AMETEK®
SPECIALTY METAL PRODUCTS
Innovative & Advanced Metallurgical Technology

Pfinodal®

Description

Spinodal hardened alloys are characterized by regular submicroscopic chemical composition fluctuations. These chemical fluctuations occur spontaneously at the aging temperature and their formation is called spinodal decomposition. In the case of Pfinodal, the copper, nickel (15%), and tin (8%) alloying elements are homogeneous throughout the manufacturing process prior to aging. Mill processing requires a solution anneal and quench step to produce a homogeneous single-phase structure. This is followed by cold work and finally a low temperature aging step. The amount of cold work, aging temperature, and time all affect the strength and formability of the final Pfinodal product. AMETEK's patented powder metallurgy process accomplishes this uniformity, thus ensuring optimum reproducible properties.

Key Features and Benefits

- Anti-Galling
- Anti-Seizing
- Excellent Ductility
- Excellent Formability
- Excellent Lubricity
- Excellent Machinability
- High Strength and Hardness
- Non-Corrosive
- Non-Magnetic
- Non-Sparking

Applications

- Bearings
- Bushings
- Centralizers
- Connectors
- Couplings
- Drive Train Components
- Fasteners
- Motor Components
- Non-Sparking Tools
- Pump Shafts
- Spacers
- Thrust Washers
- Well Casing Equipment

Physical Properties of Pfinodal Alloys

Electrical Conductivity at 68ºF (20ºC)	7.8	% IACS
Electrical Conductivity at 392ºF (200ºC)	7.3	% IACS
Thermal Capacity (Specific Heat) at 68ºF (20ºC)	0.09 ($30x10^3$)	Btu/lb·°F (J/kg·K)
Thermal Conductivity at 68ºF (20ºC)	17 (29)	Btu/ft·hr·ºF (W/m·K)
Coefficient of Thermal Expansion at 68ºF-572ºF (20ºC-200ºC)	$9.1x10^{-6}$ ($16.4x10^{-6}$)	Per ºF (Per ºC)
Modulus of Elasticity (Tension)	$18.5x10^6$ ($127x10^3$)	psi (MPa)
Modulus of Rigidity	$7.5x10^6$ ($52x10^3$)	psi (MPa)
Density	0.323 (8.95)	lb/in^3 (gm/cc)

Mechanical Properties of Pfinodal Alloys

Ametek Designation	Yield Strenth (.2% KSI)	UTS (KSI)	Elongation (%)	CVN ft-lbs	Hardness Rc
P90	90-100	110-120	15-22	7-10	25-27
P110	110-122	125-135	4-5	2-3	30-33
C90	90-105	110-125	15-20	12-15	20-25
C110	110-120	125-130	13-17	10-12	25-28
C140	135-140	145-150	5-10	5-8	28-30
H120	120-125	130-135	15-19	8-12	27-30

Mechanical properties can be optimized to meet customer specific requirements

Pfinodal is available in a variety of forms and sizes. Typical sizes are described in the chart below:

Form	Size
Strip	.001 - .080" Gauge, up to 13.5" widths
Rod/Bar	Up to 6" diameter, 36" length
Plate	Up to 2" x 6" x 36"
Tubes	1.5" ID min, 6.5" OD 36" length

Engineered Shapes and finished parts available on request

Pfinodal (C72900) Composition

Nickel	14.5 – 15.5%
Tin	7.5 – 8.5%
Copper	Balance
Other Elements	0.1% max

Exceptional Corrosion Resistance in the Harshest Environment

Pfinodal parts can withstand highly corrosive industrial environments without pitting. It performs exceptionally well in standard salt spray tests. C72900 meets NACE MR0175.

Patented Pfinodal Applications

Pfinodal material has been patented in shape charge liner applications (US PATENT No. 6012392) and rock bit bearing applications (US PATENT Nos. 5527113 and 5552106).

Superior Pfinodal Properties using Patented PIF Process

Ametek's Pneumatic Isostatic Forging (PIF) patented process produces fully dense material. PIF is a true forging process that uses uses high pressure gas to close porosity, thereby increasing density while improving the microstructure of the material. For CuNiSn alloys, the PIF process is an ideal consolidation process that provides homogenous material and eliminates possibility of Sn micro-segregation. Using the PIF process results in consolidated material far superior to conventional cast methods.

A Platform of Solutions

Specialty Metal Products Division (SMP) is a pioneer in manufacturing and consolidating specialty metals powders with 50 years of experience and numerous patents with technically advanced metallurgical materials. SMP produces Stainless Steel and Nickel clad alloys, Stainless Steel, Cobalt based alloys, Nickel based alloys, and Titanium and Titanium alloy powders, metal strip, specialty shaped wire, metal matrix composites and engineered shaped materials. SMP can provide you with customized or standard solutions using any number of our sophisticated technologies and capabilities:

Processes

P/M Roll Compaction
Precision Strip Rerolling
Roll Bonded Clad Metal
Pneumatic Isostatic Forging
Water and Gas Atomization
Hydride DeHydride Process
Aluminothermic Production

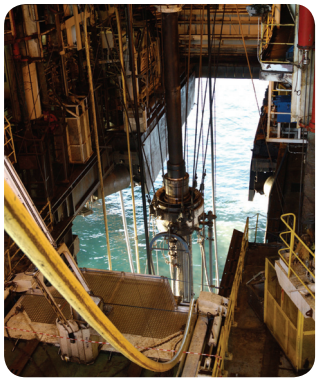
Semifinished Material

Metal and Metal Alloy Powders
Titanium and Ti Alloy Powders
Titanium Master Alloys
Metal and Metal Alloy Strip
CIP/PIF Plates and Preforms
P/M Rod, Bar, Tube, Plate
Thin Metal Strip and Foil

Finished Goods

Near Net Shape Parts
Specialty Shaped Wire
Thermal Management Materials
Specialty Metal Parts

Ametek, Inc. (NYSE AME) is a leading global manufacturer of electronic instruments and electromechanical components.



AMETEK®
Innovative & Advanced Metallurgical Technology

AMETEK Specialty Metal Products
21 Toelles Road
Wallingford, CT 06492
USA
Tel: 203-265-6731
Fax: 203-949-8876
www.ametekmetals.com