

航空機 機械加工

NACHI

Nachi's technology for machining parts for aircraft
is contributing more to advances in manufacturing

Aircraft Machining

NACHI

NACHI-FUJIKOSHI CORP.

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Products for the Aircraft Manufacturing Industry

Nachi is in a unique position as a manufacturer of both cutting tools and machining equipment to develop the technology and know-how to meet the diverse demands for manufacturing high-precision machinery.

To give the aircraft industry what they want, we provide solutions that bring together cutting tools and machining equipment based on our extensive materials technology, plus we offer high-quality support for machinery manufacturers.

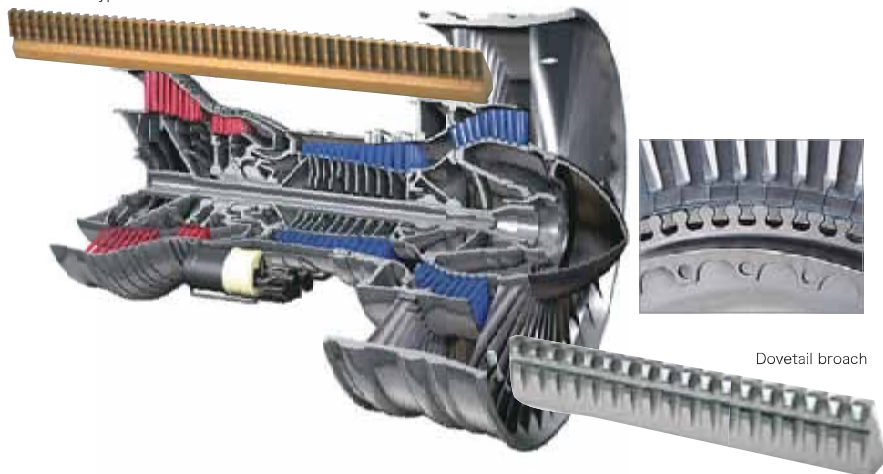
Broaching

Producing blades for turbine disks for jet engines

Jet engines intake air, compress it with compressor disks, then combustible gas is compressed to drive the turbine disks. The grooves that are used to mate the blade to the disk are produced using a dovetail broach to create a dovetail shaped groove in the compressor disk. Christmas tree broaches are used to cut Christmas tree shaped grooves in the turbine disk. The Christmas tree shape, with its superior stress distribution particularly in very hot high-pressure environments, not only fills demands for shape accuracy, but it also responds to the stringent demands for work surface characteristics such as surface roughness, and changes in the quality and ductility of the work surface layer. Nachi Fujikoshi has broaches and broaching machines that support production of the heart of jet engines with sets of cutting tool and machining equipment



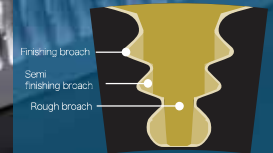
Fir tree type broach



Dovetail broach

Broaches

To produce dovetail or Christmas tree shape grooves, a set of more than 10 broaches each with differently shaped cutting shapes are used. The best design is taken into account the material to be cut, the length and shape of the cut as well as the specifications of the broaching machine to be used. Broaches are made from ultra-fine powdered HSS that has superior wear-resistance characteristics.

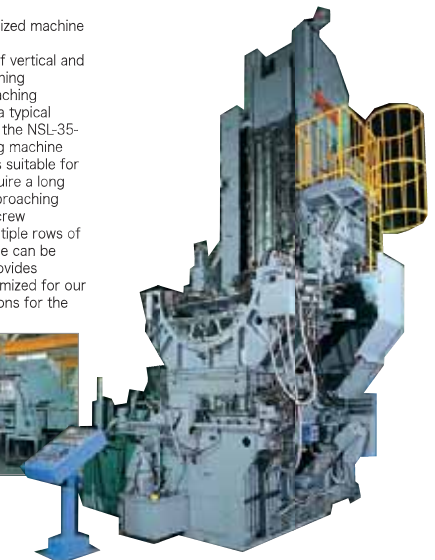


Fir tree type broach cutting method

Broaching Machines

Broaching is done with a specialized machine (broaching machine).

NACHI has developed a series of vertical and horizontal Christmas tree broaching machines. A typical vertical broaching machine is the SV-20-23M and a typical horizontal broaching machine is the NSL-35-S61MNC. A horizontal broaching machine with a long level pulling stroke is suitable for cutting large-size disks that require a long pulling stroke. A single vertical broaching machine can handle left/right screw directions, and by mounting multiple rows of broaches, the broaching machine can be made more compact. NACHI provides broaching systems that are optimized for our customers' facilities and conditions for the jobs they do.



Formed cutter
A fir tree type cutter (formed cutter) can cut grooves without using the pulling cut that broaches use. Formed cutters can be custom made to suit your application.

Cutting on Heat Resistant Alloys

Nickel-based and other heat resistant alloys that are used to form parts of jet engines have high heat resistance and low thermal conductivity that inhibits the softening that occurs as the tip of the cutting tool heats up. From the perspective of machinability, we must be very mindful of work hardening, welding, and chipping of the cutting edge.



Cutting on Titanium Alloys

The Ti-6Al-4V titanium alloy commonly used in disks, blades, and landing gear is 1/2 the weight of steel and has comparatively superior hardness and high-temperature strength. On top of that, it is corrosion resistant and non-magnetic. It also has low thermal conductivity. Because of the great affinity between the materials and cutting tools, be very careful of vibration during machining that causes welding and chipping of the blade, and chips that become cutting edges.

GSX MILL Series

These carbide end mills have robust cutting edges combined with GSX coating that provides heat resistance, wear resistance, and lubricity.



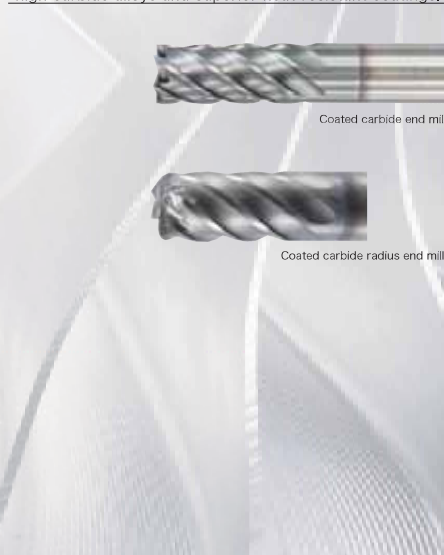
Carbide drills for heat resistant alloys

These very accurate and highly rigid drills use carbide alloys that are ultra-hard and heat resistant. The chip resistant design provides an excellent cutting edge.



Carbide end mills for heat resistant alloys

Cutting heat treated alloys requires an end mill that is very rigid with an excellent cutting edge. We provide various shapes and sizes with combinations of wear-resistant high-carbide alloys and superior heat-resistant coatings.



Carbide End Mills for Titanium Alloys

By using carbide alloys that have great chip resistance and superior coatings that are heat resistant and have lubricity, these end mills have excellent cutting edges designed to handle a variety of applications.

Carbide Oil Hole Drill for Titanium



AG Mill Roughing/Roughing Radius

High alloy HSS end mill with both wear-resistant durability and anti-chipping.



Aluminum cutting

Drills and End Mills for Aluminum Alloys

The structural materials used in frames are comparatively lightweight aluminum alloys. However, high-performance cutting is necessary because more than 80% of the material is cut away and ejected as chips. Also, this work demands high quality for the thin-gage materials. We have the solid carbide DLC end mill and the NWEX that uses DLC coated replaceable inserts.

DLC Drill End Mill Series



DLC coating has a low friction coefficient that reduces adhesion to aluminum, which has extreme surface smoothness. The shapes of the cutting edges and flutes keep the cutting edge keen and increase chip ejection to make high-performance cutting possible.

DLC SLTSL/DLC Mill Slot Long Shank

With 3 cutting edges to balance chipping and a low cutting edge shape for great drilling, it is possible to work continuously from drilling to shaping deep pockets.



DLCDR/DLC Drill Regular

For both high-speed wet and dry work. Our unique flute design, with increasingly wider flutes, makes it possible to do non-stepped drilling to depths of 5D.



Cutting with CFRP

Drills and End Mills for CFRP

CFRP is a compound material made of plastic reinforced with carbon fibers. It is used in the aerospace industry because it is lighter than steel or aluminum and provides the same strength and rigidity with great wear resistance, heat resistance, thermal expansion properties, and durability. Although the difficulty of working with these materials may be mentioned as a shortcoming, using thin-film diamond coating for keen cutting edges extends tool life to a higher level than conventional carbide drills and end mills.



Special Drills and End Mills for Aluminum



Carbide counterboring end mill



Diamond coated step drill



Diamond coated drill

Diamond Coated Drills for CFRP

These drills have tip shapes with excellent lead-in that minimize shock of through holes. The thin-film diamond coating provides sharp cutting edges and long tool life. These drills make it possible to minimize burrs on edges of entry and exit holes.



Diamond coated double angle drill

Carbide drill for CFRP

These carbide drills use carbide alloys with superior wear-resistance for keen cutting edges. A wide variety of sizes are available.



Double angle carbide drill



Carbide drill with double margin

Diamond coated end mill for CFRP

Optimized end mill design handles applications that need to suppress burring and gouges.



Diamond coated end mill



Diamond coated end mill for rough milling

Thin film coating technology for diamond coatings



A thin-film diamond coating of 10 μm or less produces excellent quality work surfaces