Hi-Performance Alloy Series
Technical Data

High Strength 8%-Tin Phosphor Bronze

# Hyper C5210

JX Nippon Mining & Metals Corporation

## 1.Introduction

JX Nippon Mining & Metals has been supplying numbers of copper alloys.

Recently, NMM has developed new series of alloys, *Hi-Performance Phosphor Bronze Series*. On this brochure, *Hyper C5210 Alloy* will be introduced.

*Hyper C5210 (C5210HP)* has high tensile strength as well as excellent bend formability, while chemical composition stays same as conventional C5210 Alloy.

You will be satisfied, we are sure, to find excellent characteristics of *Hyper C5210* for electronic materials such as switches, connectors, relays etc.

*Technical Data on this brochure show typical value not guarantied one.

## 2.Features

(1) *Hyper C5210* has higher yield strength, spring toughness and fatigue strength, compared with NMM's or other supplier's conventional phosphor bronze for spring applications (C5210).

(2) Excellent bend formability provides severe bending design.

(3) Excellent stamp capability makes longer lifetime of press dies.

(4) Same chemical composition as C5210 means easy scrap control.

## 3.Chemical Composition

Table 1. Typical chemical composition of *Hyper C5210*

| | Cu | Sn | P | Fe | Pb | Cu+Sn+P |
|---|---|---|---|---|---|---|
| Typical | Bal | 8.0 | 0.15 | ≦0.10 | ≦0.05 | ≧99.7 |

## 4.Physical Properties

Table 2. Physical Properties of *Hyper C5210*

| | | |
|---|---|---|
| Electric Conductivity | 12 | %IACS(@20℃) |
| Specific Resistance | 144 | nΩ・m(@20℃) |
| Thermal Conductivity | 63 | W/mK |
| Thermal Expansion Coefficient | 18.2 | $\times 10^{-6}$ (20 to 300℃) |
| Young's Modulus | 110 | $kN/mm^2$ |
| Density | 8.80 | $g/cm^3$ |

## 5.Mechanical Properties

Table 3. Mechanical Properties of *Hyper C5210*

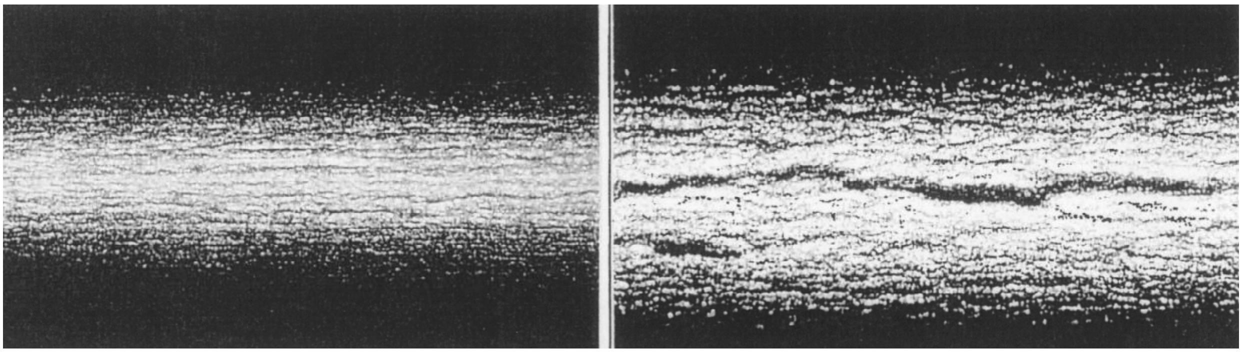
| Temper | | Tensile Strength (N/mm$^2$) | 0.2% offset Yield Strength (N/mm$^2$) | Elongation (%) | Fatigue Strength (N/mm$^2$) |
|---|---|---|---|---|---|
| H | Range | 590～705 | — | ≧20 | — |
| | Hyper | 636 | 565 | 33.4 | 400 |
| | Conventional | 625 | 528 | 28.9 | 300 |
| EH | Range | 685～785 | — | ≧11 | — |
| | Hyper | 729 | 688 | 22.1 | 450 |
| | Conventional | 724 | 667 | 19.0 | 350 |
| SH | Range | 735～835 | — | ≧9 | — |
| | Hyper | 790 | 760 | 17.8 | 400 |
| | Conventional | 764 | 710 | 18.1 | 350 |
| ESH | Range | 770～885 | — | ≧5 | — |
| | Hyper | 853 | 823 | 12.0 | 400 |
| | Conventional | 813 | 786 | 12.6 | 300 |
| XSH | Range | 835～1000 | — | ≧1 | — |
| | Hyper | 918 | 879 | 2.8 | — |
| | Conventional | — | — | — | — |

## 6.Bend Formability

"W" shaped bending test was performed to evaluate bend formability. The minimum bending radius (MBR) without surface crack is determined. Table 4 shows MBR/t value, while fig. 1 shows outside surface. It is apparent that *Hyper C5210* gives much better bend formability.

Table 4. Minimum Bending Radius (MBR) of *Hyper C5210*

| Temper | MBR/t | | | |
|---|---|---|---|---|
| | good way | | bad way | |
| | *Hyper C5210* | C5210 (Conventional) | *Hyper C5210* | C5210 (Conventional) |
| H | *0* | 0 | *0* | 0.5 |
| EH | *0* | 0 | *0.5* | 2.0 |
| SH | *0* | 0 | *2.0* | 2.5 |
| ESH | *0* | 0 | *4.0* | ≧4.0 |



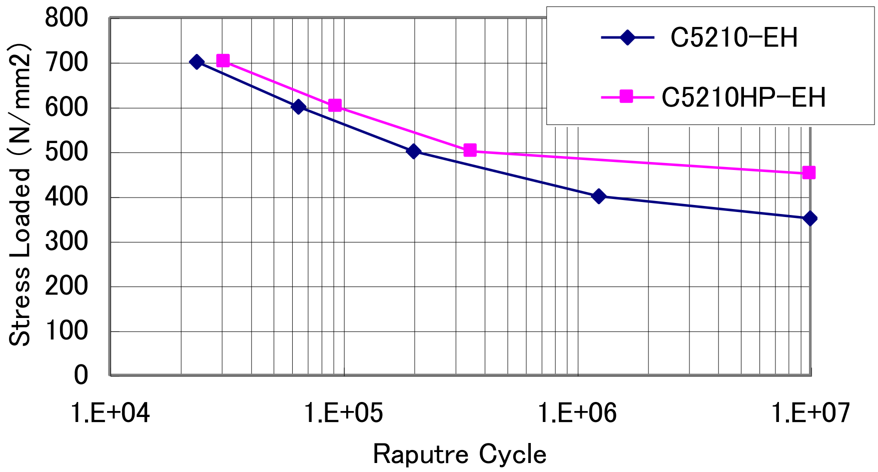
Hyper C5210 C5210(Conventional)

EH temper, bad way, R/t=1.0, Specimen size : 0.5×10mm, Number of tests=4
90° "W" shaped bending test (According to JIS-H-3130)

Fig. 1 Surface appearance of "W" shaped bending test specimen.

# 7.Fatigue Characteristic

Fatigue Characteristic is important when material is used as spring application such as connectors. Fig. 2 shows results of fatigue tests. *Hyper5210(C5210HP)* shows better fatigue strength, compared with conventional C5210.




Amplitude direction : both side

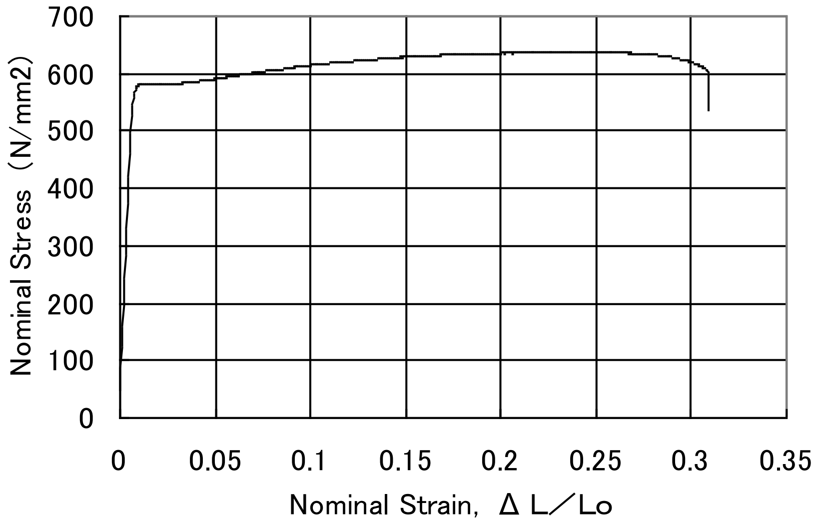
Size of specimen : 0.25mm×10mmw direction of specimen : good way

Testing method : According to JIS-Z-2273

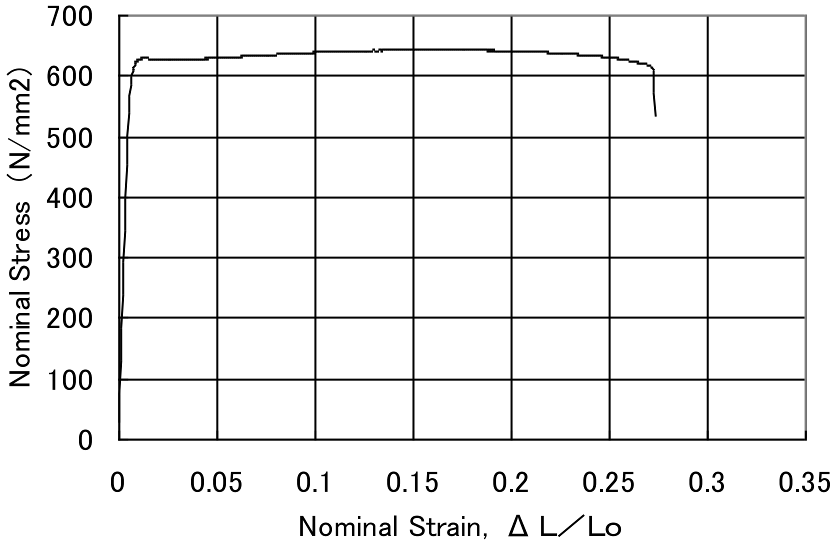
Fig. 2 Comparison of Fatigue Strength

## 8.Stress-Strain Curve

Fig.3 through Fig.4 show stress-strain curve of Hyper *C5210*.




S-S curve (temper H, longitude to rolling)

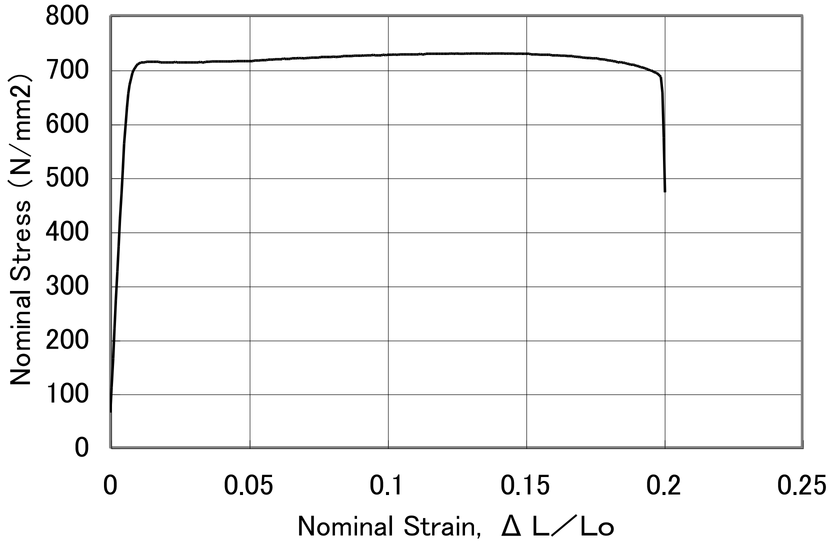



S-S curve (temper H, traverse to rolling)

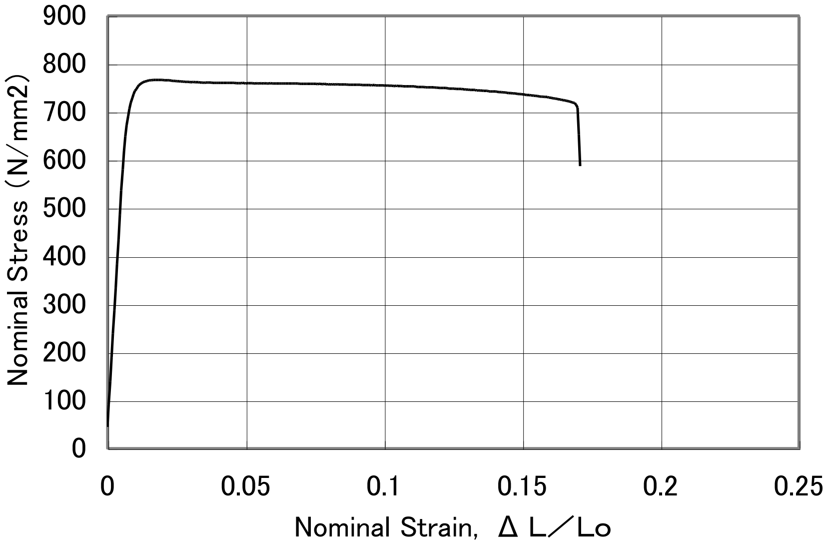
Tensile test (according to JIS-Z-2241)

Specimen：JIS-Z-2201#5 tensile test specimen number of tests：2

Fig. 3　Stress-Strain Curve（1）

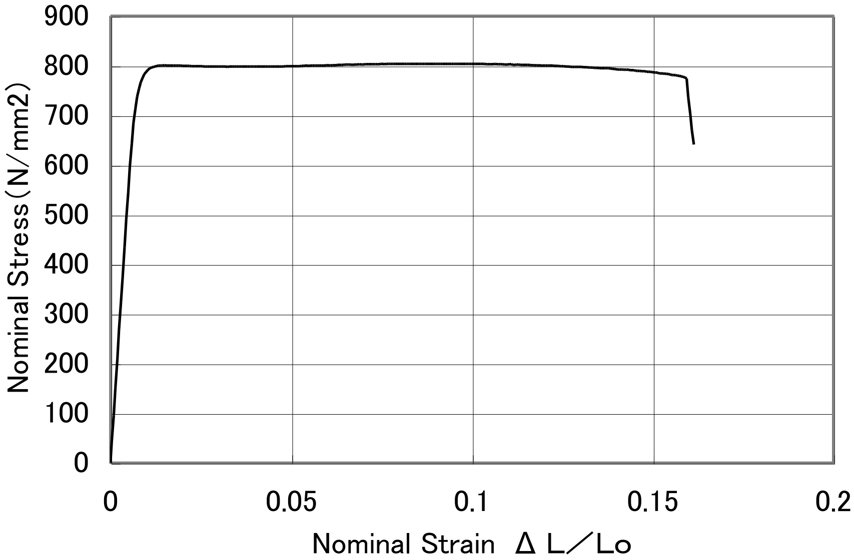



S-S curve (temper EH, longitude to rolling)

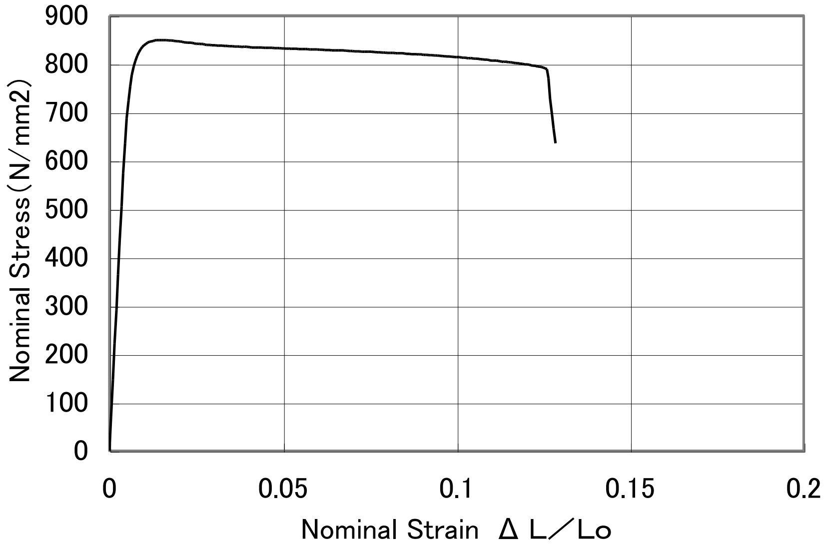



S-S curve (temper EH, transverse to rolling)

Fig. 4　Stress-Strain Curve（2）

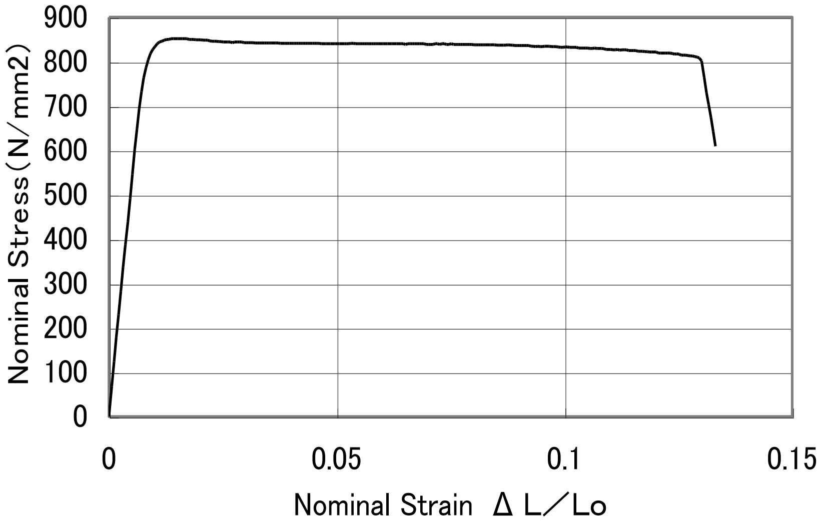



S-S curve (temper SH, longitude to rolling)

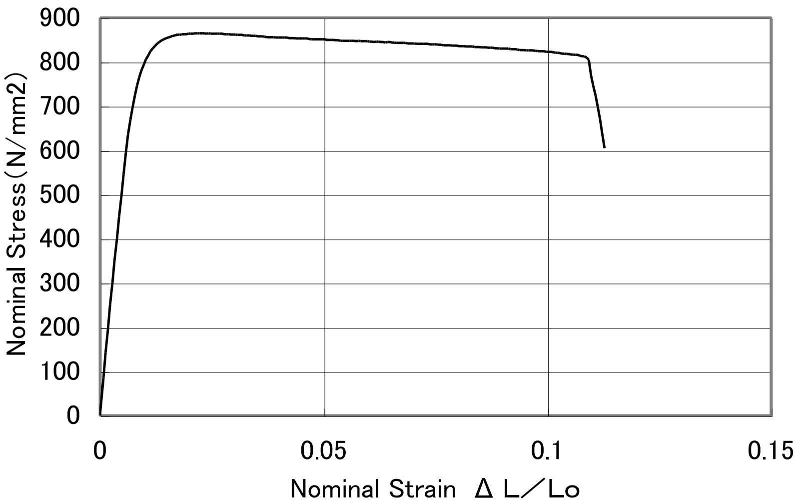



S-S curve (temper SH, transverse to rolling)

Fig. 5　Stress-Strain Curve（3）




S-S curve (temperESH, longitude to rolling)




S-S curve (temper ESH, transverse to rolling)

Fig. 6 Stress-Strain Curve（4）

＜Further Information＞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