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CNC – Gear Hobbing / Skiving and Deburring Machine (actually setted for Gear Shaft Machining)

PRAEWEMA SynchroForm WPSLV 2 – 2

Year of Manufacture 2019 (ca. 12.000 working hours)

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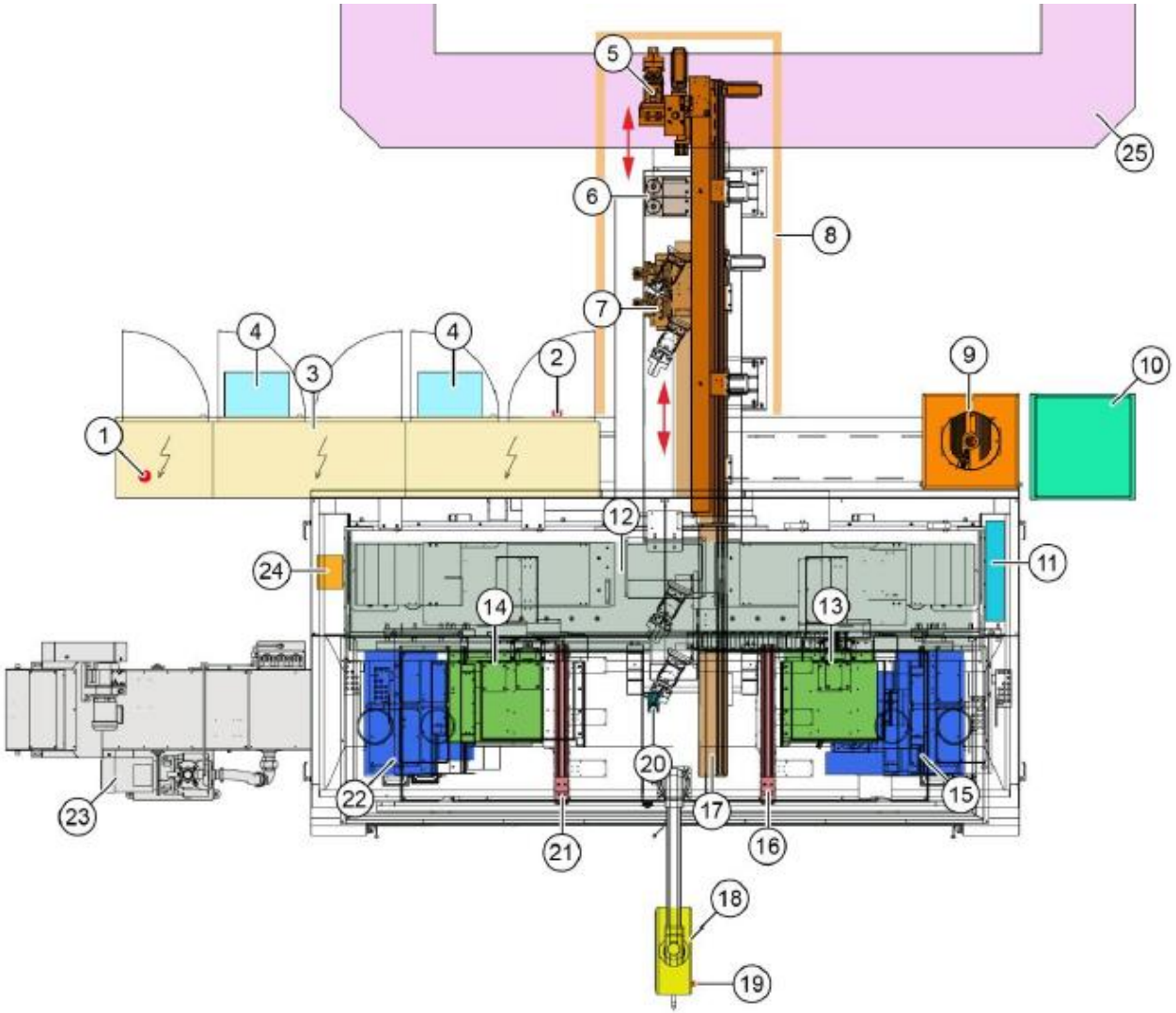
Layout of Machine and main Components:



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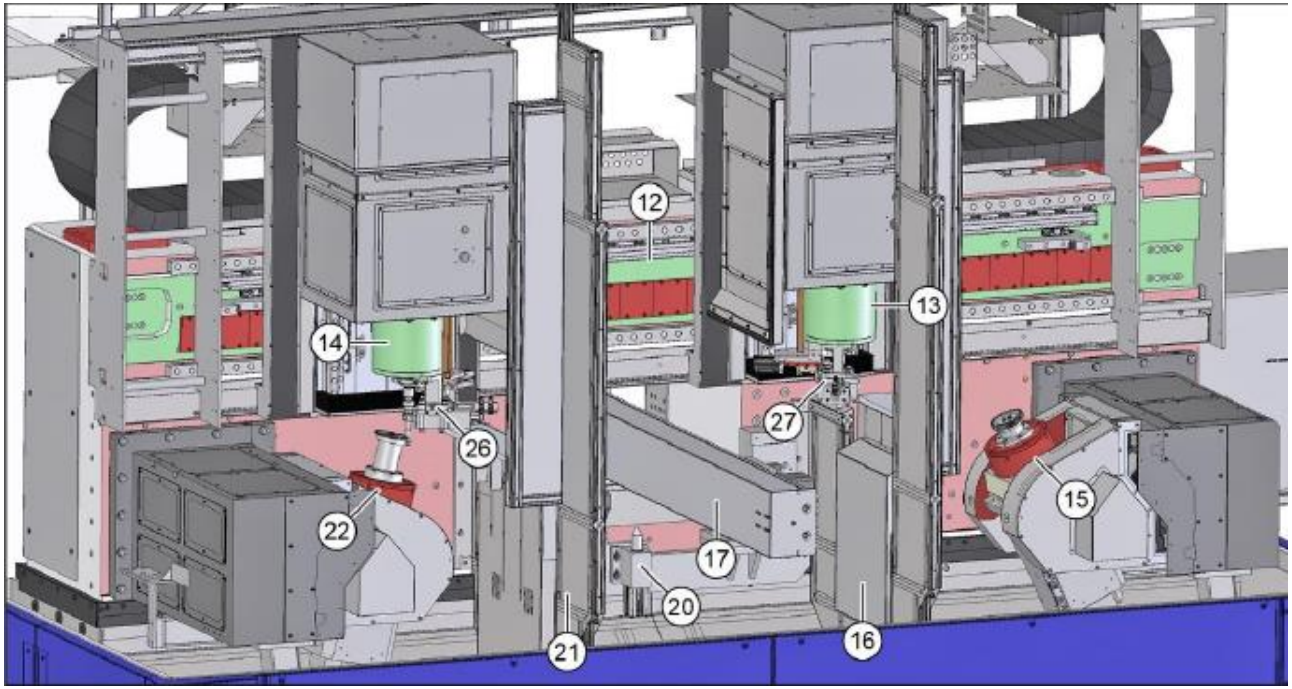
Work Area of Machine:



1 Power Connection
2 Main Switch
3 Electric Cabinet
4 Electric Cabinet Coolant
5 Part Handling Gantry
6 Workpiece Table
7 Shuttle-Slide with two grippers
8 Enclosure
9 Hydraulic
10 Spindle Coolant
11 Pneumatic
12 Machine Bed / Cross Slide
13 Werkpiece Spindle C2
14 Werkpiece Spindle C1
15 Skiving Module Hobbing Spindle E2
16 Workplace seperation / Chip Protection - right
17 Shuttle
18 Operation Panel
19 Emergency Stop
20 Counter Steady
21 Workplace seperation / Chip Protection - left
22 Skiving Module Hobbing Spindle E1
23 Magnet Band Chip Conveyor
24 Central Lunbrication
25 Transport Conveyor
26 Deburring Unit left
27 Deburring Unit right

Description of Machine and Functions:

The CNC gear processing PRAEWEMA SynchroForm® WPSLV 2-2 is designed for producing gears and subsequent deburring. The machine is loaded and unloaded by a conveyor belt. A part handling gantry (5) and a shuttle (17) are connected to this in the protective enclosure (8). These are located behind the machine. Two swivel heads with grippers are positioned on the shuttle carriage (17). The vertical gear skiving modules (22+15) are located on the left and right to create the gear teeth of the workpieces. There are also two deburring devices (26+27) placed directly on the workpiece spindles in the machine to remove the remaining burrs during milling. The two vertically arranged workpiece spindles C1+C2 (14+13) have roller bearings and are lubricated for life. They are mounted vertically on the cross slide (12) and equipped with a highly dynamic drive. The workpiece spindles are equipped with a suitable mounting flange to accommodate the clamping device. The workpiece spindles are electronically coupled to the milling spindles. The gear ratios can be freely selected on the control panel. The machine is intended for dry processing. Chips are disposed of via the magnetic belt chip conveyor (23). The ejection is on the left side of the machine. The spindle cooling (10) is located on a frame on the right behind the machine. The hydraulics (9) are placed next to the spindle cooling. The work area with the adjustment axes is accessible via large electromagnetically locked sliding protective doors. The machine has a paneling with a roof element that is closed on all sides. A control cabinet cooling device (4) is attached to the back of the control cabinet (3). All slide units run on profile rail roller guides. Wipers protect the work guides from chips and dirt. Thanks to the compact design of all units, mounted on a common base frame, the machine can be transported ready for operation.

The machine has a SIEMENS 840 D SL CNC control. The individual drives of the position-controlled axes are equipped with corresponding highly dynamic motors and controllers. The control is equipped with plain text error diagnosis. The error message is displayed in English (other languages available at an additional cost). The electrical control is housed in two control cabinets, separated into the power section and the control section. The control cabinets are connected to the machine frame via consoles on the back of the machine. A separate control panel (18) with all the necessary controls, the emergency stop button (19) and OP012 screen is attached to the left front of the machine so that it can be swiveled and rotated. A 230 volt socket as well as a V24 and a programming device interface are installed on the back of the control panel. All CNC axes are equipped with wear-free, highly dynamic AC motors made by SIEMENS that are adapted to the requirements. All linear axes also have length measuring systems made by HEIDENHAIN. All moving guides of the machine are lubricated by a central lubrication unit (24) at adjustable time intervals. The usual monitoring devices and limit switches are available.

Technical Data of Machine: **max Gear Shaft Dimensions, ca. diameter 100 x 300 mm**

Electrical data	
Operating voltage	400V, 50Hz
Rated power	40kW
Rated current	80A
Max. backup fuse	100A
Control voltage	24VDC
CNC	SINUMERIK 840 D SL
Operating voltage	400 V, 50 Hz

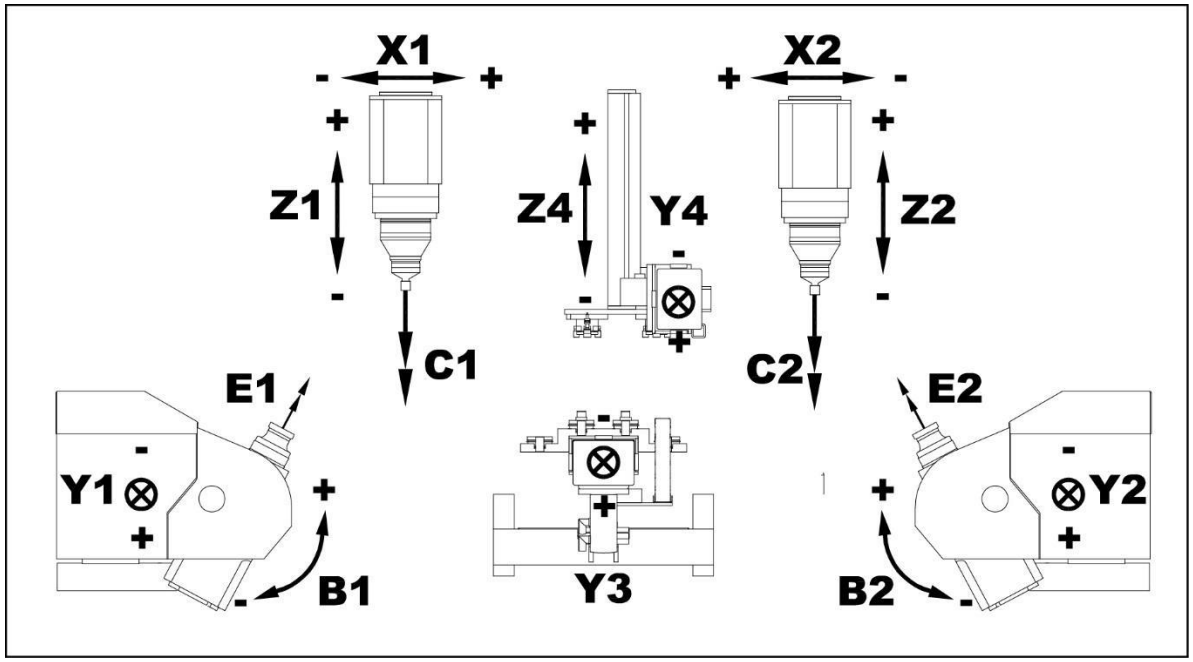
Mechanical data Dimensions	
Space WxLxH	6.9 x 4.7 x 3.6 m
Machine WxLxH	4.4 x 2.9 x 3.6 m
Weight, ca.	16 tons
Shafts workpiece	
spindles	2x vertical (make WMZ)
speed	max. 6,000 1/min

tool spindles 2x vertical tools Gear hob cutter / Peeling wheel, with holder CAPTO C5 deburring tools on the workpiece spindles from SANDVIK, solid carbide steel

Work Process:

Raw part on a workpiece pallet on the conveyor belt (25). Run to pickup position and picked up by the gripper of the loading gantry (5). The gripper places the blank in the workpiece tray (6). Two grippers are arranged one behind the other on the shuttle carriage (7). The gripper of the loading gantry then moves to the shuttle carriage (7) and takes the finished part from the swivel head gripper 1 on the shuttle carriage and places it on the empty workpiece pallet on the conveyor belt. He then takes the raw part from the workpiece tray and hands it over to the swivel head gripper 1 on the shuttle carriage. The shuttle carriage moves forward with the raw part into the machining area of the machine. The swivel head gripper 2 on the shuttle carriage remains at the loading position, directly above the counterholder (20). The workpiece spindle C1 (14) moves with a semi-finished part to the loading position and transfers it to the swivel head gripper 2. The counterholder is moved upwards onto the workpiece. The shuttle carriage then moves back slightly so that the swivel head gripper 1 with the raw part is above the loading position. The workpiece spindle C1 takes over the new blank. The counterholder is again moved upwards against the workpiece. The workpiece spindle C1 moves with the new blank to the gear skiving module on the left (22) for milling the upper gearing. At the same time, the workpiece is deburred directly on the workpiece spindle by the deburring device (26). At the same time, the workpiece spindle C2 moves with a finished part to the loading position and transfers it to the swivel head gripper 1 on the shuttle carriage. The counterholder is moved upwards onto the workpiece again. The shuttle carriage then moves forward slightly so that the swivel head gripper 2 with the semi-finished part is above the loading position. The workpiece spindle C2 takes over the semi-finished part. The counterholder is again moved upwards against the workpiece. The workpiece spindle C2 (13) moves the semi-finished part to the skiving module on the right (15) to mill the lower gearing. At the same time, the workpiece is deburred directly on the workpiece spindle by the deburring device (27). At the same time, the shuttle carriage with the finished part moves backwards out of the machine. The gripper of the gantry (5) takes the finished part again from the swivel head gripper 1 on the shuttle carriage and places it on the conveyor belt on the empty workpiece pallet. Cycle starts again. NOK and SPC parts can be delivered to the workpiece tray (6) using the gripper on the loading portal. Various workpieces are processed on the machine. The machine must be converted for this.

Machine Axes:



CNC and positioning axes

B1 Swivel axis milling spindle 1
B2 swivel axis milling spindle 2
C1 workpiece spindle 1 left
C2 workpiece spindle 2 right
E1 milling spindle 1 left (hobbing)
E2 milling spindle 2 right (hobbing)
X1 cross slide workpiece spindle 1
X2 cross slide workpiece spindle 2
Y1 feed axis milling spindle 1
Y2 feed axis milling spindle 2
Y3 longitudinal slide shuttle
Y4 longitudinal slide loading portal
Z1 vertical axis workpiece spindle 1
Z2 vertical axis workpiece spindle 2
Z4 vertical axis loading gantry

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Machine Fotos:







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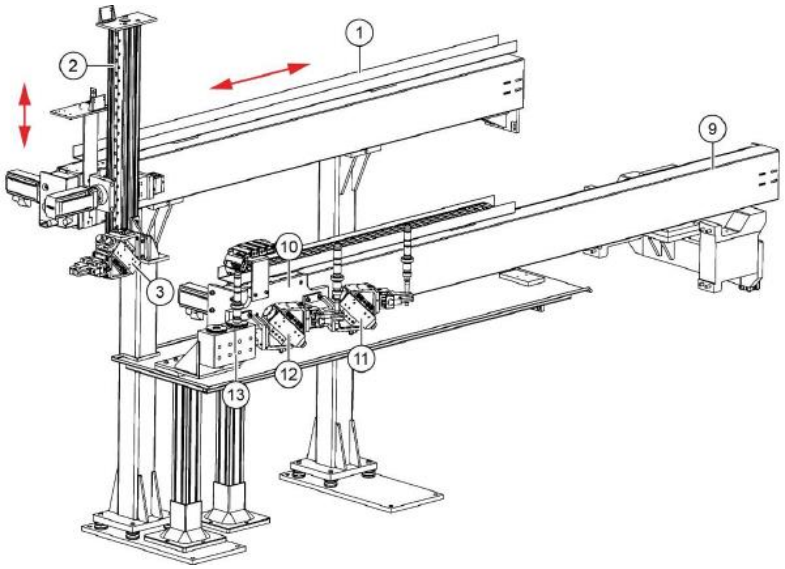
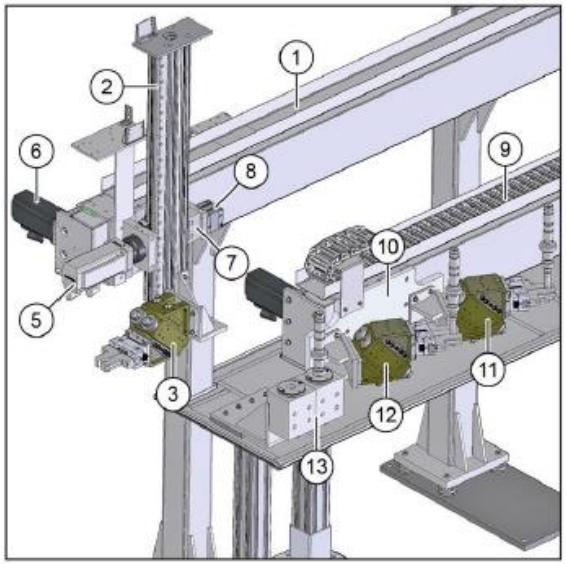
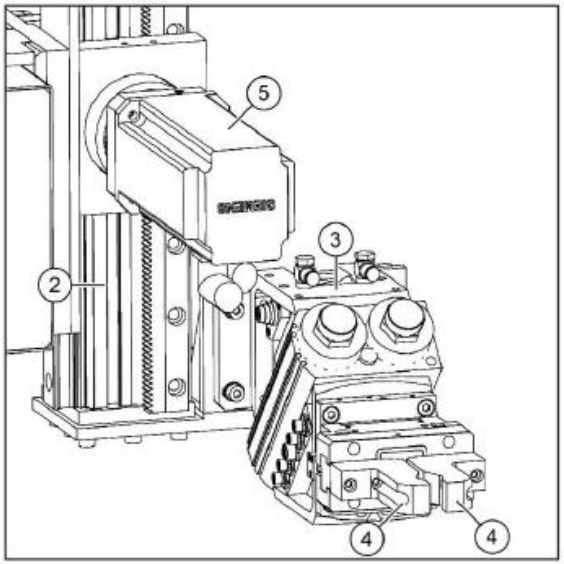
Handling Gantry:

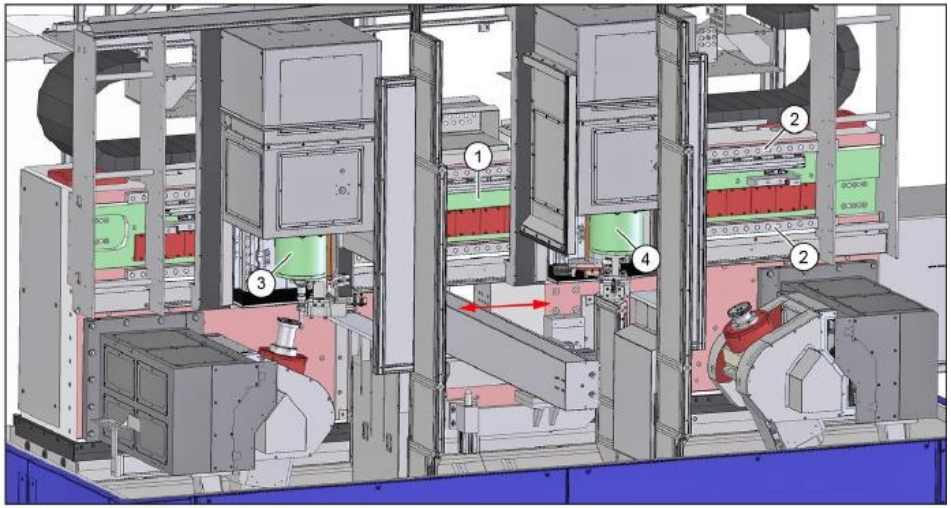


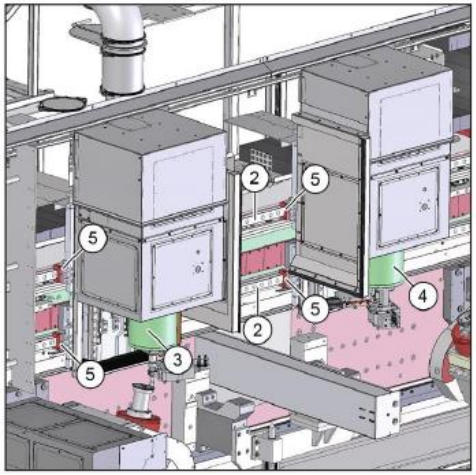


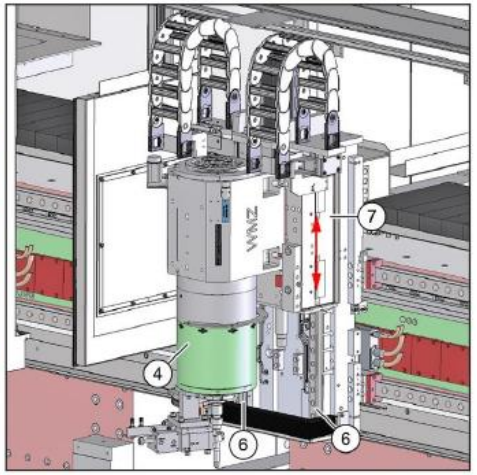


1 linear guide
2 vertical guide
3 swivel head
4 gripper jaws
5 servo motor
6 servo motor
7 brake
8 pneumatic cylinders
9 shuttle linear guide
10 shuttle sledges
11 Swivel head gripper 1
12 swivel head grippers 2
13 workpiece storage

Work Areas and Spindles:





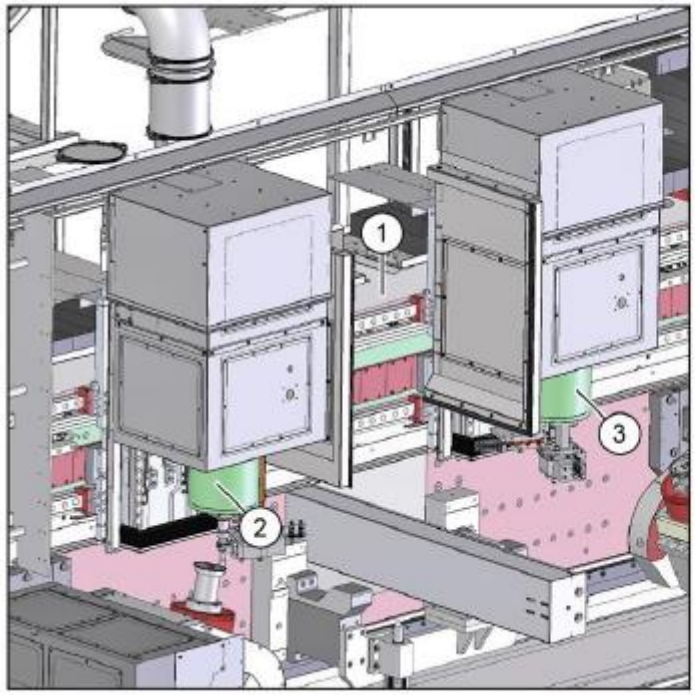


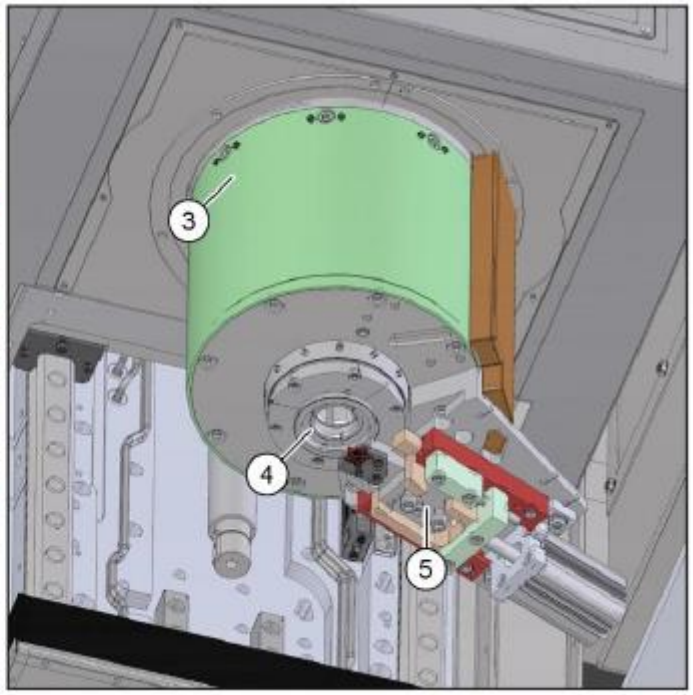
Machine frame - cross slide

1 machine frame
2 horizontal guide rails
3 workpiece spindle C1
4 workpiece spindle C2
5 guide carriages
6 vertical guide rails
7 cross slides

The machine frame is placed on the foundation with the machine feet and leveled, see Chapter 3.6. The guide rails (2) with movable guide carriages (5) are mounted on the machine frame (1).

The cross slides (7) with the workpiece spindles (3+4) are mounted on the guide carriage.



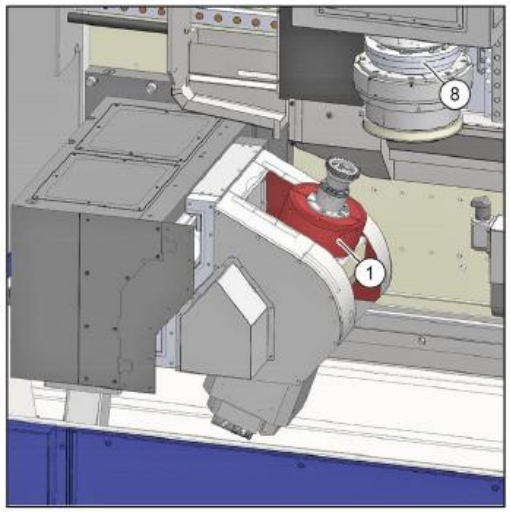


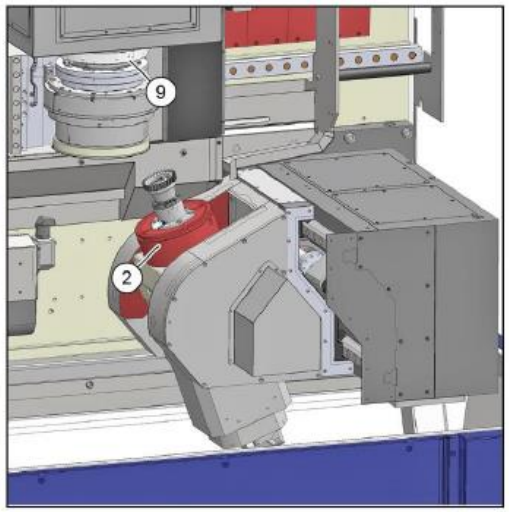
Workpiece spindles and clamping devices

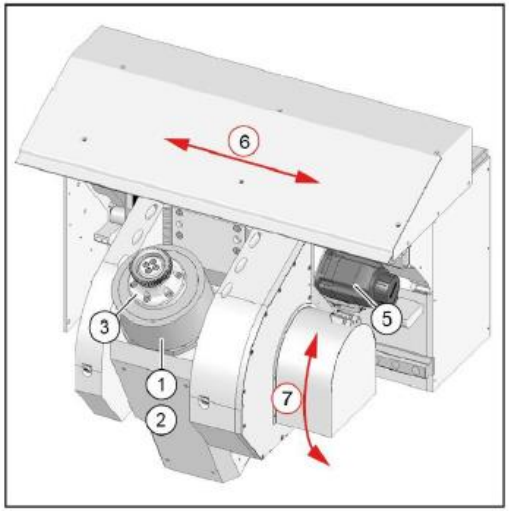
1 machine frame / cross slide
2 workpiece spindle C1
3 workpiece spindle C2
4 tensioning device
5 deburring device

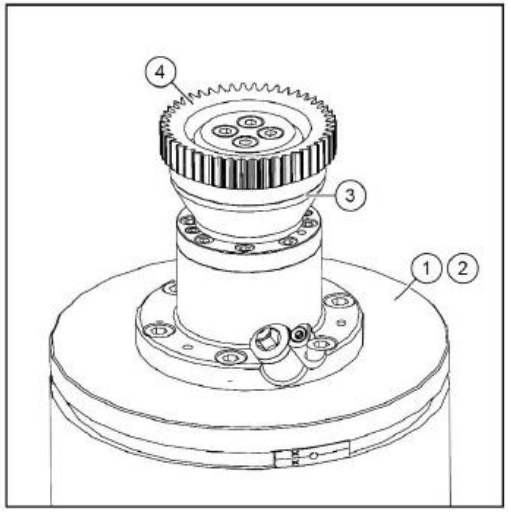
The workpiece spindles and the clamping device form a unit. The workpiece spindles are mounted on a cross slide so that they can move in the x and z directions.

Changing the clamping devices is necessary to process different workpieces.







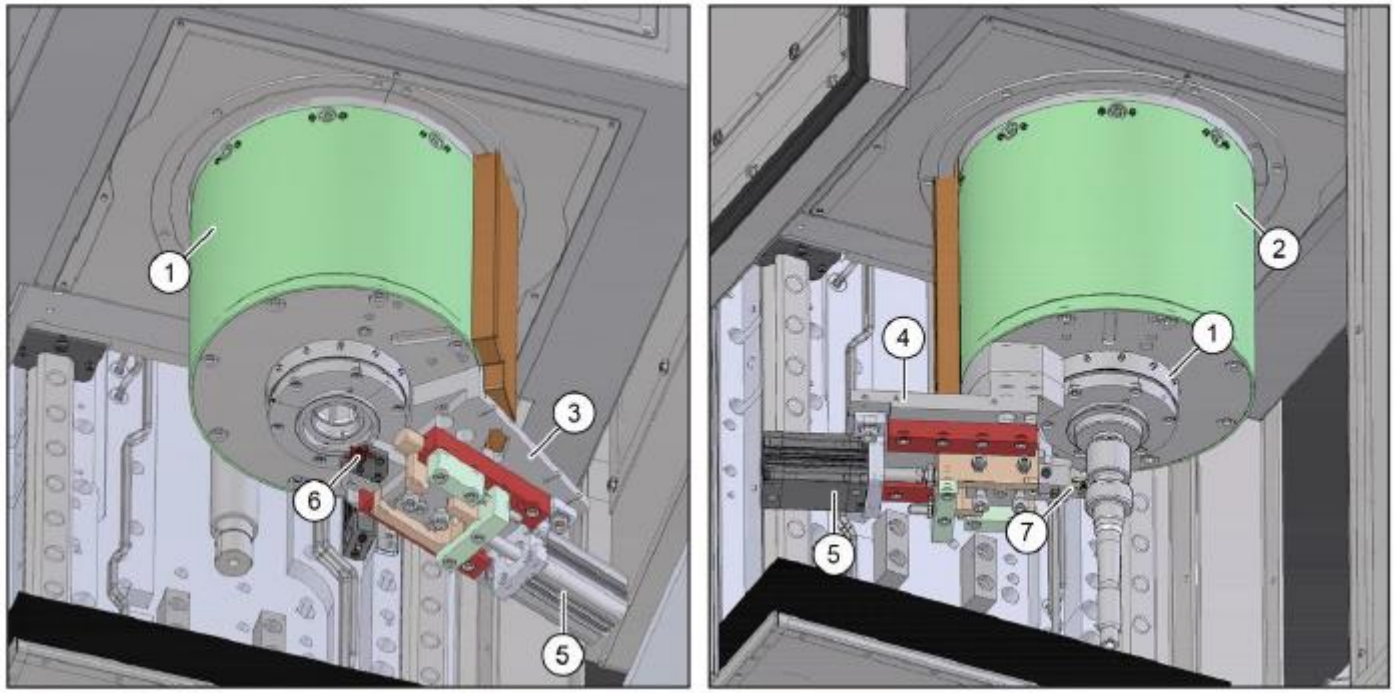


Tool spindles E1 and E2 (similar to illustration)

1 milling spindle E1
2 milling spindles E2
3 Tool holder for gear skiving
4 peeling wheel
5 drive
6 linear axis
7 pivot axis
8 workpiece spindle C1
9 workpiece spindle C2

The machine is equipped with two adjustable, vertical tool spindles E1 and E2 (1+2) for milling the gears.

The tool spindles each have a swivel axis (7) and a linear axis (6). The tools (4) must be changed to process different workpieces and when they are worn.



Deburring device on the workpiece spindles (illustration similar)

1 workpiece spindle C1
2 workpiece spindle C2
3 Deburring device on the left
4 deburring device on the right
5 pneumatic cylinders
6 cutting insert on the left
7 cutting insert right

A deburring device (3+4) is mounted on each of the two workpiece spindles C1+C2 (1+2). These are used to deburr the remaining burr on the workpiece directly after skiving.

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