

# ALLOY C19010

COPPER-NICKEL-SILICON  
Cu-Ni-Si



**Exceptional Performance**  
**Versatile Product**  
**Global Availability**

**Stol76 KHP102 PMC102 XP125**



**W**hen the heat is on,  
the design problem

becomes more complex. In  
addition to strength,  
formability and conductivity,  
stress relaxation is crucial to  
your design reliability.

C19010 has been  
engineered to meet these  
design expectations. C19010  
offers excellent formability,  
strength, and 125°C stress  
relaxation resistance coupled  
with excellent conductivity  
and plateability so you won't  
have to compromise in  
design.

# Ex·cep·tion·al (ik-sĕp'shən-əl) *adj.*

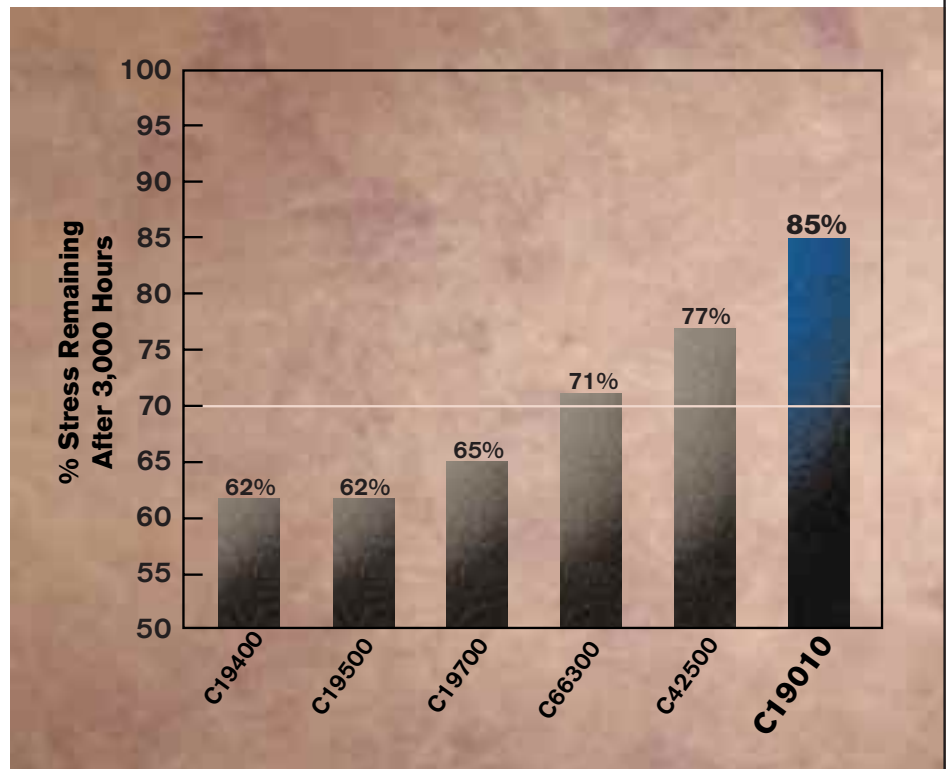
1.) Well above average.  
*e.g.:* C19010

## Performance When the Heat is On

With each new generation in connector design, increased performance at elevated temperatures requires designers to be more demanding in alloy selection.

As shown in Figure 1, C19010 stands up to the test at 125°C, while maintaining 85% of the initial stress after 3,000 hours (and >79% remaining after 10,000 hours), well above the standard of 70% that many designers require as a minimum.

C19010 provides superior performance over all the competitive alloys. Such stability allows designers to take advantage of the alloy consolidation opportunities even at slightly lower strength.



**Figure 1**  
**Stress Relaxation Resistance at 125°C**





Like most people today  
you're looking for that  
do-everything tool that lets  
you go from design to  
implementation with less  
worry, little hassle and in less  
time than your competition.

While it may not open  
your favorite bottle of wine,  
C19010 is the versatile alloy  
you've been searching for.

With its wide range of  
capabilities and world-wide  
availability, C19010 makes  
designing a finished product  
easier, purchasing a global  
alloy friendlier and your life a  
little bit simpler.

Perhaps you should start  
looking for that corkscrew.

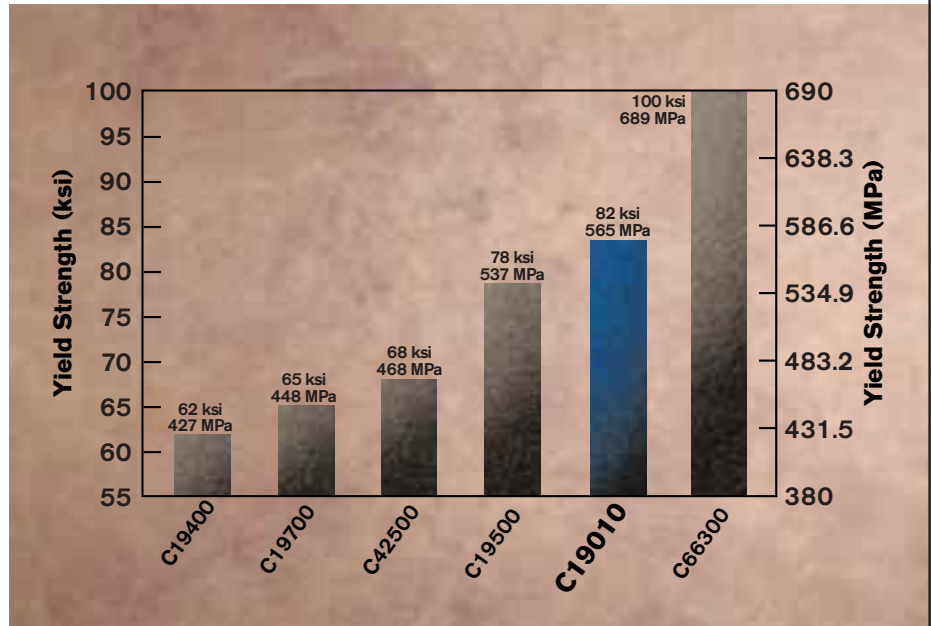
# Ver·sa·tile (vûr'sə-təl) adj.

1.) Capable of doing many things.  
e.g.: C19010

## Formable

Bend formability is an important focus as connector designs continue to miniaturize. Unlike many alloys on the market, the increased strength and stress relaxation benefits of C19010 are achieved without sacrificing formability. (Figure 2)

C19010 possesses ideal formability for many of your interconnect products. 1.0TGW bends can typically be made at strengths of up to 92 ksi/565 MPa. 0.5TGW bends can be utilized up to 70ksi.

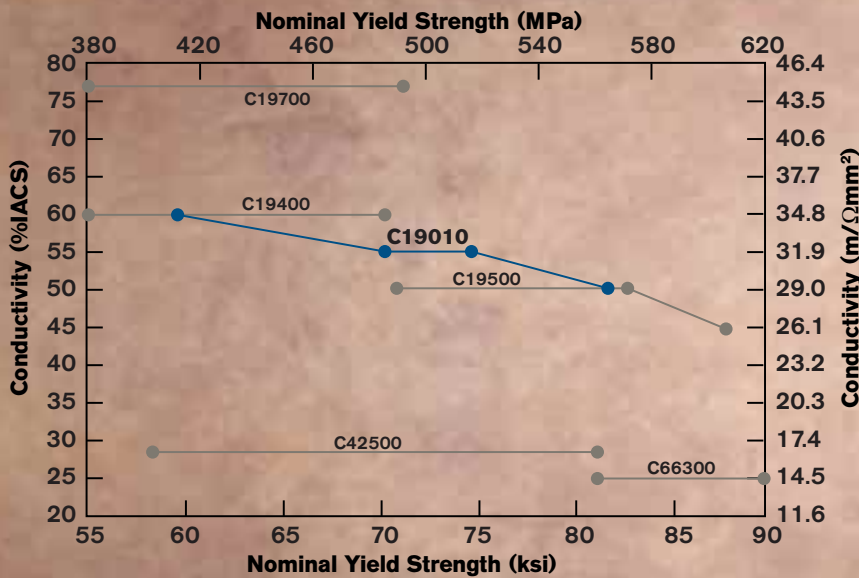


**Figure 2**  
Typical Yield Strength Available at a 1t 90 Degree Goodway Bend

## Bend Properties

	Temper					
	H01	H02	H03	H04	H06	H08
Goodway - (max. R/T) - Spec.	0.5	0.5	1.0	1.0	1.0	1.0
Goodway - Typical	0.0	0.0	0.5	0.8	1.0	1.0
Badway (max. R/T) - Spec	0.8	1.0	1.5	2.0	2.0	2.0
Badway - Typical	0.0	0.5	1.0	1.5	1.8	2.0

Note: (1) Temper Hxx: Cold Worked Tempers by Cold Rolling (from ASTM B-601)



## Strong Yet Conductive

One of the most discussed aspects of alloy selection is strength versus conductivity. It is often the case that many alloys will sacrifice conductivity for strength. In contrast, alloy C19010 has high conductivity for yield strengths up to 80 ksi. (Figure 3)

Note: ksi = 1,000 pounds/in<sup>2</sup>

### Conversions

1 psi = 0.0068948 MPa

1 ksi = 6.8948 MPa

1% IACS = 0.58 m/Ωmm<sup>2</sup>

**Figure 3**

### Comparison of Yield Strength to Electrical Conductivity of Various Connector Alloys

## Global (glō'bəl) adj.

1.) World wide.

e.g.: C19010

Today's business environment has drastically changed from that of 30, or even 10 years ago. Not only do many companies compete in a global marketplace, but they also design, test, and manufacture products in a "global factory." Competitive pressures continue to shrink new product development cycle time requirements. In this environment, the streamlining of raw materials is an excellent way to shrink time to market while controlling costs. Of all the alloys compared that have good formability, and stand up to 125°C temperatures, only C19010 surpasses 50% IACS conductivity, making it an excellent candidate for connector alloy consolidation.

To consolidate and standardize alloys in a global factory, it is also necessary to have a global supply base for raw materials. Alloy C19010 is available globally; you will find the same uniform properties and tempers, the same quality workmanship and the same exceptional product made to your demanding standards and requirements no matter what corner of the world you are designing in.

Engineers today are looking at products of tomorrow, C19010 has been designed to meet your needs both today and in the future.

# C19010

(Cu/1.6Ni/0.3Si)

## Connector Alloy for Electrical and Electronic Applications

### Chemical Composition

	Wt. %
Copper	Balance
Nickel	0.8-1.8
Silicon	0.15-0.35
Phosphorous	0.01-0.05
Other	0.50 max

### Physical Properties

	SI Unit	US Customary Unit
Melting Point	1062 (°C)	1944 (°F)
Density	8.9 (gm/cm <sup>3</sup> @ 20°C)	0.322 (lbs/in <sup>3</sup> ) @68°F
Electrical Conductivity (Annealed)	34.8 m/Ωmm <sup>2</sup>	60 (%IACS) @68°F
Thermal Conductivity (Annealed)	0.62 (cal•cm/cm <sup>3</sup> •sec•°C@20°C)	149 Btu•ft/ft <sup>2</sup> •hr•°F @68°F
Modulus of Elasticity (Tension)	131,000 MPa	19,000 ksi

### Mechanical Properties

SI Unit	Temper(1)					
	R360	R410	R460	R490	R520	R580
Tensile Strength (MPa)	360-430	410-470	460-520	490-560	520-580	580-650
Yield Strength (0.2% Offset, MPa)	275 min.	370 min.	410 min.	435 min.	460 min.	520 min.
Elongation (%)	12 min.	10 min.	8 min.	7 min.	6 min.	6 min.
Hardness (HV) ref.	100-130	125-155	135-165	145-175	150-180	170-200
Conductivity (Min m/Ωmm <sup>2</sup> )	31.9	31.9	29	29	29	27.8
Conductivity (m/Ωmm <sup>2</sup> , Typical)	34.8-37.7	34.8-37.7	30.2-33.6	30.2-33.6	30.2-33.6	29.6-32.5
US Customary Unit	H01	H02	H03	H04	H06	H08
Tensile Strength (ksi)	52-64	60-70	67-77	71-81	75-86	84 min.
Yield Strength (0.2% Offset, ksi)	40 min.	54 min.	62 min.	66 min.	72 min.	78 min.
Elongation (%)	12 min.	10 min.	8 min.	7 min.	6 min.	6 min.
Hardness (HV) ref.	100-130	125-155	135-165	145-175	150-180	170-200
Conductivity (Min %IACS)	55	55	50	50	50	48
Conductivity (%IACS, Typical)	60-65	60-65	52-58	52-58	52-58	51-56

Note: (1) Temper Hxx: Cold Worked Tempers by Cold Rolling (from ASTM B-601)



# Alloy C19010

## An Intelligent Solution

### North America

#### **PMX Industries, Inc.**

5300 Willow Creek Dr. SW

Cedar Rapids, IA 52404

U.S.A.

Tel: 1-800-531-5268

Fax: 319-368-7721

Web: [www.pmxindustries.com](http://www.pmxindustries.com)

E-mail: [product.technology@pmxindustries.com](mailto:product.technology@pmxindustries.com)

ISO 9002 Certified

### European Community

#### **KEMPER Metallwerke**

GmbH + Co. KG

Postbox 1520

D-57445 Olpe-Biggesse, Germany

Tel: (++49) 0 2761-891-0

Fax: (++49) 0 2761-891-175

Web: [www.kemper-olpe.de](http://www.kemper-olpe.de)

E-mail: [vtietz@kemper-olpe.de](mailto:vtietz@kemper-olpe.de)

ISO 9001 Certified

#### **SMU / Stolberger Metallwerke**

GmbH & Co KG

Frankentastasse 5

D-52222 Stolberg, Germany

Tel: (++49) 0 2402-105-263

Fax: (++49) 0 2402-105-355

Web: [www.kme.de](http://www.kme.de)

E-mail: [udo.adler@kme.com](mailto:udo.adler@kme.com)

ISO 9001/QS9000 Certified

### Korea

#### **Poongsan Corporation**

60-1 Chungmu-ro 3Ka, Chung-Ku

(C.P.O. Box 3537)

Seoul, Korea

Tel: (++822) 3406-5114

Fax: (++822) 3406-5400

Web: [www.poongsan.co.kr](http://www.poongsan.co.kr)

E-mail: [i-d-kim@poongsan.co.kr](mailto:i-d-kim@poongsan.co.kr)

ISO 9002 Certified