

[TVET]

# 3.0 Unimat in TVET

## Curriculum example Technics I:

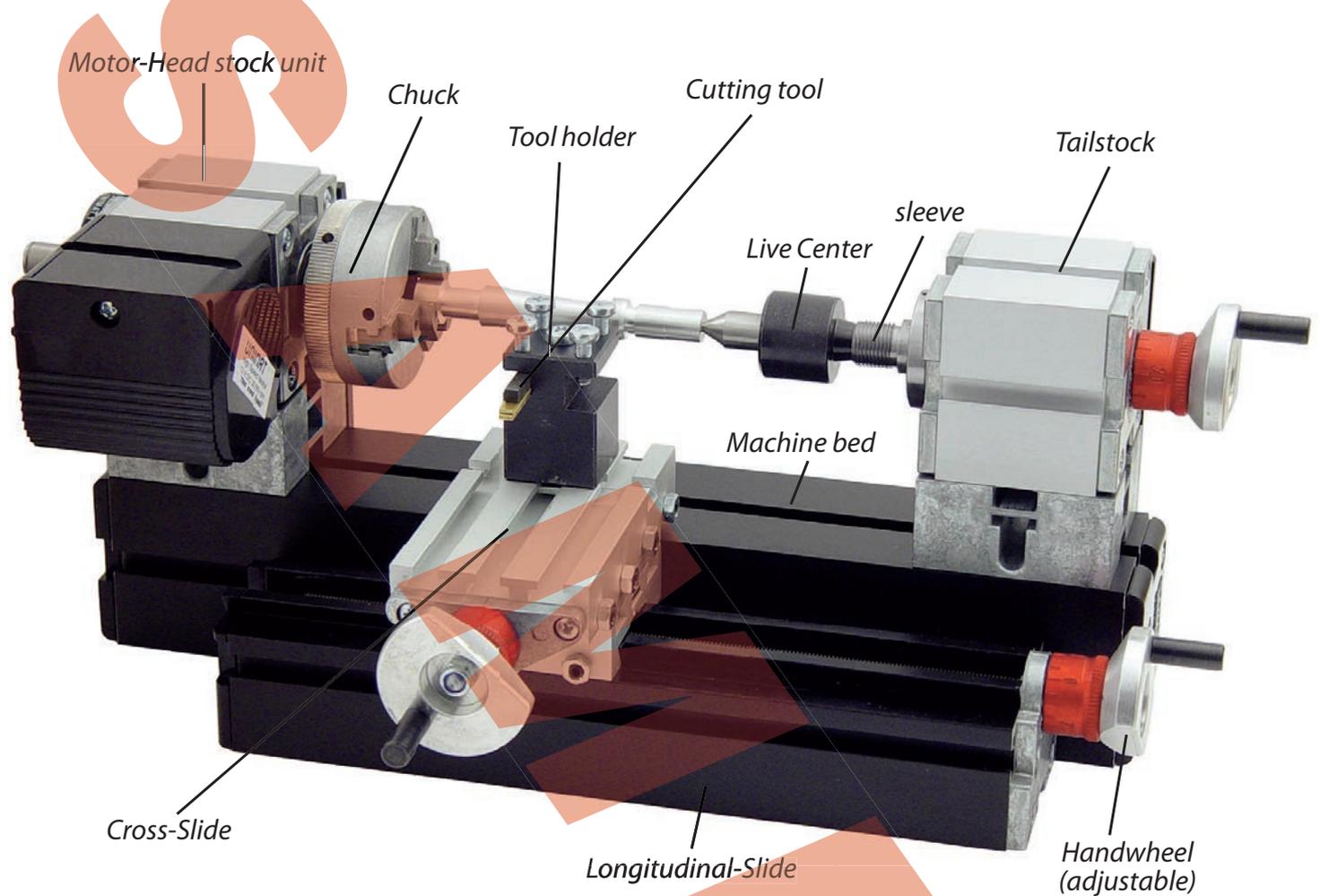
German state Mecklenburg-Vorpommern, for technical education, levels 7-10: „General architecture of machinery, devices; ... block diagram and facilities; ... cogwheel gearing mechanism (symbolic illustrations, models; experiment transmit, allocate reps. deflect rotating movement; change direction and rotation speed)“

## Curriculum example Technics II:

German state Saarbrücken, Technology/Technical Mathematics Technical Communication Vocational Basic Education Vocational School – Subject Area Technique Upper Classes Subject Area TM1 – Machining „Structure and principle of operation of Milling machines ... Outside and inside turning, lengthwise and crosswise turning with and without feeding ... centering, drilling“

STEM Fields			
Science	Technology	Engineering	Mathematics
<i>characteristics of materials like wood, acrylics and aluminium</i>	<i>introduction to industrial machines, types and components, HSS and carbide tools</i>	<i>simple mechanical and civil engineering projects, introduction to turning and milling operation</i>	<i>coordinate system of a 2 or 3-axis machine, discussion of feed rates and cutting speed</i>
↓	↓	↓	↓
			
↑		↑	↑
<i>Besprechung von Vorschub- und Umlaufgeschwindigkeit, Koordinatensystem einer 2- oder 3-Achsmaschine</i>		<i>Materialeigenschaften von Holz, Kunststoff, Aluminium, HSS- und Hartmetallwerkzeugen</i>	<i>Einführung gewerbliche Maschinen, Maschinentechnik, Drehen und Fräsen, Modellbau</i>
Mathematik	Informatik	Naturwissenschaft	Technik
MINT-Fächer			

### The major parts of a metal lathe (Unimat)



### The most important parts of a lathe

#### Bed

The bed is a robust base that connects to the headstock and permits the carriage and tailstock to be aligned parallelly with the axis of the spindle.

#### Motor-Headstock

The headstock houses the main spindle, speed change mechanism and gears to change the rotation speed. The headstock is required to be made as robust as possible due to the cutting forces involved. The main spindle is generally hollow to allow long bars to extend through to the work area. The spindle runs in precise bearings and is fitted with some means (thread) of attaching work holding devices like chucks, collets,.... This end of the spindle will also have an included taper, usually morse, to allow the insertion of tapers and centers.

## Various cutting tools

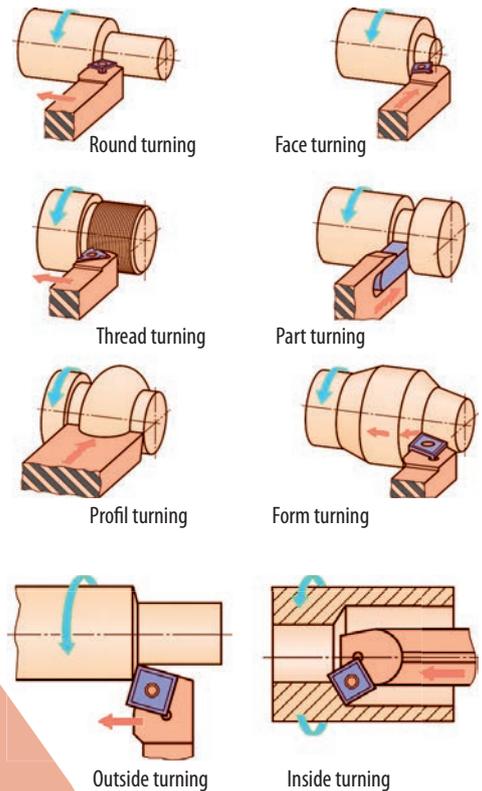
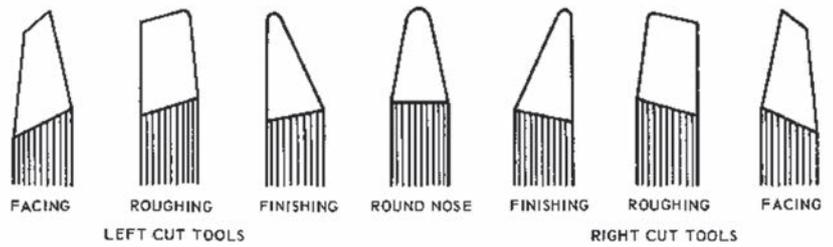
**NORMAL TURNING TOOL** – this feeds from right to left and is used to reduce work to the desired diameter and is the most frequently used of all tools.

**SIDE TOOLS** – these are used to face off the ends of shoulders and may also be used as normal turning tools. Note that a tool which is fed from LEFT to RIGHT is called a LEFT side tool.

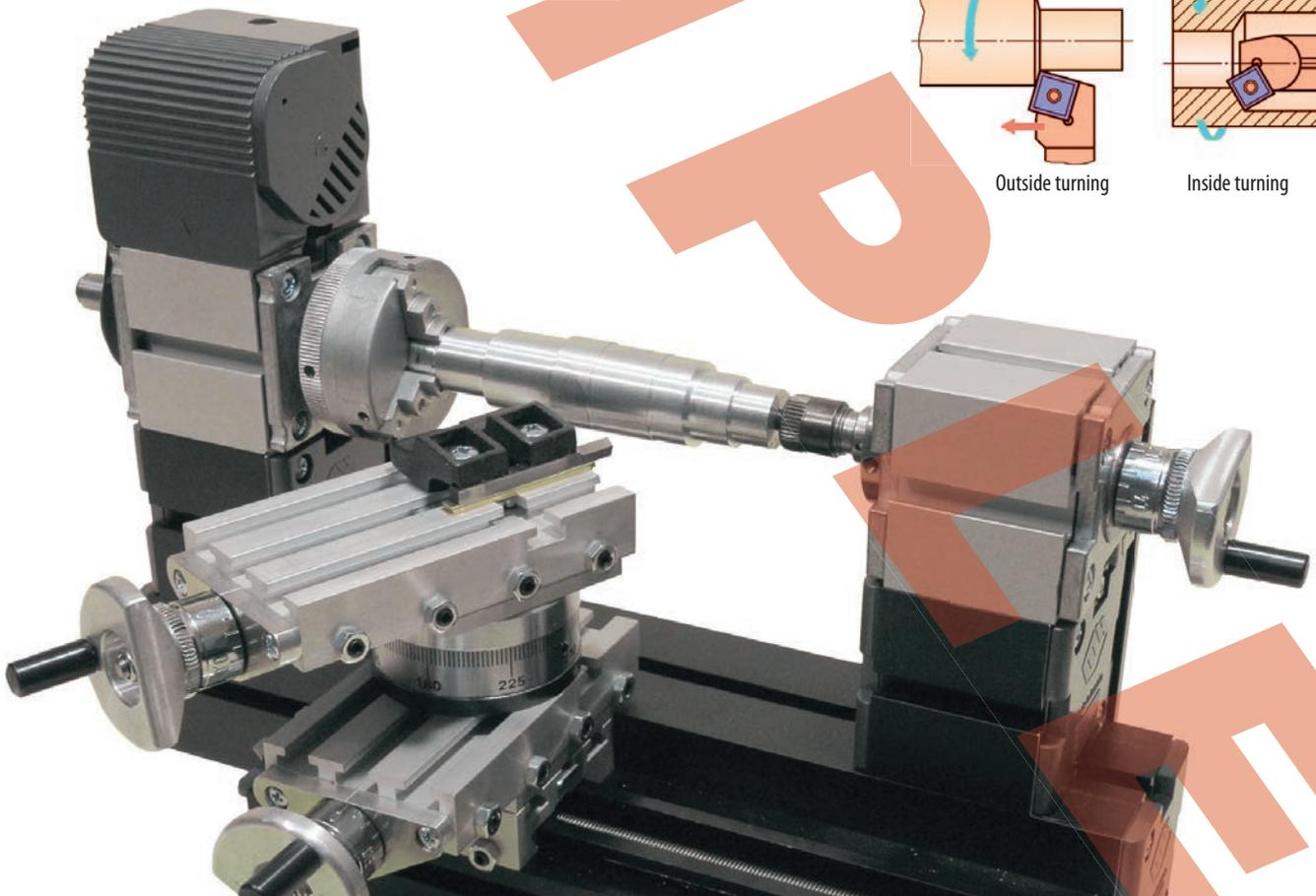
**PARTING TOOL** (cut off tool) – is used to cut off work pieces by feeding the end of the tool across the lathe bed and through the work piece

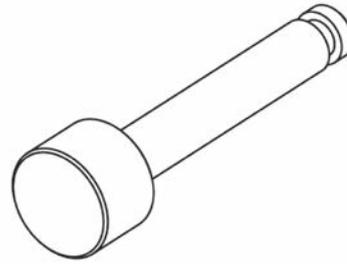
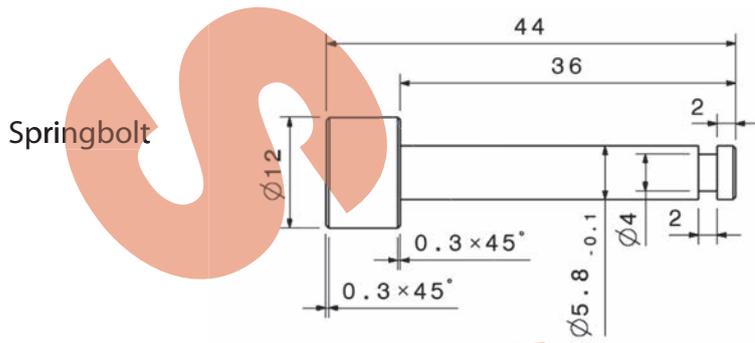
**BORING TOOL** – used in the tool post on a lathe or in an offset table boring head on a mill to enlarge holes in a work piece.

**THREAD CUTTING TOOL** – to cut threads. It has two types  
 a) Outside thread cutting tool and  
 b) Inside thread cutting tool (used after a hole is turned in the face of the work piece by using the boring tool)

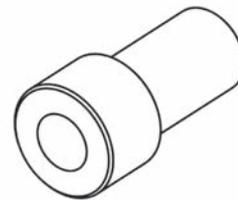
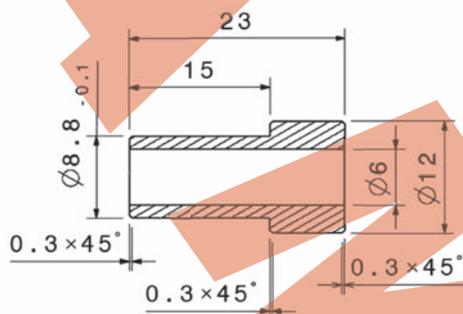


Taper turning with compound slide and rotary table





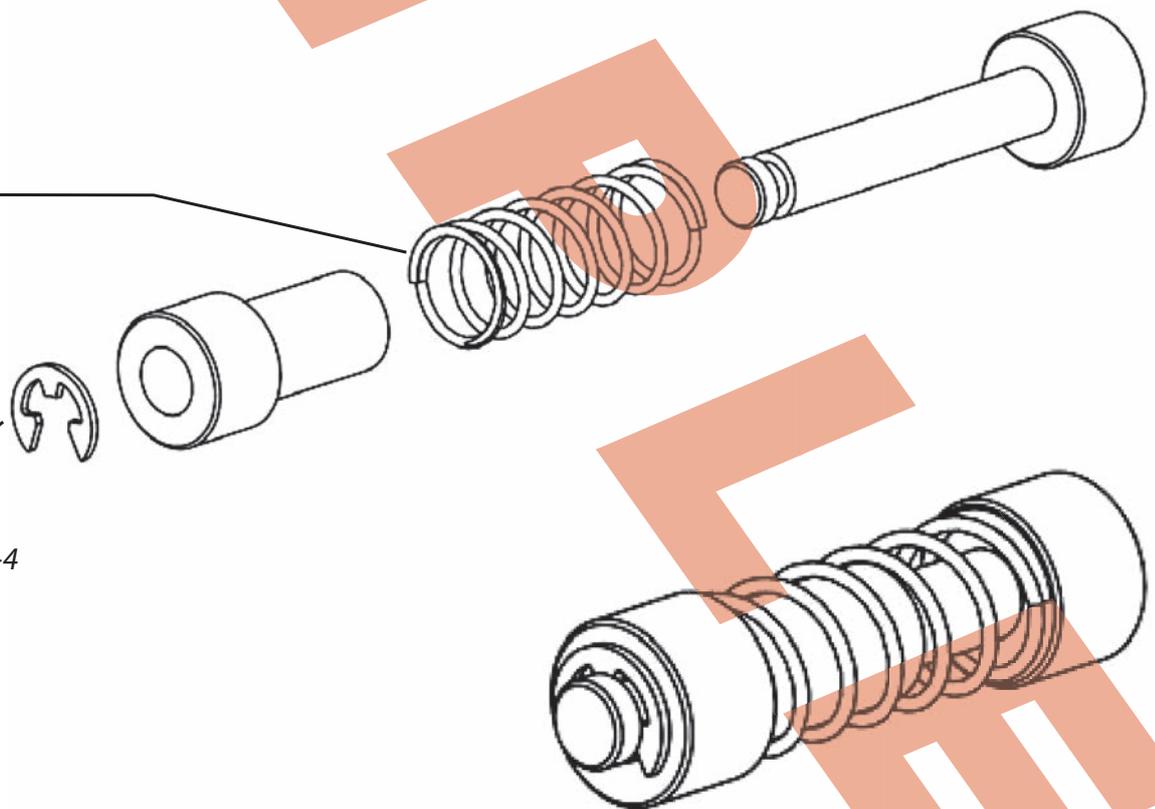
Springguide



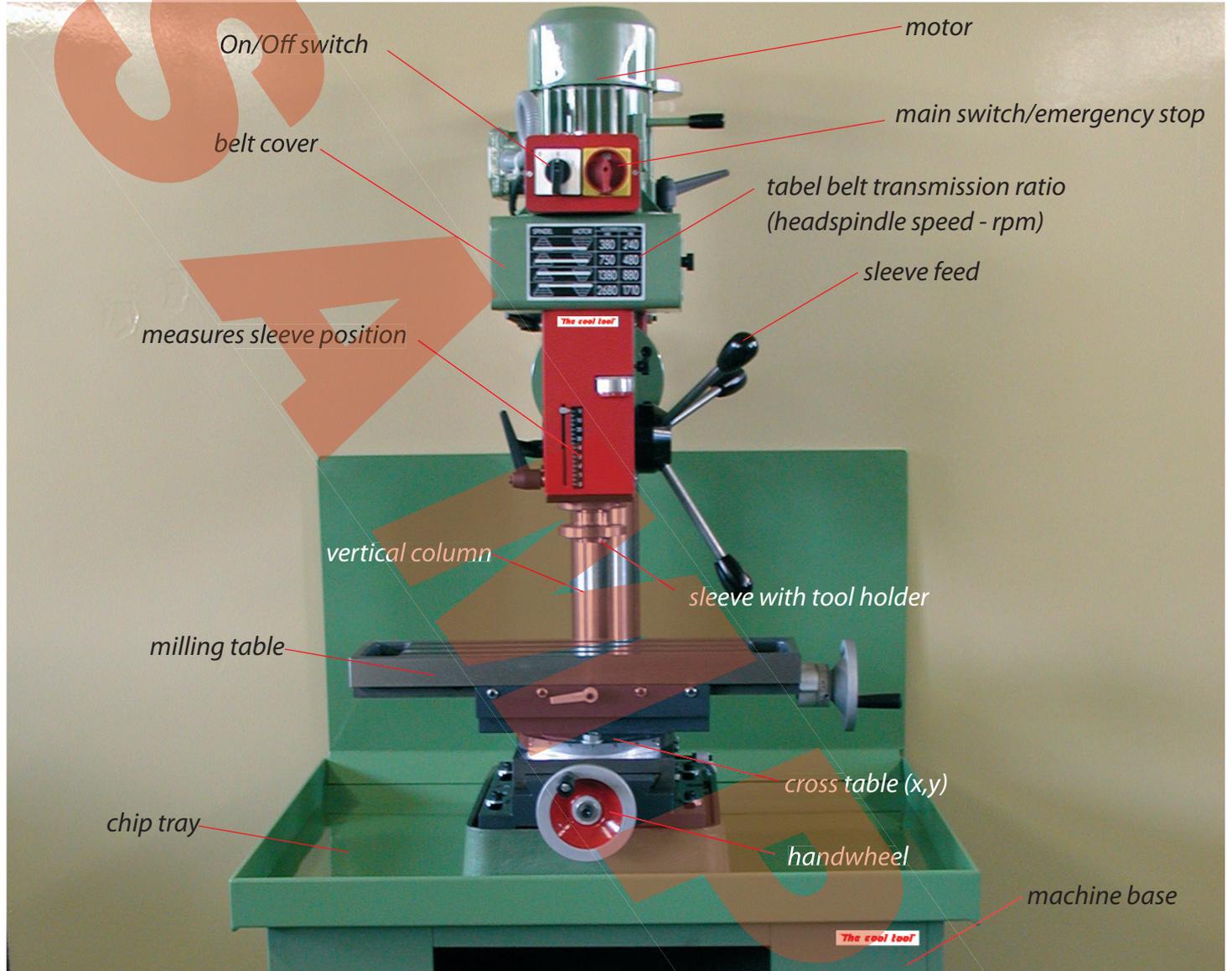
### Assembly of the parts

Spring 1,0 x 11 x 26mm

Retaining ring DIN 6799-4

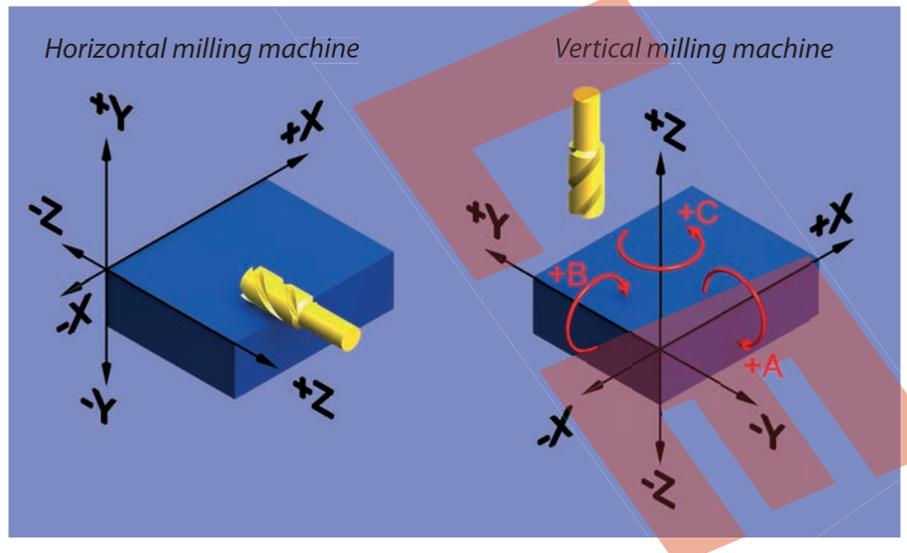


## The major parts of a vertical mill



## Coordinate system milling machines

This information is more important for CNC controlled milling machines.



### MAINTENANCE

#### Lubrication

**MACHINE SLIDES** – Use a light oil, such as sewing machine oil, on all points where there is a sliding contact. This should be done immediately after each cleanup. We grease the slides at the factory, but light oil will work fine. When assembling the machine make sure the bottom of the cross slide and the longitudinal profile has a light coat of grease on all the sliding surfaces. This will have been applied at the factory, just check that it has not been wiped off and that it is evenly distributed.

**LEAD SCREW, TAILSTOCK SCREW, CROSSLIDE SCREW**-Sewing machine oil should be placed along all threads regularly. At the same time, check that the threads are free from any metal chips. Use air or a small brush to keep them clean.

#### POSSIBILITIES:

Three-dimensional working (in every angle), special wood connections (grooves, prongs, ...), architectural model building, toy building, ...; center-hole boring (with fixed drills.)

#### TECHNICAL DATA:

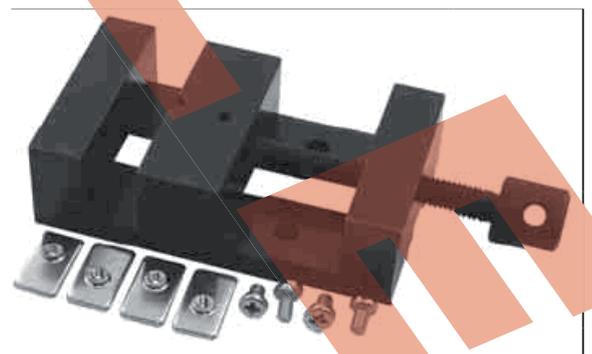
Slide travel: 32 and 145 mm

Collets from 1 – 6 mm

#### Materials for Processing:

Hard wood strips (beech-tree, nut-tree), wooden bars or plastic and metal. When using a soft wood (spruce) it is not possible to have a quality surface finish.

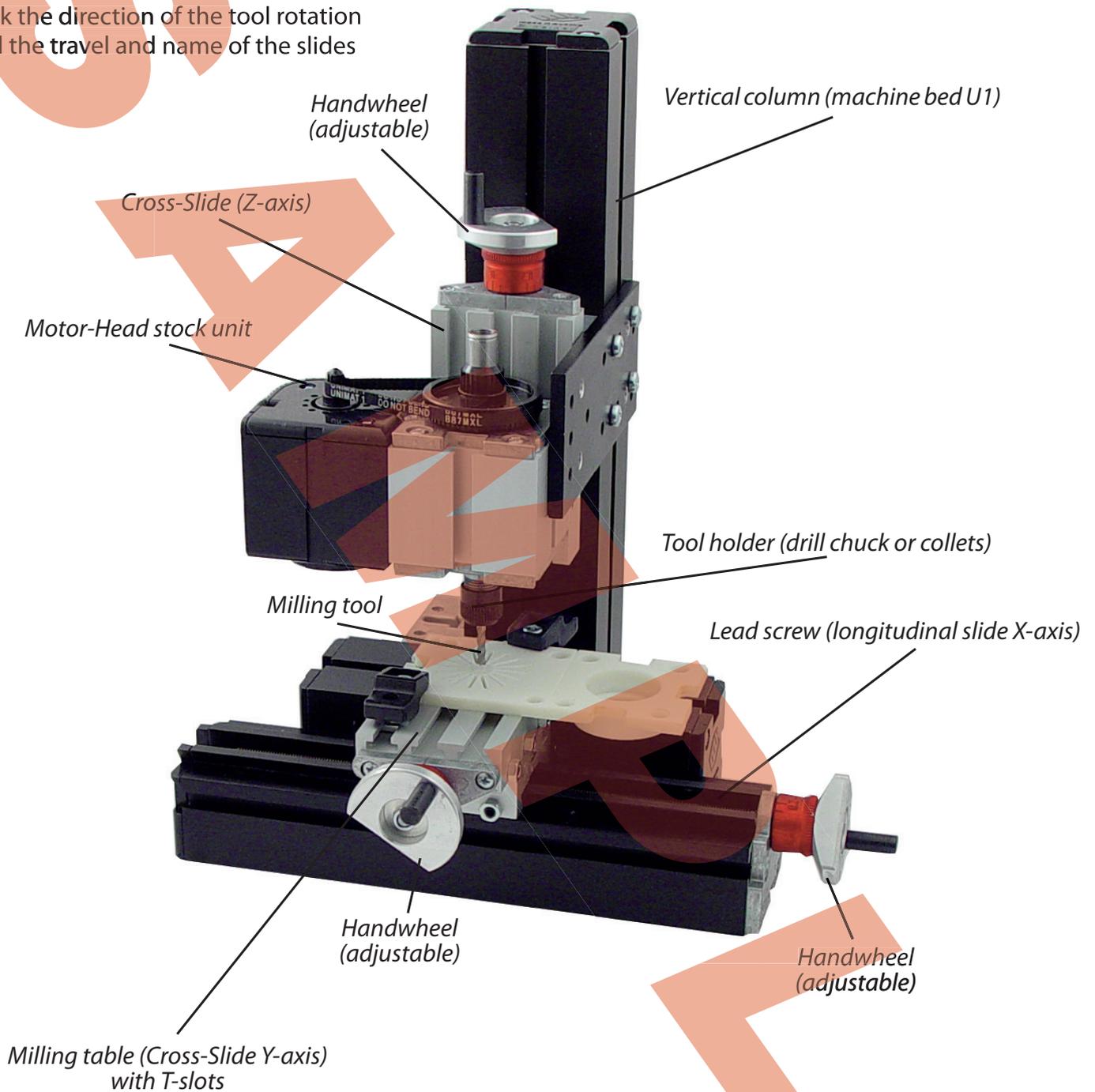
Larger capacity with 164 090 – Fullmetal Milling-Vice



## Questions on Milling

### The major parts of a milling machine

- 1) Name the components
- 2) Mark the direction of the tool rotation and the travel and name of the slides



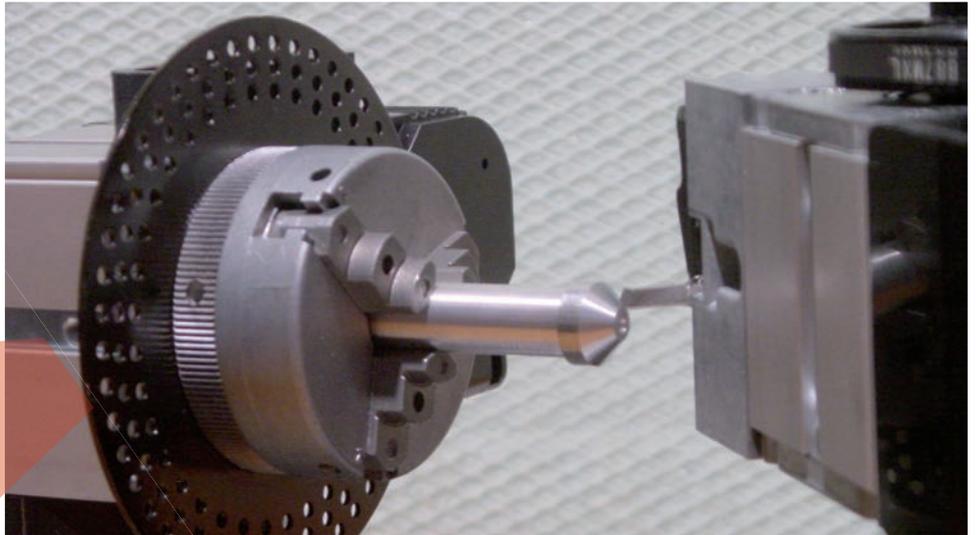
3) What part is turning:



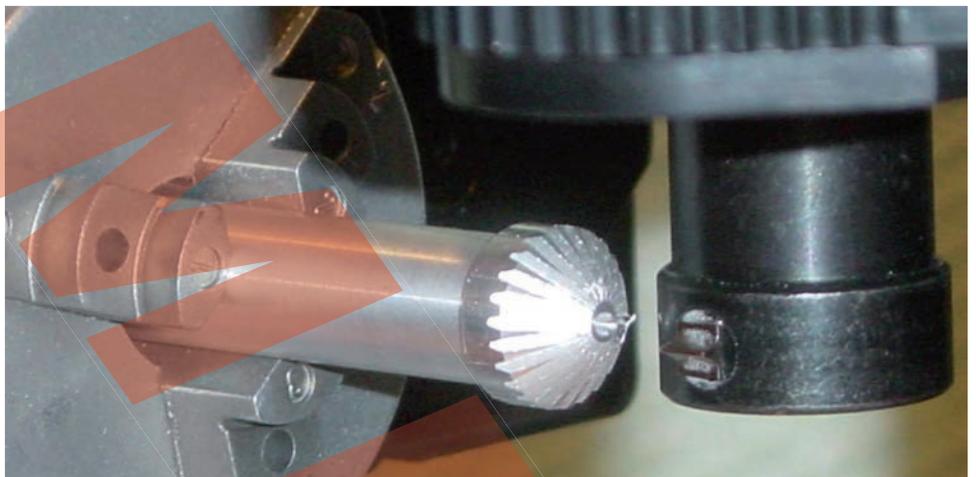
work piece

4) What kind of metal you know? Ferrous metals (steel, stainless steel), Soft-, Non-ferrous metal (aluminium, brass), Precious metal (gold, silver, .....)

The angle of the taper is 45 degrees. For other angles use different intermediate pieces between the long-slide and the machine bed.



Now the taper can be pre-fabricated and then cranked to the second mark where you can start milling the gear. For 24 teeth, take the 48-divide of the dividing attachment and use every 2nd hole. The best depth for milling turned out to be 0.95mm.



Use the 0.5 milling module. To make it easier set a mark on the vertical slide for height of the turning steel as well as on the milling head.

The finished parts are then glued together. For the driving wheel, take the one from the PowerLine motor.

