

CT930/CT960

The Allrounder
for complex grinding tasks

The Art of Grinding.



Features

CT930/960 – dimensions

- Height of centres 150 mm (220 mm)
- Swing diameter in front of work table max. 300 mm
- Length of parts max. 300 mm
- Grinding length 150 mm internal / 100 mm external
- Weight of workpiece incl. chuck max. 100 kg

Hardware

- Up to three HF grinding spindles in a linear arrangement (CT930)
- Complete finishing with up to four grinding spindles on turret (CT960)
- Spindle turret with direct drive (CT960) and resolution of 0.00005 deg
- Fully-automatic B axis with direct drive and swiveling range of +61 to -91 deg
- Compact machine for internal, external and form grinding of a wide range of workpieces in a single clamping

- C axis for the workhead enabling form and thread grinding
- Full enclosure with sliding door
- Fanuc 31i-A

Software

- Simple to use and program thanks to HMI StuderSimCT
- Programming and simulation software, StuderSimCT, to create and simulate grinding and dressing programs on the machine control panel or on an external computer (StuderSimCTpc)
- Standardized interfaces for loader and peripheral devices

Your advantages

- It can be configured for any imaginable internal grinding task
- High flexibility
- Compact with excellent accessibility to the machine room from 3 (4) sides (for maintenance and service)
- Short set-up and changeover times thanks to well thought-through set-up philosophy

CT930/CT960





The Allrounder for complex grinding tasks

Perfect internal grinding

This highly-precise CNC internal cylindrical grinding machine in a very compact and extremely robust design is available with 3 HF spindles arranged linearly (CT930) or with 4 HF spindles on a rotating turret (CT960).

The CT930/960 with automatic B axis leaves no wishes unfulfilled. In the area of internal, form, external, taper and radius grinding, the CNC universal internal cylindrical grinding machine opens up a particularly wide range of applications for processing small to medium-sized workpieces. The machine is particularly suitable for grinding complex workpieces made of very hard materials such as tungsten carbide, ceramic, sapphire as well as for general grinding tasks. Optimal stability and rigidity enables diameters, cones and transitional radii (ground according to a pendulum method via interpolation of the B and X/Z axes) to be ground to a polished surface quality.

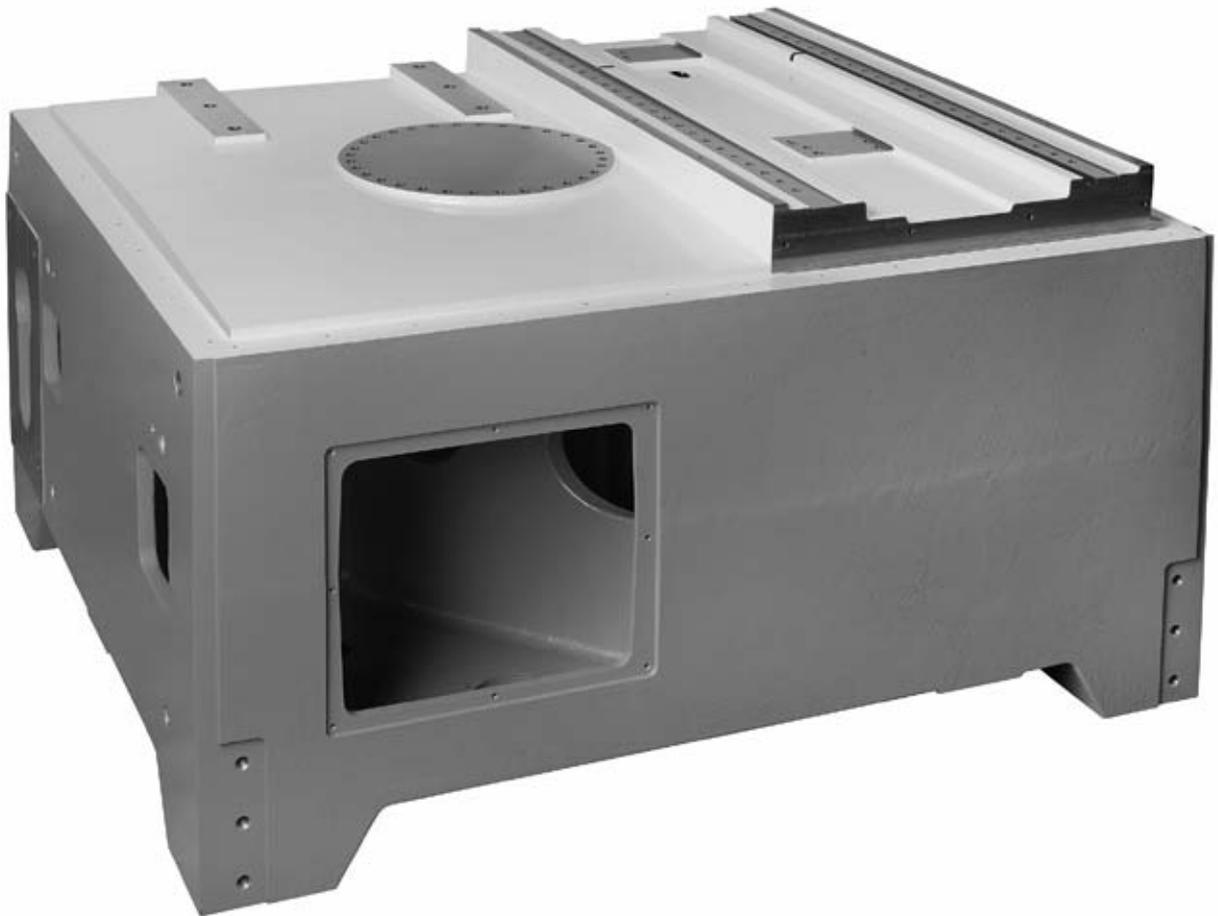
C axis with digital angle encoders right on the workpiece spindle for form and thread grinding operations. Up to two grinding spindles can optionally be fitted with a swivel unit (A axis, manually adjustable), in order to move the grinding spindle into the pitch angle for precision thread grinding.

Thanks to programming that includes simulation and a set-up philosophy that cuts down set-up times to the extreme as well as integrated measuring cycles for process control, both beginners and professionals will soon find their way around the functionality.

The full enclosure plus large sliding door is very convenient for setting things up and enables the use of emulsion or oil as a cooling lubricant.

Machine bed

The machine bed of gray cast iron is composed of a single component and forms the basis for setting up the high-precision cross table and the B axis. The support of the guides for the X axis is cast directly into the machine base. The remaining area on the upper part of the machine base conveys the coolant around the base back into the coolant unit or the coolant cleaning unit, via a coolant tank.



1

1 | Machine bed

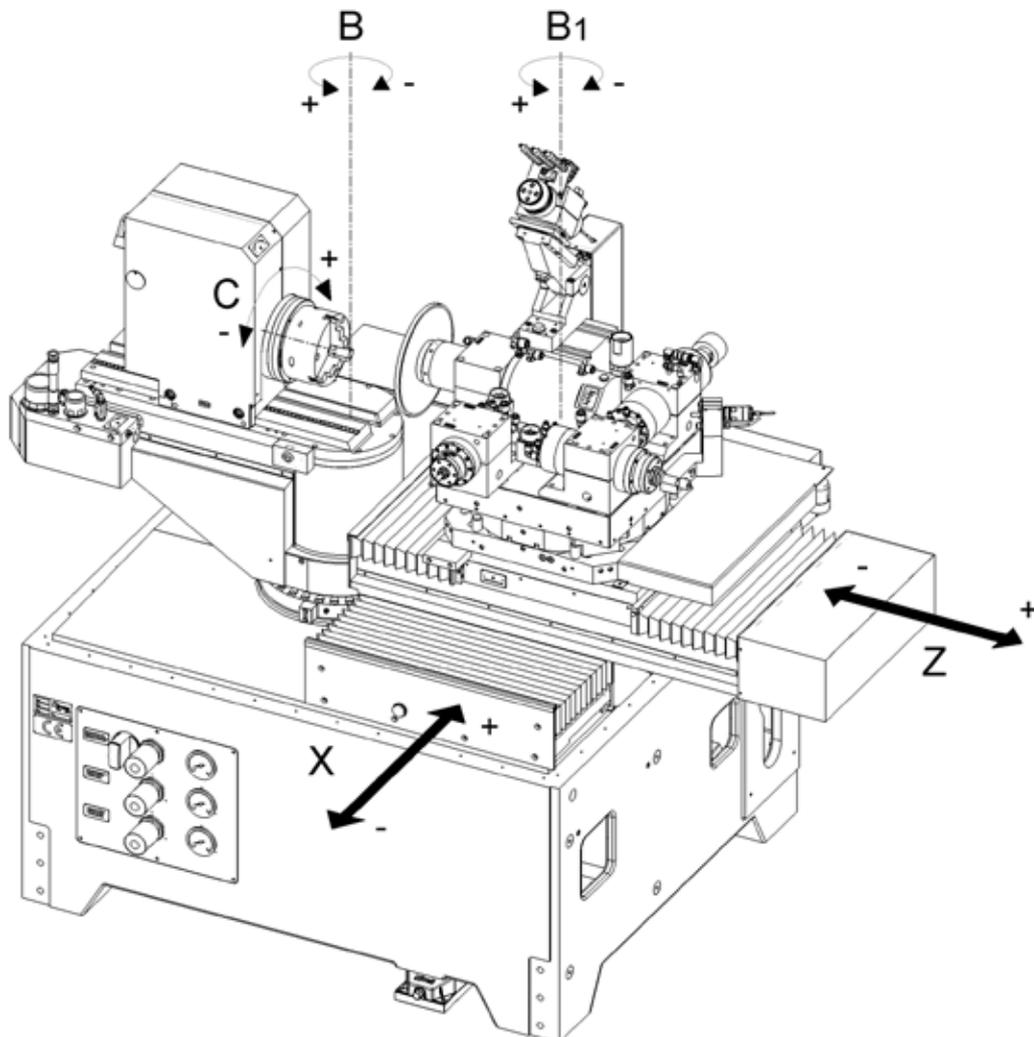
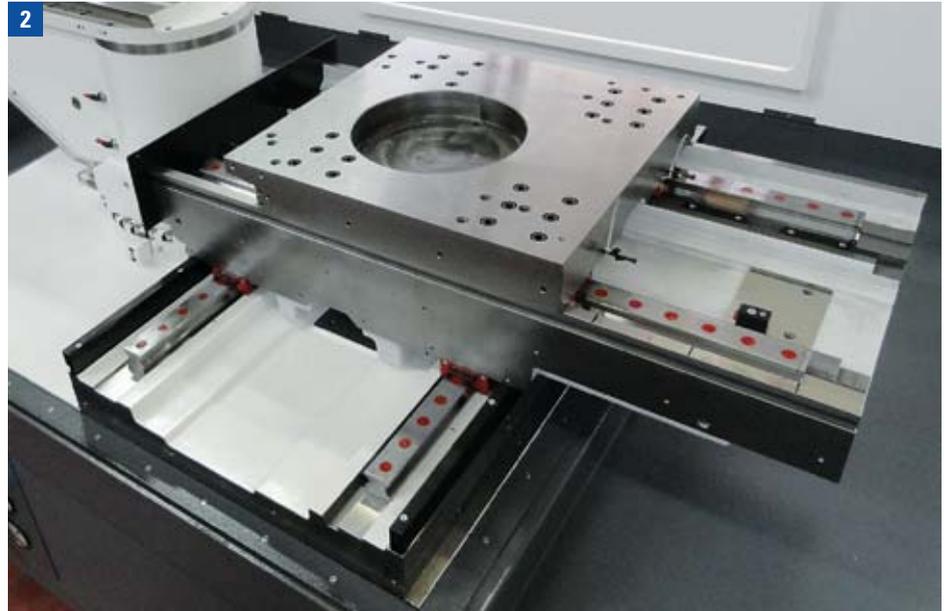
2 | X and Z axis

3 | Axis arrangement

- High geometrical traverse precision
- Effective covering of the guideways
- Good damping characteristics
- High rigidity

X and Z axis

The generously dimensioned cross slide comprises quality cast iron. Ground and pretensioned high-precision linear guides (rolls) are used for the linear and cross slides. The feed is provided via ground recirculating ball screws with pretensioned, backlash-free double nut. The guides and recirculating ball screws have an integrated central lubricating system. The X and Z axes are covered effectively by bellows. The length measuring systems (absolute glass scale) are protected from dust by sealing air and are additionally protected by guard plates. The drive motor (AC servo motor) is similarly protected by a guard plate.





Turret wheelhead (CT960)

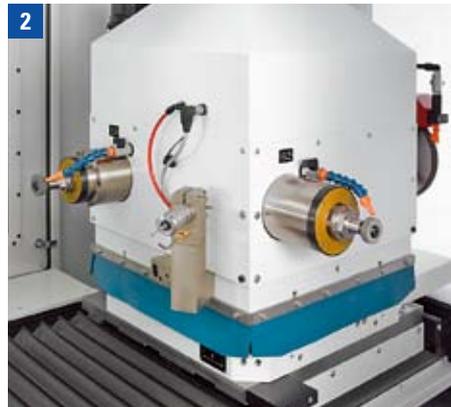
A very important component for complete-machining is the spindle turret with integrated swivel axis (B1). This swivels automatically and enables you to use up to four grinding spindles. This means that workpieces can be completely machined in the same clamping – with minimal auxiliary times combined with superior precision.

The swivel axis (B1) has a direct drive which provides for very quick and precise positioning. The high-resolution direct measuring system guarantees a positioning range of <math><1''</math>.

Finely adjustable turret angle for the areas of:

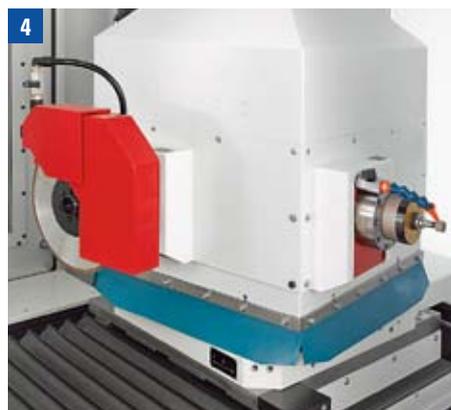
- Pos 1: $-5/+30$ deg
- Pos 2: $-10/+30$ deg
- Pos 3: $-10/+30$ deg
- Pos 4: $-10/+5$ deg

- Large selection of grinding spindles
- External and internal grinding in a single clamping



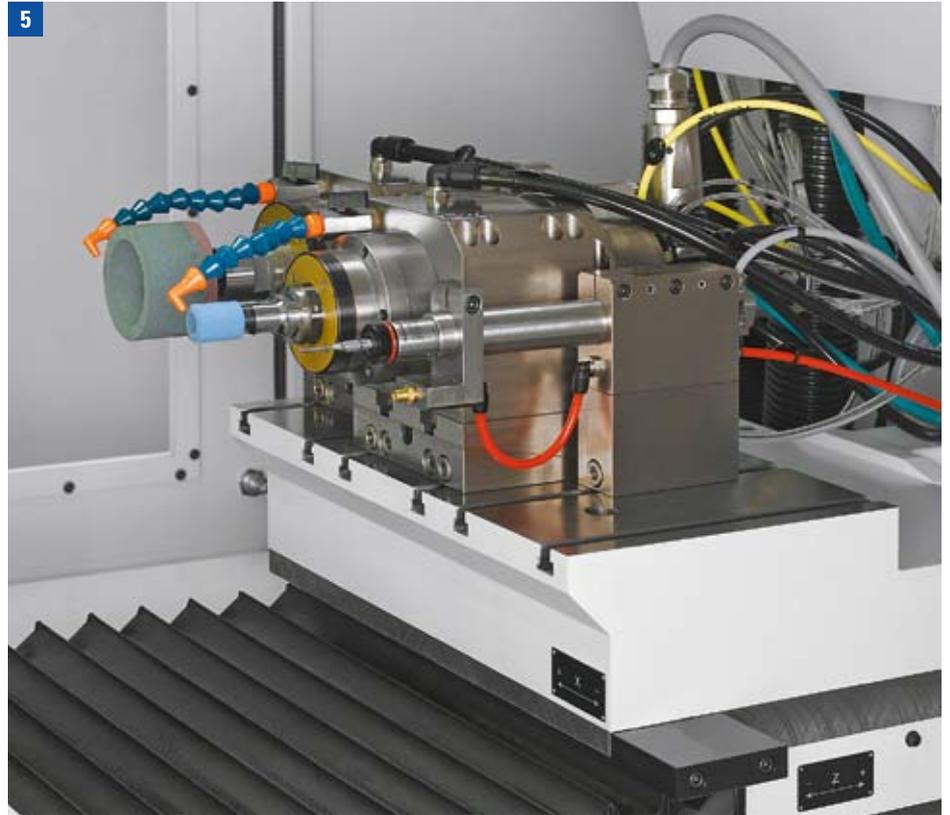
Special design for precision thread grinding

Two of a total of four grinding spindles can be put into the pitch angle via two independent, manually activated swivel axes. This swivel axis is set up as a cradle, meaning that the turning centre is outside of the machine and enables the pitch angle to be set at a max. of ± 10 deg without the need for an additional vertical axis. Once the required pitch angle is set, the swivel axis can be tightened and remains stable and fixed throughout the entire machining process. The grinding spindle is positioned via a toothed wedge bar until the thread serrations on the grinding wheel are at the center of the turning point of the swivel axis. This position is set precisely by a centering microscope.



Grinding spindle support / grinding spindle arrangement

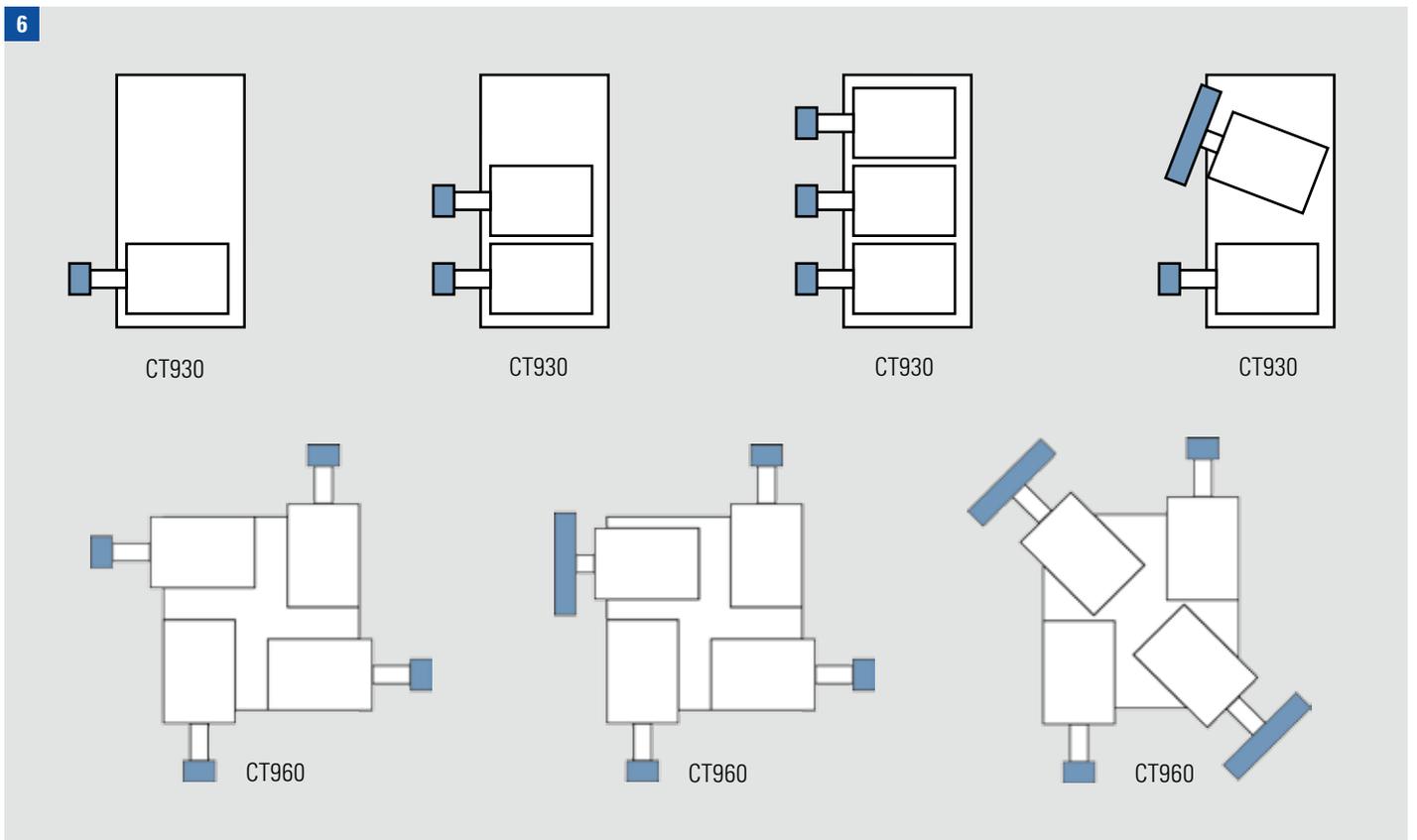
The modular grinding spindle housing concept (linear arrangement in the CT930, turret with up to four spindles in the CT960) enables optimal adjustment to the grinding task in hand. In the linear arrangement, if more than one grinding spindle is being used, process clarification needs to be made (checks the grinding and dressing situation). With two or three linearly arranged spindles, the maximum possible grinding length is limited. This diversity of spindle arrangements enables optimal adaptation to your process requirement. Speeds of up to 120 000 rpm are possible. Some grinding spindles are multi range HF spindles and all spindles are connected to a water chiller unit.



1–4 | Turret wheelhead with 3 internal, 1 external grinding spindle and measuring probe

5 | Linear spindle arrangement

6 | Possible spindle arrangements

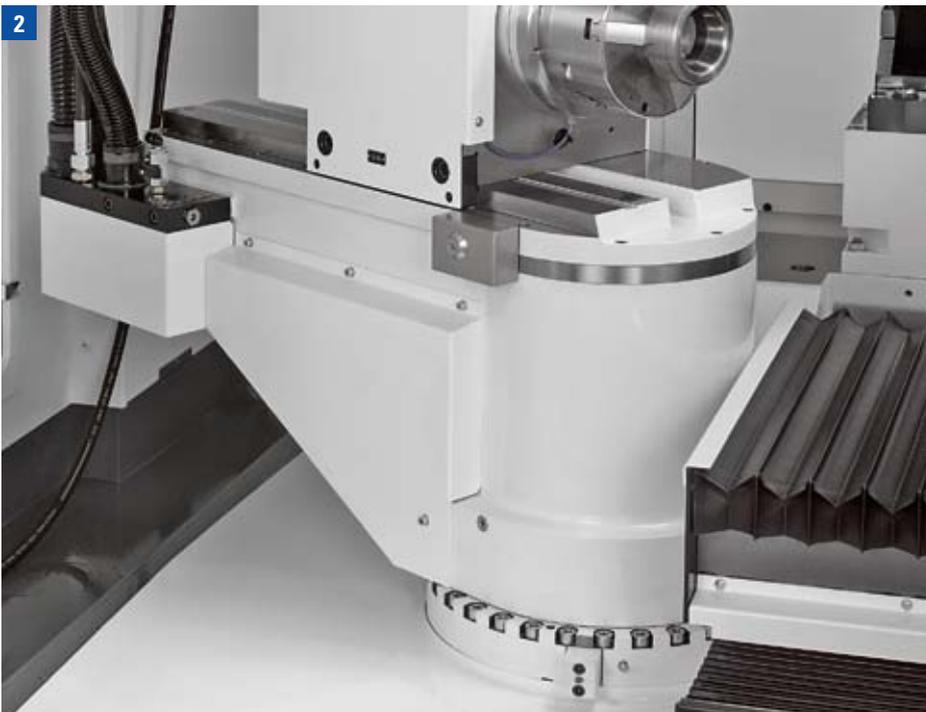


Workhead

The high-precision workhead is equipped with special bearings and guarantees the highest roundness accuracy. The A2.4/MK5 spindle nose complies with the DIN/ISO 702-1 standard. The airlift simplifies adjustment when setting up or resetting the workhead. A high-precision C axis, with direct measuring system on the workhead spindle, is available for form and thread grinding.



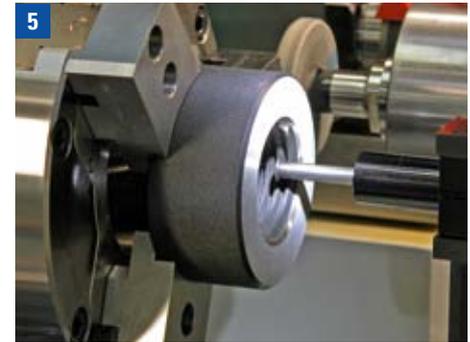
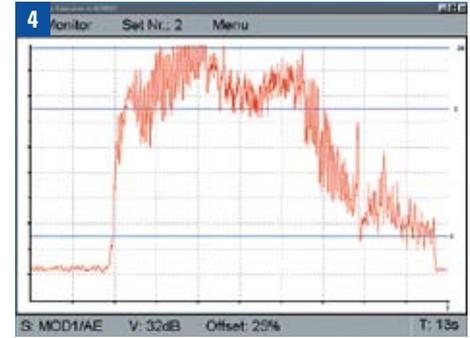
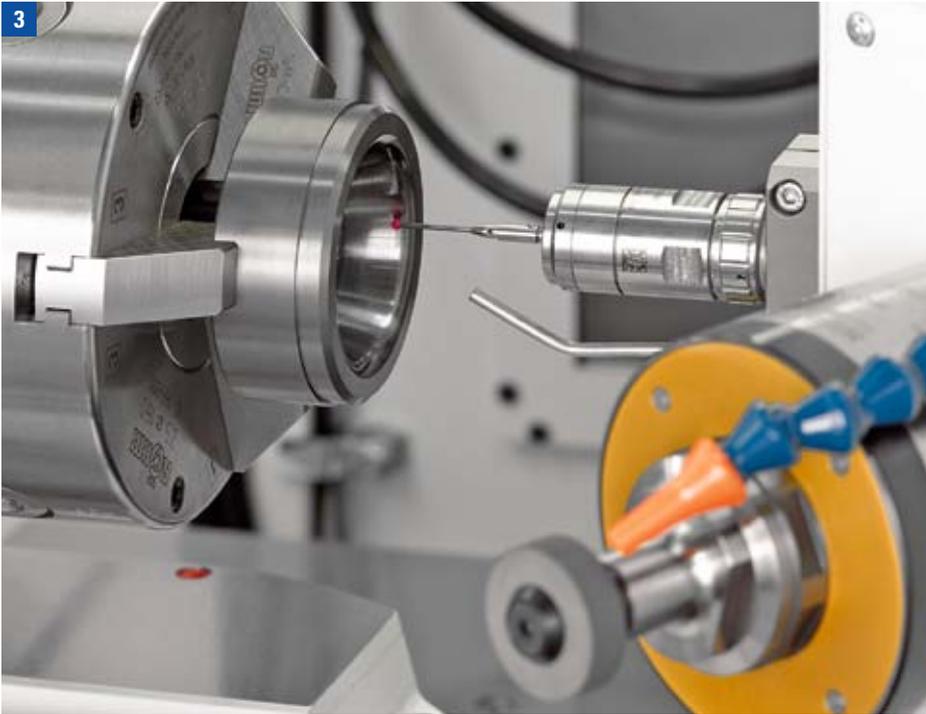
- High roundness accuracy
- Low-maintenance
- Air lift



B axis

The automatic B axis with a swiveling range of $+61 / -91$ deg has a direct drive which provides for very quick and precise positioning. This enables extremely precise grinding with the interpolation of the B axis to machine radii. The high-resolution direct measuring system guarantees a positioning range of the high-precision B axis $< 1''$.

The B axis is completely sealed off and requires no maintenance.



Sensors/measuring probe

STUDER attaches great importance to optimized grinding processes. The sensor system plays a big role, particularly in internal grinding. Three main objectives are targeted:

- Air-gap elimination for cycle time reduction
- Process monitoring during grinding and dressing
- Simple registration of grinding wheel and workpiece

With small bore diameters it is difficult to obtain an analyzable signal. STUDER achieves the best result with a ring sensor, comprising a revolving transmitter ring and a fixed receiver ring. The signal transmission between the rings occurs without contact.

The measuring probe is used for the following operations:

- Measuring the ZB-distance
- Length positioning
- Measuring non-interrupted inner and outer diameters
- Compensation for wheel wear when using non-dressable grinding wheels
- Optimized grinding cycles
- Measuring lengths
- Detecting the thread position with a thread sensor
- Process monitoring on machines with loader

1 | Workhead with ring sensor on the spindle nose

2 | B axis

3 | Measuring probe

4 | Signal curve

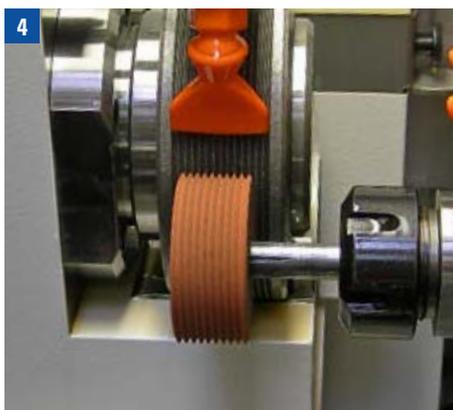
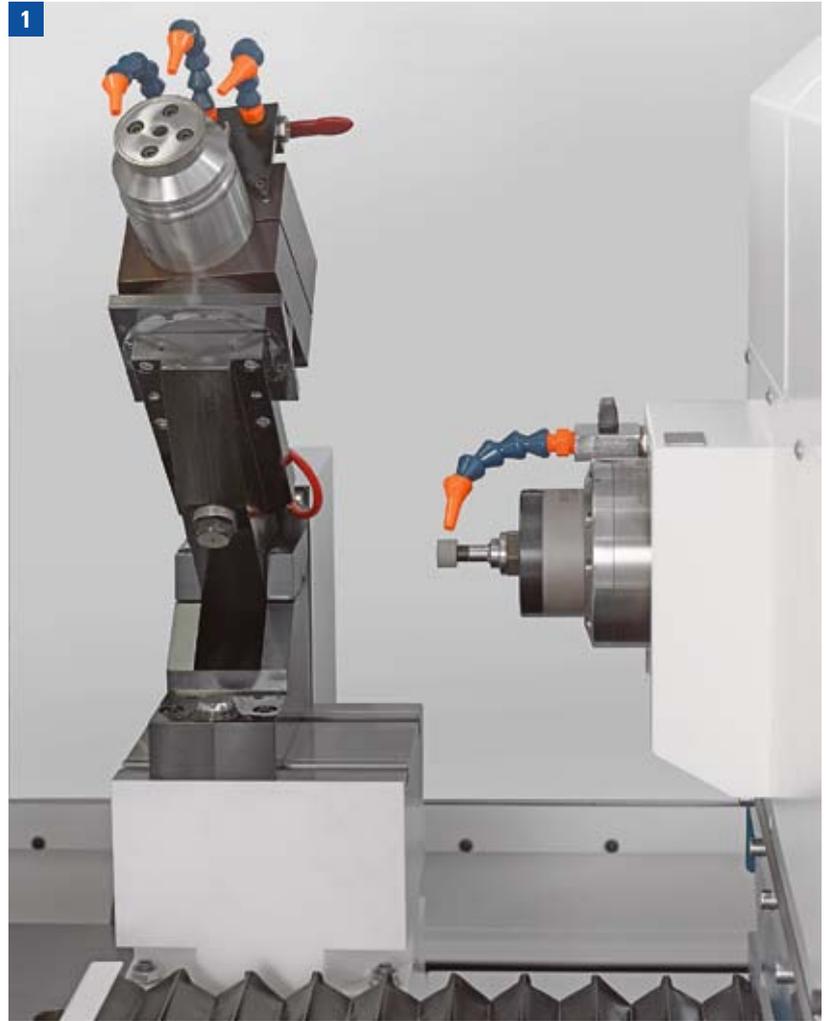
5 | Thread intake

- Air-gap elimination
- Set-up assistance
- Process reliability
- Process optimization

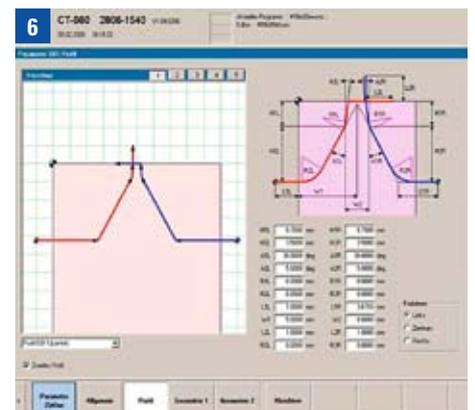
Dressing

An easy-cutting grinding wheel is essential for cost-effective and high-quality grinding. STUDER offers a large selection of dressing units, in order to coordinate the dressing process flexibly and optimally with the properties specific to the work-piece, tool or materials.

In addition to permanent dressing units, other units can be mounted in order to attach rotating dressing tools. The latter are especially suitable for dressing ceramic bond CBN grinding wheels. Combined with the acoustic touch sensor, the Touch-Dressing-CBN method enables a precisely defined, minimum amount to be dressed.



- 1 | Pivoting dressing unit
- 2 | Diamond dressing wheel
- 3 | Several dressing systems in operation
- 4 | Profile role
- 5 | Fixed dresser with PCD plates
- 6 | Dressing cycle
- 7 | Fanuc 31i-A
- 8 | Main screen with simulation
- 9 | Use of the measuring probe





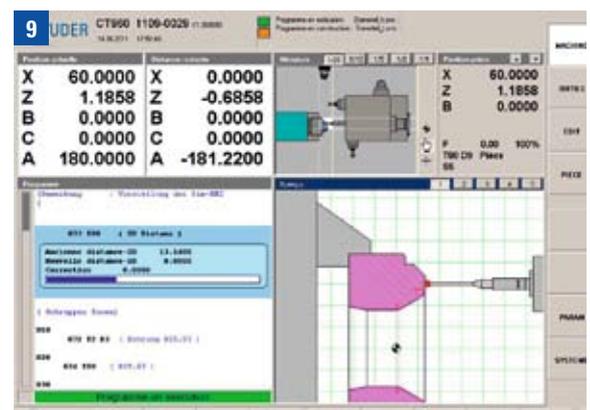
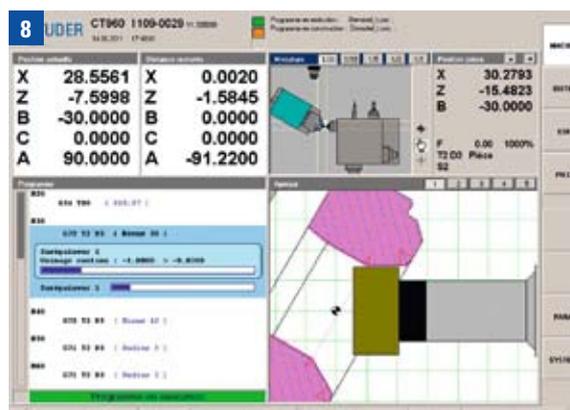
Machine control and operation

The CT930/960 is equipped with a 31i-A series Fanuc control with integrated PC. The 15" touch screen facilitates intuitive operation and programming of the machine.

The layout of the elements complies with the relevant safety norms and is EMC-tested. All controls are clearly and ergonomically arranged. An important role is played by the manual control unit, which facilitates setup close to the grinding process. A special function – the Sensitron electronic contact detection device – reduces downtimes to a minimum.

The control panel is extremely reliable and is perfectly coordinated to the drive elements.

- PCU manual control unit
- EMC-tested control cabinet
- Ergonomically designed Operating elements

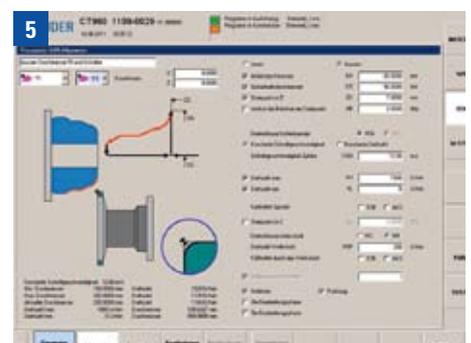
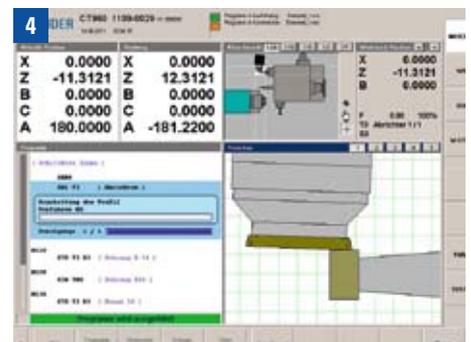
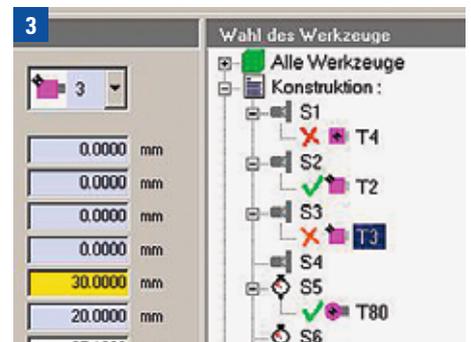
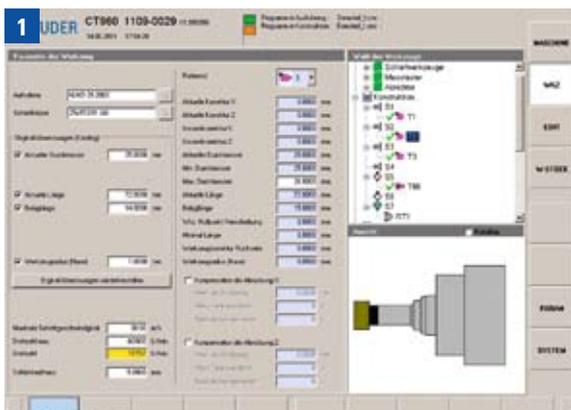


- 1 | Tool management
- 2 | Grinding tool catalog
- 3 | Tool set-up status
- 4 | Dressing simulation
- 5 | Grinding data input window

The StuderSimCT operating system

The machine control is equipped with the StuderSimCT operating system. This operating system, specially developed for internal grinding applications, enables the programming of all basic cycles for grinding, dressing and process-support gauging. The basic cycles such as face grinding, bore grinding, taper grinding, thread grinding, dressing and gauging are defined in the Parameter Input window. This type of programming provides great flexibility, while remaining very user-friendly and workshop-oriented. Each cycle is equipped with a dynamic

help system, which guides the operator through the grinding data creation process. After programming, the process can be simulated and optimized. This ensures reliability, as well as guaranteeing short programming times and increased cost-effectiveness.





- 1 | Deployment of engineers on the customer's premises
- 2 | Training on the machine
- 3 | Operating worldwide

Customer Service

Machines must consistently fulfil customer requirements, operate cost-effectively and reliably, and be constantly available.

30 competent HelpLines as well as spare parts staff and more than 60 service technicians worldwide, will guarantee support in your area throughout the lifetime of your STUDER machine:

- We will find a quick solution to your problems
- We will provide assistance promptly and without fuss
- We will help you to increase your productivity
- We work professionally, reliably and transparently



Start up

For a smooth production start.

Know-how

For trained, motivated personnel and increased productivity.

Service

For quick and professional problem solving.

Prevention

For long-term preventative measures and detailed monitoring.

Materials

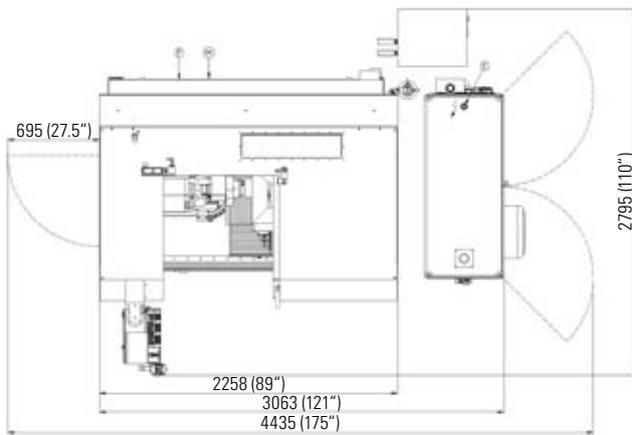
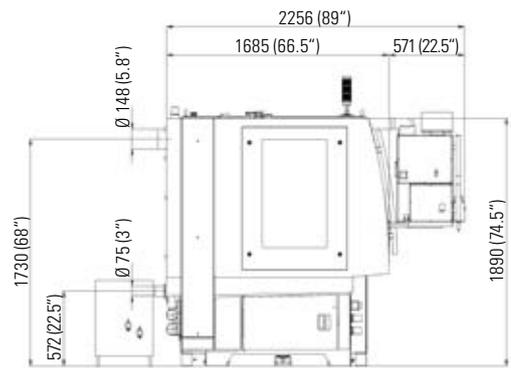
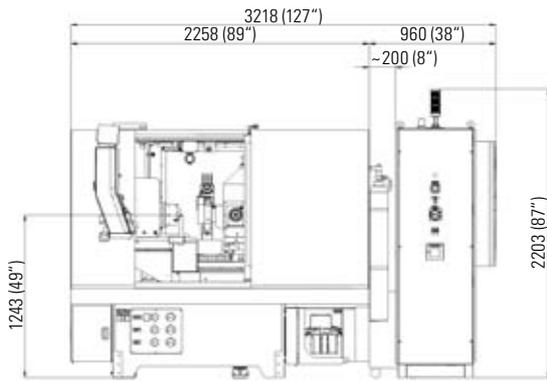
For perfect fitting accuracy and process reliability with STUDER original parts.

Renew

To give your grinding machine a new lease of life.

| Main dimensions | | |
|----------------------------------|---------------------------------|---------------------------------|
| Height of centers above table | 150 mm [220 mm] (5.9" [8.7"]) | |
| Swing diameter in front of table | 300 mm (11.8") | |
| Length of parts | max. 300 mm (11.8") | |
| Internal grinding length | max. 150 mm (5.9") | |
| External grinding length | max. 100 mm (3.9") | |
| Transverse axis X | | |
| Max. travel | 400 mm (15.7") | |
| Max. speed | 12000 mm/min. (472 ipm) | |
| Resolution | 0.0001 mm (0.000,004") | |
| Longitudinal axis Z | | |
| Max. travel | 400 mm (15.7") | |
| Max. speed | 12000 mm/min. (472 ipm) | |
| Resolution | 0.0001 mm (0.000,004") | |
| Grinding spindle support | CT930 | CT960 |
| Spindle set-up | Linear | Turret |
| Max. number of spindles | 3 | 4 |
| HF spindle | dia. 100 / 120 mm (3.9" / 4.7") | dia. 100 / 120 mm (3.9" / 4.7") |
| External grinding wheel | max. 250 mm (10") | max. 250 mm (10") |
| Swiveling range | | -5 to +275 deg |
| Repetition accuracy | | < 1" |
| Swiveling time for 180 deg | | < 3 s |
| Resolution | | 0.00005 deg |
| Workhead | | |
| Rpm range | 1 – 1 200 rpm | |
| Fitting taper DIN/ISO 702-1 | A2.4 / MK5 | |
| Bar capacity | dia. 35.5 mm (1.4") | |
| Driving power | 1.6 kW (2.2 hp) | |
| Load on spindle nose | 300 Nm (223 ft lbs) | |
| C axis, direct measuring system | 0.0001 deg | |
| Manual length adjustment | 300 mm (11.8") | |
| B axis | | |
| Swiveling range | +61 to -91 deg | |
| Repetition accuracy | < 1" | |
| Resolution | 0.00005 deg | |
| Control unit | | |
| Fanuc 31-A | | |
| Connected loads | | |
| Total connected load | 34 kVA | |
| Air pressure | 5 – 10 bar (72 – 145 psi) | |
| Total weight | 3600 kg (7920 lbs) | |

The information given is based on the technical levels of our machine at the time of this brochure going to print. We reserve the right to further develop our machines technically and make design modifications. This means that the dimensions, weights, colors, etc. of the machines supplied can differ. The diverse application possibilities of our machines depend on the technical equipment specifically requested by our customers. The equipment specifically agreed with the customer is therefore exclusively definitive for the equipping of the machines, and not any general data, information or illustrations.





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