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Operational training · Metal working

Machine-based material processing

Section: Turning

Textbook

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Manfred Möllers | Machine-based material processing
Part: Turning - Textbook
2. Auflage 2014
Artikelnr.: 74326 | ISBN 978-3-86522-809-3

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1. General information

This manual is part of the METINA method integrated training model developed by RUHRKOHLE AG. It consists of the following documentation for the main training phases as specified in the industrial training regulations:

1. **Theoretical information**
2. **Trainer's manual**
3. **Practical information**
4. **Trainee materials**

The training concept assumes that the skills specified in the vocational training regulations are being imparted by way of systematic documentation or course-based learning processes.

Turning is part of the "Machining materials" training component and is taught as part of a formal instruction course.

Other courses in this training component are:

- Milling

Each course is self-contained and teaches the practical skills, expertise and typical patterns of behaviour that are required of industrial mechanics following the vocational training plan. Using selected exercises, trainees will learn basic skills and will recognize and improve their working techniques.

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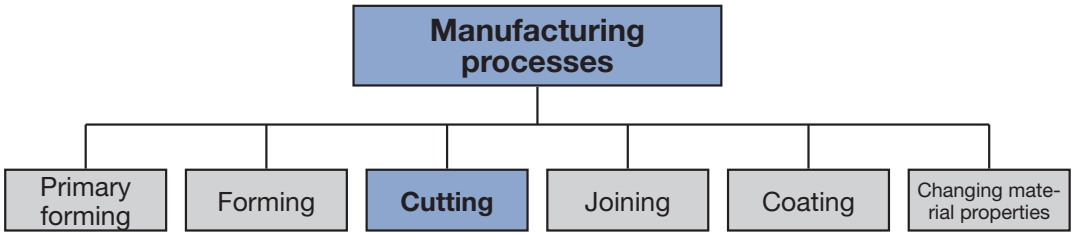
2. Turning techniques

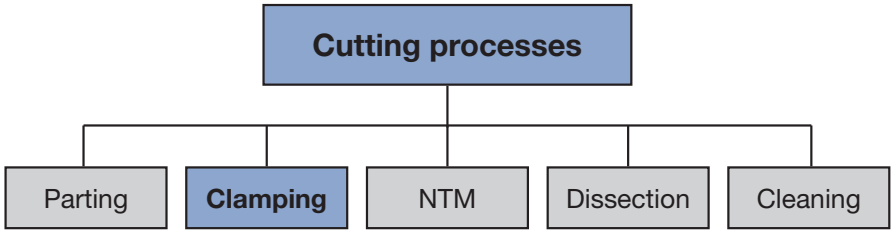
2.1 Manufacturing processes

The manufacturing processes are divided into six main groups in accordance with DIN 8580.



2.2 Cutting processes

Cutting processes are divided into five subgroups in accordance with DIN 8580.



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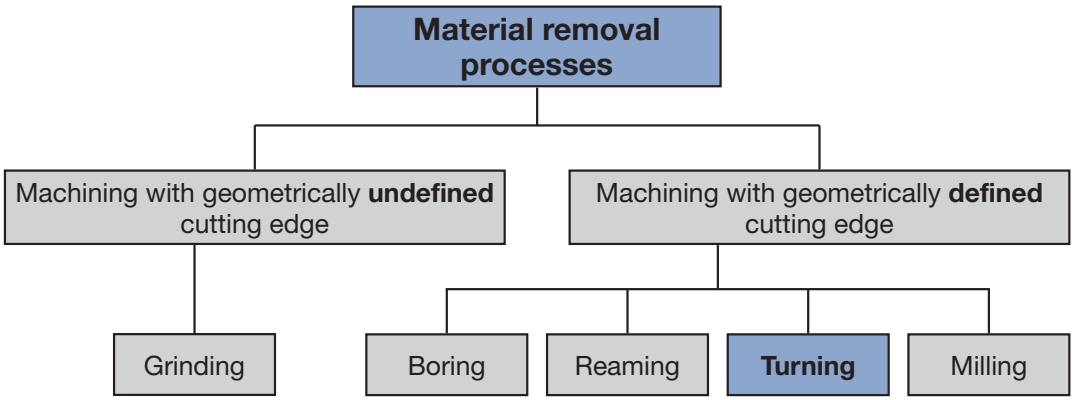
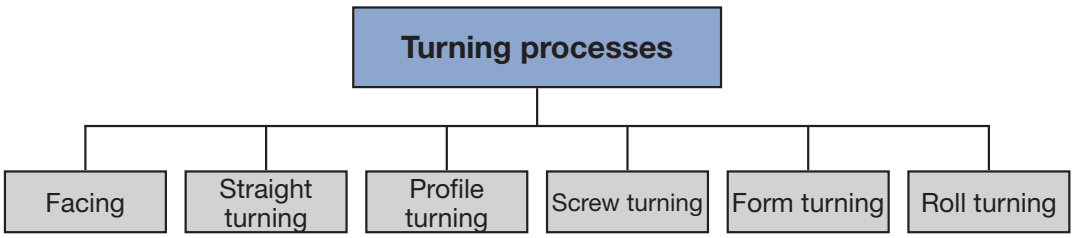
2.3 Material removal processes

Machine-based material removal processes are subdivided in accordance with DIN 8589 (Part 0) as follows:



2.4 Turning processes

Turning processes are subdivided in accordance with DIN 8589 (Part 1).



Note

Turning is a material removal process that comes under the general heading of machining and as such is defined as a separative manufacturing processes in accordance with DIN 8580.

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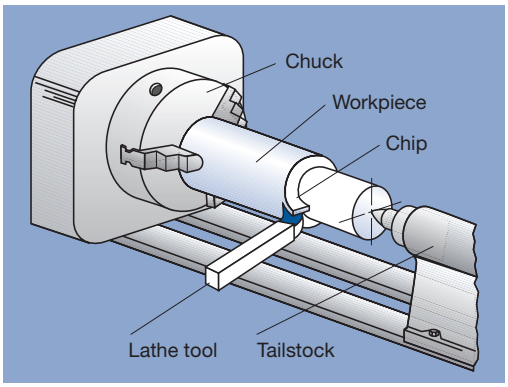
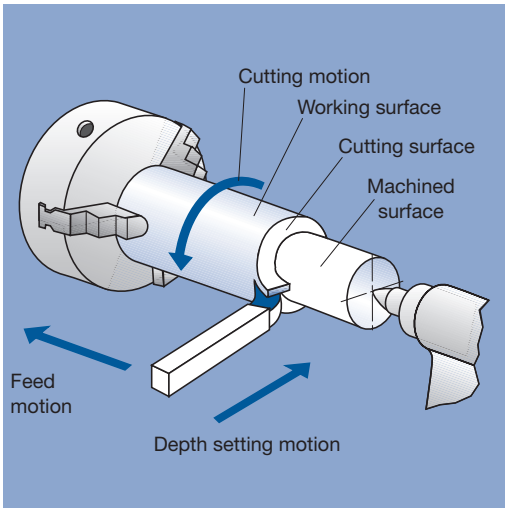
3. General principles





Turning uses a circular cutting motion to remove the material. As a result, the workpieces are mainly rotationally symmetrical (shafts, axles, bushes, threaded stems, etc.).

The cutting tool is referred to as a lathe tool and it has a geometrically defined cutting edge.

3.1 Central lathe movements

Cutting motion

The rotational movement of the workpiece is called the cutting motion. The number of rotations of the workpiece per minute is referred to as the rotational speed (*n*). It is specified in revolutions per minute (rpm).

Feed motion (feed)

The feed motion causes the lathe tool to be drawn along the rotating workpiece. The feed motion combines with the cutting motion to continually remove the material. Feed (*f*) s specified in millimetres per revolution.

Depth setting motion (cutting depth)

The depth setting motion serves to set the lathe tool at the required cutting depth. The depth setting (a_p) is specified in millimetres.

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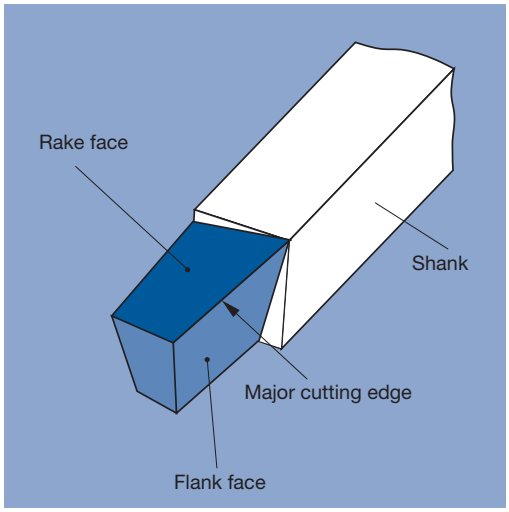
3.2 Cutting tool geometry



Cutting wedge

Cutting tools always have a wedge-shaped cutting edge.

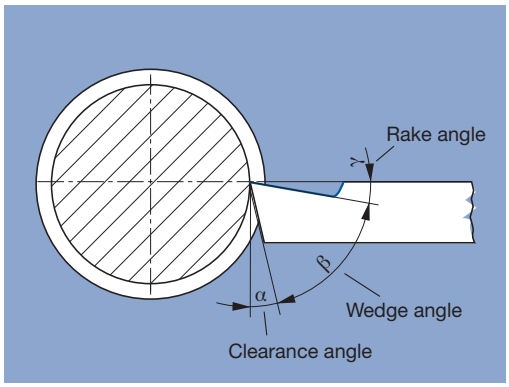
The cutting wedge is formed by the angle between the rake face and the flank face.

The surface against which the metal chip comes away from the material is known as the rake face.

The surface that is directed at the cutting surface is known as the flank face.

The cutting edge is the edge between the flank face and the rake face.

The angles at the cutting wedge of the tool cutting edge are described in accordance with DIN 6581.



Wedge angle β (beta)
This is the angle between the rake face and the flank face. A larger wedge angle is required when the material being cut is a high-strength material. When cutting softer materials, the wedge angle can be correspondingly smaller.

Clearance angle α (alpha)
This is the angle between the surface of the workpiece and the flank of the cutting wedge. Clearance angles of 6° to 8° are effective for metal working purposes.

Rake angle γ (gamma)
The rake angle has a major impact on chip formation. The rake angle lies between the horizontal line to the cutting surface and the rake face.

On lathe tools, the rake angle, wedge angle and clearance angle always add up to 90°.