201 Type 1 Ni-Resist Iron

Description

Dura-Bar Ni-Resist irons contain an austenitic matrix of approximately 10% alloy carbides. The austenitic structure is suitable for corrosive environments in sour well oils, salts, salt water acids and alkalies. The iron is relatively soft and chrome is added to produce carbides that help improve wear resistance. Ni-Resist is denser than gray or ductile irons and has a higher coefficient of thermal expansion. Dura-Bar Type 1 Ni-Resist is manufactured to produce a material conforming to ASTM A436.

Applications

Miscellaneous:
Insecticide Pumps, Piston Ring Inserts, Sea Water Valves

Transportation:
Valve Guides

Physical Properties

Property	Measurement
Density (lbs/in^3)	0.265
Modulus of Elasticity (psi x 10^6)	12-14
Modulus of Rigidity (psi x 10^6)	4-5
Poisson's Ratio	–
Relative Wear Resistance	–
Coefficient of Thermal Expansion (x 10^-6/°F)****	10.7
Thermal Conductivity (BTU/hr/ft/°F)	23
Relative Damping Capacity***	–
Heat Treat Response (HRc)	–
Relative Magnetic Properties	Non-Magnetic
Electrical Resistance (micro-ohms cm)	140-170

** Based on 1212 = 100%*
*** Impact properties are not typically relevant to gray iron given the non-ductile behavior.*
**** Natural Log of Rate of Successive Amplitude*
***** Gray iron values from Room Temperature to 212 F. Ni-Resist values from Room Temperature to 400 °F.*

Mechanical Properties

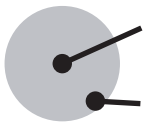
Brinell hardness values for nominal as-cast diameters are shown in the table. Hardness properties listed are minimum and maximum across the bar. Hardness values for rectangles and squares are a function of the height and width ratios and will be supplied on request. BHN in the center of bars 1.750” and smaller may be lower than the values shown because of thermal center microshrinkage.

Size Range		BHN	
Inches	mm	Min	Max
1.000 – 6.000	25 - 152	131	183

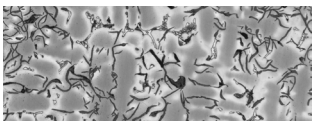
The tensile strength of 201 Type 1 Ni-Resist will be approximately 25,000 psi for bars up to 3.00” diameter and 20,000 psi for bars larger than 3.00”. Tensile strength tests in bars 1.750” and smaller may not be accurate because of thermal center microshrinkage.

Mechanical Properties	
Tensile strength psi (min)	20,000
Yield strength psi (min)	N/A *
Elongation (min)	N/A*

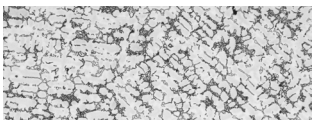
Microstructure



Center Area
100x, etched in 5% Nital



Edge Area
100x, etched in 5% Nital



The microstructure will consist of Type VII, A, size 4-6 graphite as defined in ASTM A247. The matrix will be austenite with 5-10% alloy carbide. The edge or rim will contain Type D graphite, size 6-8. Chill carbides are less than 5% in any field at 100x and will be well dispersed.

Heat Treat Response

Austenitic alloys cannot be hardened by heat treatment. They may be softened and homogenized by heating to 1800-1900° F (980-1040° C) for three to five hours and air-cooling. This breaks down some of the carbides and most of those remaining will be sphereoidized. Anneal softens the material without detrimental effect on the strength properties. Type 1 Ni-Resist should not be used in applications involving service above 1300° F (430° C).

Chemical Composition

Element	Percentage
Carbon*	3.00% Max
Silicon*	1.00 - 2.80%
Manganese	0.50 - 1.50%
Nickel	13.50 - 17.50% Max
Copper	5.50 - 7.50%
Chromium	1.50 - 2.50%
Sulfur	0.12% Max

*Carbon and silicon targets are specified for each bar size in order to control the size and shape of the graphite flake. Titanium is added as an inoculant in order to produce the Type D graphite structure.

Disclaimer

All of the above information is for reference only. Actual results are influenced by process variables and actual size of the raw material.

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