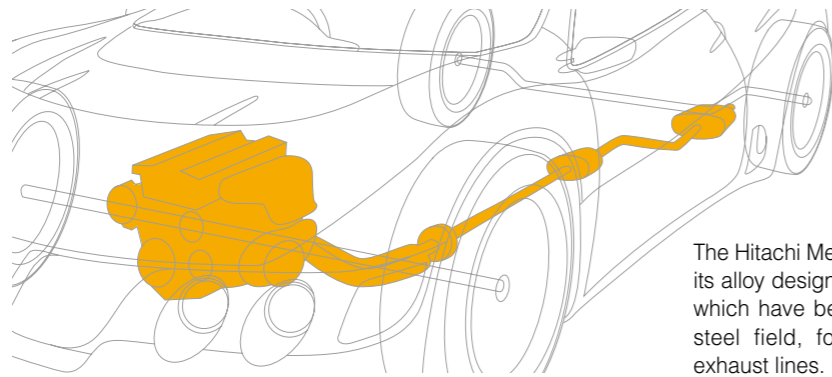


Our Dreams
Onboard

Engine & Exhaust Lines



The Hitachi Metals Group integrally makes the most of its alloy design, casting and electronics technologies, which have been long accumulated in the specialty steel field, for the development of engines and exhaust lines.

Engine Components and Materials

Engine Components and Materials in High-Grade Specialty Steels [Specialty Steel Company]

We can furnish quality engine components suitable for applications that boast such characteristics as high wear resistance, high heat resistance, strong corrosion-proof, high strength and low thermal expansion.



Piston ring materials

● Piston ring materials:

Stainless piston rings are mainly adopted for the engines of first-grade automobiles, of which compact size and higher output are pursued. Our piston ring materials are enhanced in wear resistance and sliding capacity via nano-level control of the metal structure. Our materials can be supplied not only as raw materials but also as net-shape coil to which plastic forming is applied.

● Engine valve materials:

We supply extremely heat-resistant and oxidation-resistant engine valve materials that excel in cost performance. They serve to reduce weight and improve the durability of engine valves.

● Other components and materials:

Materials for fuel-injection system components, spark plugs and so on. Variable Timing Control (VTC*) materials

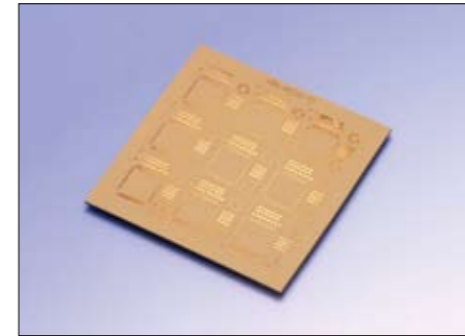
* VTC: Variable Timing Control



Engine valve materials

Electronic Components and Materials for Engine Control

LTCC Substrates Used in Electrical Equipment [Information System Components Company]



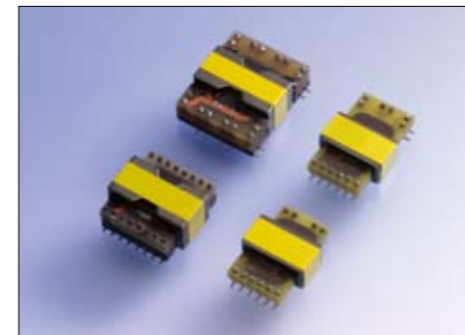
LTCC substrates used in electrical equipment

LTCC* substrates are high-strength, multilayer substrates developed based on the past performance in the high-frequency field for mobile phones. Compared with conventional printed circuit substrates, they excel in heat resistance, thereby enabling higher density via multilayer wiring. One major feature is low power loss due to the use of Ag (silver) wiring material with low electric resistance. The lead-free structure and the use of non-cyanic material for plating Au (gold) are also friendly to the environment.

Suitable applications include the use as substrates for devices for electronic control such as engine control.

* LTCC: Low Temperature Co-fired Ceramics

Inverter Transformers for IGBTs [Information System Components Company]



Inverter transformers for IGBTs

These compact and lightweight inverter transformers were exclusively developed for use in IGBTs.* An IGBT is a power element that enables high electric power conversion of several dozen kW and is used for IPMs,* which are often used for engine controls and the drive motor control in hybrid cars. These Inverter transformers for IGBTs support high electric power conversion, thereby contributing to smaller IPMs with high efficiency.

* IGBT: Insulated Gate Bipolar Transistor

A semiconductor switching element that boosts battery voltage and converts the pressurized direct current into motor-driving alternate current.

* IPM: Intelligent Power Module

A packaged module in which a signal-amplifying circuit is assembled on IGBTs that function at high speeds.

Exhaust Line Components and Materials

“HERCUNITE® Series” Heat-Resistant Cast Steel/Iron Components [Automotive Components Company]



Exhaust manifolds



MANITURBO™

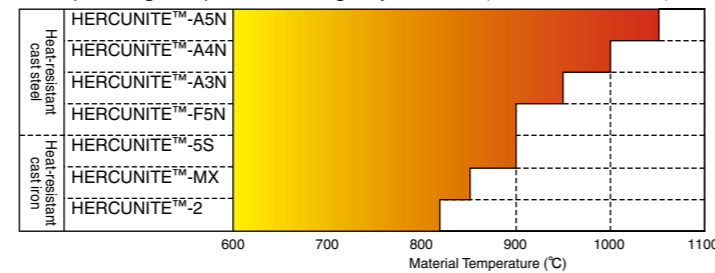
HERCUNITE®* is a heat-resistant cast steel/iron component series suitable for use in exhaust lines developed by Hitachi Metals. The heat-resistant cast steel HERCUNITE®-S series, together with the cast iron EX, MX, N and D series, meets different needs in diversified temperature zones.

These products are available as components in exhaust lines, such as exhaust manifolds, turbine housings and MANITURBO™, which must withstand high combustion engine temperatures.

* HERCUNITE®

This name derives from the acronym for “Heat Resisting Cast materials for UNIT of Exhaust parts.” “HERCU” is associated with the image of Hercules (a Greek mythology hero) and “NITE” is often used as a suffix for jewels or ores.

Operating Temperature Range by Material (Reference values)



Diesel Particulate Filter [Roll Company]



Diesel Particulate Filter

Enlarged Cross section view

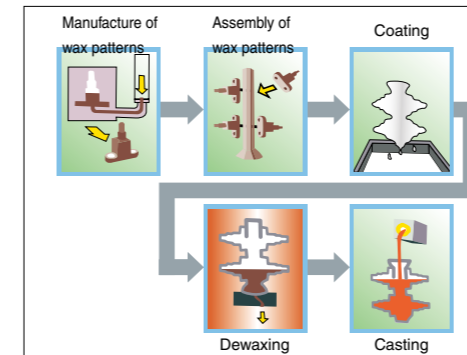
This is a ceramic filter for removing soot discharged from diesel vehicles. This large-scale, single-piece product has achieved a high collection ratio for micro soot particles on the order of 10 nm and the reduction of pressure loss through sophisticated control of shape, size and distribution of pores.

This filters will likely be used on future medium and large-duty commercial diesel vehicles as a means of post-processing the exhaust gas.

Precision Castings (Produced with the Lost Wax Process) [Hitachi Metals Precision, Ltd.]



Turbine wheels for turbochargers



Major manufacturing processes

The lost wax process* is a precision casting method used especially for the integral formation of complicated 3-D shapes such as turbines and hollow molding products. This method contributes to making components more lightweight, shortening processes, reducing materials cost and increasing the degree of design flexibility. Based on our metallurgical expertise in specialty steels, our products are applicable to a wide variety of materials such as iron, aluminum and titanium.

The castings are mainly used for exhaust lines where high resistance to heat and oxidization are required, and therefore are suitable for the manufacture of turbine wheels for turbochargers, vanes, EGR (exhaust gas recirculation) valves, gas turbine blades and so on.

* Lost wax process

When ceramics are coated and heated on wax patterns, only wax is melted, or lost, leaving hollow molds. The molten metal is then poured into the mold cavity where the wax used to be via casting using the molds. The finished products are removed by breaking the ceramics-made molds.

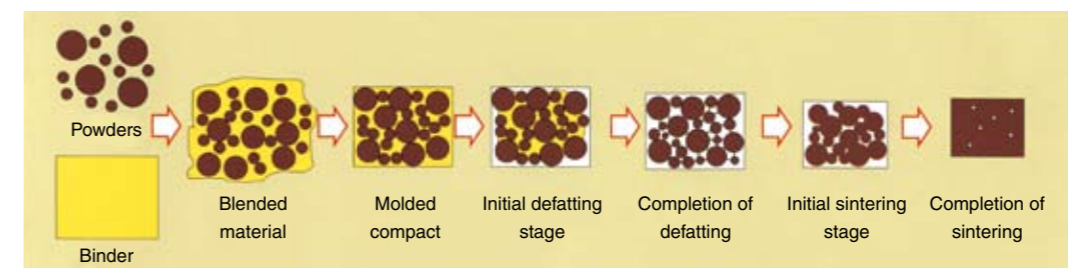
Metal Powder Injection Sintered Moldings (Produced with the MIM [Metal Injection Molding] Process) [Hitachi Metals Precision, Ltd.]



Successful MIM-processed products

MIM (Metal injection molding) is an innovative technology that combines injection-molding technology with the sintering technology for metal powders. The mixture of metal powders and the binder are injection-molded, then sintered after a defatting process. The resulting compact and slim products are near net shaped, and have strength and durability as a metal and also feature shaping flexibility thanks to the injection molding. In addition, processing errors can be avoided and fine bores and small slits can be obtained.

Accordingly, the sintered moldings are suitable for small metal parts including engine components and other mechanical elements with compact and precise shapes.



Pattern diagram of the MIM method