



**HEIDENHAIN**

**5X** axes

**Master the Power of Five Axes**  
High-end 5-axis machining

[www.heidenhain.com/5-axes](http://www.heidenhain.com/5-axes)

# Powerful functions for 5-axis machining

Machining aerospace parts requires smart, high-performance solutions. HEIDENHAIN controls are an efficient and user-friendly way to meet the industry's unique requirements, providing extensive functionality and software options for achieving:

- High removal rates
- Reliable processes, even with hard materials
- Perfect surfaces
- High tolerances





Discover how TNC controls from HEIDENHAIN and their powerful 5-axis machining functions can further evolve your aerospace applications:

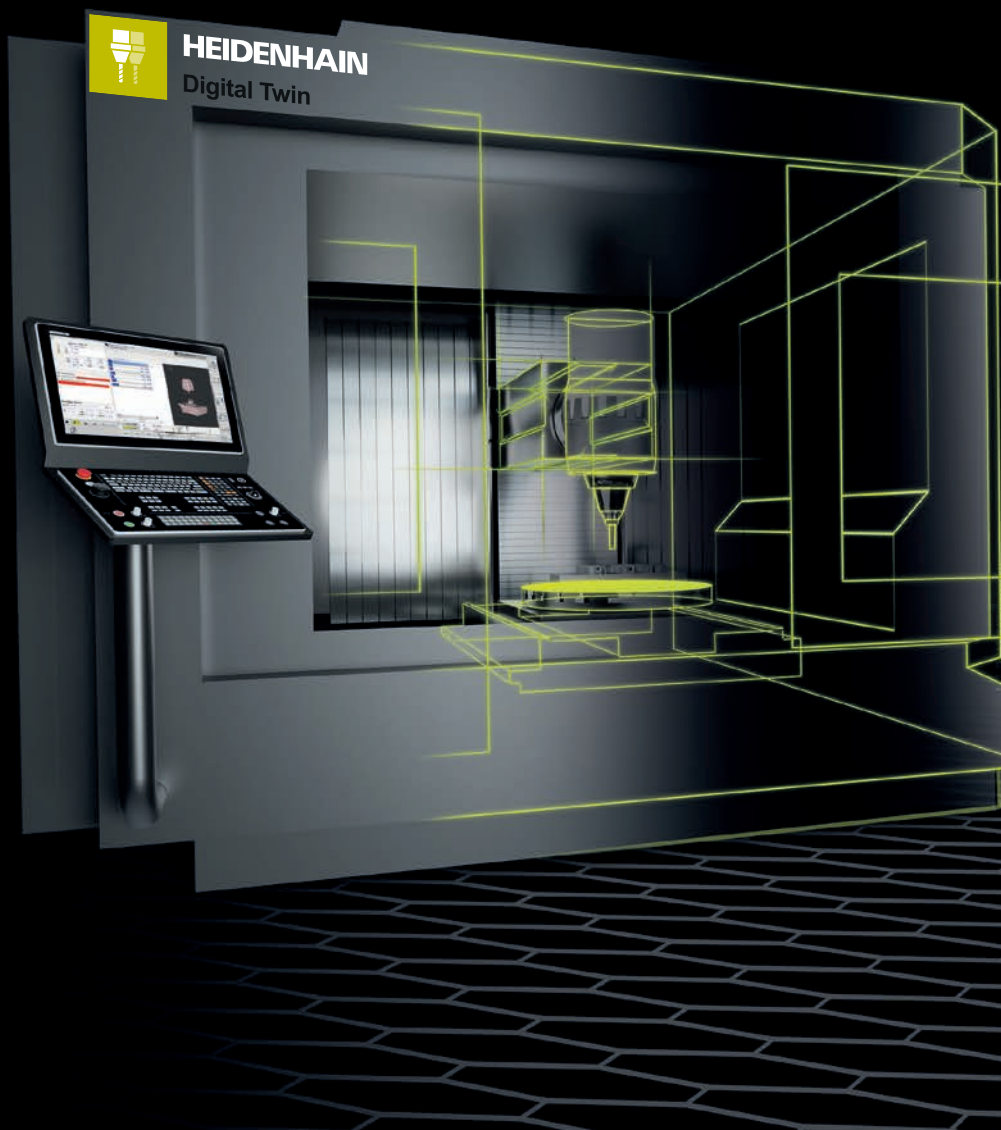
- Digital Twin
- 3D simulation
- Dynamic Collision Monitoring (DCM)
- KinematicsOpt
- OCM trochoidal milling cycles
- Cycle 444

MASTER THE POWER OF



# Digital Twin

Realistic simulation for reliable production processes



The Digital Twin is an accurate digital model of your machine for use on the programming station, allowing you to leverage the machine's actual kinematics, parameters and functions during front-office design and programming work. You gain peace of mind from knowing that programming-station and CAM-generated programs will run seamlessly in real life.

### **Fast and reliable production**

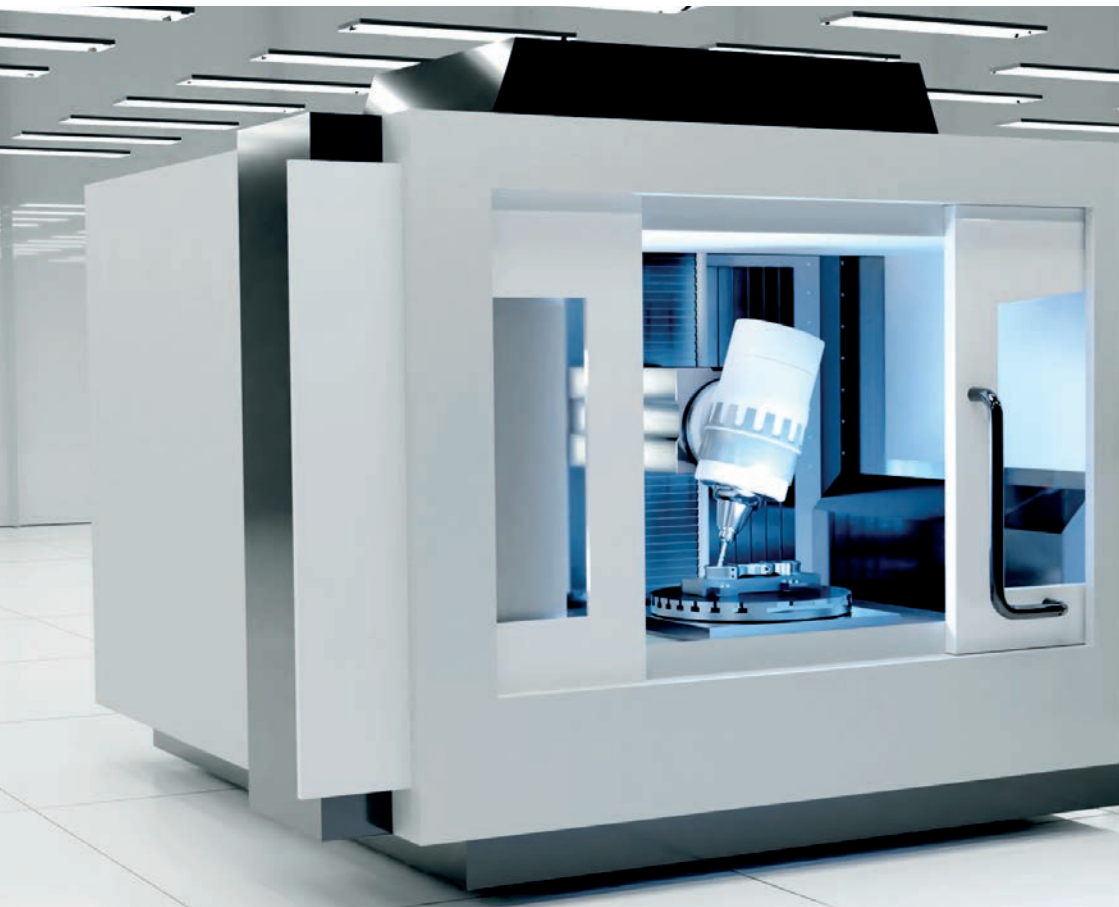
- Check and optimize tool paths
- Prevent program interruptions
- Avoid collisions
- Make full use of the work envelope
- Test complex 5-axis movements
- Check and optimize the clamping position

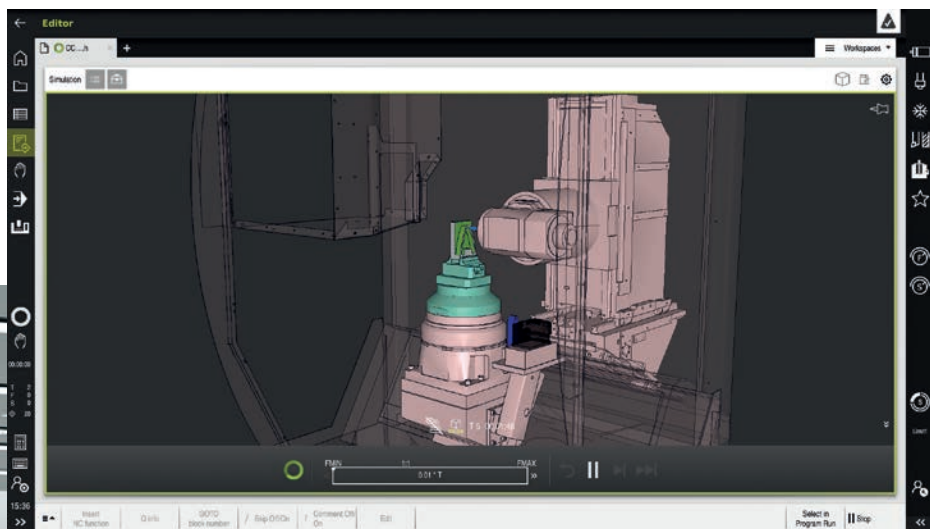


# DCM

## Dynamic Collision Monitoring

Five-axis machining motion is so complex that it's difficult to conceptualize. To minimize the risk of machine damage and operator injury, Dynamic Collision Monitoring (DCM) monitors the work envelope for possible collisions between the tool, workholding and machine elements. In Test Run mode, you can even detect collisions before running the program, thereby avoiding program interruptions and reclamping.





### Maximum protection for your machine

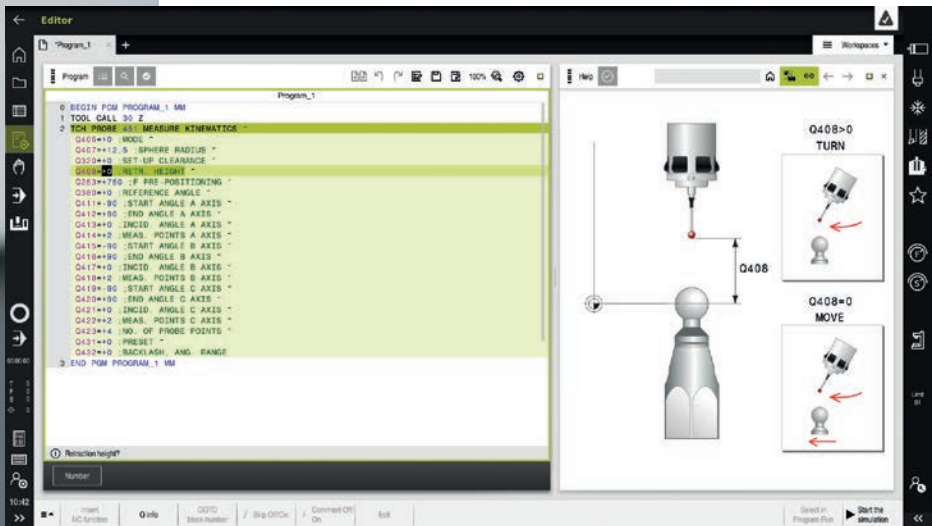
- Detailed rendering of machine components
- Reliable tool-distancing retraction
- Visualization and additional dialog texts
- Monitoring of tool, tool-carrier kinematics and workholding
- Optimum use of the work envelope



## KinematicsOpt

Increase 5-axis accuracy  
with this automatic cycle

The KinematicsOpt function lets you check the accuracy of rotary or swivel axes and compensate for any offset in their center of rotation. Offsets are automatically sent to the kinematic model, where they are taken into account.



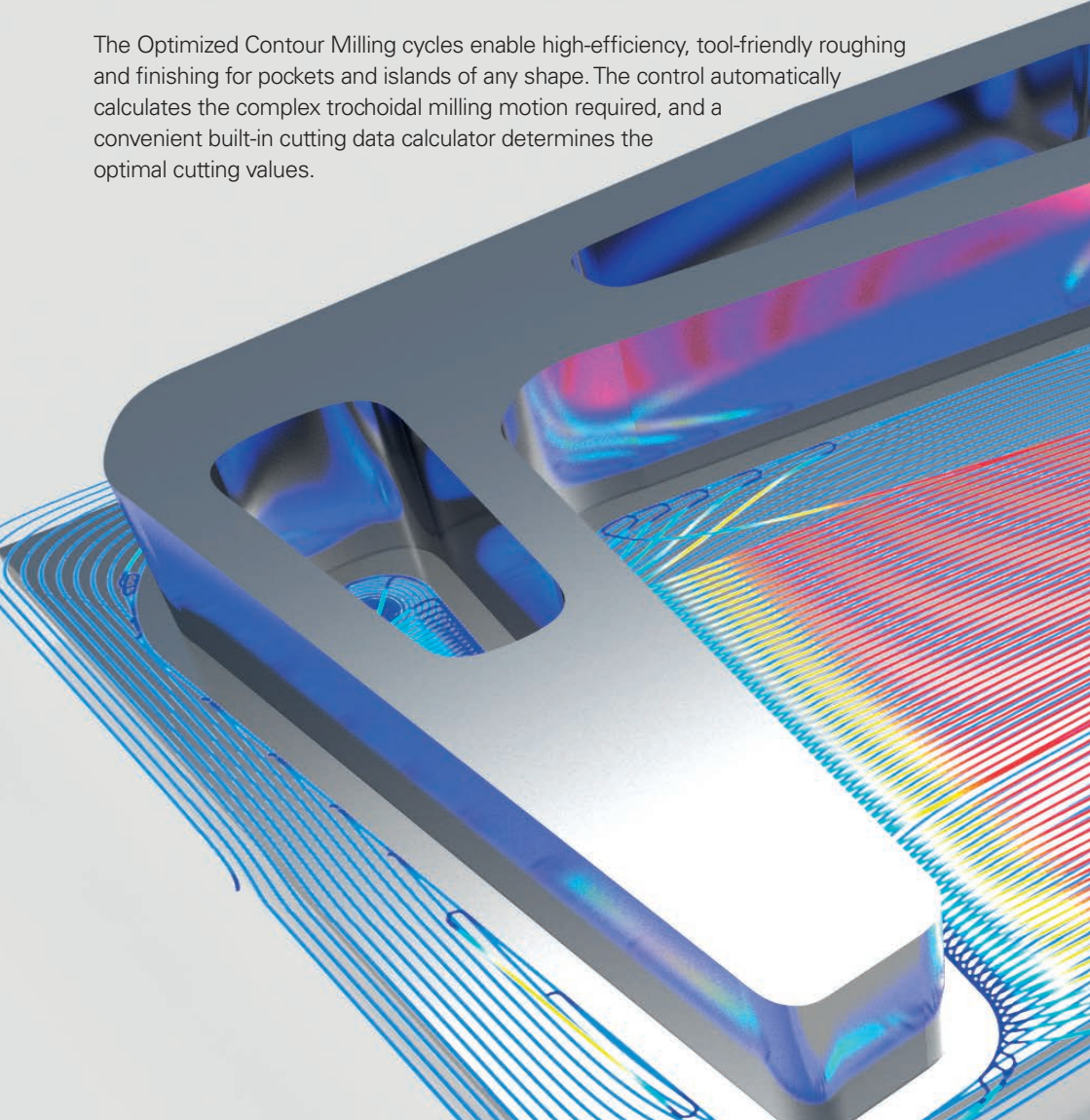
### Manufacture with reproducible accuracy

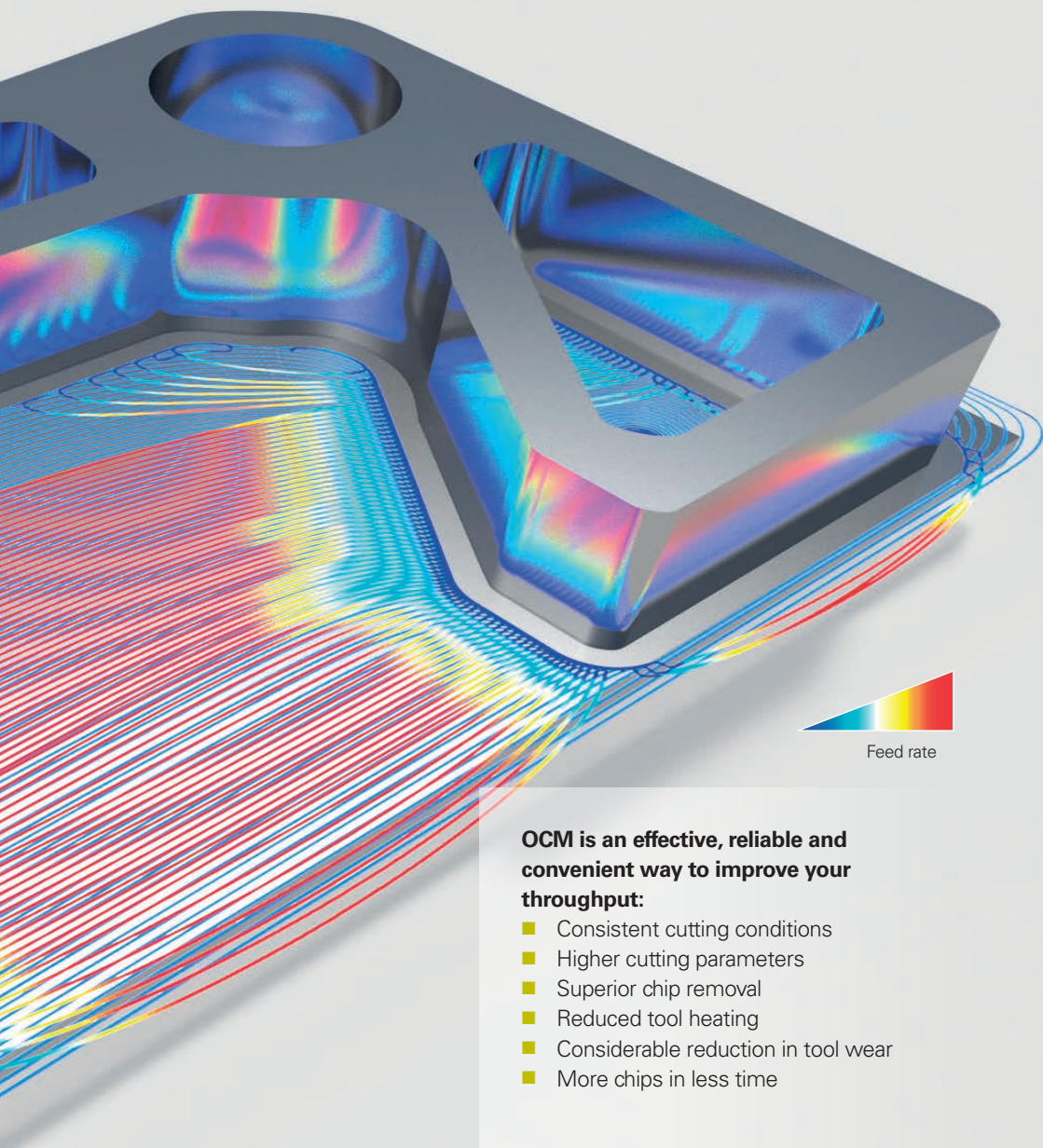
- Easy recalibration for long-term accuracy
- Data backup for changes in the kinematic model
- Easy recovery of previously determined configurations
- Measurement log for rigorous documentation requirements

# OCM

## Achieve high-efficiency machining with low tool wear

The Optimized Contour Milling cycles enable high-efficiency, tool-friendly roughing and finishing for pockets and islands of any shape. The control automatically calculates the complex trochoidal milling motion required, and a convenient built-in cutting data calculator determines the optimal cutting values.



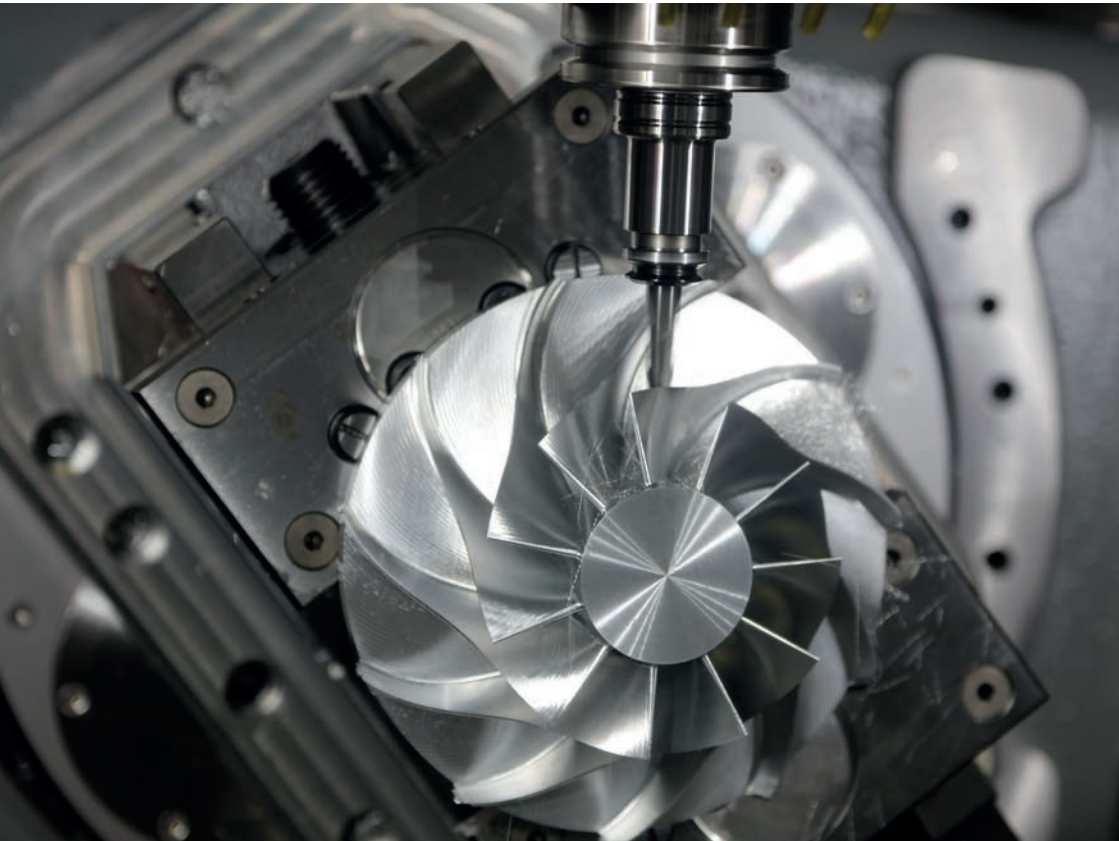


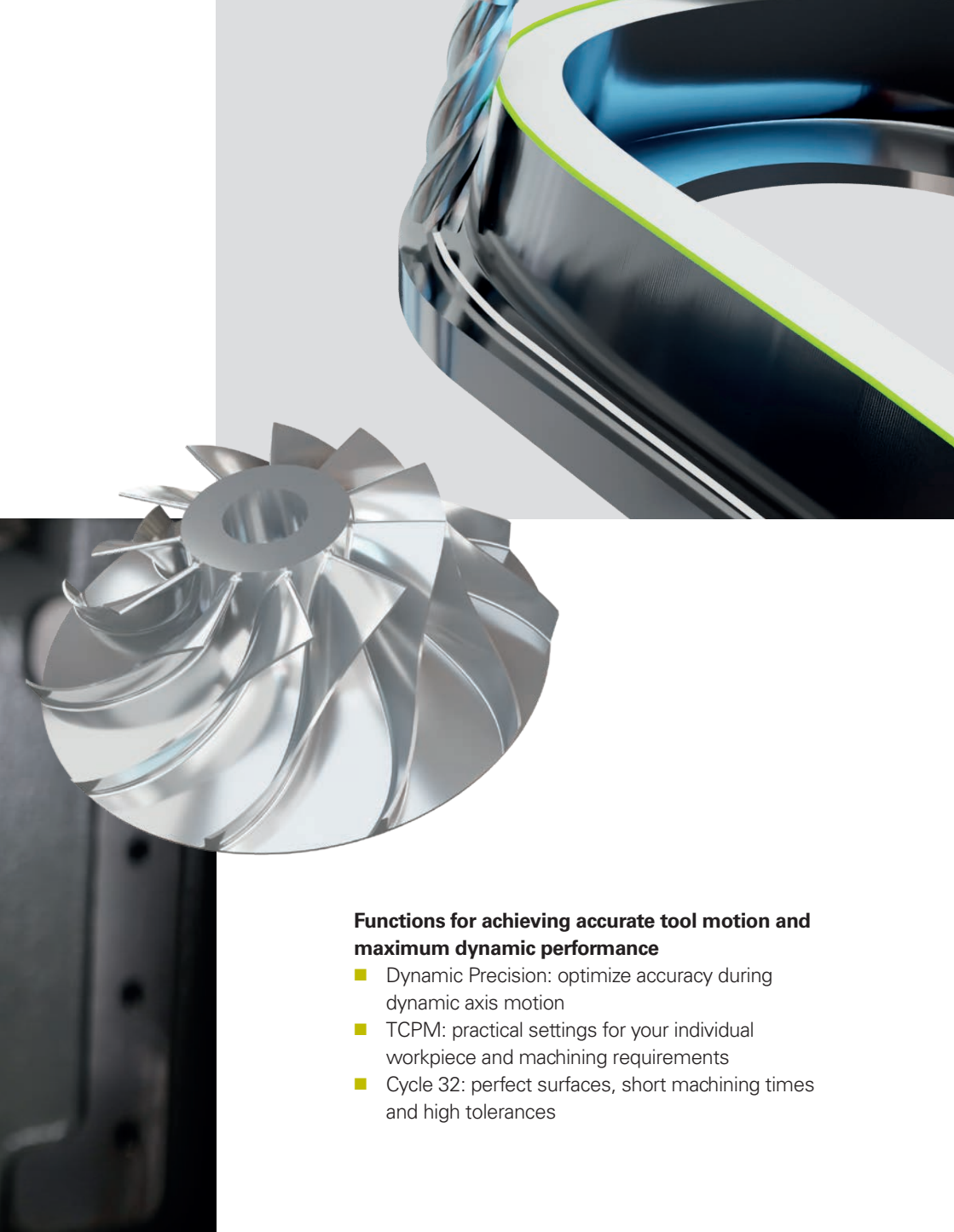
# 5-axis machining

## Powerful functions for demanding tasks

During 5-axis machining, linear axes often execute highly dynamic compensating movements. The resulting high feed rates and accelerations may lead to vibrations or other sources of error. The powerful motion control of the TNC optimizes these movements for all axes, finding the best-possible solution for vibration dampening and dynamic cutting performance.

By ensuring smooth and accurate rotary axis motion, the TNC delivers optimal surface quality even during rapid changes in direction between the tool and workpiece.





**Functions for achieving accurate tool motion and maximum dynamic performance**

- Dynamic Precision: optimize accuracy during dynamic axis motion
- TCPM: practical settings for your individual workpiece and machining requirements
- Cycle 32: perfect surfaces, short machining times and high tolerances

## Cycle 444

### Automatable quality assurance on the machine

Cycle 444 lets you evaluate measuring points on 3D geometries for quality assurance. Simply enter the given measuring point with its coordinates and the normal vector. The TNC then automatically initiates probing and determines whether the desired point is within a given tolerance.

#### **Measure contour errors in three dimensions**

- Fully automatable process optimization
- Measurement of 3D geometries with an inclined touch probe
- 3D calibration for high-accuracy measurements
- Program-controlled polling via system parameters
- Detection of necessary rework
- Reporting of program interruptions and error messages
- Easy-to-read measurement log in HTML format





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