

5 Axes Features

› Functions for 5-axis machine tools ›



FIDIA 

Simple 5-axis machining

The ability to use shorter tools, improved cutting conditions and greater efficiency as a result of being able to orient the tool in the ideal direction with respect to the surface to be machined: these are the most significant advantages of 5-axis machining.

On the other hand, using and programming 5-axis machines often proves to be more complex and less intuitive than with 3-axis machines.

A leading builder of high performance 5-axis milling systems, Fidia has developed various specific functions to simplify their use and enable users to benefit from the advantages of this technology.

TCS

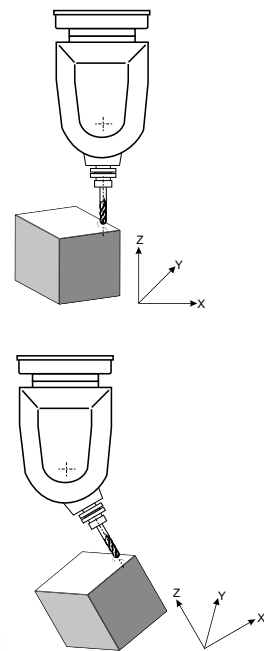
How it works

This CNC function allows the reference system to be rotated in either of two ways:

- By programming the angles of rotation and the tool centre $G194 R_x R_y R_z C_x C_y C_z$;
- By linking the reference system to the tool axis; in this way, when the head rotary axes are positioned, the XYZ reference system undergoes the same rotation.

Advantages

- Having performed the rotation, machining programs and axis movements by pushbutton or by the handwheel will, from that moment on, be referred to the rotated XYZ system;
- A tool path can be executed according to a reference system that is different from that used for programming; this simplifies machining programs, for example machining that is to be executed on an inclined plane can be programmed on the XY plane of the machine tool and then rotated.



When the TCS function is active, rotating the tool axis means the entire programmed path is rotated

Retract

How it works

This is a pushbutton on the numerical control panel: after using the Hold pushbutton to stop the machining, pressing Retract moves the tool away from the part.

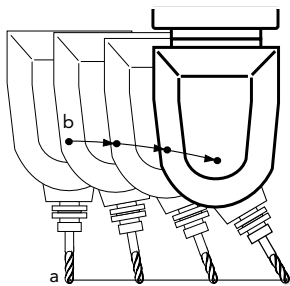
Advantages

In the event of an unforeseen interruption of the machining, the Retract pushbutton enables the tool to be moved away from the part in complete safety. This is particularly useful on 5-axis machine tools when combined with the Virtual Quill function: in this instance, the tool is moved away automatically according to the actual direction of the tool axis. When the Release pushbutton is pressed to resume machining, the tool is automatically returned to the point of interruption.

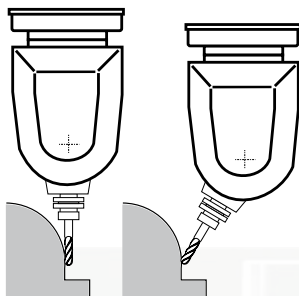


Retract pushbutton

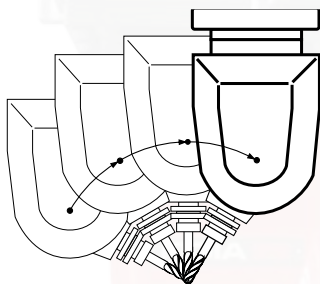
RTCP



When RTCP is active, by programming the rectilinear movement of the tool centre (a) with the simultaneous rotation of the head, the control executes movement (b)



Using the RTCP function to avoid collision with the part during 3-axis machining



When RTCP is active, by positioning the rotary axes in manual mode the tool centre remains still

How it works

This CNC function compensates for movement of the tool centre, owing to the rotation of the bi-rotary head, according to the angle of rotation and length of the tool. A similar operating mode is used with roto-tilting tables (ROTO function).

Advantages in 5-axis machining

- Programming of the tool centre path and feed, therefore independently of the tool length;
- Setting the tool length on the machine, so the same program can be used independently of the tool length.

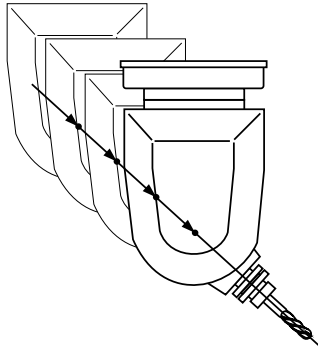
Advantages in 3- and 5-axis machining

- Combined with the handwheel CQA function, manual modification of the position of one or more rotary axes during machining to avoid possible collision or improve cutting conditions.

Advantages in manual mode

- Positioning of the rotary axes by pushbutton or by the handwheel, keeping the tool centre still.

Virtual quill



Movement along the axis defined by the virtual quill

How it works

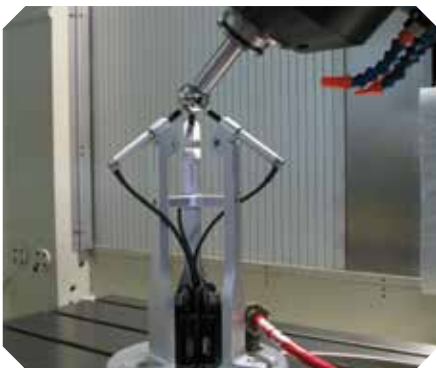
This is a virtual axis, positioned according to the tool axis, that can be selected by the operator like a real axis and, also like a real axis, moved from the program, or manually by pushbutton or by the handwheel. According to the position of the two bi-rotary head axes, the control calculates the position of the tool axis and combines the X, Y and Z movement to obtain translation along this same axis.

Advantages

The virtual quill simplifies all operations in which the tool is required to move according to its axis, both manual operations and from the program, for example inclined drilling or tool release movements at the end of machining.



HMS (Head Measuring System)



HMS: cycle for measuring and compensating bi-rotary head error

How it works

This device is used to measure and automatically compensate geometric error on continuous or indexed bi-rotary heads and roto-tilting tables. It is equipped with 3 sensors connected to the CNC and a specific measurement software.

Advantages

- Improves the accuracy and quality of machining on 5-axis machine tools;
- Can be used by non-specialist operators;
- Drastically reduces checking times compared to traditional systems (half an hour, rather than a whole day);
- Measures all head and/or table positions (not just orthogonal positions);
- Also measures RTCP parameters;
- Automatically inserts the correction values in the CNC.

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