

## 磷青銅 (Phosphor Bronze) 特性及規格一覽表：

### (1)化學成份 (Chemical Composition)

合金編號		化學成份(wt. %)					
Material Designation		Cu	Sn	p	Pb	Fe	Zn
JIS	C5111	Rem.	3.5~4.5	0.03~0.35	< 0.05	< 0.10	< 0.30
	C5102	Rem.	4.2~5.5	0.03~0.35	< 0.05	< 0.10	< 0.30
	C5191	Rem.	5.5~7.0	0.03~0.35	< 0.05	< 0.10	< 0.30
	C5212	Rem.	7.0~9.0	0.03~0.35	< 0.05	< 0.10	< 0.30

### (2)物理特性(Physical Properties)

合金編號 (Alloy No.)	密度 (Density) g/cm <sup>3</sup>	彈性係數 (Modulus of Elasticity) (Young's Modulus) GPa	熱膨脹係數 (Coefficient of Thermal Expansion at 20 °C to 300 °C) µm/m · K	熱傳導係數 (Thermal Conductivity at 20 °C) W/m · K	導電率 (Electrical Conductivity at 20 °C) %IACS
C5111	8.86	110	17.8	83.8	19
C5102	8.86	110	17.8	69.2	15
C5191	8.84	110	18.0	65.8	14
C5212	8.80	110	18.2	62.3	12

### (3)機械性質(Mechanical Properties)

合金編號 Alloy No.	質別 Temper	符號 Symbol	抗拉試驗 Tensile test			硬度試驗 Hardness test
			厚度 Thickness (mm)	抗拉強度 Tensile strength (kgf/mm <sup>2</sup> )	延伸率(50mm) Elongation(in 2") (%)	Hv Thickness >0.15mm
C5111	O	C5111R-O	> 0.2	> 30	> 38	-
	H/4	C5111R-H/4	> 0.2	38~45	> 28	120~150
	H/2	C5111R-H/2	> 0.2	42~52	> 18	130~160
	3/4H	C5111R-3/4H	> 0.2	48~58	> 10	150~170
	H	C5111R-H	> 0.2	50~58	> 8	170~190
	EH	C5111R-EH	> 0.2	> 58	> 5	> 190
C5102	O	C5102R-O	> 0.2	> 31	> 40	-
	H/4	C5102R-H/4	> 0.2	38~48	> 28	120~150
	H/2	C5102R-H/2	> 0.2	48~58	> 18	150~170

	3/4H	C5102R-3/4H	> 0.2	50~58	> 10	170~190
	H	C5102R-H	> 0.2	58~68	> 8	190~210
	EH	C5102R-EH	> 0.2	> 63	> 5	> 210

### Mechanical Properties (continuous)

合金編號 Alloy No.	質別 Temper	符號 Symbol	抗拉試驗 Tensile test			硬度試驗 Hardness test
			厚度 Thickness (mm)	抗拉強度 Tensile strength (kgf/mm <sup>2</sup> )	延伸率(50mm) Elongation(in 2'') (%)	Hv Thickness >0.15mm
C5191	O	CC5191R-O	> 0.2	> 32	> 42	-
	H/4	C5191R-H/4	> 0.2	40~52	> 35	120~150
	H/2	C5191R-H/2	> 0.2	50~60	> 20	150~170
	3/4H	C5191R-3/4H	> 0.2	52~62	> 18	170~190
	H	C5191R-H	> 0.2	60~70	> 10	190~210
	EH	C5191R-EH	> 0.2	65~75	> 8	210~230
	SH	C5191R-SH	> 0.2	> 75	> 5	230~270
C5212	O	CC5210R-O	> 0.2	> 35	> 45	-
	H/4	C5210R-H/4	> 0.2	40~52	> 40	120~150
	H/2	C5210R-H/2	> 0.2	50~60	> 30	150~170
	3/4H	C5210R-3/4H	> 0.2	52~62	> 20	170~190
	H	C5210R-H	> 0.2	60~72	> 12	190~210
	EH	C5210R-EH	> 0.2	70~80	> 8	210~230
	SH	C5210R-SH	> 0.2	> 75	> 5	230~270

## 黃銅 (Brass) 特性及規格一覽表：

### (1)化學成份 (Chemical Composition)

合金編號		化學成份 (wt.%)			
Material Designation		Cu	Zn	Fe	Pb
JIS	C2600	68.5~71.5	Rem.	0.05(max)	0.07(max)
	C2680	64.0~68.5	Rem.	0.05(max)	0.15(max)
	C2801	59.0~63.0	Rem.	0.05(max)	0.30(max)

### (2)物理特性(Physical Properties)

合金編號	密度	彈性係數	熱膨脹係數	熱傳導係數	導電率
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(Alloy No.)	(Density) g/cm <sup>3</sup>	(Modulus of Elasticity) (Young's Modulus) GPa	(Coefficient of Thermal Expansion at 20 °C to 300 °C) μm/m · K	(Thermal Conductivity  at 20 °C) W/m · K	(Electrical Conductivity at 20 °C) %IACS
C2600	8.53	110	19.9	120	28
C2680	8.47	105	20.3	116	27
C2801	8.39	105	20.8	123	28

### (3)機械性質(Mechanical Properties)

合金編號 Alloy No.	質別 Temper	符號 Symbol	抗拉試驗 Tensile test			硬度試驗 Hardness test
			厚度 Thickness (mm)	抗拉強度 Tensile strength (kgf/mm <sup>2</sup> )	延伸率(50mm) Elongation(in 2") (%)	Hv  Thickness >0.15mm
C2600	O	C2600R-O	> 0.2	> 28	> 40	70~90
	H/2	C2600R-H/2	> 0.2	36~45	> 28	110~130
	H	C2600R-H	> 0.2	42~55	-	140~160
	EH	C2600R-EH	> 0.2	53~60	-	160~180
	SH	C2600R-SH	> 0.2	> 58	-	> 180
C2680	O	C2680R-O	> 0.2	> 28	> 40	70~90
	H/2	C2680R-H/2	> 0.2	36~46	> 28	110~130
	H	C2680R-H	> 0.2	42~55	-	140~160
	EH	C2680R-EH	> 0.2	53~60	-	160~180
	SH	C2680R-SH	> 0.2	> 58	-	> 180
C2801	O	C2801R-O	> 0.2	> 33	> 35	-
	H/4	C2801R-H/4	> 0.2	36~45	> 25	95~115
	H/2	C2801R-H/2	> 0.2	42~50	> 15	115~140
	H	C2801R-H	> 0.2	> 48	-	> 140

### C194 合金(HSM Copper)特性及規格一覽表：

#### (1)化學成份(Cheical Composition)

合金編號		化學成份 (wt.%)				
Material Designation		Cu	Fe	P	Zn	Pb
JIS	C194	Rem.	2.10~2.60	0.015~0.15	0.05~0.20	<0.03

#### (2)物理特性(Physical Properties)

合金編號	密度	彈性係數	熱膨脹係數	熱傳導係數	導電率
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(Alloy No.)	(Density) g/cm <sup>3</sup>	(Modulus of Elasticity) (Young's Modulus) GPa	(Coefficient of Thermal Expansion at 20 °C to 300 °C) μm/m · K	(Thermal Conductivity at 20 °C) W/m · K	(Electrical Conductivity at 20 °C) %IACS
C194	8.83	121	16.3	262	65

### (3)機械性質(Mechanical Properties)

合金編號 Alloy No.	質別 Temper	符號 Symbol	抗拉試驗 Tensile test			硬度試驗 Hardness test
			厚度 Thickness (mm)	抗拉強度 Tensile strength (kgf/mm <sup>2</sup> )	延伸率(50mm) Elongation(in 2") (%)	Hv Thickness>0.15mm
C194	O	C194R-O	> 0.2	31~38	> 25	90~115
	H/2	C194R-H/2	> 0.2	37~44	> 6	115~135
	H	C194R-H	> 0.2	42~49	> 3	125~145
	EH	C194R-EH	> 0.2	47~51	> 2	135~150
	SH	C194R-SH	> 0.2	49~53	-	140~155
	ESH	C194R-ESH	> 0.2	51~56	-	145~160

## 紅銅 (Copper) 特性及規格一覽表

### (1)化學成份(Cheical Composition)

合金編號		化學成份 (wt.%)	
Material Designation		Cu	P
JIS	C1100(ETP)	99.9(min)	-
	C1200(DLP)	99.9(min)	0.004~0.012
	C1220(DHP)	99.9(min)	0.015~0.040

### (2)物理特性(Physical Properties)

合金編號 (Alloy No.)	密度 (Density) g/cm <sup>3</sup>	彈性係數 (Modulus of Elasticity) (Young's Modulus) GPa	熱膨脹係數 (Coefficient of Thermal Expansion at 20 °C to 300 °C) μm/m · K	熱傳導係數 (Thermal Conductivity at 20 °C) W/m · K	導電率 (Electrical Conductivity at 20 °C) %IACS
C1100	8.94	117	16.9	391.1	101
C1200	8.94	117	16.9	386.0	98
C1220	8.94	117	17.1	339.2	85

### (3)機械性質(Mechanical Properties)

合金編號 Alloy No.	質別 Temper	抗拉試驗 Tensile test			硬度試驗 Hardness test
		厚度 Thickness (mm)	抗拉強度 Tensile strength (kgf/mm <sup>2</sup> )	延伸率(50mm) Elongation(in 2" ) (%)	Hv Thickness >0.15mm
C1100 C1200 C1220	O	> 0.2	< 27	> 30	< 65
	H/4	> 0.2	24~30	> 13	60~80
	H/2	> 0.2	26~33	> 10	70~90
	3/4H	> 0.2	29~35	> 5	80~100
	H	> 0.2	30~37	> 4	90~110
	EH	> 0.2	33~40	> 3	95~110
	SH	> 0.2	35~41	> 2	100~125

### 磷青銅(Phosphor Bronze)合金各規格對照表

規格名稱 SPEC	合金編號 Alloy No.	化學成分 Chemical Composition (wt.%)								規格編號 Spec n
		Cu	Sn	P	Fe	Ni	Pb	Zn	Others	
ISO	CuSn 4	Rem.	3.5~4.5	0.01~0.40	≤0.1	≤0.3	≤0.05	≤0.3	---	427
	CuSn 5		4.5~5.5							
	CuSn 6		5.5~7.5							
	CuSn 8		7.5~9.0							
CNS	C5101	Rem.	3.0~5.5	0.03~0.35	---	---	---	---	Cu+Sn+P≥99.5	9503
	C5191		5.5~7.0							H3112
	C5212		7.0~9.0							
JIS	C5111	Rem.	3.5~4.5	0.03~0.35	---	---	---	---	Cu+Sn+P≥99.5	H3110
	C5102		4.5~5.5							
	C5191		5.5~7.0							
	C5212		7.0~9.0							
	C5210		7.0~9.0							
ASTM	C51100	Rem.	3.5~4.9	0.03~0.35	≤0.1	---	≤0.05	≤0.3	---	B103
	C51000		4.2~5.8							
	C51900		5.0~7.0							
	C52100		7.0~9.0					≤0.2		
DIN	CuSn 4	Rem.	3.5~4.5	0.01~0.35	≤0.1	≤0.3	≤0.05	≤0.3	≤0.2	17662
	CuSn 6		5.5~7.5							
	CuSn 8		7.5~8.5							
BS	PB101	Rem.	3.5~4.5	0.02~0.40	---	---	≤0.02	≤0.3	---	2870
	PB102		4.5~5.5							
	PB103		5.5~7.5							

### 銅合金板材厚度公差 (Thickness tolerances for strip):

紅銅 (C1100、C1200、C1220)

黃銅 (C2600、C2680、C2801)

寬度 Width	厚度公差 Tolerance
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厚度 Thickness	JIS Standard (H3100)				S&T
	≤ 200 mm	≤ 300 mm	≤ 400 mm	≤ 700 mm	≤ 400 mm
over 0.10 mm to 0.15 mm incl.	±0.010 mm	±0.020 mm	±0.020 mm	----	±0.008 mm
over 0.15 mm to 0.25 mm incl.	±0.020 mm	±0.020 mm	±0.020 mm	±0.030 mm	±0.010 mm
over 0.25 mm to 0.35 mm incl.	±0.020 mm	±0.030 mm	±0.030 mm	±0.040 mm	±0.010 mm
over 0.35 mm to 0.50 mm incl.	±0.030 mm	±0.030 mm	±0.040 mm	±0.050 mm	±0.012 mm
over 0.50 mm to 0.80 mm incl.	±0.030 mm	±0.040 mm	±0.050 mm	±0.060 mm	±0.015 mm
over 0.80 mm to 1.20 mm incl.	±0.040 mm	±0.050 mm	±0.060 mm	±0.070 mm	±0.020 mm
over 1.20 mm to 2.00 mm incl.	±0.050 mm	±0.060 mm	±0.070 mm	±0.080 mm	±0.025 mm
over 2.00 mm to 3.00 mm incl.	±0.060 mm	±0.070 mm	±0.080 mm	±0.100 mm	±0.040 mm

磷青銅 (C2600、C2680、C2801)

特殊銅合金 (C194)

厚度 Thickness	寬度 Width		厚度公差 Tolerance		
			JIS Standard (H3100)		S&T
	≤ 400 mm	400 ~ 650 mm	≤ 400 mm	≤ 400 mm	
over 0.10 mm to 0.15 mm incl.	±0.010 mm	----	±0.008 mm	±0.008 mm	
over 0.15 mm to 0.25 mm incl.	±0.015 mm	----	±0.010 mm	±0.010 mm	
over 0.25 mm to 0.40 mm incl.	±0.020 mm	----	±0.010 mm	±0.010 mm	
over 0.40 mm to 0.55 mm incl.	±0.025 mm	±0.045 mm	±0.012 mm	±0.012 mm	
over 0.55 mm to 0.70 mm incl.	±0.030 mm	±0.050 mm	±0.015 mm	±0.015 mm	
over 0.70 mm to 0.90 mm incl.	±0.035 mm	±0.060 mm	±0.015 mm	±0.015 mm	
over 0.90 mm to 1.20 mm incl.	±0.040 mm	±0.070 mm	±0.020 mm	±0.020 mm	
over 1.20 mm to 1.50 mm incl.	±0.045 mm	±0.080 mm	±0.025 mm	±0.025 mm	
over 1.50 mm to 2.00 mm incl.	±0.050 mm	±0.090 mm	±0.025 mm	±0.025 mm	

銅合金板材寬度公差 (Width tolerances for strip):

厚度 Thickness	寬度 Width		厚度公差 Tolerance		
			JIS Standard (H3100)		S&T
	≤ 100 mm	≤ 200 mm	≤ 100 mm	≤ 200 mm	
0.10 ~ 0.55 mm.	±0.10 mm	±0.20 mm	±0.05 mm	±0.10 mm	
0.55 ~ 2.00mm.	±0.20 mm	±0.30 mm	±0.10 mm	±0.20 mm	

銅合金板材蛇彎度公差 (Permissible max. value on camber):

寬度 Width	公差 Tolerance (per 1000 mm)
over 6 mm to 9 mm inc	9 mm max.
over 9 mm to 13 mm incl.	6 mm max.
over 13 mm to 25 mm incl.	4 mm max.
over 25 mm to 50 mm incl.	3 mm max.
over 50 mm to 100 mm incl.	2 mm max.
over 100 mm	1 mm max.

\* Dimensional tolerances shall be in accordance with JIS H3100