

Turn-milling with counterspindle, multichannel technology and balanced cutting

Principle and application using SINUMERIK Operate

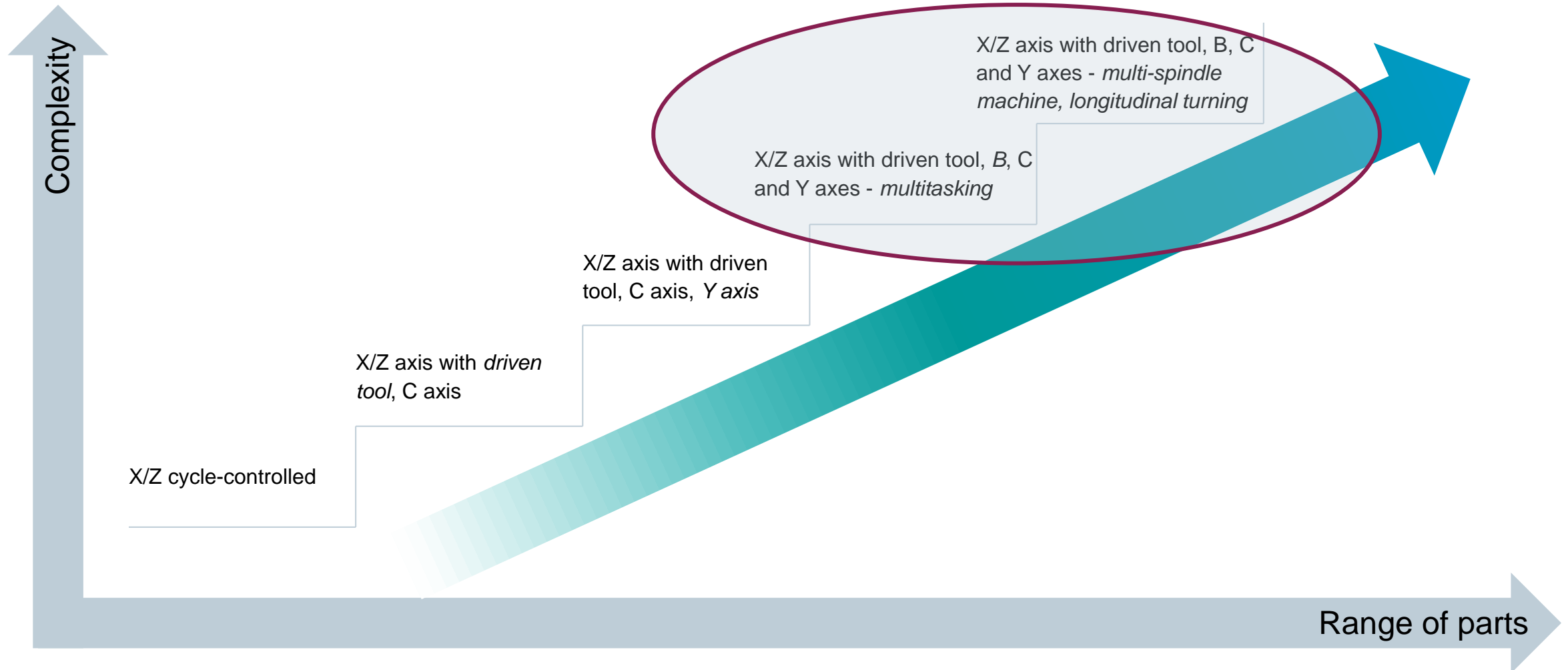
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Fundamentals of turn-milling

Development of CNC lathes

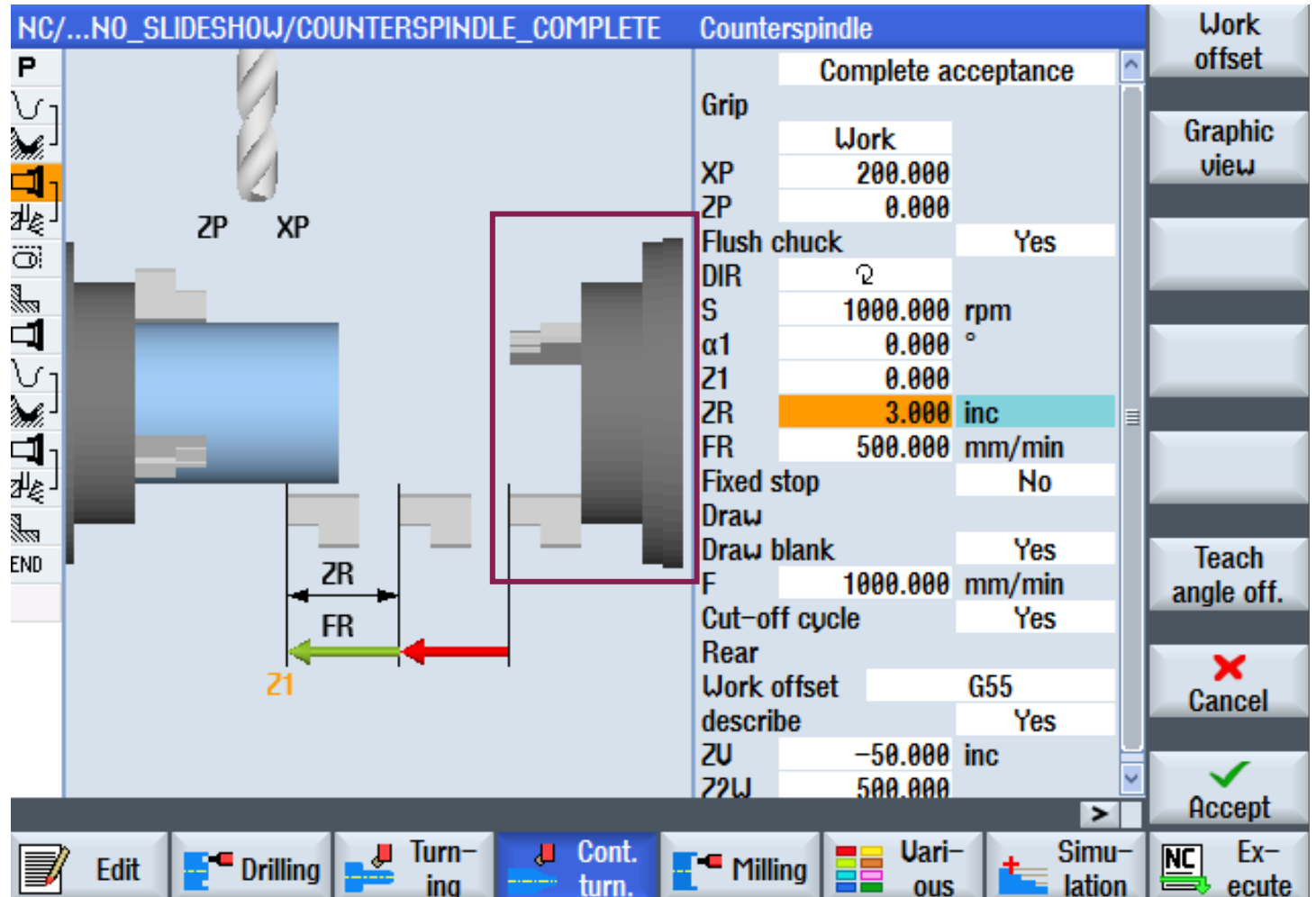


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Description:

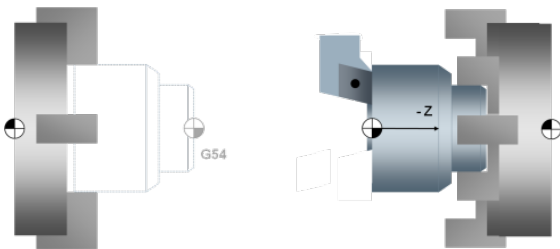
- The counterspindle is positioned opposite the main spindle.
- The counterspindle augments the functionality of a machine with another fully functional spindle.
- The counterspindle is programmed in SINUMERIK OPERATE in the same way as the programming of the main spindle.
- Counterspindle machining is programmed with only one channel, i.e. it is not a multichannel application.



1 Counterspindle Function and handling

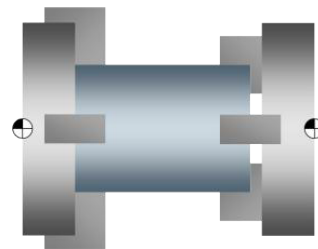
Takeover of parts

Permits the automatic takeover from the main to the counterspindle and back again.



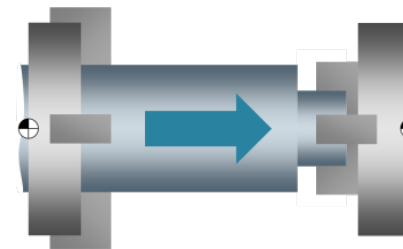
Support/stabilization

The counterspindle can perform the function of the tailstock in order to provide support or to counteract imbalances or out-of-round movements.



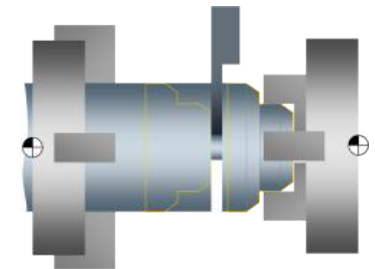
Positioning

Positioning of the workpiece by gripping, "pulling" and "pushing, in order to adjust to the optimum machining position during the machining process.



Fixing

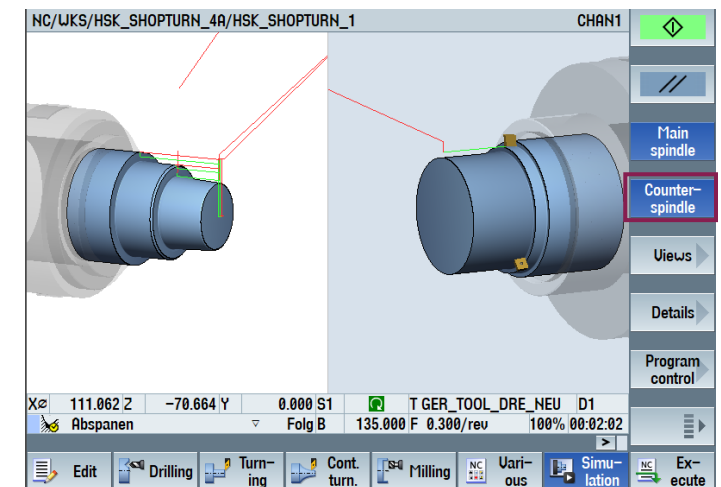
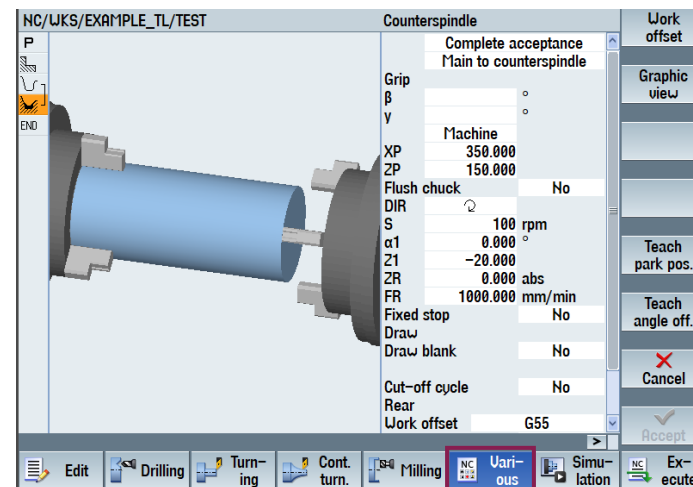
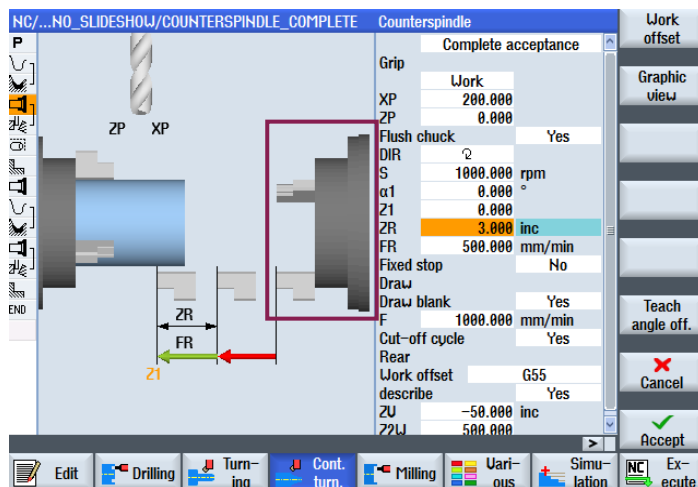
Holding the component firmly during parting, so there is no uncontrolled movement (flying around) of the workpiece in the machining area.



Counterspindle machining expands the possibilities of a lathe enormously. It increases **productivity** as well as the **processing quality of the workpiece**, while at the same time **reducing the defect rate**.

1 Counterspindle Counterspindle with SINUMERIK Operate

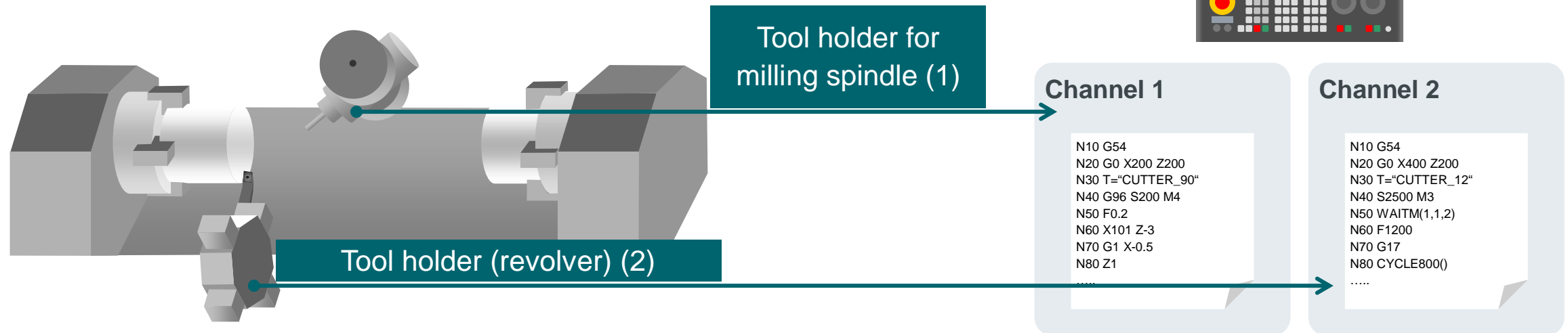
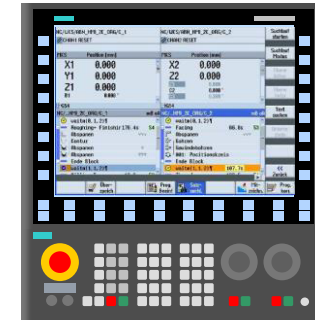
- The **intelligent counterspindle cycle** in ShopTurn permits the **graphic-interactive programming** of the counterspindle.
- In the simulation, the counterspindle is realistically represented with the programmed steps in the program.
- When creating the program, it is necessary to select in advance in the program header between programming with the main spindle, counterspindle or main and counterspindle.
- The "counterspindle" softkey can be found under "Various" (HSK bar).



2 Multichannel machining General features

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The number of tool holders determines whether multichannel machining exists. When talking of multichannel machining, therefore, **at least two** tool holders are present!



Each **tool holder** corresponds to one **machining channel**. An independent program is necessary for each channel. These programs are **processed in synchronization**.

2 Multichannel machining Mode of operation, principle and applications

Before creating a new program it is necessary to select whether a single or multichannel program is to be created. The assignment of leading and following channel can be performed in the cycle.



Channel 1 (leading channel)

Call tool 1

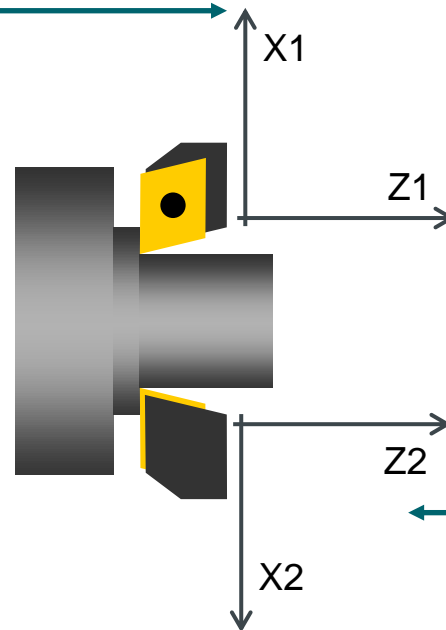
Tool length compensation

Coupled motion X2 and Z2

Constant cutting rate

Path motion

WAITM(1,1,2); Channel synchronization



Channel 2 (following channel)

Call tool 2

Tool length compensation

WAITM(1,1,2); Channel synchronization

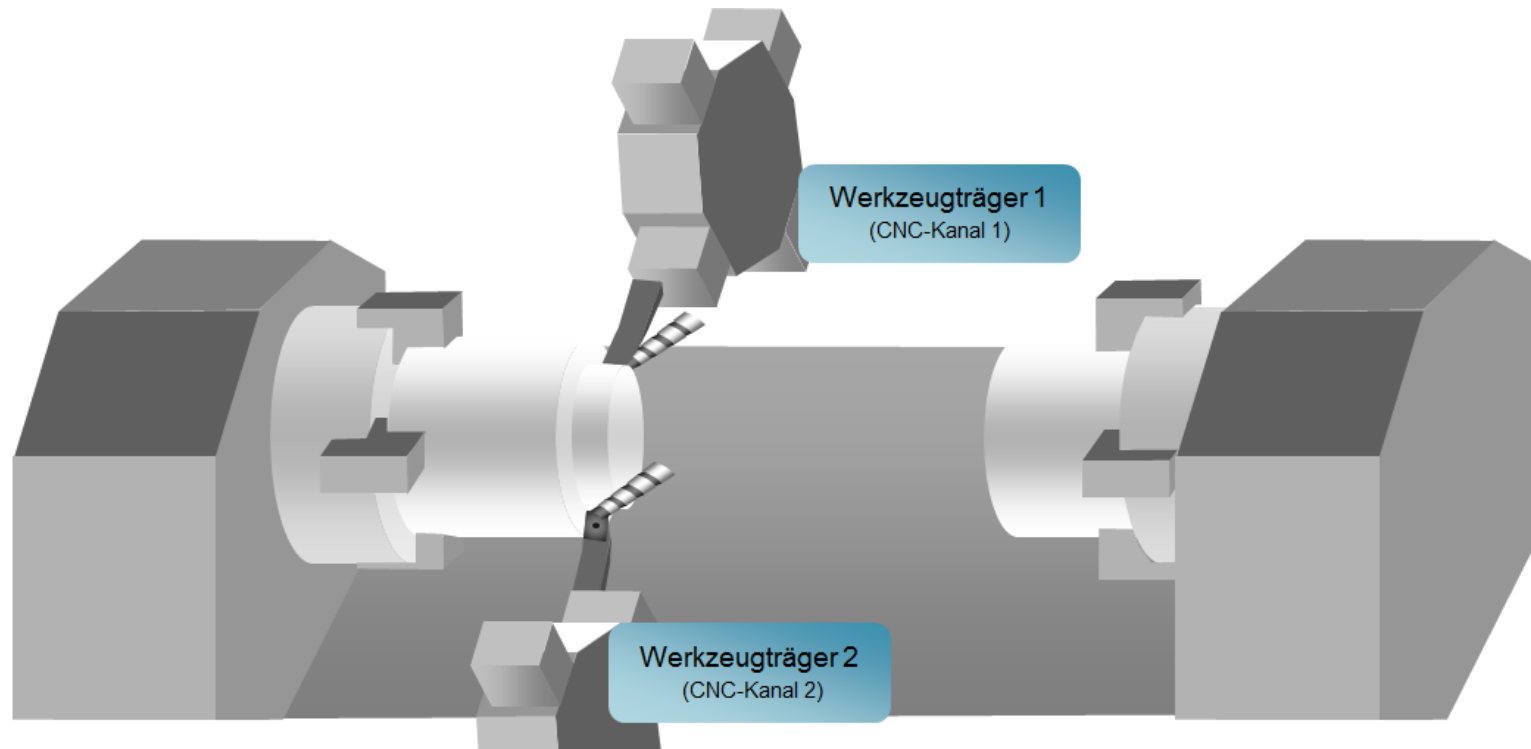
Waiting or synchronization marks are used for the necessary coordination of tool holders and machine axes in order to avoid collisions between the tool holders.

2.1 Balanced cutting

Mode of operation, principle – available in Version 4.7 or higher

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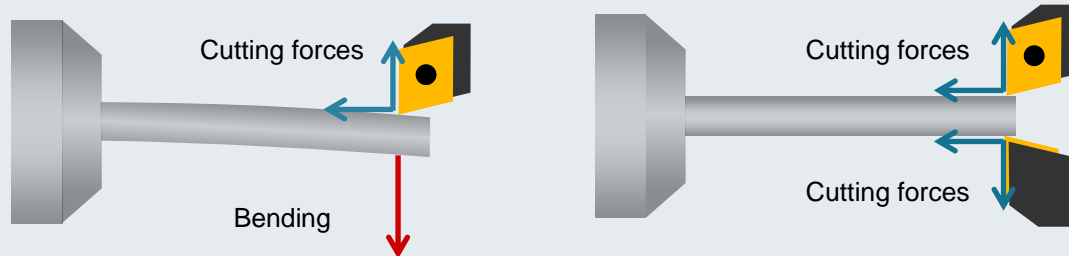
Dual machining during turning is described by the "**balanced cutting**" function. This is understood as the **simultaneous use of two tool holders on the same machining profile**.



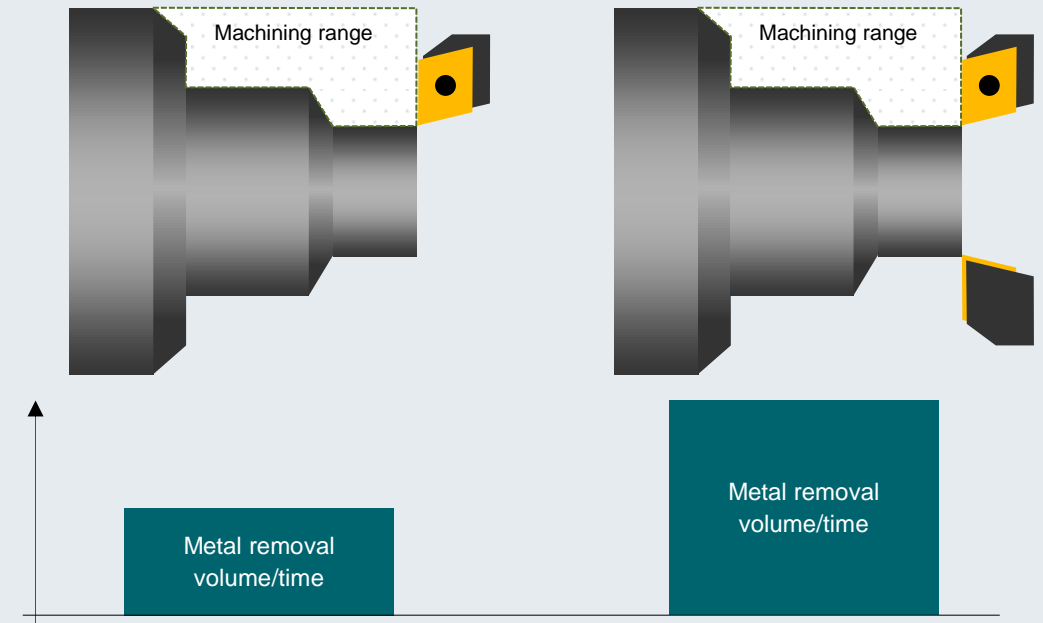
2.1 Balanced cutting

Mode of operation, principle – available in Version 4.7 or higher

Balance of the cutting forces



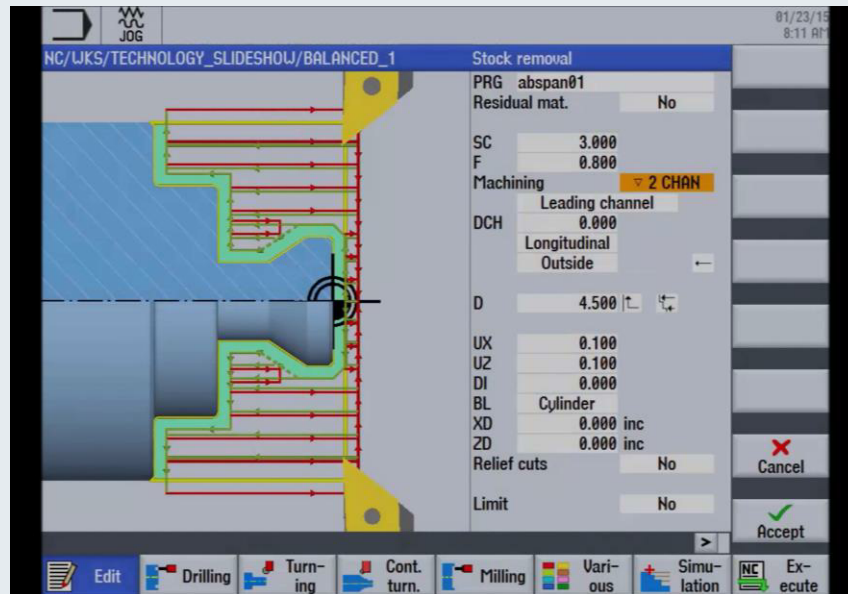
Increasing the volume of metal removal



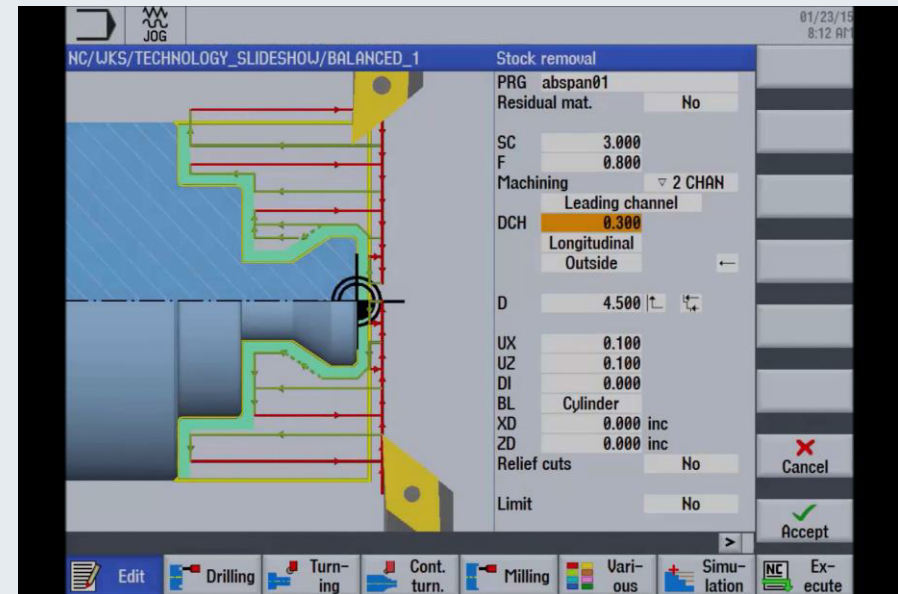
Apart from **increasing the volume of metal removed without changing the loading on the cutting plate**, balanced cutting also serves to **balance the cutting forces** on narrow or long workpieces.

2.1 Balanced cutting Mode of operation, principle

Synchronous path control of the tools



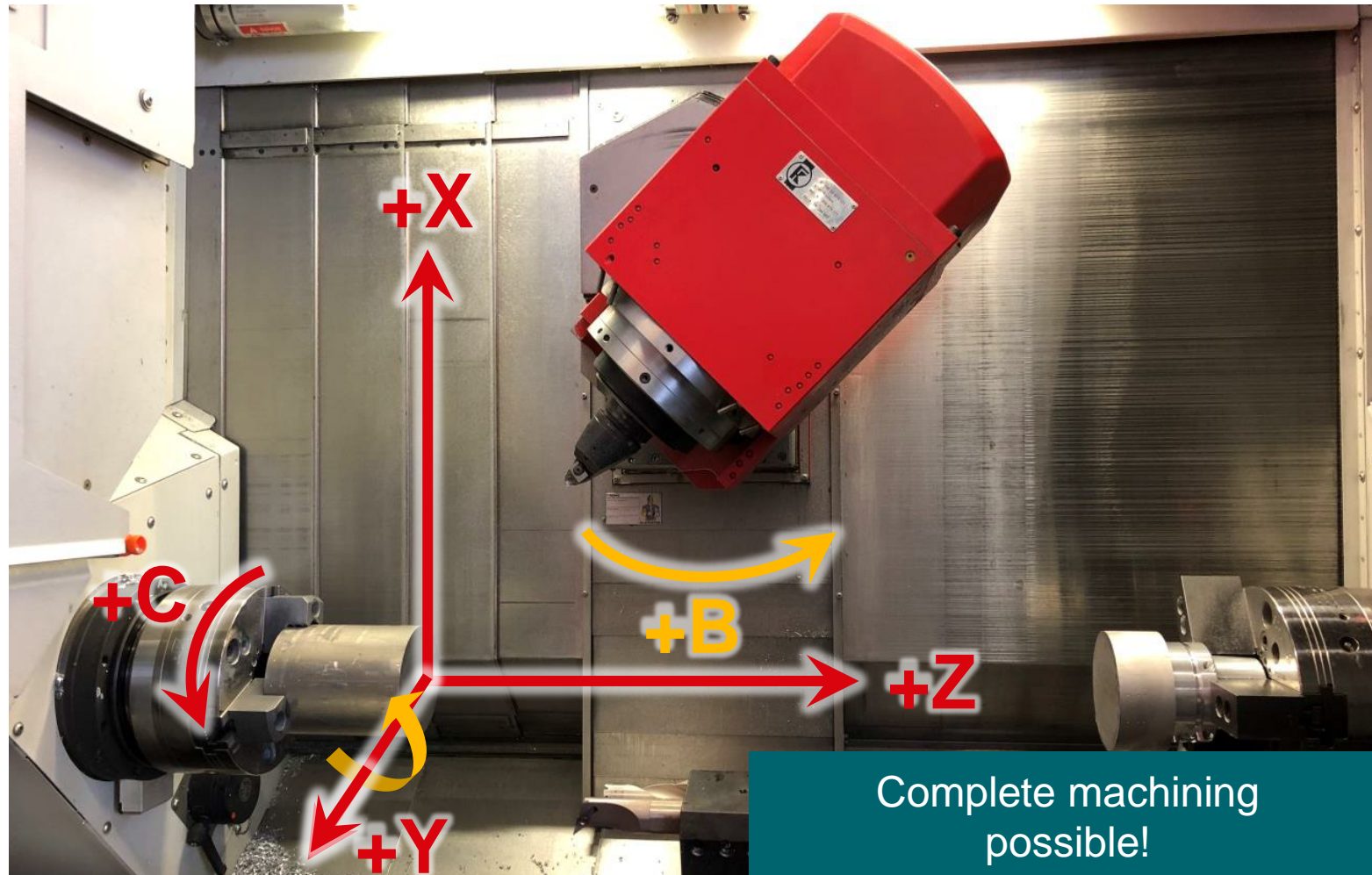
Offset path control of the tools



Double the volume of metal removal per unit of time can be achieved either by **doubling the feedrate** or by **doubling the effective infeed**. To do this, however, different strategies of tool path control are required.

2.2 B-axis for functional expansion Application

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The following must be taken into consideration from the user's perspective:

Increased...

- capital investment and maintenance costs for the machine as well as the tools
- training costs for operators, wage levels

... possibly procurement of a CAD-CAM system for complex contours

Advantages for the user:

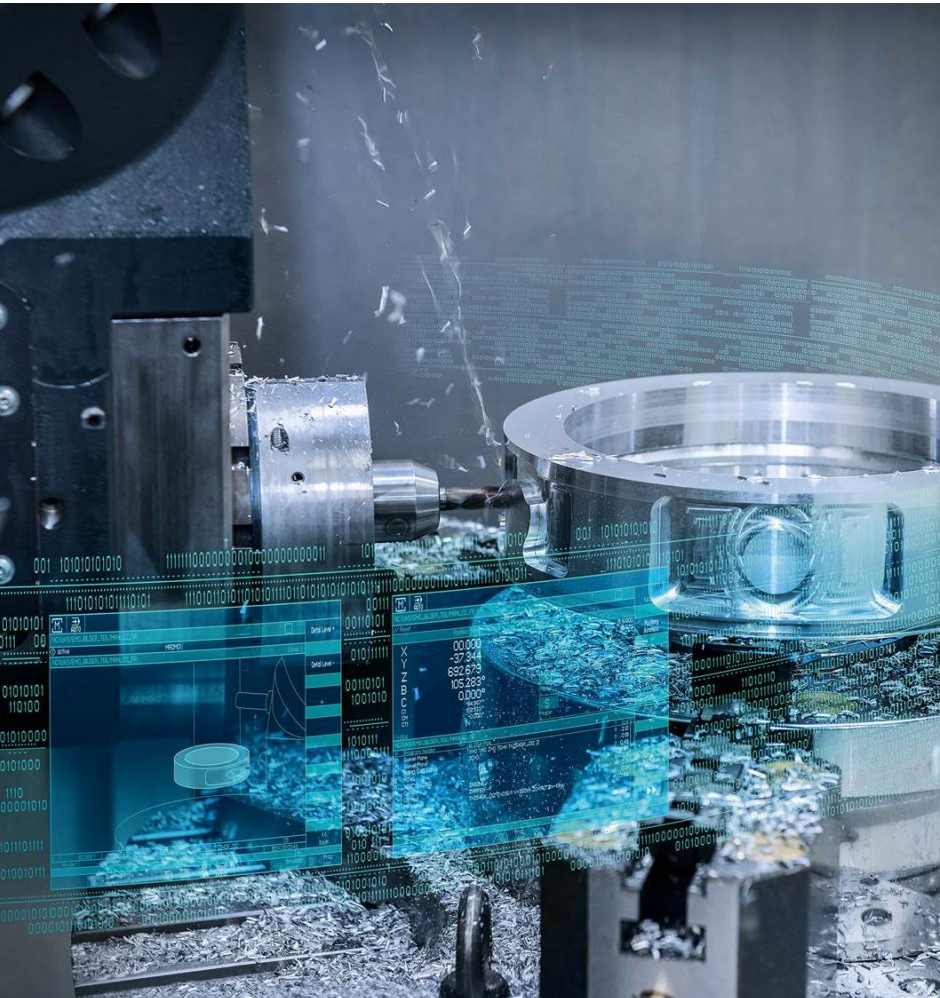
- Time saving through...
 - Reduction of setup times and machine downtimes
 - Shorter machining times
- Shorter delivery times
- More flexible use of machinery



Increased **flexibility** in the range of machining

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