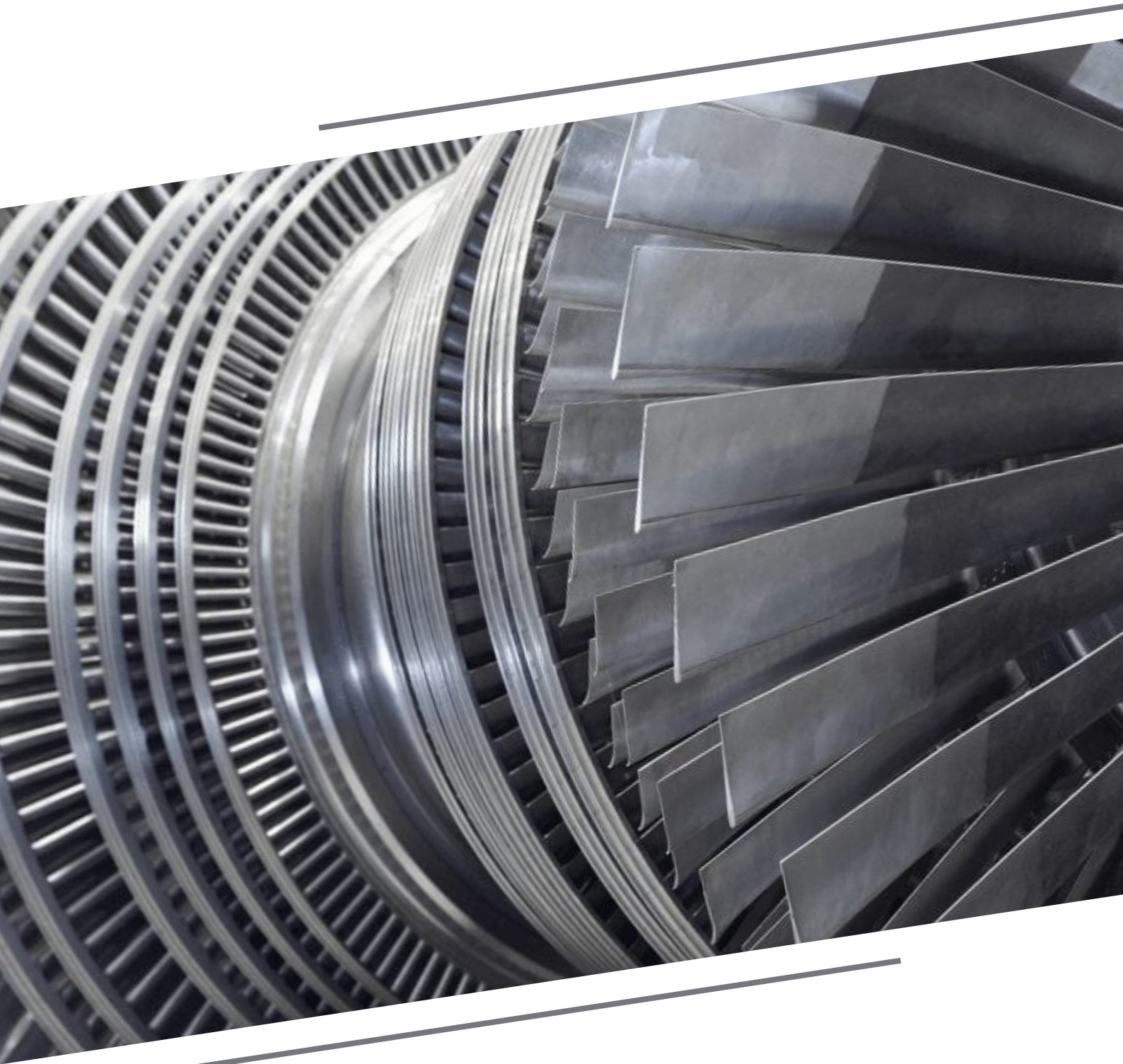


OUR MANUFACTURING POTENTIAL IN THE ENERGY SECTOR





GF MILL P 800 U

Maximum Machinable Blade Dimensions

The Mikron MILL P 800 U 5-axis machining center by GF Machining Solutions has been selected for the precise and high-performance machining of complex geometries found in both LP (Low Pressure) and HP (High Pressure) turbine blades.

Maximum blade length: ~780 mm

Maximum blade width: ~200–250 mm

Maximum thickness (height): ~500 mm



APEC G 800 TR

Maximum Machinable Blade/Root Component Dimensions

Based on the axis travel of the **APEC G 800 TR** (X: 800 mm, Y: 830 mm, Z: 560 mm), the maximum machinable dimensions for medium-sized steam and gas turbine blades, as well as root components, can be summarized as follows:

Maximum blade length: ~780 mm

Maximum blade width: ~250–300 mm

Maximum thickness (height): ~560 mm

(The table is limited by the Y-axis travel, and has been prepared considering the clamping fixtures.)

Kök Parçaları için: These are generally more compact parts. With their wide and thick structures, part sizes ranging from 200 to 400 mm can typically be machined with ease.



YCM NDC 3016 B

Maximum Machinable Part Dimensions

YCM NDC 3016 B is a bridge-type CNC vertical machining center featuring high rigidity and load-bearing capacity, making it an ideal solution for the precise machining of large and heavy components. With this machine, the following components can be machined with high precision:

- **Circumferential operations of rotor discs**
- **Rotor bodies**
- **Turbine housing components**

These operations can be carried out within a maximum machining area of **3,200 mm (X) × 1,600 mm (Y) × 762 mm (Z)**, and up to a workpiece weight of **10,000 kg**. Highly rigid structure, the machine enables vibration-free and stable operations even on large parts. This ensures reliable manufacturing of critical components for the energy sector, such as steam and gas turbines.



GENTIGER GT 105 V

Maximum Machinable Part Dimensions

Gentiger GT 105 V is a CNC vertical machining center designed for high-precision mold making and component machining applications. In steam and gas turbine components, it is particularly suited for operations such as:

- **Connection slots** (e.g., root-to-casing transition fits)
- **Root transitions** (including tenon, dovetail, and fir-tree connection geometries)
- **Fine surface finishing and tolerance-critical areas** (e.g., surfaces requiring micron-level accuracy)

Diameter: up to 600 mm

Length: up to 600 mm

Height: up to 500 mm

It enables precise machining on large housing slots and extended root sections of components.



OKUMA GENOS L3000-E CNC LATHE

Rotor Shaft Components:

- Centering, rough/finish turning, and groove cutting
- Threading or drilling operations on shaft ends

Flanges:

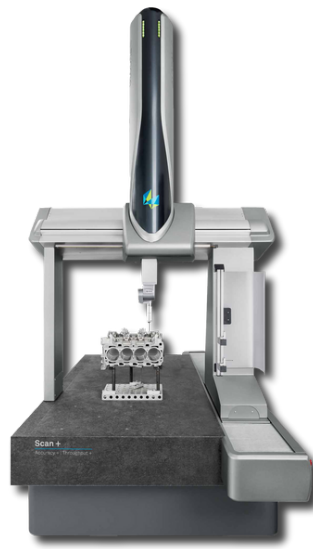
- External and internal diameter turning, face turning, and groove machining
- Surface finish quality achievable between Ra 0.3–0.8 μm
- Precision machining of press-fit seating areas

Additional Capabilities:

- Drilling, reaming, and thread tapping operations are also available
- High-volume production can be achieved with an automatic bar feeding system

Application Notes:

- For rotor shafts: High-precision turning and detailed end machining are possible for lengths up to 1,080 mm
- For flanges: Circular flanges up to $\varnothing 250$ mm can be machined with tight-tolerance surfaces and grooves



HEXAGON GLOBAL S & ADVANTAGE SCAN+MODEL CMM

When used together, the **HEXAGON GLOBAL S** coordinate measuring machine (**CMM**) and the **ADVANTAGE SCAN+MODEL** scanning system provide a powerful solution for high-precision measurement and reverse engineering of steam and gas turbine components.

Measuring Volume	Typically ranges from 700×1000×600 mm to 1500×3000×1200 mm
Accuracy	1.5 – 2.5 µm (MPEe)
Probe System	Touch-trigger (TP20, TP200), scanning (SP25, SP80), and laser sensor options available.
Application Area	Blade root geometries, rotor flange surfaces, disk slots, and profile inspections

Usage Scenarios:

- Complex root measurements (e.g., fir tree geometry)
- High-precision dimensional inspection of disk slot geometries
- Concentricity and centering verification on rotor components
- Surface deformation and out-of-tolerance analysis

Application Area:

- 3D scanning of blade and housing surfaces
- Non-contact measurement of disk and blade slots
- Reverse engineering for wear, deformation, and reproduction
- Part-to-CAD comparison and deviation map analysis



FANUC A-C600iC

By adding the **FANUC α-C600iC** wire EDM machine to our manufacturing facility, we have significantly enhanced our capabilities to meet the complex and precise machining requirements in steam and gas turbine production.

This high-tech EDM system provides ideal solutions for components with geometries that are difficult to machine using conventional methods particularly blade roots, fir tree transitions, and internal contour features.

Thanks to **FANUC's** advanced automation capabilities, stable process control, and surface-finishing technology, we achieve significant advantages in both quality and efficiency when manufacturing critical turbine components that demand tight tolerances.

- **We are capable of machining with tolerances down to ± 2 microns.**
- **We ensure smooth surface finishes, even on difficult-to-machine alloys.**
- **We guarantee high repeatability and low scrap rates in serial production.**
- **Engineering flexibility for complex internal geometries and narrow transitions.**

The **FANUC α-C600iC** not only strengthens our competitive edge in industries with demanding engineering standards, such as energy and defense, but also enables us to deliver fast and precise solutions tailored to our customers' specific design requirements.



OSCARMAX SINKER EDM S430

Sinker EDM (Electric Discharge Machining) method, operating with graphite or copper electrodes, is especially suited for machining parts that require complex internal geometries with high precision. It is a non-contact and low-deformation process.

Blade Roots (Fir Tree, Dovetail, Curved Root)

- Complex interlocking structures
- Narrow corner transitions and internal forms
- Precision contours required for high-strength connections

Disk Slots (Blade Slot / Root Slot)

- Creating blade mounting slots on rotor disks
- Machining a large number of equivalent and repetitive forms
- Typically symmetrical, multi-cornered, or notched internal profiles

Very Fine Channel Molds / Inserts

- Small, fine components used in the production of cooling channels
- Special contour molds for jet engine parts

Electrical Insulation Parts

- Electrical separator parts exposed to high temperatures



EXCELLENT ZNC 760

EXCELLENT ZNC 760 is a precision sinker EDM control unit that provides vertical Z-axis motion, enabling the use of deeper and larger electrodes with the S430 EDM machine. It offers advantages in vertical machining of large components.

Long Fir Tree Roots

- Deep cutting of root structures longer than 200 mm
- Operations requiring a high depth-to-precision ratio

Large Rotor Disk Slots

- Machining of central internal slots on rotor disks ranging from Ø300 to Ø500 mm
- Slot arrays requiring high positioning accuracy

Areas Requiring High Surface Quality

- Machining with surface quality of Ra 0.3–0.5 µm, especially in contact areas

Step Transition Geometries

- Step-like indentations and protrusions within the part
- Variable form structures along the part's Z-axis



EXCELLENT CNC 1260

EXCELLENT CNC 1260 EDM (Electrical Discharge Machine) is particularly well-suited for machining complex internal geometries and precision features that are difficult or impossible to produce using conventional milling or turning.

- **Blade roots (fir tree or dovetail profiles) with tight tolerances.**
- **Internal cooling channels and micro-holes on blades and vanes.**
- **Internal keyways and splines inside rotors or shafts.**
- **Sealing ring grooves and honeycomb structures.**
- **Precision molds or dies for turbine part production.**
- **High precision on nickel-based superalloys, Inconel, Titanium, and stainless steels**
- **No mechanical contact → perfect for delicate geometries**
- **Complex internal cuts in hard-to-reach areas.**