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GB/T 5231-2001

Wrought copper and copper alloys chemical composition
limits and forms of wrought products
加工铜及铜合金化学成分和产品形状

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The People's Republic of China
National Standard
**Wrought copper and copper alloys chemical composition
limits and forms of wrought products**

GB/T 5231-2001

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Foreword

This standard is revised and combine edition of Standards GB/T 5231-1985 *Wrought copper and copper alloys chemical composition limits and forms of wrought products*, GB/T 5232-1985 *Wrought brass – chemical composition limits and forms of wrought products*, GB/T 5233-1985 *Wrought bronze – chemical composition limits and forms of wrought products*, and GB/T 5234 -1985 *Wrought cupronickel – chemical composition limits and forms of wrought products*. This standard makes reference to the designations and chemical composition limits specified in ASTM, whilst making new amendments to certain designations and chemical composition limits in previous editions of the national standards involved.

This standard incorporates 111 designations, including 88 in Standards GB/T 5231 – 5234 -1985 and 23 supplements. Among the supplements, 1 designation of TU0 is for fine copper; 10 designations of HPb89-2, HPb66-0.5, HPb62-3, HPb62-2, HPb60-2, HPb59-3, HA161-4-3-1, HMn62-3-3-0.7, H85A, and H70A for pure copper; 8 designations of QSn1.5-0.2, QSn8-0.3, QBe0.6-2.5, QBe0.4-1.8, QBe0.3-1.5, QCr1, QFe2.5, and QTe0.5 for bronze; and 4 designations of B30, BFe5-1.5-0.5, BZn18-18, and BZn18-26 for cupronickel.

This standard follows the coding system of designations defined in the previous national standards. For designations completely adopting U.S. alloys, corresponding U.S. alloy descriptions shall be included in brackets and so marked under the description.

The Annex A of this standard is informative.

This standard supersedes Standard GB/T 5231-5234-1985 as of the enforcement date.

This standard has been proposed by The China Nonferrous Metals Industry Association.

This standard is supervised by The Research Institute of Standard Metering Quality under The China Nonferrous Metals Industry Association.

Shenyang Nonferrous Metals Factory is responsible for the drafting of this standard.

Luoyang Copper Manufacturing Plant participated in the drafting of this standard.

Drafters are: Wang Xingmao, Jiang Baichang, Liu Guanqiang, Zhang Fumian, Wang Li, Shen Wei, Meng Huijuan, and Guo Shumei.

The State Nonferrous Standardization Technical Committee is entrusted for the interpretation of this standard.

National Standard of the People's Republic of China
Wrought copper and copper alloys chemical composition limits and forms of wrought products

GB/T 5231-2001
Supersedes GB/T 5231-5234-1985

1 Scope

This standard specifies the chemical compositions of wrought copper and copper alloys, together with the forms of common products.

This standard applies to copper and copper alloy products (plate, strip, leaf, tube, bar, shape, wire and forgings) manufactured by pressure methods, and to ingots and blanks of copper and copper alloy.

2 Requirements

2.1 Chemical compositions and forms

2.1.1 The chemical compositions and forms of wrought copper shall meet the requirements in Table 1.

2.1.2 The chemical compositions and forms of wrought brass shall meet the requirements in Table 2.

2.1.3 The chemical compositions and forms of wrought bronze shall meet the requirements in Table 3.

2.1.4 The chemical compositions and forms of wrought cupronickel shall meet the requirements in Table 4.

2.2 Elements with upper and lower limits of contents in Tables 1, 2, 3 and 4 are alloys. For elements with a single value of content, the value is the lower limit of content for coppers, and the upper limit for other impurities.

2.3 The designation of chemical compositions of wrought copper and copper alloys corresponds to the designations in ASTM. See Annex A (Informative).

Table 1 Chemical compositions and product forms of wrought coppers

Group	SN	Designations		Chemical compositions ¹⁾ ,%													Product forms
		Names	Codes	Cu+Ag	P	Ag	Bi ²⁾	Sb ²⁾	As ²⁾	Fe	Ni	Pb	Sn	S	Zn	O	
Pure copper	1	No.1 copper	T1	99.95	0.001	—	0.001	0.002	0.002	0.005	0.002	0.003	0.002	0.005	0.005	0.02	Plate, strip, leaf, tube
	2	No.2 copper	T2 ³⁾	99.90	—	—	0.001	0.002	0.002	0.005	—	0.005	—	0.005	—	—	Plate, strip, leaf, tube, bar, wire, shape
	3	No.3 copper	T3	99.70	—	—	0.002	—	—	—	—	0.01	—	—	—	—	Plate, strip, leaf, tube, bar, wire
oxygen-free copper	4	No.0 oxygen-free copper	TU0 ⁴⁾ [C10100]	Cu 99.99	0.0003	0.0025	0.0001	0.0004	0.0005	0.0010	0.0010	0.0005	0.0002	0.0015	0.0001	0.0005	Plate, strip, leaf, tube, bar, wire
				Se:0.0003 Te:0.0002 Mn:0.00005 Cd:0.0001													
	5	No.1 oxygen-free copper	TU1	99.97	0.002	—	0.001	0.002	0.002	0.004	0.002	0.003	0.002	0.004	0.003	0.002	Plate, strip, leaf, tube, bar, wire
6	No.2 oxygen-free copper	TU2	99.95	0.002	—	0.001	0.002	0.002	0.004	0.002	0.004	0.002	0.004	0.003	0.003	Plate, strip, tube, bar, wire	
phosphorus deoxidized copper	7	No. 1 deoxidized copper	TP1 [C12000]	99.90	0.004~ 0.012	—	—	—	—	—	—	—	—	—	—	—	Plate, strip, tube
	8	No. 2 deoxidized copper	TP2 [C12200]	99.9	0.015~ 0.040	—	—	—	—	—	—	—	—	—	—	—	Plate, strip, tube
silver-bearing copper	9	0.1 silver-bearing copper	TAg0.1	Cu 99.5	—	0.06~ 0.12	0.002	0.005	0.01	0.05	0.2	0.01	0.05	0.01	—	0.1	Plate, tube, wire

- 1) Elements without limits or elements allowing for more strict limits in the table 1 may be restricted as agreed between customer and supplier.
- 2) The elements of arsenic, bismuth and stibium need not be analyzed, provided that the supplier shall guarantee the contents do not exceed the limits.
- 3) Conductive copper T2 with P no higher than 0.001% may be supplier as agreed between customer and supplier.
- 4) TU0[C10100] copper amount is obtained with difference method.

Table 2 Chemical compositions and product forms of wrought brass

Group	SN	Designations		Chemical composition,%									Product forms
		Names	Codes	Cu	Fe ¹⁾	Pb	Al	Mn	Sn	Ni ⁴⁾	Zn	Total impurities	
common brass	1	96 brass	H96	95.0~97.0	0.10	0.03	—	—	—	0.5	residue	0.2	Plate, strip, tube, bar, wire
	2	90 brass	H90	88.0~91.0	0.10	0.03	—	—	—	0.5	residue	0.2	Plate, strip, bar, wire, tube, leaf
	3	85 brass	H85	84.0~86.0	0.10	0.03	—	—	—	0.5	residue	0.3	tube
	4	80 brass	H80 ²⁾	79.0~81.0	0.10	0.03	—	—	—	0.5	residue	0.3	Plate, strip, tube, bar, wire
	5	70 brass	H70 ²⁾	68.5~71.5	0.10	0.03	—	—	—	0.5	residue	0.3	Plate, strip, tube, bar, wire
	6	68 brass	H68	67.0~70.0	0.10	0.03	—	—	—	0.5	residue	0.3	Plate, strip, leaf, tube, bar, wire
	7	65 brass	H65	63.5~68.0	0.10	0.03	—	—	—	0.5	residue	0.3	Plate, strip, wire, tube, leaf
	8	63 brass	H63	62.0~65.0	0.15	0.08	—	—	—	0.5	residue	0.5	Plate, strip, tube, bar, wire
	9	62 brass	H62	60.5~63.5	0.15	0.08	—	—	—	0.5	residue	0.5	Plate, strip, tube, bar, wire, shape, leaf
	10	59 brass	H59	57.0~60.0	0.3	0.5	—	—	—	0.5	residue	1.0	Plate, strip, wire, tube
nickel brass	11	65-5 nickel brass	HNi65-5	64.0~67.0	0.15	0.03	—	—	—	5.0~6.5	residue	0.3	Plate, bar
	12	56-3 nickel brass	HNi56-3	54.0~58.0	0.15~0.5	0.2	0.3~0.5	—	—	2.0~3.0	residue	0.6	bar
Iron brass	13	59-1-1 Iron brass	HFe59-1-1	57.0~60.0	0.6~1.2	0.20	0.1~0.5	0.5~0.8	0.3~0.7	0.5	residue	0.3	Plate, bar, tube
	14	58-1-1 Iron brass	HFe58-1-1	56.0~58.0	0.7~1.3	0.7~1.3	—	—	—	0.5	residue	0.5	bar

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Table 2 (cont'd)

Group	SN	Designations		Chemical composition, %											Product forms
		Names	Codes	Cu	Fe ¹⁾	Pb	Al	Mn	Ni ⁴⁾	Si	Co	As	Zn	Total impurities	
Lead brass	15	89-2 Lead brass	HPb89-2 [C31400]	87.5~90.5 ⁵⁾	0.10	1.3~2.5	—	—	0.7	—	—	—	—	—	Bar
	16	66-0.5 Lead brass	HPb66-0.5 [C33000]	65.0~68.0 ⁵⁾	0.07	0.25~0.7	—	—	—	—	—	—	—	—	Tube
	17	63-3 Lead brass	HPb63-3	62.0~65.0	0.10	2.4~3.0	—	—	0.5	—	—	—	—	0.75	Plate, Strip, Bar, Wire
	18	63-0.1 Lead brass	HPb63-0.1	61.5~63.5	0.15	0.05~0.3	—	—	0.5	—	—	—	—	0.5	Wire, Bar
	19	62-0.8 Lead brass	HPb62-0.8	60.0~63.0	0.2	0.5~1.2	—	—	0.5	—	—	—	—	0.75	Wire
	20	62-3 Lead brass	HPb62-2 [C36000]	60.0~63.0 ⁶⁾	0.35	2.5~3.7	—	—	—	—	—	—	—	—	Bar
	21	62-2 Lead brass	HPb62-2 [C35300]	60.0~63.0 ⁶⁾	0.15	1.5~2.5	—	—	—	—	—	—	—	—	Plate, Strip, Bar
	22	61-1 Lead brass	HPb61-1 [C37100]	58.0~62.0 ⁵⁾	0.15	0.6~1.2	—	—	—	—	—	—	—	—	Plate, Strip, Bar, Wire
	23	60-2 Lead brass	HPb60-2 [C37700]	58.0~61.0 ⁶⁾	0.30	1.5~2.5	—	—	—	—	—	—	—	—	Plate, Strip
	24	59-3 Lead brass	HPb59-3	57.5~59.5	0.50	2.0~3.0	—	—	0.5	—	—	—	—	1.2	Plate, Strip, Tube, Bar, Wire
	25	59-1 Lead brass	HPb59-1	57.0~60.0	0.5	0.8~1.9	—	—	1.0	—	—	—	—	1.0	Plate, Strip, Tube, Bar, Wire
Aluminum brass	26	77-2 Aluminum brass	HA177-2 [C68700]	76.0~79.0 ⁶⁾	0.06	0.07	1.8~2.5	—	—	—	—	0.02~0.06	—	—	Tube
	27	67-2.5 Aluminum brass	HA167-2.5	66.0~68.0	0.6	0.5	2.0~3.0	—	0.5	—	—	—	—	1.5	Plate, Bar
	28	66-6-3-2 Aluminum brass	HA166-6-3-2	64.0~68.0	2.0~4.0	0.5	6.0~7.0	1.5~2.5	0.5	—	—	—	—	1.5	Plate, Bar
	29	64-4-3-1 Aluminum brass	HA161-4-3-1	59.0~62.0	0.3~1.3	—	3.5~4.5	—	2.5~4.0	0.5~1.5	0.5~1.0	—	—	0.7	Tube
	30	60-1-1 Aluminum brass	HA160-1-1	58.0~61.0	0.70~1.50	0.40	0.70~1.50	0.1~0.6	0.5	—	—	—	—	0.7	Plate, Bar
	31	59-3-2 Aluminum brass	HA159-3-2	57.0~60.0	0.50	0.10	2.5~3.5	—	2.0~3.0	—	—	—	—	0.9	Plate, Tube, Bar

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Table 2 (the end)

Group	SN	Designations		Chemical composition, %										Product forms	
		Names	Codes	Cu	Fe ¹⁾	Pb	Al	Mn	Sn	As	Si	Ni ⁴⁾	Zn		Total impurities
manganese brass	32	62-3-3-0.7 manganese brass	HMn62-3-3-0.7	60.0~63.0	0.1	0.05	2.4~3.4	2.7~3.7	0.1	—	0.5~1.5	0.5	residue	1.2	Tube
	33	58-2 manganese brass	HMn58-2 ³⁾	57.0~60.0	1.0	0.1	—	1.0~2.0	—	—	—	0.5	residue	1.2	Plate, Strip, Bar, Wire, Tube
	34	57-3-1 manganese brass	HMn57-3-1 ³⁾	55.0~58.5	1.0	0.2	0.5~1.5	2.5~3.5	—	—	—	0.5	residue	1.3	Plate, Bar
	35	55-3-1 manganese brass	HMn55-3-1 ³⁾	53.0~58.0	0.5~1.5	0.5	—	3.0~4.0	—	—	—	0.5	residue	1.5	Plate, Bar
tin brass	36	90-1 tin brass	HSn90-1	88.0~91.0	0.10	0.03	—	—	0.25~0.75	—	—	0.5	residue	0.2	Plate, Strip
	37	70-1 tin brass	HSn70-1	69.0~71.0	0.10	0.05	—	—	0.8~1.3	0.03~0.06	—	0.5	residue	0.3	Tube
	38	62-1 tin brass	HSn62-1	61.0~63.0	0.10	0.10	—	—	0.7~1.1	—	—	0.5	residue	0.3	Plate, Strip, Bar, Wire, Tube
	39	60-1 tin brass	HSn60-1	59.0~61.0	0.10	0.30	—	—	1.0~1.5	—	—	0.5	residue	1.0	Wire, Tube
arsenic brass	40	85A arsenic brass	H85A	84.0~86.0	0.10	0.03	—	—	—	0.02~0.08	—	0.5	residue	0.3	Tube
	41	70A arsenic brass	H70A [C26130]	68.5~71.5 ⁷⁾	0.05	0.05	—	—	—	0.02~0.08	—	—	residue	—	Tube
	42	68A silicon brass	H68A	67.0~70.0	0.10	0.03	—	—	—	0.03~0.06	—	0.5	residue	0.3	Tube
silicon brass	43	80-3 silicon brass	HSi80-3	79.0~81.0	0.6	0.1	—	—	—	—	2.5~4.0	0.5	residue	1.5	Bar

- 1) The iron mass percent of diamagnetic brass is no higher than 0.030%.
- 2) For special-purpose H70 and H80, the maximum limits of impurities are Fe 0.07%, Sb 0.002%, P 0.005%, As 0.005%, S 0.002%, and the total impurities 0.20%.
- 3) The P mass percent of HMn57-3-1 and HMn58-2, which are used for mould castings and hot forging, is no higher than 0.03%; the Al mass percent of HMn55-3-1, which is used for special purposes, is no higher than 0.1%.
- 4) For brasses without corresponding foreign designations, with an exception for brasses of which Nickel is the major constituent, the Nickel content is included in brass.
- 5) Cu+, listed elements total no lower than 99.6%
- 6) Cu+, listed elements total no lower than 99.5%
- 7) Cu+, listed elements total no lower than 99.7%

Table 3 Chemical compositions and product forms of wrought bronze

Group	SN	Designations		Chemical composition, %												Product forms
		Names	Codes	Sn	Al	Si	Mn	Zn	Ni	Fe	Pb	P	As ¹⁾	Cu	Total impurities	
tin bronze ^{2),5)}	1	1.5-0.2 tin bronze	QSn1.5-0.2 [C50500]	1.0~1.7	—	—	—	0.30	0.2	0.10	0.05	0.03~0.35	—	residue ⁶⁾	—	Tube
	2	4-0.3 tin bronze	QSn4-0.3 [C51100]	3.5~4.9	—	—	—	0.30	0.2	0.10	0.05	0.03~0.35	—	residue ⁶⁾	—	Tube
	3	4-3 tin bronze	QSn 4-3	3.5~4.5	0.002	—	—	2.7~3.3	0.2	0.05	0.02	0.03	—	residue	0.2	Plate, Strip, leaf, Bar, Wire
	4	4-4-2.5 tin bronze	QSn4-4-2.5	3.0~5.0	0.002	—	—	3.0~5.0	0.2	0.05	1.5~3.5	0.03	—	residue	0.2	Plate, Strip
	5	4-4-4 tin bronze	QSn 4-4-4	3.0~5.0	0.002	—	—	3.0~5.0	0.2	0.05	3.5~4.5	0.03	—	residue	0.2	Plate, Strip
	6	6.5-0.1 tin bronze	QSn6.5-0.1	6.0~7.0	0.002	—	—	0.3	0.2	0.05	0.02	0.10~0.25	—	residue	0.1	Plate, Strip, leaf, Bar, Wire, Tube
	7	6.5-0.4 tin bronze	QSn6.5-0.4	6.0~7.0	0.002	—	—	0.3	0.2	0.02	0.02	0.26~0.40	—	residue	0.1	Plate, Strip, leaf, Bar, Wire, Tube
	8	7-0.2 tin bronze	QSn 7-0.2	6.0~8.0	0.01	—	—	0.3	0.2	0.05	0.02	0.10~0.25	—	residue	0.15	Plate, Strip, leaf, Bar, Wire
	9	8-0.3 tin bronze	QSn8-0.3 [C52100]	7.0~9.0	—	—	—	0.20	0.2	0.10	0.05	0.03~0.35	—	residue ⁶⁾	—	Plate, Strip
aluminum bronze ⁵⁾	10	5 aluminum bronze	QAl5	0.1	4.0~6.0	0.1	0.5	0.5	0.5	0.5	0.03	0.01	—	residue	1.6	Plate, Strip
	11	7 aluminum bronze	QAl7 [C61000]	—	6.0~8.5	0.10	—	0.20	0.5	0.50	0.02	—	—	residue ⁶⁾	—	Plate, Strip
	12	9-2 aluminum bronze	QAl 9-2	0.1	8.0~10.0	0.1	1.5~2.5	1.0	0.5	0.5	0.03	0.01	—	residue	1.7	Plate, Strip, leaf, Bar, Wire
	13	9-4 aluminum bronze	QAl 9-4	0.1	8.0~10.0	0.1	0.5	1.0	0.5	2.0~4.0	0.01	0.01	—	residue	1.7	Tube, Bar
	14	9-5-1-1 aluminum bronze	QAl 9-5-1-1	0.1	8.0~10.0	0.1	0.5~1.5	0.3	4.0~ 6.0	0.5~1.5	0.01	0.01	0.01	residue	0.6	Bar
	15	10-3-1.5 aluminum bronze	QAl 10-3-1.5 ³⁾	0.1	8.5~10.0	0.1	1.0~2.0	0.5	0.5	2.0~4.0	0.03	0.01	—	residue	0.75	Tube, Bar

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Table 3 (cont'd)

Group	SN	Designations		Chemical composition, %																		Product forms
		Names	Codes	Sn	Al	Be	Si	Mn	Zn	Ni	Fe	Pb	P	Ti	Mg	As ¹⁾	Sb ¹⁾	Co	Ag	Cu	Total impurities	
aluminum bronze	16	10-4-4 aluminum bronze	QAl10-4-4 ⁴⁾	0.1	9.5~11.0	—	0.1	0.3	0.5	3.5~5.5	3.5~5.5	0.02	0.01	—	—	—	—	—	—	residue	1.0	Tube, Bar
	17	10-5-5 aluminum bronze	QAl10-5-5	0.20	8.0~11.0	—	0.25	0.5~2.5	0.50	4.0~6.0	4.0~6.0	0.05	—	—	0.10	—	—	—	—	residue	1.2	Bar
	18	11-6-6 aluminum bronze	QAl11-6-6	0.2	10.0~11.5	—	0.2	0.5	0.6	5.0~6.5	5.0~6.5	0.05	0.1	—	—	—	—	—	—	residue	1.5	Bar
beryllium bronze	19	2 beryllium bronze	QBe2	—	0.15	1.80~2.1	0.15	—	—	0.2~0.5	0.15	0.005	—	—	—	—	—	—	residue	0.5	Plate, Strip, Bar	
	20	1.9 beryllium bronze	QBe1.9	—	0.15	1.85~2.1	0.15	—	—	0.2~0.4	0.15	0.005	—	0.10~0.25	—	—	—	—	residue	0.5	Plate, Strip	
	21	1.9-01 beryllium bronze	QBe1.9-0.1	—	0.15	1.85~2.1	0.15	—	—	0.2~0.4	0.15	0.005	—	0.10~0.25	0.07~0.13	—	—	—	residue	0.5	Strip	
	22	1.7 beryllium bronze	QBe1.7	—	0.15	1.6~1.85	0.15	—	—	0.2~0.4	0.15	0.005	—	0.10~0.25	—	—	—	—	residue	0.5	Plate, Strip	
	23	0.6-2.5 beryllium bronze	QBe0.6-2.5 [C17500]	—	0.20	0.40~0.7	0.20	—	—	—	0.10	—	—	—	—	—	—	2.4~2.7	—	residue	—	Plate, Strip
	24	0.4-1.8 beryllium bronze	QBe0.4-1.8 [C 17510]	—	0.20	0.20~0.6	0.20	—	—	1.4~2.2	0.10	—	—	—	—	—	—	0.30	—	residue ⁶⁾	—	Strip
	25	0.3-1.5 beryllium bronze	QBe0.3-1.5	—	0.20	0.25~0.50	0.20	—	—	—	0.10	—	—	—	—	—	—	1.40~1.70	0.90~1.10	residue	—	Plate, Strip
silicon bronze	26	3-1 silicon bronze	QSi3-1 ²⁾	0.25	—	—	2.7~3.5	1.0~1.5	0.5	0.2	0.3	0.03	—	—	—	—	—	—	residue ⁶⁾	1.1	Plate, Strip, leaf, Bar, Wire, Tube	
	27	1-3 silicon bronze	QSi1-3	0.1	0.02	—	0.6~1.1	0.1~0.4	0.2	2.4~3.4	0.1	0.15	—	—	—	—	—	—	residue	0.5	Bar	
	28	3.5-3-1.5 silicon bronze	Si3.5-3-1.5	0.25	—	—	3.0~4.0	0.5~0.9	2.5~3.5	0.2	1.2~1.8	0.03	0.03	—	—	0.002	0.002	—	—	residue	1.1	Tube

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Table 3 (cont'd)

Group	SN	Designations		Chemical composition, %																		Product forms	
		Names	Codes	Mn	Zr	Cr	Cd	Mg	Al	Si	Fe	Pb	P	Zn	Sn	Sb ¹⁾	Ni	Bi ¹⁾	As ¹⁾	S	Cu		Total impurities
manganese bronze	29	1.5 manganese bronze	QMn1.5	1.20~1.80	—	0.1	—	—	0.07	0.1	0.1	0.01	—	—	0.05	0.005	0.1	0.002	—	0.01	residue	0.3	Plate, Strip
	30	2 manganese bronze	QMn2	1.5~2.5	—	—	—	—	0.07	0.1	0.1	0.01	—	—	0.05	0.05	—	0.002	0.01	—	residue	0.5	Plate, Strip
	31	5 manganese bronze	QMn5	4.5~5.5	—	—	—	—	—	0.1	0.35	0.03	0.01	0.4	0.1	0.002	—	—	—	—	residue	0.9	Plate, Strip
zirconium copper	32	0.2 zirconium copper	QZr0.2	—	0.15~0.30	—	—	—	—	—	0.05	0.01	—	—	0.05	0.005	0.2	0.002	—	0.01	residue	0.5	Bar
	33	0.4 zirconium copper	QZr0.4	—	0.30~0.50	—	—	—	—	—	0.05	0.01	—	—	0.05	0.005	0.2	0.002	—	0.01	residue	0.5	Bar
chromium bronze	34	0.5 chromium bronze	QCr0.5	—	—	0.4~1.1	—	—	—	—	0.1	—	—	—	—	—	0.05	—	—	—	residue	0.5	Plate, Bar, Wire, Tube
	35	0.5-0.2-0.1 chromium bronze	QCr0.5-0.2-0.1	—	—	0.4~1.0	—	0.1~0.25	0.1~0.25	—	—	—	—	—	—	—	—	—	—	—	residue	0.5	Plate, Bar, Wire
	36	0.6-0.4-0.05 chromium bronze	QCr0.6-0.4-0.05	—	0.3~0.6	0.4~0.8	—	0.04~0.08	—	0.05	0.05	—	0.01	—	—	—	—	—	—	—	residue	0.5	Bar
	37	1 chromium bronze	QCr1[C18200]	—	—	0.6~1.2	—	—	—	0.10	0.10	0.05	—	—	—	—	—	—	—	—	Residue ⁶⁾	—	Bar, Wire, Tube
cadmium bronze	38	1 cadmium bronze	QCd1 [C16200]	—	—	—	0.7~1.2	—	—	—	0.02	—	—	—	—	—	—	—	—	—	residue ⁶⁾	—	Wire, Strip, Bar, Wire

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Table 3 (the end)

Group	SN	Designations		Chemical composition, %													Product forms
		Names	Codes	Mg	Fe	Pb	P	Zn	Sn	Sb ¹⁾	Ni	Bi ¹⁾	Te	S	Cu	Total impurities	
magnesium bronze	39	0.8 magnesium bronze	QMg0.8	0.70~0.85	0.005	0.005	—	0.005	0.002	0.005	0.006	0.002	—	0.005	residue	0.3	Wire
iron bronze	40	2.5 iron bronze	QFe2.5 [C19400]	—	2.1~2.6	0.03	0.015~0.15	0.05~0.20	—	—	—	—	—	—	97.0	—	Strip
tellurium bronze	41	0.5 tellurium bronze	QTe0.5 [C14500]	—	—	—	0.004~0.012	—	—	—	—	—	0.40~0.7	—	99.90 ⁷⁾	—	Bar

1) The elements of arsenic, bismuth and stibium need not be analyzed, provided that the supplier shall guarantee the contents do not exceed the limits.

2) The iron mass percent of conductive tin bronze is no larger than 0.020%; the iron mass percent of QSi3-1 is no larger than 0.030%.

3) The zinc mass percent of non-wear-resistant material QAl10-3-1.5 is up to 1%, and the impurities total is no larger than 1.25%

4) As agreed between customer and supplier, the zinc mass percent of QAl10-4-4, which is used for welding and other special purposes, is no larger than 0.2%.

5) The content of impurity Nickel in Aluminum bronze and tin bronze is included in copper content.

6) Cu+, listed elements total no lower than 99.5%

7) Including Te + Sn

Table 4 Chemical compositions and product forms of wrought cupronickel

Group	SN	Designations		Chemical composition, %														Product forms
		Names	Codes	Ni+Co	Fe	Mn	Zn	Pb	Al	Si	P	S	C	Mg	Sn	Cu	Total impurities	
Common cupronickel	1	0.6 cupronickel	B0.6	0.57~0.63	0.005	—	—	0.005	—	0.002	0.002	0.005	0.002	—	—	residue	0.1	Wire
	2	5 cupronickel	B5	4.4~5.0	0.20	—	—	0.01	—	—	0.01	0.01	0.03	—	—	residue	0.5	Tube, Bar
	3	19 cupronickel	B19 ²⁾	18.0~20.0	0.5	0.5	0.3	0.005	—	0.15	0.01	0.01	0.05	0.05	—	residue	1.8	Plate, Strip
	4	25 cupronickel	B25	24.0~26.0	0.5	0.5	0.3	0.005	—	0.15	0.01	0.01	0.05	0.05	0.03	residue	1.8	Plate
	5	30 cupronickel	B30	29~33	0.9	1.2	—	0.05	—	0.15	0.006	0.01	0.05	—	—	residue	—	Plate, Tube, Wire
Iron cupronickel	6	5-1.5-0.5 Iron cupronickel	BFe5-1.5-0.5 [C70400]	4.8~6.2	1.3~1.7	0.30~0.8	1.0	0.05	—	—	—	—	—	—	—	residue ⁴⁾	—	Tube
	7	10-1-1 Iron cupronickel	BFe10-1-1	9.0~11.0	1.0~1.5	0.5~1.0	0.3	0.02	—	0.15	0.006	0.01	0.05	—	0.03	residue	0.7	Plate, Tube
	8	30-1-1 Iron cupronickel	BFe30-1-1	29.0~32.0	0.5~1.0	0.5~1.2	0.3	0.02	—	0.15	0.006	0.01	0.05	—	0.03	residue	0.7	Plate, Tube
Manganese cupronickel	9	3-12 Manganese cupronickel	BMn3-12 ³⁾	2.0~3.5	0.20~0.50	11.5~13.5	—	0.020	0.2	0.1~0.3	0.005	0.020	0.05	0.03	—	residue	0.5	Plate, Tube, Wire
	10	40-1.5 Manganese cupronickel	BMn40-1.5 ³⁾	39.0~41.0	0.50	1.0~2.0	—	0.005	—	0.10	0.005	0.02	0.10	0.05	—	residue	0.9	Plate, Tube, leaf, Bar, Wire, Tube
	11	43-0.5 Manganese cupronickel	BMn43-0.5 ³⁾	42.0~44.0	0.15	0.10~1.0	—	0.002	—	0.10	0.002	0.01	0.10	0.05	—	residue	0.6	Wire

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Table 4 (the end)

Group	SN	Designations		Chemical composition, %																Product forms		
		Names	Codes	Ni+Co	Fe	Mn	Zn	Pb	Al	Si	P	S	C	Mg	Bi ¹⁾	As ¹⁾	Sb ¹⁾	Cu	Total impurities			
Nickel silver	12	18-18 Nickel silver	BZn18-18 [C75200]	16.5~19.5	0.25	0.50	Residue	0.05	—	—	—	—	—	—	—	—	—	—	63.5~66.5 ⁴⁾	—	Plate, Strip	
	13	18-26 Nickel silver	BZn18-26 [C77000]	16.5~19.5	0.25	0.50	Residue	0.05	—	—	—	—	—	—	—	—	—	—	53.5~56.5 ⁴⁾	—	Plate, Strip	
	14	15-20 Nickel silver	BZn15-20	13.5~16.5	0.5	0.3	Residue	0.02	—	0.15	0.005	0.01	0.03	0.05	0.002	0.010	0.002	—	62.0~65.0	0.9	Plate, Strip, leaf, Tube, Bar, Wire	
	15	15-21-1.8 nickel silver with lead	BZn15-21-1.8	14.0~16.0	0.3	0.5	Residue	1.5~2.0	—	0.15	—	—	—	—	—	—	—	—	—	60.0~63.0	0.9	Bar
	16	15-24-1.5 nickel silver with lead	BZn15-24-1.5	12.5~15.5	0.25	0.05~0.5	Residue	1.4~1.7	—	—	0.02	0.005	—	—	—	—	—	—	—	58.0~60.0	0.75	Bar
Aluminum cupronickel	17	13-3 Aluminum cupronickel	BAI13-3	12.0~15.0	1.0	0.50	—	0.003	2.3~3.0	—	0.01	—	—	—	—	—	—	—	residue	1.9	Bar	
	18	6-1.5 Aluminum cupronickel	BAI6-1.5	5.5~6.5	0.50	0.20	—	0.003	1.2~1.8	—	—	—	—	—	—	—	—	—	residue	1.1	Plate	

- 1) The elements of arsenic, bismuth and stibium need not be analyzed, provided that the supplier shall guarantee the contents do not exceed the limits
- 2) Special-purpose cupronickel strip B19, with the silicon mass percent no larger than 0.05%, may be supplied.
- 3) For BMn3-12 alloy, BMn40-1.5 and BMn43-0.5 alloys used for thermal couplers, the specified contents with maximum and minimum limits may exceed slight from the values in Table 4 to guarantee the behavior of electricity.
- 4) Cu+, listed elements total no lower than 99.5%

Annex A
(informative)

Contrast Table of equivalent designations according to ASTM standard

Designations in this standard	ASTM designations	Designations in this standard	ASTM designations
TU0	C10100	QSn4-0.3	C51100
TP1	C12000	QSn8-0.3	C52100
TP2	C12200	QA17	C61000
HPb89-2	C31400	QBe0.6-2.5	C17500
HPb66-0.5	C33000	QBe0.4-1.8	C17510
HPb62-3	C36000	QCr1	C18200
HPb62-2	C35300	QCd1	C16200
HPb61-1	C37100	QFe2.5	C19400
HPb60-2	C37700	QTe0.5	C14500
HA177-2	C68700	BFe5-1.5-0.5	C70400
H70A	C26130	BZn18-18	C75200
QSn1.5-0.2	C50500	BZn18-26	C77000`

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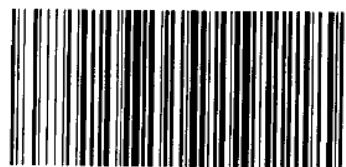
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