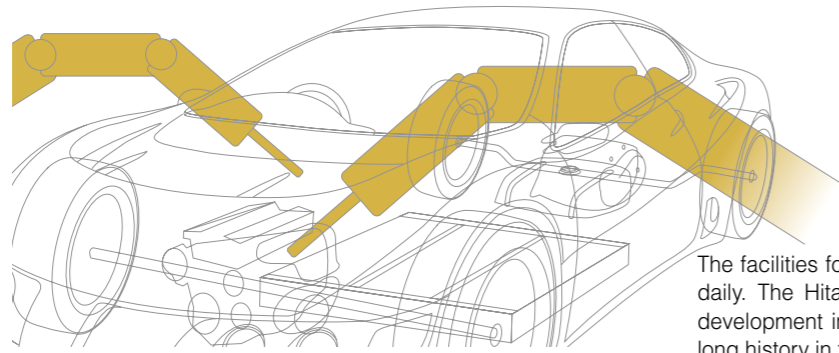


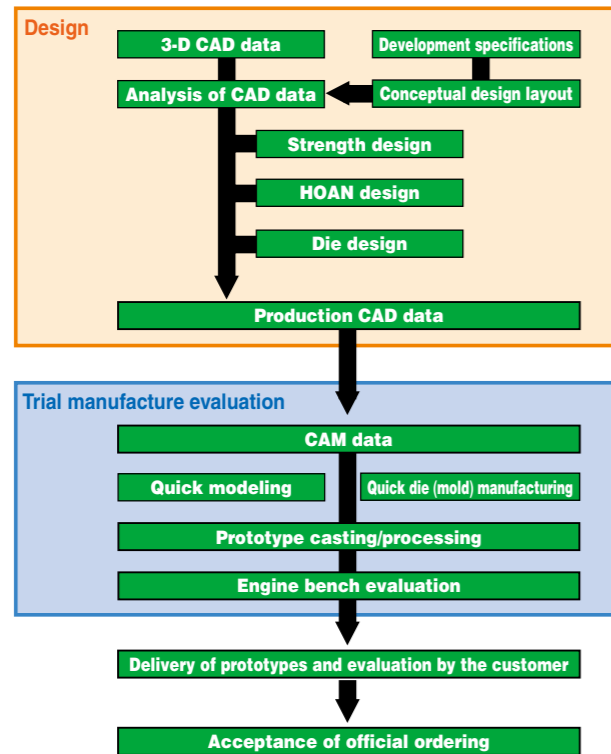
# Development & Production Facilities



The facilities for car development continue to evolve daily. The Hitachi Metals Group supports new car development in diverse modalities by leveraging its long history in the automobile industry.

## Development Support Technologies and Products

### Integrated Design-in System (IDIS™\*) [Automotive Components Company]



The Hitachi Metals Group recognizes the need for sophisticated design and development facilities as well as processes to support car development worldwide. We continue this ever-evolving support in many diverse ways by calling upon the expertise we have learned over our long history in the automobile industry.

IDIS™ is our design and trial manufacture evaluation system for casting components. This innovative system allows us to integrally analyze and use 3-D CAD data from the die design to the manufacturing stage, as well as for casting, processing and evaluation tests. As a consequence, trial manufacture is quicker while remaining in compliance with various 3-D CAD systems and global networks. The system is suitable for the development of engines, exhaust line components, aluminum wheels, suspension components and others.

\* IDIS™

This name derives from the acronym for "Integrated Design-In System."

Applicable Range of IDIS™



Engine & exhaust system components    Aluminum wheels    Suspension components

### Analysis Facilities



Combustion testing of an exhaust manifold via an exhaust gas simulator



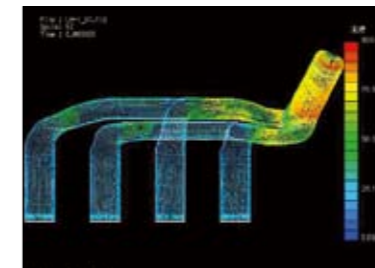
Thermal fatigue test to analyze heat resistance properties of a new material



Hot abrasion test



Microelement survey of materials using a GD-MS (Glow discharge mass spectrometer)



Fluid analysis

For automobiles that require extremely high reliability, their parts, components and materials also require established high-level quality. Drawing on its long experience in the automotive component field and extensive expertise in the materials field, Hitachi Metals endeavors to meet diversified customer needs with its analysis and other testing equipment facilities to supply customers with high-quality components and materials.

## Components for Handling Molten Aluminum

### Sialon Die-Cast Sleeves [Roll Company]



Die-Cast Sleeve

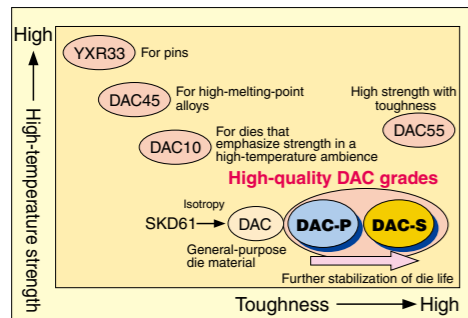
This aluminum die-cast sleeve is made of "sialon" ceramics, which exceed other new ceramics in high-temperature strength, thermal shock resistance and erosion resistance.

The inner layer of the sleeve is sialon, whereas its outer layer is made of a specialized alloy. This dual-layer structure ensures excellent molten metal heat retention and extrusion stability even with low lubrication. With a useful life that is 2-5 times longer than steel sleeves, the sialon sleeve is often applied for large die-casting machines of the 3,000-ton class to help increase the quality of aluminum alloy castings and minimize defects.

## High-Grade Die Materials

The development period of a new car model tends to get shorter every year and a further time reduction in die making is a consistent requisite for car manufacturers. With high-quality **YSS** (Yasugi Specialty Steel)-brand products, Hitachi Metals strives to improve the die life and machinability of tool steel depending upon its applications.

### “DAC® Series” Steels for High-Performance Die Casting Dies [Specialty Steel Company]

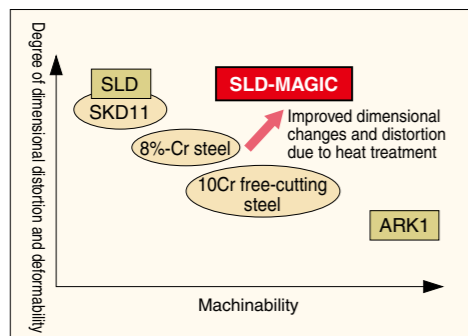


Positioning of the DAC® series

With high hot strength and outstanding toughness, our “DAC® Series” specialty steels contribute to quality improvement and the stabilization of die castings. We offer abundant steel variations in response to the diversifying die-casting technology.

The products in this series are widely available for dies including those that emphasize surface touch feel, thin parts, high-strength parts, wheels and high-melting-point aluminum products.

### “SLD-MAGIC®” New Cold-Formed Die Steel [Specialty Steel Company]



Positioning of Hitachi Metals' new cold-formed die steel

SLD-MAGIC® is, compatible with high performance (longer die life) and easy die making, the innovative cold working die steel.

Its excellent machinability can drastically reduce costs and lead time for manufacturing die molds.

Distortion and dimensional changes due to heat treatment can be reduced compared to currently used grades.

SLD-MAGIC® is also excellent in wear resistance and complies with requirements for repeated surface treatment that is resulting in longer die life.

SLD-MAGIC® is suitable for automotive sheet pressing dies for high-tensile steel sheets and light-electrical pressing dies for stainless steels, plain carbon steels and Al sheets.

### “CENA1™” New Plastic Die Material [Specialty Steel Company]



CENA1™ 3-D weldless dies

Our CENA1™ new plastic die material has excellent machinability and anti-rust resistance. As it has better anti gas corrosion and is less likely to rust compared with conventional 40HRC pre-hardened grade, the die life shall be extended and maintenance cost reduced. Moreover, CENA1™ is suitable for weldless dies for which temperature control is required.

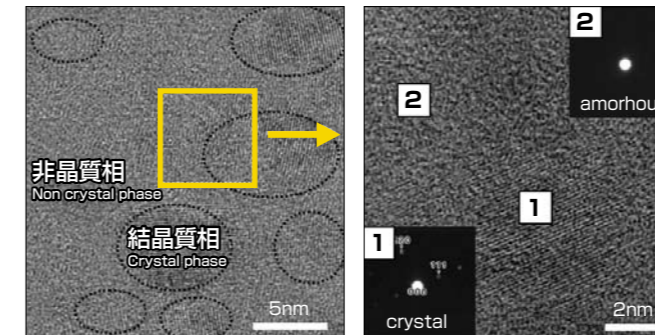
CENA1™ is recommended for dies for products as external frames of PDP (Plasma display panel), mobile phones and video cameras. Also, CENA1™ may be used for the primary attribute in surface touch feel such as a mirror-finished surface, fine creping or an electric discharged surface.

## Cutting Tools

Hitachi Tool Engineering carries out active R&D efforts on cutting tools under four basic themes: Coating, Polishing, Material and Design. The tools that it produces include end mills for creating the smooth curves of press and resin products, and inserts and drills for machining high-precision components. Consistent efforts are under way to increase the accuracy of machining and productivity, as well as to develop new machining technologies.

### Coating Technology

[Hitachi Tool Engineering, Ltd.]

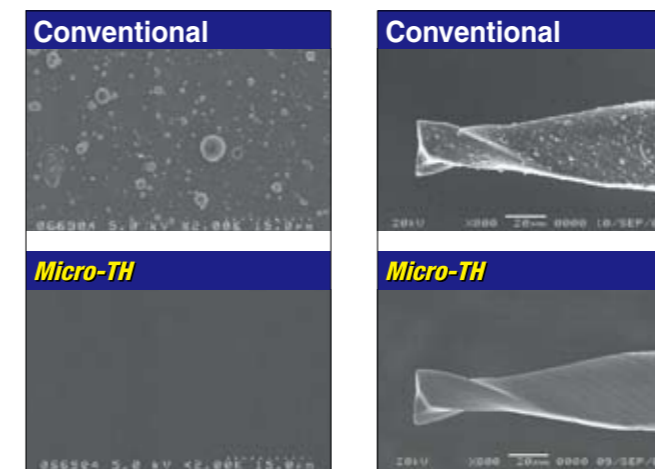


Nano-crystal structure (CS / TH)

#### ● Nano Composite Coatings

We have succeeded in increasing the hardness of nano-composite coating films by scattering nano-crystal grains in the non-crystalline structure. TH coatings have excellent resistance to heat and oxidation because invasion of oxygen into the coatings is eliminated. CS coatings have enhanced resistance to adhesion due to lubricants contained within the coatings. AT coatings have optimal content of aluminum for increased hardness and resistance to abrasion. New types of coatings-TB, JX, MZ and HG-are also added to the lineup to deliver the most appropriate coatings according to how coated tools are used.

### Microscopic Technology [Hitachi Tool Engineering, Ltd.]



Coated surfaces

Coatings on the 0.03-mm-diameter tool blades

#### ● Micro Tools

The Epoch Micro End Mill TH has an extremely small blade diameter of 30 microns. Its special coating contains little micro particles, widening the spectrum of cutting applications. The new end mill extends the choice of cutting to portions that conventionally required etching, increasing productivity and environmental soundness.

### Design Technology

[Hitachi Tool Engineering, Ltd.]



Alpha High Feed Radius mills

Non-Step Borers

#### ● Alpha High Feed, Epoch High Feed and Non-Step Borer Series

The time-consuming rough cutting process is shortened by using these mills at a high feed with an increased per-minute discharge of cut chips. This enables shorter turnaround and allows more time for subsequent processes.