

Ni-Resist

Heat, Wear, Erosion & Corrosion Resistant
High Nickel Alloyed Austenitic, Flake & Spheroidal/ Ductile Cast Irons

Applications in

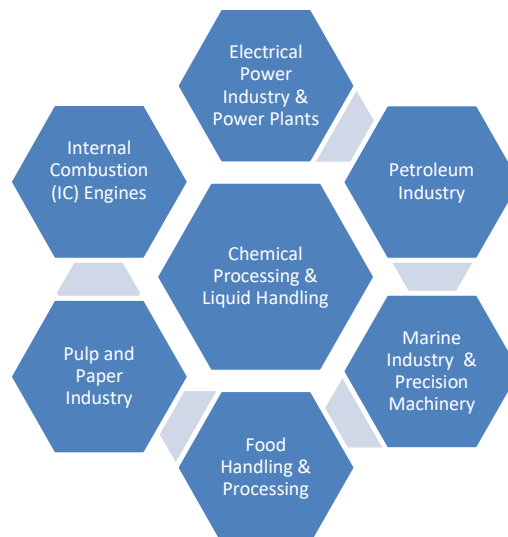
Marine, Food Handling & Processing,
Chemical, Pulp & Paper, Power, Oil, Petroleum Industries

General Characteristics of the Ni-Resist austenitic cast irons

These are the standard or flake graphite alloys and the ductile or spheroidal graphite alloys. As time passes, the spheroidal grades, because of its strength, ductility and elevated temperature properties are becoming more prominent. However, the flake materials with much lower cost, few foundry problems and better machinability and thermal conductivities are still manufactured by us for client's area and industry specific end application needs.

International Standards for Ni-Resist Alloys

USA	ASTM A 439/ A 439M
UK	BS 3468
Germany	DIN 1694
France	NF A32-301
Australia	AS 1833
Japan	JIS G 5510





**Steel, Stainless Steel, High & Super Alloy-
Heat, Wear, Abrasion, Pressure & Corrosion Resistant**
Castings, Spares, Replacement Parts, Custom-Made Components
Manufacturer-Supplier to OEM's, Plants, & Process Industry
Machined, Proof-Machined, CNC/VMC Precision Machined Components
Conversion to Castings from Fabrications, Forgings & Welded Assemblies
Engineering, Materials & Metallurgical Consulting

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Fields of Application

Chemical Processing

Chemical equipment requires the ability to withstand long periods of service under a wide variety of corrosive conditions. For those applications in chemical plants where cast components are suitable and economical, the Ni-Resist alloys are widely used.

Some of the more frequent applications are:

- Blowers
- Compressors
- Cryogenic equipment
- Furnace parts
- Piping
- Pots and kettles
- Pump casings and impellers
- Rolls and conveyors
- Salt solution and slurry handling equipment
- Valves and valve fittings

Liquid Handling

The same characteristics that have made Ni-Resist alloys so valuable in the chemical and process industries apply to many other areas where corrosive fluids and erosive conditions exist.

Some of the more frequent applications are:

- Diffuser housings
- Mechanical seals
- Pipe and pipe fittings
- Steam ejectors
- Strainers
- Valves of all kinds

Electrical Power Industry & Power Plants

Increases in the demand for electricity and the need to replace old and obsolete generating facilities have meant that engineers and designers must devise means for increasing the efficiency of power plant. High pressures, higher operating temperatures and other requirements imply demand for better materials of construction. In many cases, Ni-Resist family of alloys provides economical and effective solutions. For example, application opportunities include equipment for generation and utilization of electricity derived from gasoline and diesel engines as well as from steam, water and gas-powered turbines.



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Some of the more frequent applications are:

- Mechanical seals
- Meter parts
- Non-magnetic housings
- Pole line hardware
- Pump casings, diffusers and impellers
- Resistance grids
- Steam handling equipment
- Switch parts
- Turbine parts
- Valves and related attachments

Internal Combustion (IC) Engines

The Ni-Resist alloys have certain outstanding advantages in this field. They are used in gasoline, diesel and LPG/CNG powered engines in trucks, buses, railway locomotives, stationery power plants and marine and aircraft propulsion units.

For exhaust parts such as manifolds and valve guides, Ni-Resist castings have proved resistant to the effects of temperatures up to 1050°C (1930°F) and the severe wear that can be caused by valve stem motion. They are also resistant to attack by most usual combustion products. Thermal expansion coefficients of Ni-Resist Alloys, which closely match those of stainless steels and UNS N06600 are another factor in exhaust applications.

Cylinder heads of Ni-Resist alloys resist corrosion from water and combustion products and have good metal-to-metal wear behaviour. Ni-Resist finds wide spread use as insert rings in alloy pistons.

Water pump impellers and bodies offer another appropriate use for Ni-Resist alloys in engines. With increase in power, modern water pumps must operate at higher velocities than in the past. Higher water temperatures and pressures many increase the corrosion hazard and higher speeds can cause increased erosion damage.

Some of the more frequent applications are:

- Cylinder liners
- Diesel engine exhaust manifolds
- Exhaust valve guides
- Gas turbine housings, stators, and other parts
- Insert rings and hot spot buttons for Aluminium Alloy pistons
- Turbocharger housings, nozzle rings, heat shields and other parts
- Water pump bodies and impellers

Marine Industry

The corrosion and erosion resistance of Ni-Resist alloys in seawater have made these materials exceptionally useful for a broad range of applications where seawater is encountered.

Some of the more frequent applications are:



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- Diesel engine manifolds
- Miscellaneous hardware
- Pipe and pipe fittings
- Pumps and pump parts
- Strainers
- Valves and valve parts

Petroleum Industry

When petroleum fluids enter feed lines, refineries and other processing plants, they must be distributed to the processing equipment. In addition, large quantities of water are often required in the various operations. In all area applications, corrosion resistant materials are needed. For cast parts, Ni-Resist alloys have proven to be very successful. They possess good corrosion resistance to salt water, corrosive petroleum fractions and some of the milder acids and caustics often encountered.

Some of the more frequent applications are:

- Deep well, acid water and water flood pumps
- Gas compressors
- Motor parts
- Pipe and pipe fittings
- Petroleum fluids pumps and pump parts
- All kinds of valves and valve parts

Precision Machinery

Because of their low coefficients of thermal expansion, Ni-Resist 5 and D-5 are the primary cast alloys used where dimensional stability is a requirement. Using them in vital parts may increase the accuracy of many machine tools, gauges, and instruments. The coefficient of thermal expansion of these Ni-Resist alloys is one-third of that for cast iron. Ni-Resist D-5 is considerable tougher. Both alloys are more corrosion resistant and they are comparable with regard to vibration damping capacity and machinability.

Some of the more frequent applications are:

- Bases, bridges and work supports
- Forming dies
- Gauges
- Glass moulds
- Instrument parts
- Machine tool ways
- Measuring tools
- Optical parts
- Spindle housings



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Pulp & Paper Industry

Corrosion is a problem at practically all stages in the manufacture of pulp and paper. The Sulphite process has acid conditions. Kraft mills have alkaline environments. A combination of corrosion and erosion exist in both types of plants. Ni-Resist alloys offer useful solutions in many areas.

Some of the more frequent applications are:

- Dryer rolls
- Fourdrinier castings
- Grids
- Pipe and pipe fittings
- Press rolls
- Pump and pump parts
- Screen runners
- Spiders
- Valves and valve parts
- Wood steamers

Food Handling & Processing

Sanitation is necessary in all food processing equipment that comes in contact with the product. Corrosion must be minimized and cleaning must be quick and through. For equipment that lends itself to castings, Ni-Resist alloys have given very satisfactory service.

Prevention of contamination or discoloration of food is often achieved by the use of Ni-Resists 2, 2b, 3 or 4 and their ductile counterparts in pumps, kettles, filters and valves. Ni-Resist 4 provides advantages in quality cooking, with little warping or pitting. Food does not stick to utensils, pots or grills. Cooking equipment made with this alloy is easy to keep clean, remain smooth, bright and attractive.

Some of the more frequent applications are:

- Baking, bottling and brewing equipment
- Canning machinery
- Distillery equipment
- Feed screws
- Fish processing equipment
- Heavy duty range tops and grills
- Meat grinders, chopper and packing equipment
- Pot and kettles
- Pumps and pump parts
- Salt solution filters



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ASTM A 436

Standard Specification for Austenitic Gray Iron Castings (Ni-Resist Flake Graphite Irons)

This specification covers austenitic gray iron castings that are used primarily for their resistance to heat, corrosion, and wear. Austenitic gray iron is characterized by uniformly distributed graphite flakes, some carbide, and the presence of sufficient alloy content to produce an austenitic structure.

ASTM A 436/ A 436M Ni-Resist Alloy Flake Graphite	Characteristics & End Use
Ni-Resist NiMn 13 7	Relatively low cost, non-magnetic alloy. Is not used where corrosion and/or high temperature resistance are required.
Ni-Resist 1	Good resistance to corrosion in alkalis, dilute acids, seawater and other salt solutions. Has good moderate temperature and wear resistance. Used for pumps, valves, and products where resistance is required. Used for piston ring inserts because of matching expansion characteristics of aluminium piston alloys.
Ni-Resist 1b	Similar applications as Ni-Resist 1, but has superior corrosion-erosion resistance. Higher chromium content produces an alloy that is harder and stronger.
Ni-Resist 2	Higher nickel content makes this alloy more corrosion resistant in alkaline environments. Has found applications for handling soap, food products, rayon, and plastics. Used where freedom from copper contamination is required.
Ni-Resist 2b	Greater hardness improves corrosion and erosion resistance. This alloy performs well in metal-to-metal wear situations.
Nicrosital	Improved corrosion resistance in dilute sulphuric acid. Used for pumps, valves, and other castings requiring higher mechanical properties.
Ni-Resist 3	Resistant to corrosion in wet steam and corrosive slurries. Can be used where it is necessary to match the coefficient of expansion of gray cast iron or steel at temperatures around 260°C (500°F). Applications include pumps, valves and machinery castings.
Ni-Resist 4	Has excellent stain resistance. Is superior to other Ni-Resist alloys with regard to corrosion-erosion resistance.
Ni-Resist 5	Has lowest coefficient of thermal expansion of Ni-Resist alloys. Provides dimensional stability for machine tools, forming dies, instruments and expansion joints.
Ni-Resist 6	An uncommon alloy. When produced, it is used for pumps and valves handling corrosive solutions. Is not related to Ni-Resist D-6.

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ASTM A 439

Standard Specification for Austenitic Ductile Iron Castings (Ductile Ni-Resist)

This specification covers austenitic ductile iron castings that are used primarily for their resistance to heat, corrosion, and wear and for other special purposes. Austenitic ductile iron, also known as austenitic nodular iron or austenitic spheroidal iron, is characterized by having its graphite substantially in spheroidal form and substantially free of flake graphite. It contains some carbides, and sufficient alloy content to produce an austenitic structure.

ASTM A 439/ A 439M Ni-Resist Alloy Spheroidal Graphite	Characteristics & End Use
Ni-Resist D-2	Has good resistance to corrosion, corrosion-erosion and frictional wear. Can be used at temperatures up to 760°C (1400°F). Applications are
	pumps, valves, compressors, turbocharger housings and exhaust gas manifolds. With Ni-Resist D-2W, a primary ductile grade.
Ni-Resist D-2W	Has similar properties and applications as Ni-Resist D-2, but with better weld-ability when proper procedures are adhered.
Ni-Resist D-2B	Has higher chromium content that results in better corrosion and corrosion-erosion resistance than Ni-Resist D-2. Similar applications to Ni-Resist D-2.
Nicrosilal Spheronic	Has improved corrosion resistance in ductile sulphuric acid. Good high temperature stability. Used for pumps, valves and other castings higher mechanical properties.
Ni-Resist D-2C	Used for pumps, valves, compressors and turbocharger parts where high ductility is desired. Because of good resistance to wet steam erosion, another important application is in steam turbines. Sometimes used for non-magnetic components. Is also used for some low temperature applications.
Ni-Resist D-2M	Maintains ambient temperature mechanical properties down to -170°C (-275°F). Major used are for refrigeration and cryogenic equipment.
Ni-Resist D-3A	Suggested where a high degree of wear and galling resistance are required along with moderate amounts of thermal expansion.
Ni-Resist D-3	Has good corrosion resistance at elevated temperatures. Excellent corrosion-erosion resistance in wet steam and salt slurries. Uses include pumps, valves, filler parts, exhaust gas manifolds and turbocharger housings.

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Ni-Resist D-4A	Has excellent corrosion and corrosion-erosion resistance with superior high temperature properties. Finds used in pumps, armatures, exhaust gas piping and turbocharger parts.
Ni-Resist D-4	Corrosion, corrosion-erosion and heat resistant properties are superior to those of Ni-Resists D-2 and D-3. Applications similar to Ni-Resist D-4A.
Ni-Resist D-5	Is used where low thermal expansion is required. Applications include machine tool parts, scientific instruments and glass molds.
Ni-Resist D-5B	Has low thermal expansion with high levels of heat and corrosion resistance. Good mechanical properties at elevated temperatures. Used for low-pressure gas turbine housings, glass molds and other elevated temperature applications.
Ni-Resist D-5S	Has excellent resistance to growth and oxidation at temperatures up to 1050°C (1930°F). Low coefficient of thermal expansion with good thermal shock resistance. Used in gas turbines, turbocharger housings, exhaust manifolds and hot-pressing dies.
Ni-Resist D-6	Non-magnetic with good mechanical properties. Used for switch insulator flanges, terminals, ducts, and turbine generator parts.

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