Technical Data

High Performance Copper Alloy

C7025

JX Nippon Mining & Metals Corporation

1. C7025 Introduction

C7025 is a high-strength precipitation hardening copper alloy, Cu-Ni-Si-Mg, and is a type of so-called Corson Alloy being modified by adding Mg. Since the first market penetration in electronics industry, C7025 has established the sound base of de-facto standard in the interconnection industries such as lead frame and connector.

JX Nippon Mining & Metals is ready to supply C7025 connector alloy with creating multi-sourced situation in cooperation with Olin group. This technical brochure provides the comprehensive data of high performance copper alloy C7025 for connector and should help understand the alloy's features.

＊The data included are nominal numbers.

2.Features

(1) High strength - high conductivity
(2) High stress relaxation resistance
(3) Good bend formability
(4) Good solderability

3. Chemical compositions

Table 1 Chemical composition of C7025 (wt%)

	Cu	Ni	Si	Mg
nominal	bal.	3.0	0.65	0.15

4. Physical properties

Table 2 Physical properties of C7025

electrical conductivity	45	%IACS (@20℃)
specific resistivity	34.4	nΩ·m (@20℃)
thermal conductivity	180	W/mK
CTE	17.6	μm/mK (25 to 300℃)
Young modulus	131	Gpa
density	8.82	g/cm^3

5. Mechanical properties

Table 3　Mechanical properties of C7025

Temper	Tensile strength (N/mm^2)	0.2% Yield strength (N/mm^2)	Elongation (%)	Hv
TM02	725 (650－740)	645 (min 585)	13 (min 10.0)	215 (190-240)
TM03	745 (680－760)	710 (min 655)	9 (min 5.0)	235 (200-250)
TM04	815 (750－860)	800 (min 740)	3 (min 1.0)	248 (225-275)
TM04S	785 (710-830)	772 (min 700)	3.8 (min.　1.0)	246 (210-260)
TR02	650 (607－726)	575 (min 550)	10 (min 6.0)	204 (180-220)

※ Upper numbers → Typical mechanical properties
Lower numbers → Requirements for each temper

6. Strength-conductivity relation

Fig. 1 indicates the strength-conductivity relation for major connector copper alloys. C7025 provides the outstanding strength, which is comparable to dilute Be-Cu, and also adequate electrical conductivity.

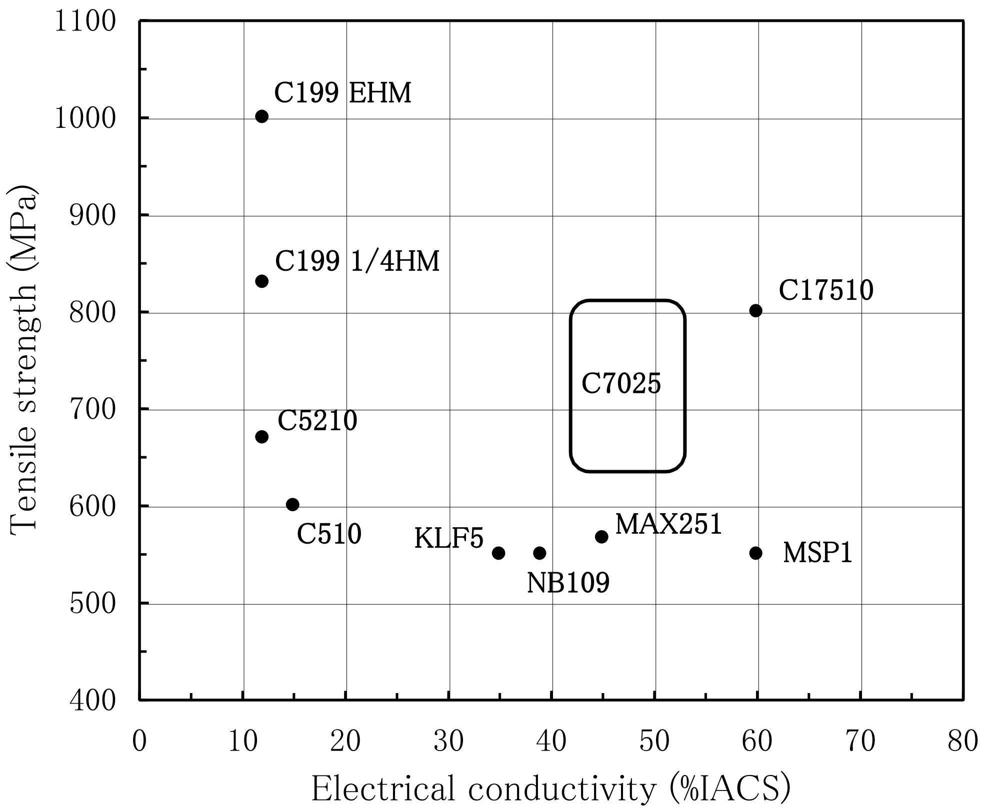


Fig. 1　Strength and conductivity of connector alloys

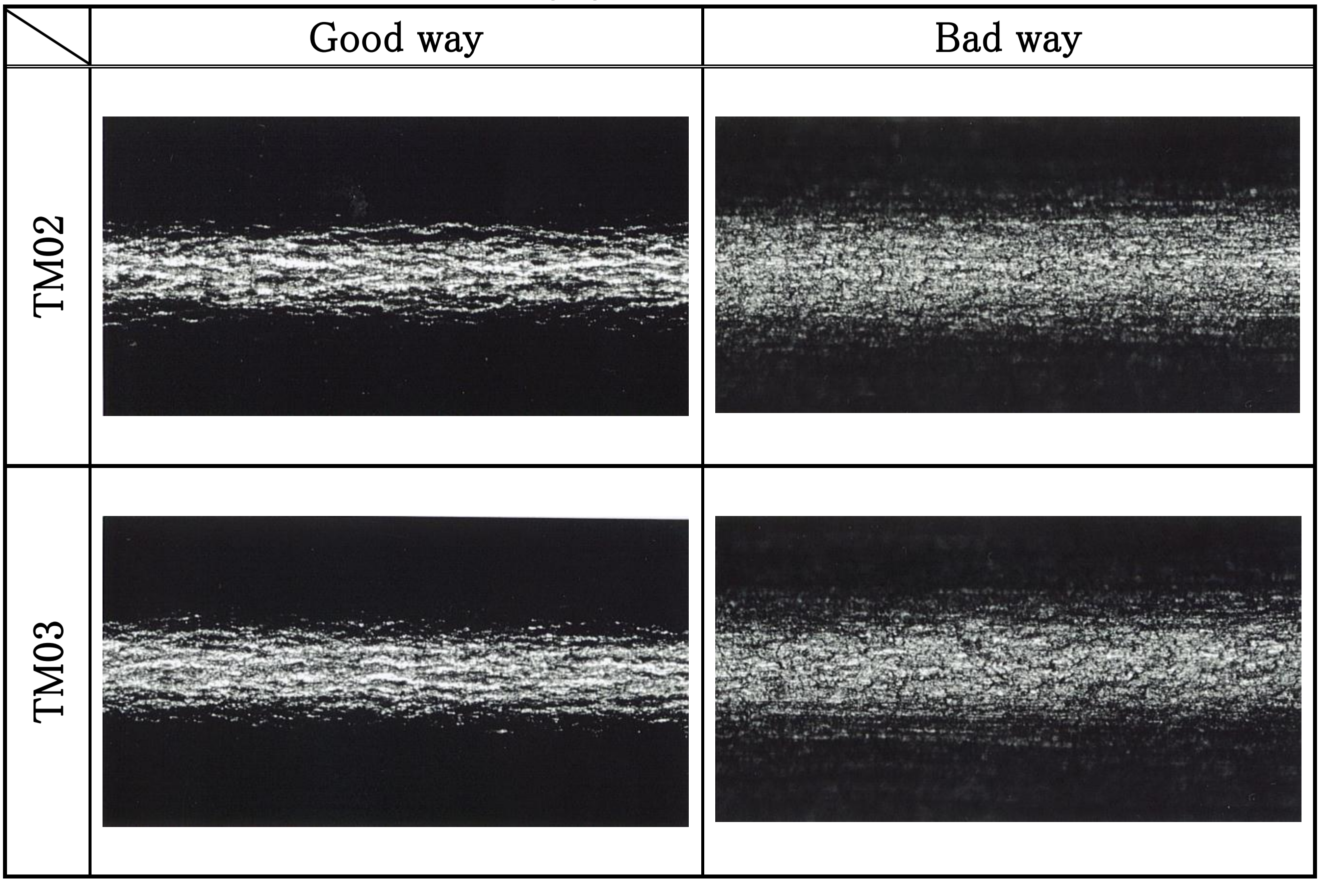
7. Bend formability

W type bend test was used based on the "Standard test method of bend formability for sheets and strips of copper and copper alloys" set by Japan Brass and Copper Makers Association. The specimen size was $10mm^{w} \times 60mm^{l}$. The minimum bend radius on bending where crack is not observed was obtained. Table 4 shows MBR／t (Minimum Bend Radius／Thickness) for each temper. C7025 indicates the adequate bend formability. Fig.2 and 3 shows MBR/t vs w/t(width/thickness) for TM04. Bend formability enhances more as width of specimen is smaller. For example, TM04 of 0.3mm width and 0.15mm thickness can be bent up to 1.5R in bad way.

Table 4　Bend formability of C7025

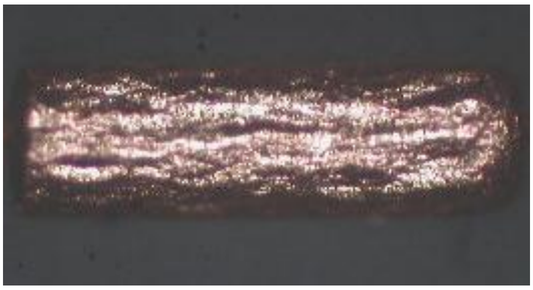
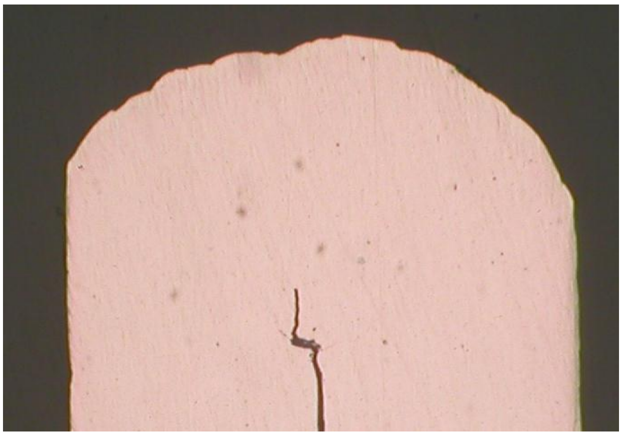
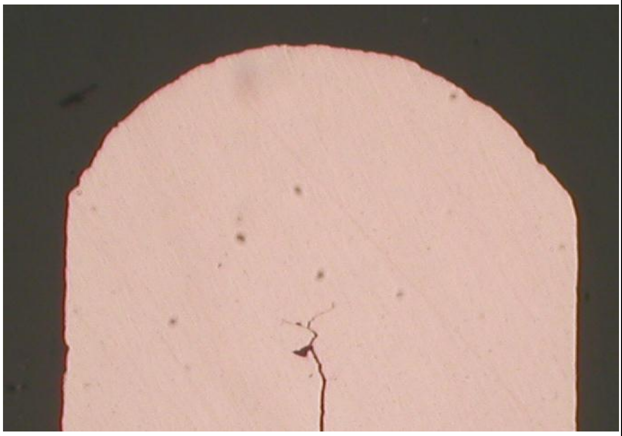
Temper	MBR ／ t	
	Good way	Bad way
TM02	1.7	0
TM03	1.7	1.0
TM04	2.5	5.0
※TM04S	1.5	1.0
TR02	1.5	4.0

※ number of TM04S is for 0.1mm gauge



Surface appearance of 90° W shaped bending test specimens

Bend radius／thickness ＝ 1.0, Width = 10mm

Good way	Bad way
	
Surface appearance of bending test specimen	**Surface appearance of bending test specimen**
	
Cross section of bending test specimen	**Cross section of bending test specimen**

C7025-TM04S 180° bending test result

thickness：0.08mm、width：0.5mm

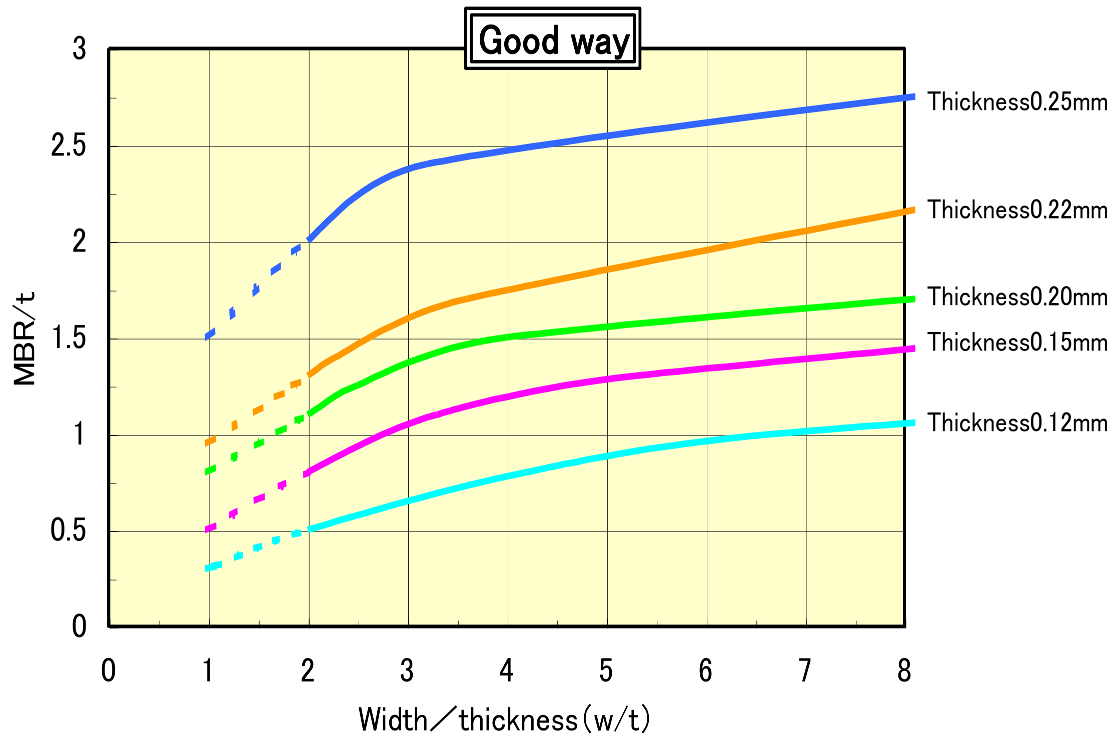


Fig.2　Bend formability variation (good way) of TM04　in case changing width of specimen

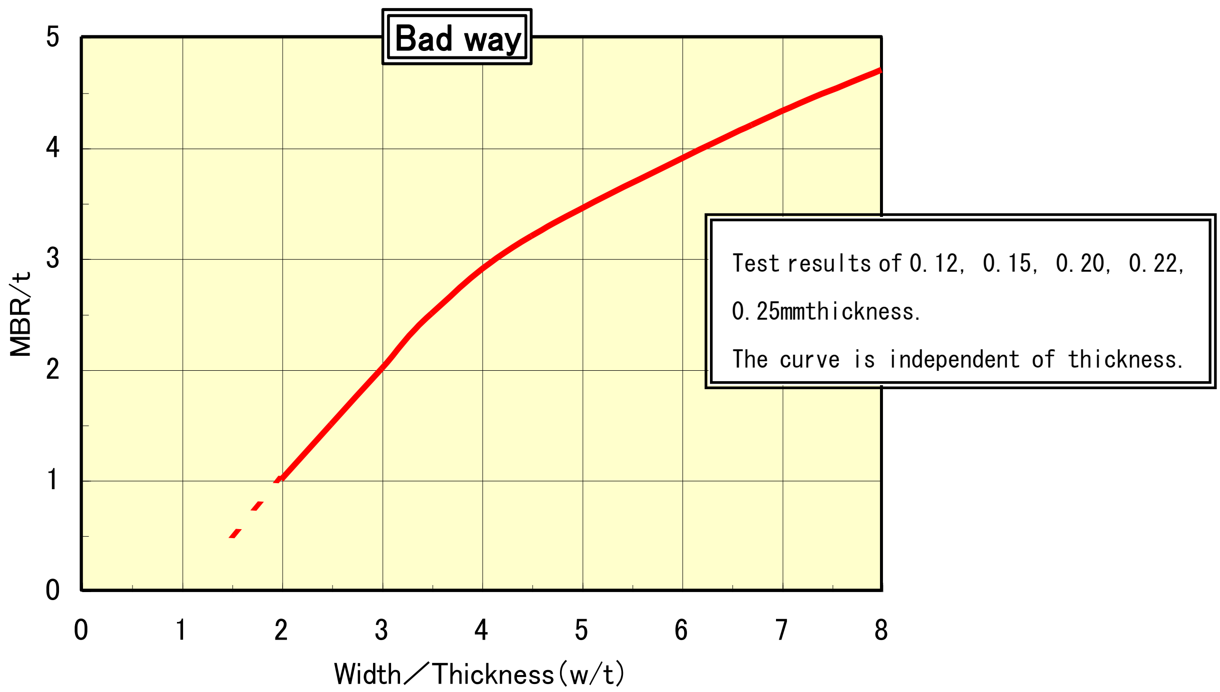


Fig.3　Bend formability variation(bad way) of TM04 in case changing width of specimen.

8. Stress Relaxation Resistance

Stress relaxation resistance is highly important for maintaining the contact force for long period of time or at elevated temperatures. Fig.4 exhibits the stress relaxation resistance of C7025 in comparison with phosphor bronzes. It is noted that C7025 maintains over 80% of the initial applied stress at 150℃ after 1000hr.

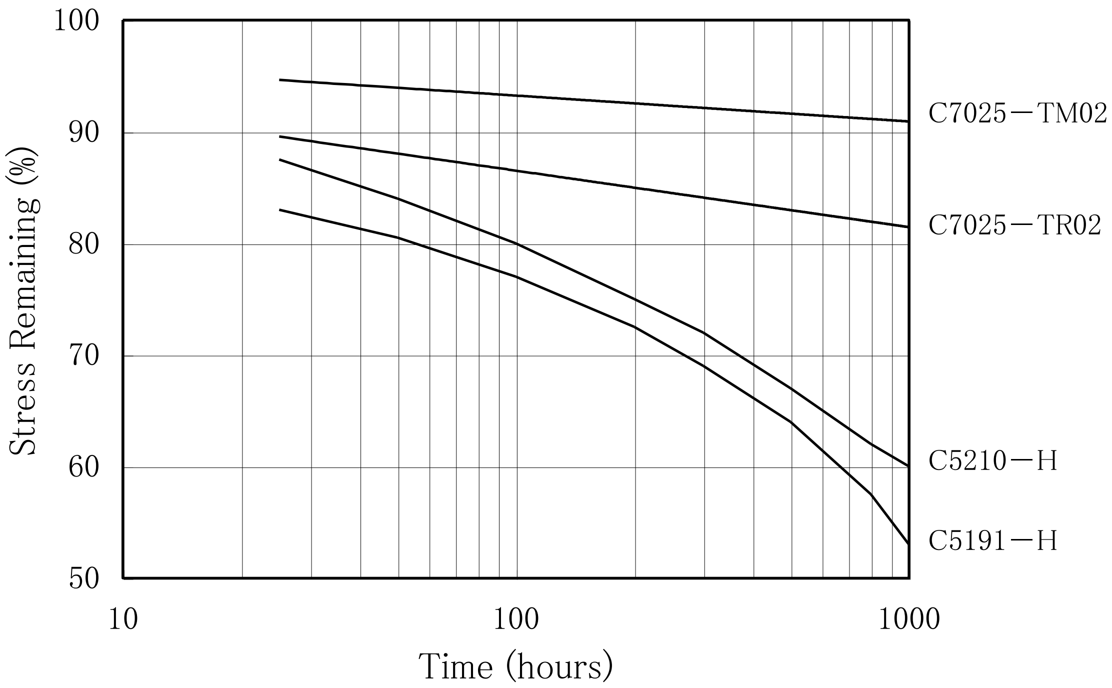


Fig.4 Stress relaxation of connector alloys at 150℃

Reference1－1　　Stress-strain curve for C7025 TM02

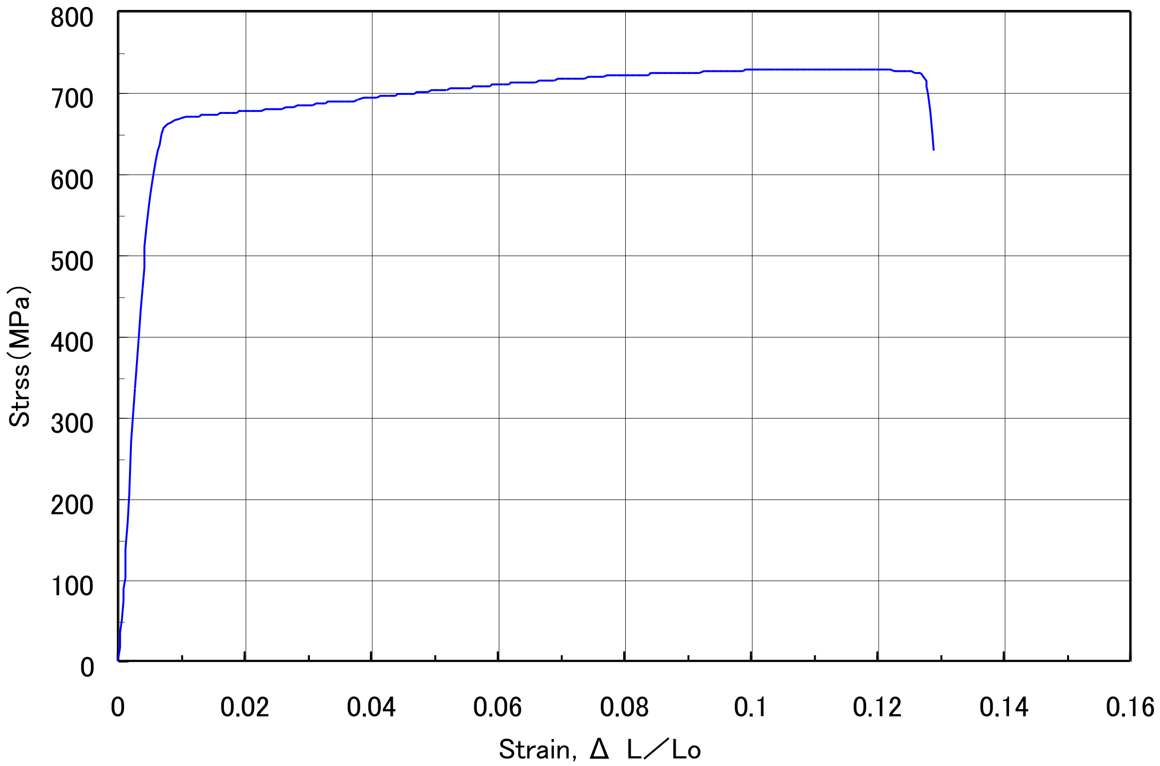


Fig. 1　Rolling direction

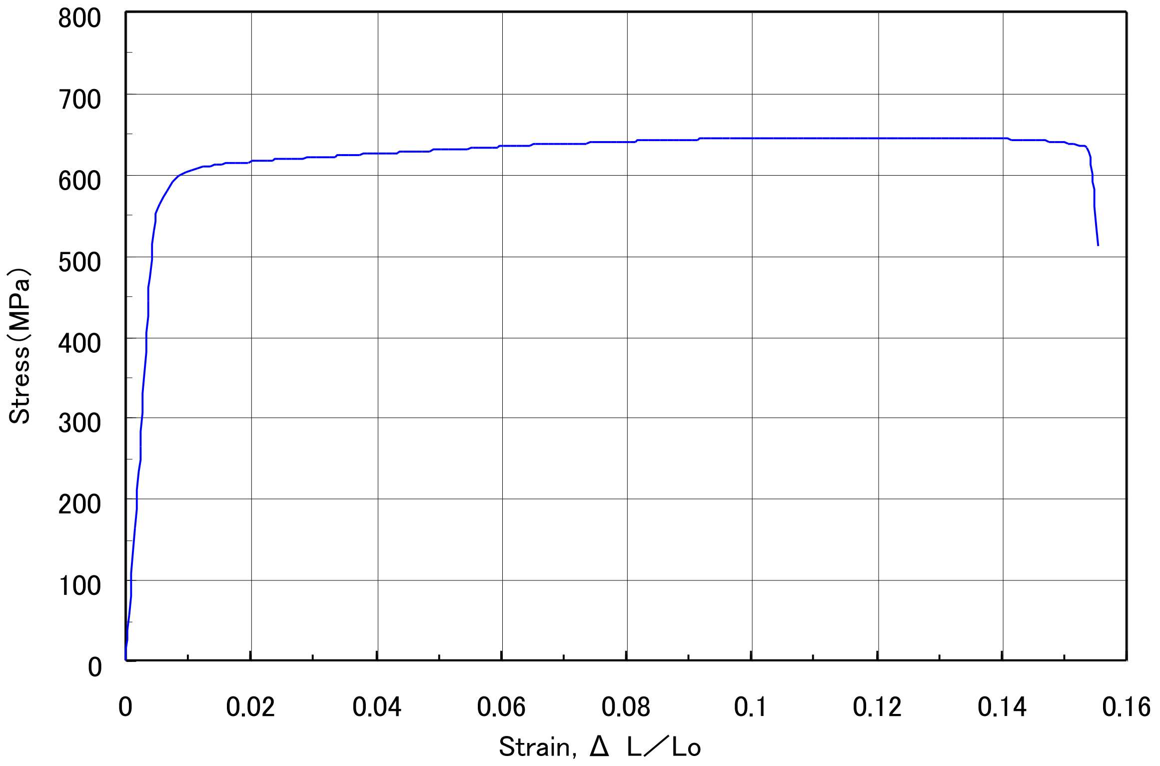


Fig. 2　Transverse direction

Reference1－2　　Stress-strain curve for C7025 TM03

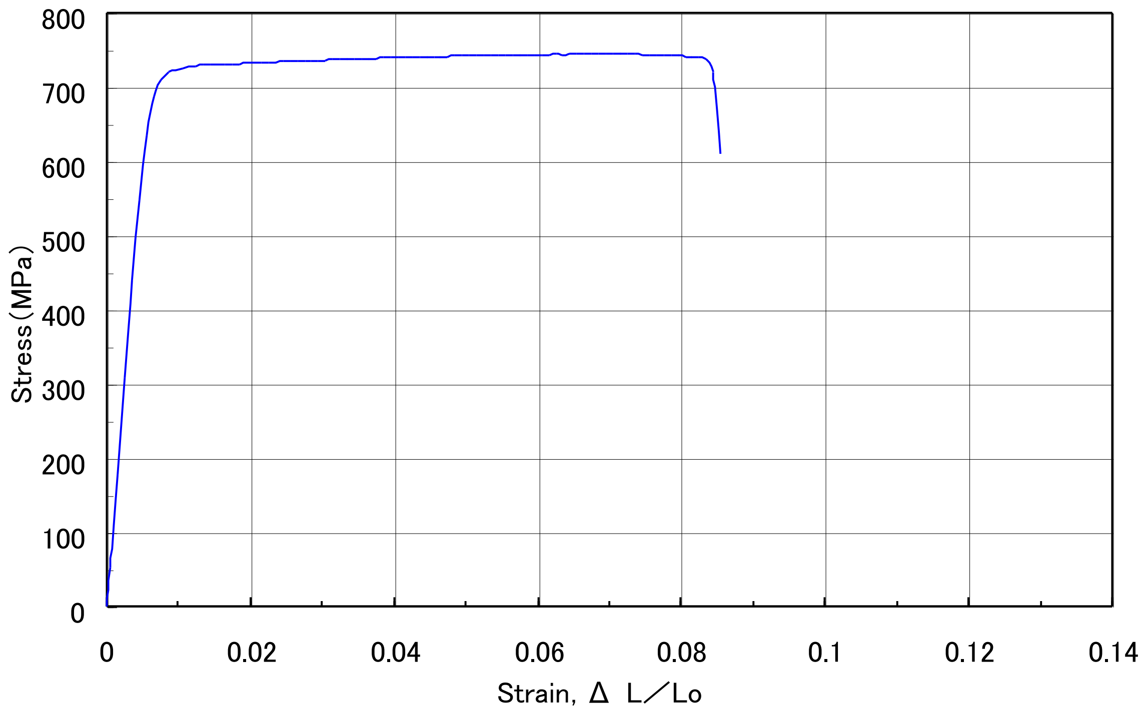


Fig. 3　Rolling direction

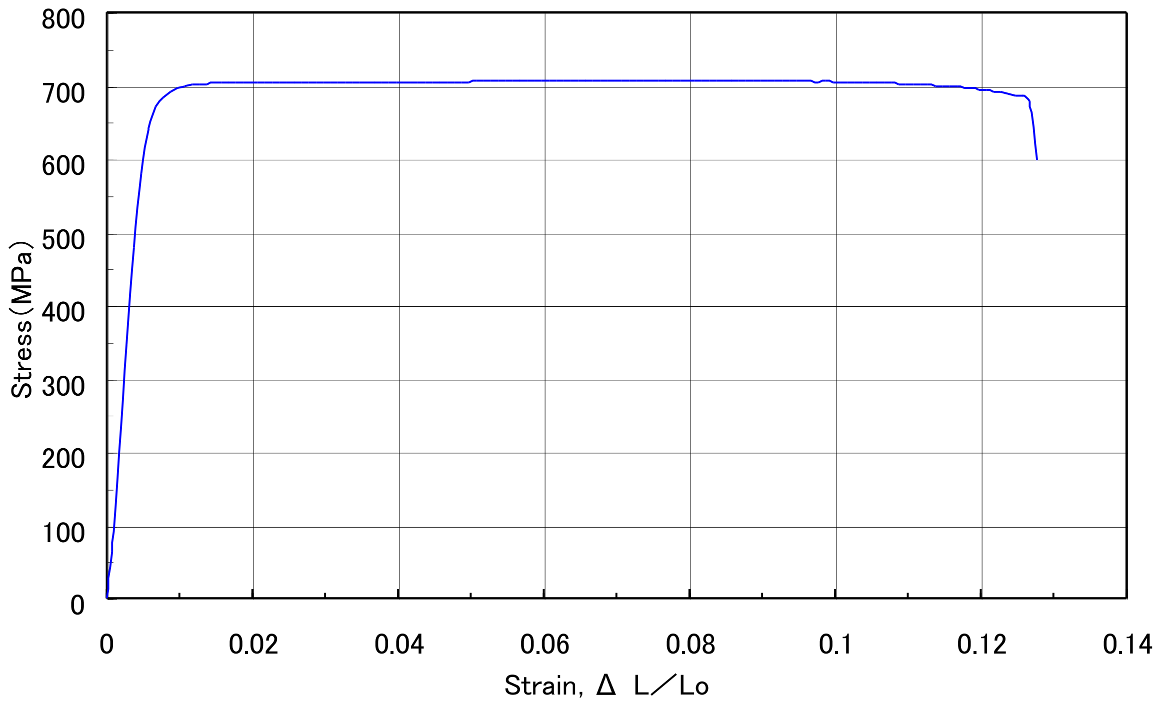


Fig. 4　Transverse direction

Reference1－3　　Stress-strain curve for C7025 TR02

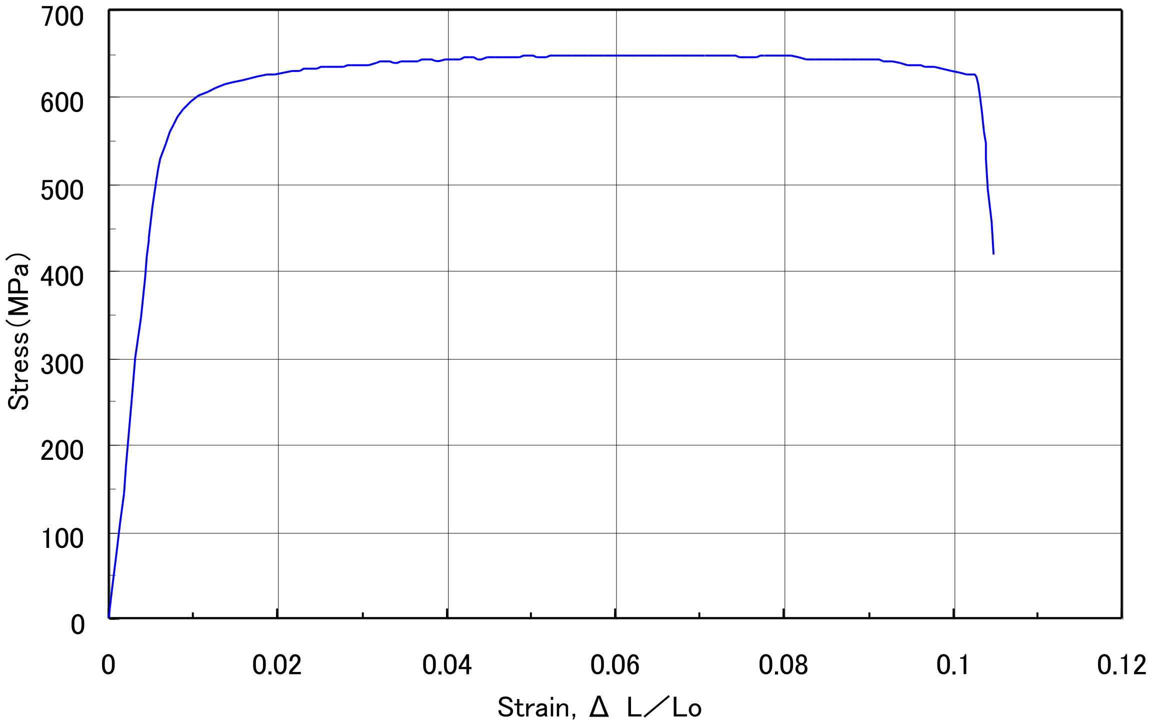


Fig. 5　Rolling direction

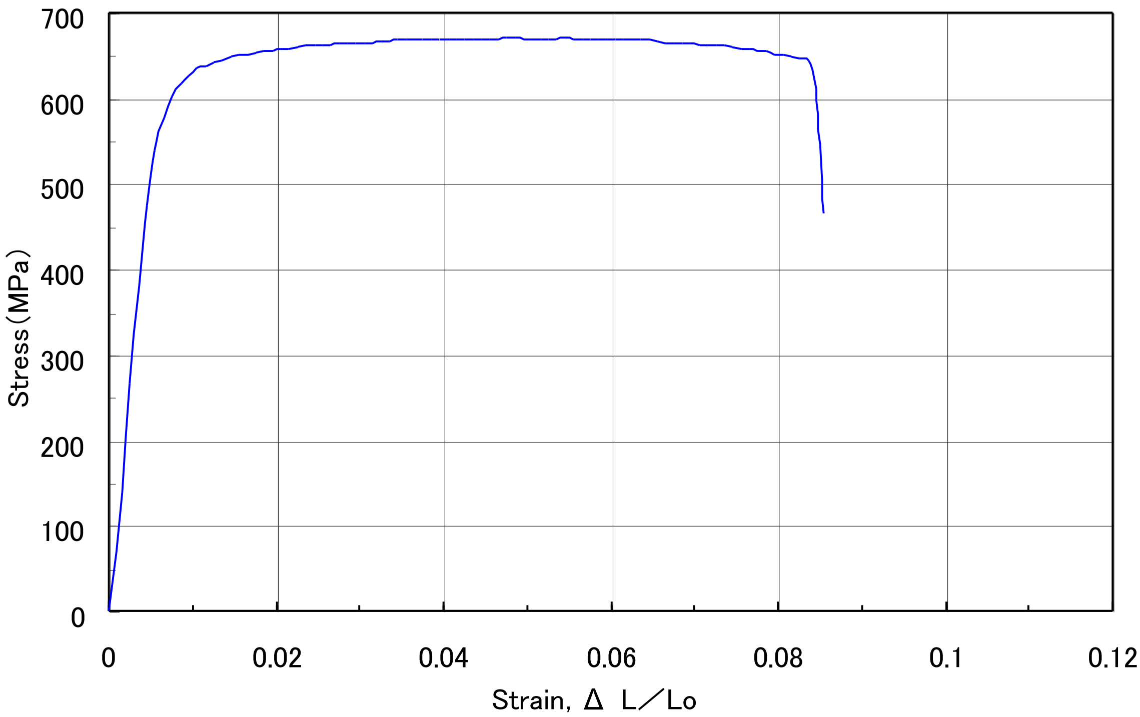


Fig. 6　Transverse direction

<Further Information>

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