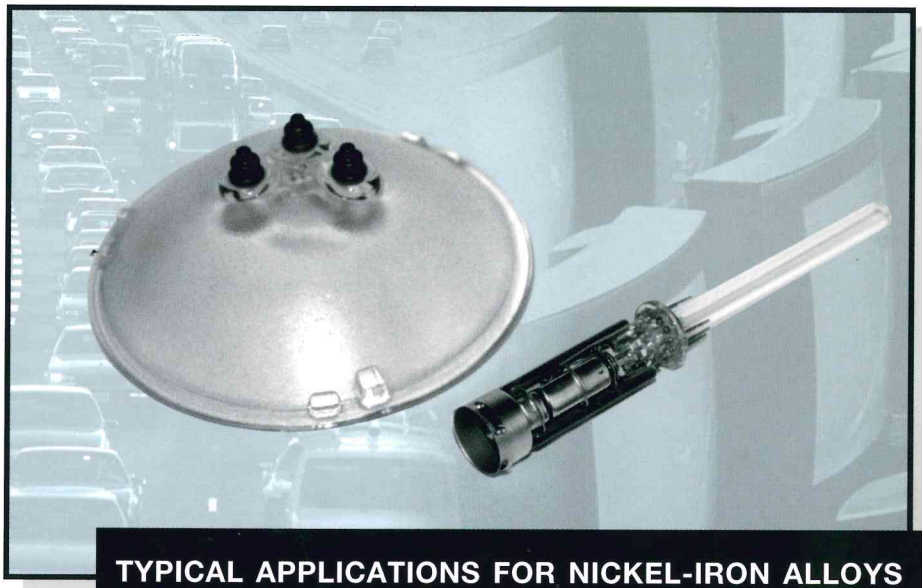
Nickel-Iron Alloys for Glass-Sealing and Controlled Thermal Expansion

AMETEK 936 ALLOY, 942 ALLOY, 946 ALLOY, 948 ALLOY, 952 ALLOY

ADVANTAGES

AMETEK Nickel-Iron alloys are distinguished for the following reasons:

- *Low gas content reduces the possibility of out gassing over time.*
- *Thermal expansion and magnetic properties are consistent.*
- *Significantly low levels of surface oxides reduce die wear.*
- *Controlled chemistry ensures superior glass sealing characteristics.*



TYPICAL APPLICATIONS FOR NICKEL-IRON ALLOYS

DESCRIPTION

AMETEK Nickel-Iron alloy systems are gas-free special combinations of metals designed to have expansion rates closely matching those of certain ceramic materials, including glasses. They are widely used by the electrical and electronic industries for glass-to-metal seals in electron tubes, transistors, headlights, thermostats, and similar applications.

936 Alloy, having 36% Nickel-Iron composition, has minimal thermal expansion at temperatures up to 400°F.

942 Alloy is designed for seals on hard or soft glass. Nominal 41% Nickel-Iron composition.

946 Alloy, having a 46% Nickel-Iron composition, is used especially as terminal bands for vitreous enameled resistors.

948 Alloy, having a 47.5% Nickel-Iron composition, is used in electronic applications.

952 Glass-Sealing Alloy has a 50.5% Nickel-Iron composition and is especially suited for seals for some of the new special soft glasses. Its thermal expansion is very constant up to 565°C.

All alloys are available in large coils rolled to close tolerances in thicknesses from 0.002 to 0.080 inches and widths up to 14 inches.

*For custom alloys contact Wallingford Technical Staff at (800) 233-2266

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CHEMICAL COMPOSITION - NOMINAL

	936 Alloy	942 Alloy	946 Alloy	948 Alloy	952 Alloy
Nickel (Ni)	36.0	41.0	46.0	47.5	50.5
Manganese (Mn)	0.1	0.2	0.2	0.2	0.2
Carbon (C)	0.005	0.005	0.005	0.005	0.005
Iron (Fe)	Balance	Balance	Balance	Balance	Balance

The total of all other impurities is less than 0.4.

PHYSICAL CONSTANTS

	936 Alloy	942 Alloy	946 Alloy	948 Alloy	952 Alloy
Specific Gravity	8.05	8.12	8.17	8.20	8.30
Density-lb. per cu. in.	0.291	0.293	0.295	0.297	0.30
Curie Point — ^{0}C	—	380	460	480	530
Melting Point — ^{0}C	1425	1425	1425	1425	1425
Specific Heat — cal/gm ^{0}C	0.12	0.12	0.12	0.12	0.12
Thermal Conductivity (20/100^{0}C) cal/cm^3.sec.^{0}C	0.025	0.025	—	—	0.032
Electrical Resistivity microhm/cm ohms/cir.mil. ft.	480	350	275	250	215

THERMAL EXPANSION—Coefficient Range as Annealed

In./in./^{0}C x 10^{-6}	936 Alloy	942 Alloy	946 Alloy	948 Alloy	952 Alloy
30—300	4.0	4.0-4.7	—	—	—
30—350	—	—	7.1-7.8	—	—
30—450	—	6.7-7.4	—	—	9.6-10.1
30—500	—	—	8.2-8.9	—	—
30—550	—	—	—	—	10.2-10.7

MECHANICAL PROPERTIES—As Annealed

	936 Alloy	942 Alloy	946 Alloy	948 Alloy	952 Alloy
Tensile Strength, psi	65,000	68,000	70,000	71,000	72,000
Yield Strength, psi	38,000	36,000	32,000	34,000	36,000
Elongation in 2"	35	30	30-35	30-35	35
Hardness, Vickers	130	125-140	120-135	120-135	120-130
Elastic Modulus, psi x 10^6	20.5	21	23	23	24
Grain Size (ASTM)	7-8	7-8	7-9	7-8	7-8

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

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