. Suitable for high quality springs. The age-hardening treatment shall be given after forming process except in the case of mill-hardened materials. Applicable to springs of terminals, connectors, sockets, switches, relays, brushes, etc., of electronic, communication, information, electric or measuring instrument and apparatus.
	Strip	C 7270 R		
C 7701	Plate	C 7701 P	Nickel silver for spring	Fine gloss, good workability, fatigue endurance and corrosion resistance. Low temperature annealed, and therefore especially suitable for high quality springs. Temper grade SH is used for leaf springs which are seldom processed by bending. Applicable to springs of switches, connectors, relays, etc., for electronic, communication, information, electric or measuring instruments and apparatus.
	Strip	C 7701 R		

Table 1 (concluded)

NOTE 1	Mill-hardened material means the material given the specified mechanical properties by suitable cold working and age-hardening treatment performed by the manufacturer.
NOTE 2	Definition of temper grade symbols shall be as given in JIS H 0500 , except that temper grades SH, ESH and XSH are defined as follows. Temper grade SH is work-hardened to gain the tensile strength between temper grade EH and temper grade ESH. Temper grade ESH is work-hardened to gain the tensile strength between temper grade SH and temper grade XSH. Temper grade XSH is work-hardened to gain the maximum tensile strength.

5 Quality

5.1 Appearance

Plates and strips shall have a workmanlike finish, homogeneity, and be free from defects detrimental to practical use. Judgement of defects detrimental to practical use shall be subject to the agreement between the purchaser and the manufacturer.

5.2 Chemical composition

The chemical composition of plates and strips, when tested by **8.1**, shall satisfy the requirements given in table 2.

Table 2 Chemical composition of plates and strips

Unit: %

Alloy No.	Cu	Pb	Fe	Sn	Zn	Be	Mn	Ni	P	Ti	Other
C 1700	—	—	—	—	—	1.60 to 1.79	—	—	—	—	Ni+Co 0.20 min. Ni+Co+Fe 0.6 max. Cu+Be+Ni+Co+Fe 99.5 min.
C 1720	—	—	—	—	—	1.80 to 2.00	—	—	—	—	Ni+Co 0.20 min. Ni+Co+Fe 0.6 max. Cu+Be+Ni+Co+Fe 99.5 min.
C 1751	—	—	—	—	—	0.2 to 0.6	—	1.4 to 2.2	—	—	Cu+Be+Ni 99.5 min.
C 1990	—	—	—	—	—	—	—	—	—	2.9 to 3.5	Cu+Ti 99.5 min.
C 5210	—	0.02 max.	0.10 max.	7.0 to 9.0	0.20 max.	—	—	—	0.03 to 0.35	—	Cu+Sn+P 99.5 min.
C 5240	—	0.02 max.	0.10 max.	9.0 to 11.0	0.20 max.	—	—	—	0.03 to 0.35	—	Cu+Sn+P 99.5 min.
C 7270	Re-sidual	0.02 max.	0.50 max.	5.5 to 6.5	—	—	0.50 max.	8.5 to 9.5	—	—	—
C 7701	54.0 to 58.0	0.03 max.	0.25 max.	—	Re-sidual	—	0.50 max.	16.5 to 19.5	—	—	—

5.3 Mechanical properties

Plates and strips shall be tested by 8.2, 8.3, 8.4, 8.5 and 8.6, and the resultant tensile strength, 0.2 % proof stress, elongation, elastic limit of spring, hardness and bending formability shall satisfy the requirements in table 3 to table 9. However, bend test and hardness test shall be performed only when requested by the purchaser.

When the hardness test is conducted, the tensile test need not be applied.

Table 3 Mechanical properties of plates and strips of C 1700, C 1720 and C 7270

Alloy No.	Temper grade	Product designation	Tensile test			Hardness test	
			Thick-ness mm	Tensile strength N/mm ²	Elonga- tion %	Thick-ness mm	Vickers hardness ^{a)} HV
C 1700	O	C 1700 P-O C 1700 R-O	0.10 min.	410 to 540	35 min.	0.10 min.	90 to 160
	¼ H	C 1700 P-¼ H C 1700 R-¼ H	0.10 min.	510 to 620	10 min.	0.10 min.	145 to 220
	½ H	C 1700 P-½ H C 1700 R-½ H	0.10 min.	590 to 695	5 min.	0.10 min.	180 to 240
	H	C 1700 P-H C 1700 R-H	0.10 min.	685 to 835	2 min.	0.10 min.	210 to 270
C 1720	O	C 1720 P-O C 1720 R-O	0.10 min.	410 to 540	35 min.	0.10 min.	90 to 160
	¼ H	C 1720 P-¼ H C 1720 R-¼ H	0.10 min.	510 to 620	10 min.	0.10 min.	145 to 220
	½ H	C 1720 P-½ H C 1720 R-½ H	0.10 min.	590 to 695	5 min.	0.10 min.	180 to 240
	H	C 1720 P-H C 1720 R-H	0.10 min.	685 to 835	2 min.	0.10 min.	210 to 270
C 7270	O	C 7270 P-O C 7270 R-O	0.10 min.	410 to 540	25 min.	0.10 min.	90 to 160
	¼ H	C 7270 P-¼ H C 7270 R-¼ H	0.10 min.	510 to 620	10 min.	0.10 min.	145 to 220
	½ H	C 7270 P-½ H C 7270 R-½ H	0.10 min.	590 to 695	4 min.	0.10 min.	180 to 240
	H	C 7270 P-H C 7270 R-H	0.10 min.	685 to 835	2 min.	0.10 min.	210 to 270
	EH	C 7270 P-EH C 7270 R-EH	0.10 min.	735 to 885	—	0.10 min.	230 to 290
	SH	C 7270 P-SH C 7270 R-SH	0.10 min.	825 to 950	—	0.10 min.	250 to 310
NOTE : 1 N/mm ² = 1 MPa							
Note ^{a)} The minimum test load shall be 1.961 N.							

Table 4 Bending formability of plates and strips of C 1700, C 1720 and C 7270

Alloy No.	Temper grade	Product designation	Bend test, rolling direction ^{a)}			Bend test, perpendicular to the rolling direction ^{a)}		
			Thick-ness mm	Bend angle	Internal radius	Thick-ness mm	Bend angle	Internal radius
C 1700	O	C 1700 P-O C 1700 R-O	0.20 max.	90° or W	0	0.20 max.	90° or W	0
	¼H	C 1700 P-¼H C 1700 R-¼H	0.20 max.	90° or W	Thickness × 1	0.20 max.	90° or W	Thickness × 2
	½H	C 1700 P-½H C 1700 R-½H	0.20 max.	90° or W	Thickness × 2	0.20 max.	90° or W	Thickness × 3
	H	C 1700 P-H C 1700 R-H	0.20 max.	90° or W	Thickness × 2	0.20 max.	90° or W	Thickness × 6
C 1720	O	C 1720 P-O C 1720 R-O	0.20 max.	90° or W	0	0.20 max.	90° or W	0
	¼H	C 1720 P-¼H C 1720 R-¼H	0.20 max.	90° or W	Thickness × 1	0.20 max.	90° or W	Thickness × 2
	½H	C 1720 P-½H C 1720 R-½H	0.20 max.	90° or W	Thickness × 2	0.20 max.	90° or W	Thickness × 3
	H	C 1720 P-H C 1720 R-H	0.20 max.	90° or W	Thickness × 2	0.20 max.	90° or W	Thickness × 6
C 7270	O	C 7270 P-O C 7270 R-O	1.5 max.	180°	Flat on itself	0.50 max.	180°	Flat on itself
	¼H	C 7270 P-¼H C 7270 R-¼H	1.5 max.	W	Thickness × 1	0.50 max.	W	Thickness × 2
	½H	C 7270 P-½H C 7270 R-½H	1.5 max.	W	Thickness × 2	0.50 max.	W	Thickness × 4
	H	C 7270 P-H C 7270 R-H	1.5 max.	W	Thickness × 3	0.50 max.	W	Thickness × 6
	EH	C 7270 P-EH C 7270 R-EH	—	—	—	—	—	—
	SH	C 7270 P-SH C 7270 R-SH	—	—	—	—	—	—
Note ^{a)} Conditions of the bend test. The letter “W” indicates the bend test. The test pieces shall endure the test without generating any cracks on the outside surface of the bent position. However, cracks on the edges of a test piece shall be excluded from this judgement.								