TEMPERATURE COMPENSATOR 30 (TYPE 2)

Type analysis

Single figures are nominal except where noted.

Iron	Balance	**Nickel**	30.00 %	**Manganese**	0.60 %
Silicon	0.25 %	**Carbon**	0.12 %		

Forms manufactured

Bar-Rounds	**Strip**

Description

Temperature Compensator 30 is a 30% nickel-iron alloy whose magnetic permeability decreases at a controlled rate with an increase in temperature. The alloy has been used in electrical circuits to compensate for the effect of variations in ambient temperature. Three types of Temperature Compensator 30 are available, each having different temperature-permeability characteristics that are controlled precisely by special processing, heat treatment and composition balance.

Temperature Compensator 30 operates over a temperature range from -60 to 160°F (-51 to 71 °C).

Key Properties:

- Precisely controllable magnetic permeability
- Operates over a wide temperature range
- Stability at low temperature

Markets:

- Consumer
- Transportation

Applications:

- Watt-hour meter shunts
- Speedometer shunts
- Tachometer shunts
- Voltage regulator shunts
- Other electrical instrument shunts

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Shunt applications

A shunt is a conductor joining two points in a magnetic line circuit and forming a desired circuit or path through which some of the magnetic lines pass. At low temperatures, the magnet is strong but the shunt, having high permeability, diverts a portion of the flux (magnetic current) away from the gap. As temperature increases, the pole strength of the magnet decreases but the permeability of the shunt decreases, so less flux is diverted through the shunt. If the shunt is properly designed, the flux in the gap can be held constant over a fairly wide temperature range, thereby compensating for temperature changes.

Stability at low temperature

Tests have been conducted at as low as -112°F (-80°C). After prolonged cooling at this temperature, no change in magnetic properties has been found in the three types of Temperature Compensator 30. This indicates no transformation at low temperatures and that the temperature permeability characteristics are reversible.

Physical properties

PROPERTY	At or From	English Units	Metric Units
SPECIFIC GRAVITY	—	8.20	—
DENSITY	—	0.2960 lb/in^3	—
MEAN SPECIFIC HEAT	—	0.1200 Btu/lb/°F	—
MEAN COEFFICIENT OF THERMAL EXPANSION	77 to 122°F (25 to 50°C)	5.11 x 10^{-6} in/in/°F	9.2 x 10^{-6} length/length/°C
	77 to 212°F (25 to 100°C)	6.00 x 10^{-6} in/in/°F	10.8 x 10^{-6} length/length/°C
	77 to 392°F (25 to 200°C)	7.61 x 10^{-6} in/in/°F	13.7 x 10^{-6} length/length/°C
	77 to 572°F (25 to 300°C)	8.33 x 10^{-6} in/in/°F	15.0 x 10^{-6} length/length/°C
	77 to 752°F (25 to 400°C)	8.72 x 10^{-6} in/in/°F	15.7 x 10^{-6} length/length/°C
	77 to 932°F (25 to 500°C)	9.05 x 10^{-6} in/in/°F	16.3 x 10^{-6} length/length/°C
THERMAL CONDUCTIVITY	—	79.79 Btu-in/hr/ft^2/°F	—
MODULUS OF ELASTICITY (E), ANNEALED	—	22.0 x 10^3 ksi	—
ELECTRICAL RESISTIVITY	70°F	480.0 ohm-cir-mil/ft	—
TEMPERATURE COEFFICIENT OF ELECTRICAL RESISTIVITY	32 to 212°F	7.00 x 10^{-4} ohm/ohm/°F	—
CURIE TEMPERATURE	—	300°F	—
MELTING RANGE	—	2600°F	—

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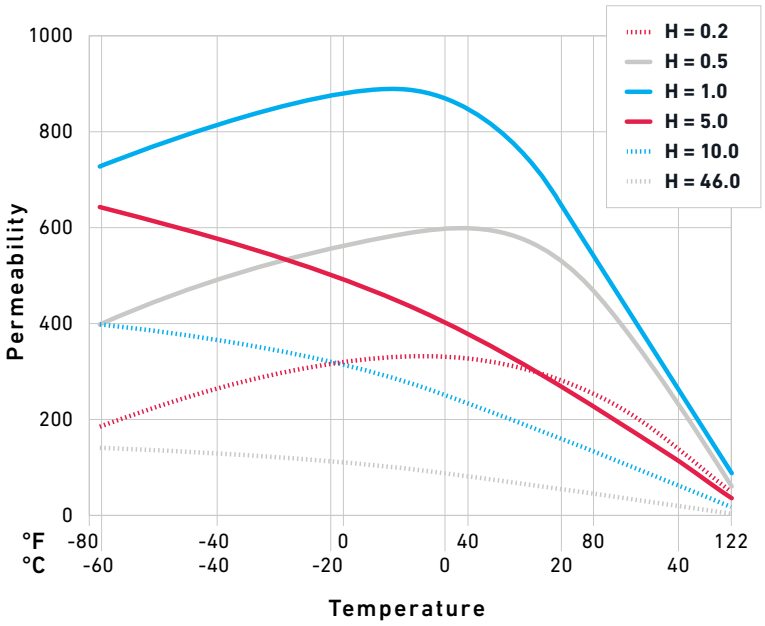
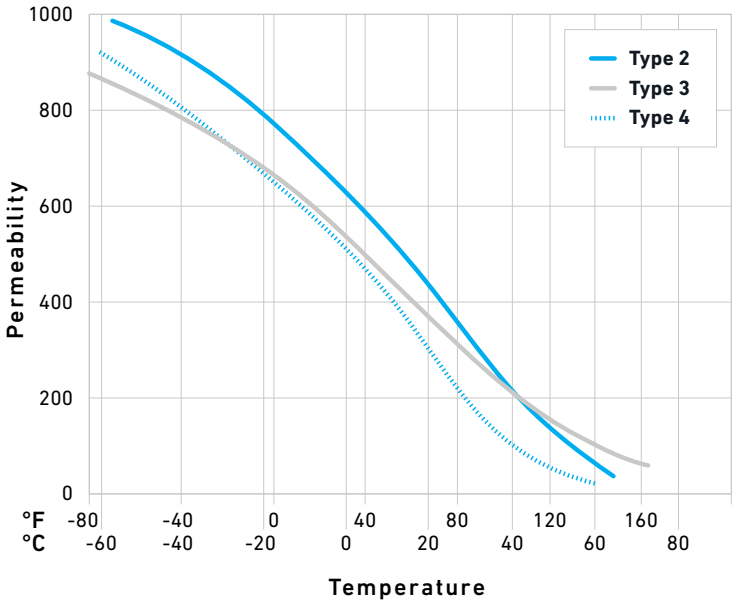
Magnetic properties

TYPE 2 TYPICAL TEMPERATURE-PERMEABILITY CURVES
AT VARIOUS MAGNETIZING FORCES BELOW 46 Oe



> TEMPERATURE COMPENSATOR 30 (TYPE 2)

TYPES 2, 3, AND 4 TYPICAL TEMPERATURE-PERMEABILITY CURVES AT H = 46 Oe



Typical mechanical properties

AS ANNEALED									
TENSILE STRENGTH		YIELD STRENGTH 0.2% OFFSET		ELONGATION IN 2 IN (50.8 MM)	HARDNESS	MODULUS OF ELASTICITY	
ksi	MPa	ksi	MPa	%	ROCKWELL B	psi X 10^4	MPa X 10^3
70	483	40	276	35	70	22.0	152.0

Workability

Cold working	Temperature Compensator 30 (Types 2, 3 and 4) can be readily blanked and formed in the annealed condition. If cold forming is required, the magnetic properties will change but can be restored by heat treating. Cold working stresses produced by forming or drawing can be eliminated and temperature permeability properties can be restored by heating to 1800 to 1850°F (982 to 1010°C) two to five minutes at heat followed by a cooling rate equivalent to an air cool.

For additional information, please contact your nearest sales office:
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