

S33

UNIVERSAL CYLINDRICAL GRINDING MACHINE



C.O.R.E.®

 **STUDER**

The Art of Grinding.

A member of the UNITED GRINDING Group



APPLICATIONS

STUDER S33 IN USE

The CNC universal grinding machine for small budgets and high demands. From small to large workpieces, from single-part to series production, for distances between centers of 400 mm (39.4") to 1,600 mm (63"). The S33 is your flexible CNC universal cylindrical grinding machine.



S33

DIMENSIONS

- Distance between centers 400/650/1000/1600 mm (15.7"/25.6"/39.4"/63")
- Centre height 175 mm (6.9")
- Max. workpiece weight 150 kg (330 lbs)

HARDWARE

- Wheelhead versions:
 - Universal wheelhead with up to 2 external grinding spindles and 1 internal grinding spindle. Automatic swiveling with 1° Hirth serration
 - External wheelhead with grinding wheel right, 0°/15°/30°
- Frequency-controlled motor grinding spindles for external and internal grinding
- C axis for the workhead, enabling form and thread grinding
- Worktable with integrated double T-slot for dressing devices
- C.O.R.E. Panel
- Portable control unit (PCU) for setting up close to the grinding process
- Full enclosure with two sliding doors
- Granitan® S103 mineral-casting machine base

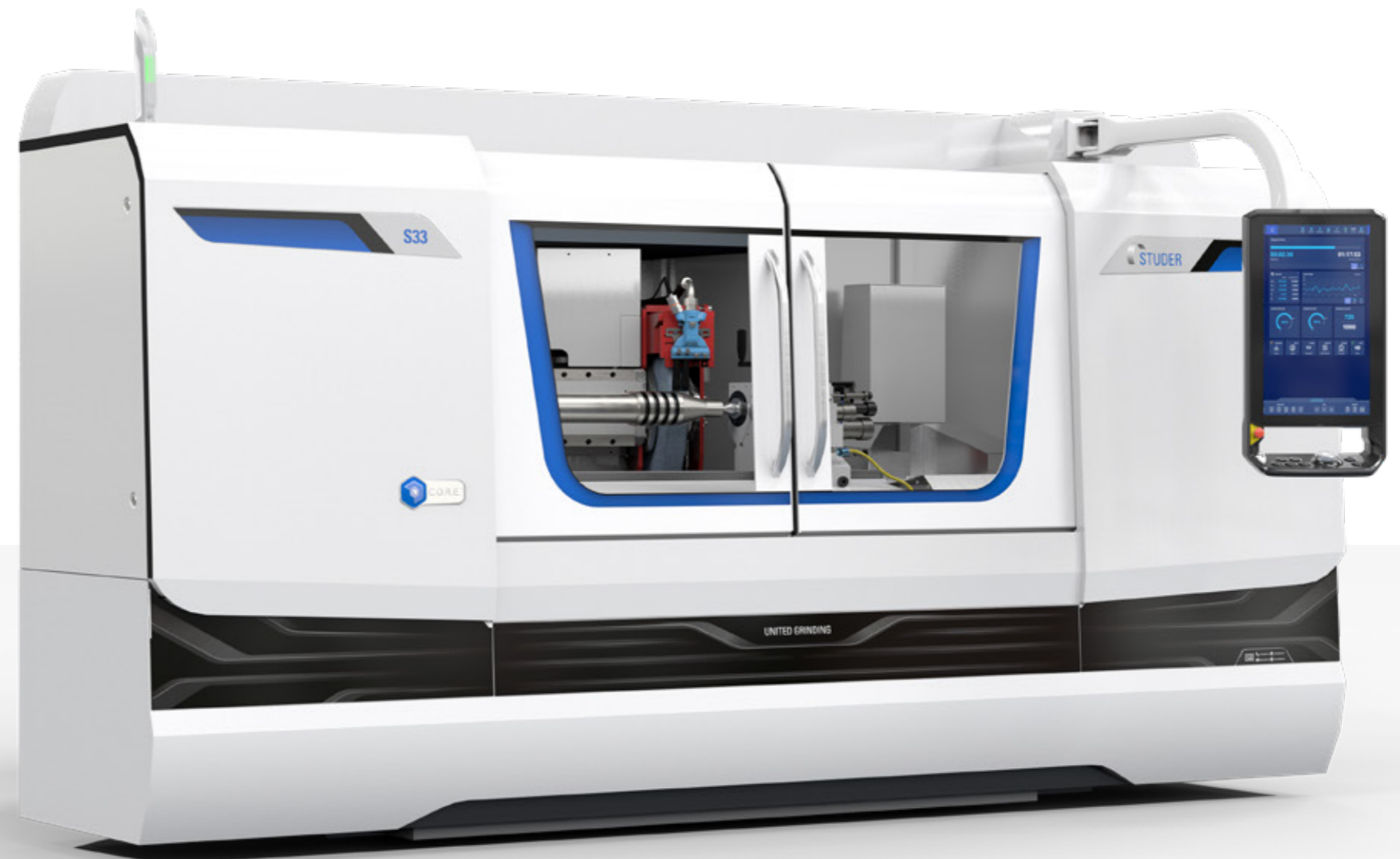
SOFTWARE

- C.O.R.E. OS operating system
- Very simple programming thanks to StuderPictogramming
- Reduced set-up and resetting times with STUDER QuickSet
- Standardized interfaces for loader and peripheral devices
- Flexibly upgradeable with integrated software modules
- StuderWIN programming software (optional) for creating grinding and dressing programs on an external PC

“The value solution for individual requirements.”

YOUR BENEFIT

- Short machining time thanks to complete machining
- Maximum precision due to perfect interplay between hardware and software
- Intuitive, user-friendly, and efficient operation
- Access to important information directly at the panel (e.g., production progress, job details etc.)
- Reduced programming effort for data exchange between C.O.R.E. machines
- Use of UNITED GRINDING Digital Solutions™ products directly at the machine
- Fast support thanks to interaction with our Customer Care team at the machine
- Environmentally friendly thanks to targeted measures to reduce energy consumption
- Ergonomic thanks to large sliding doors and three service doors



C.O.R.E. – CUSTOMER ORIENTED REVOLUTION

C.O.R.E. helps us make your production fit for the digital future.

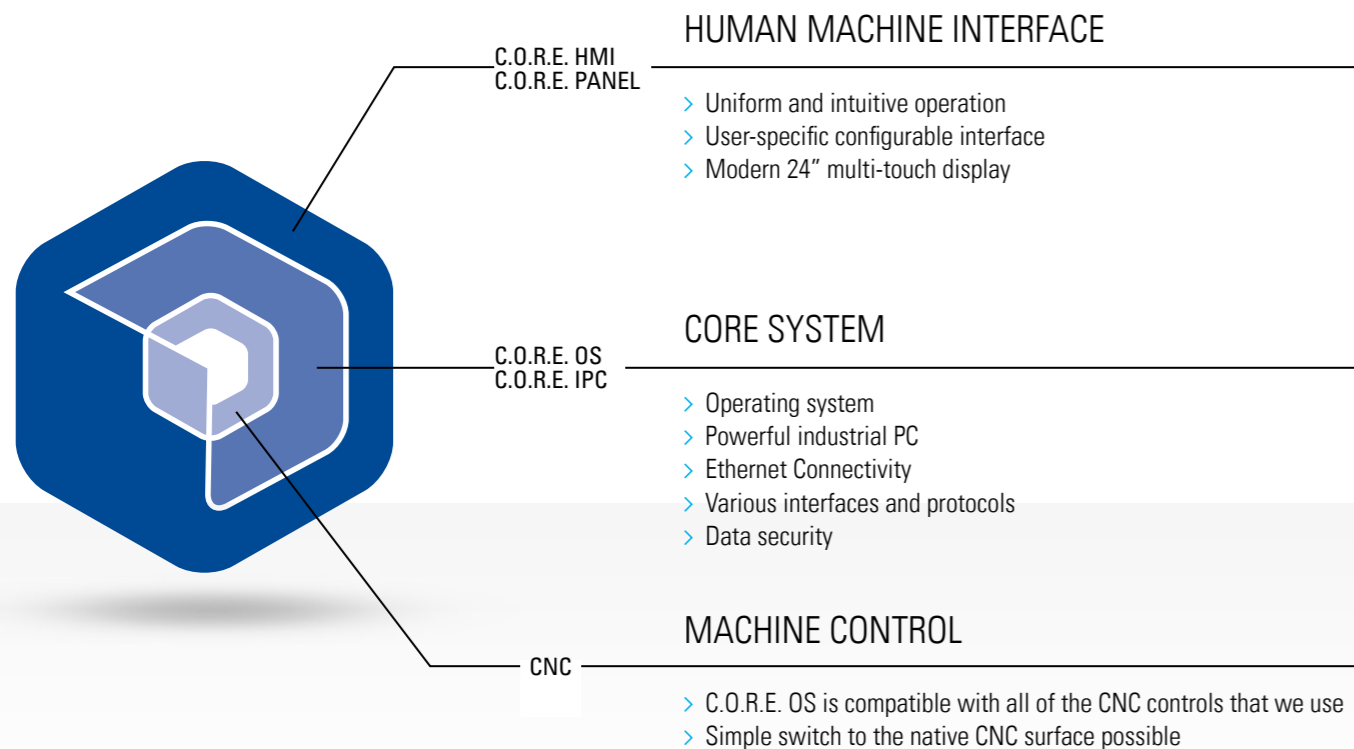
It's based on a new operating system, C.O.R.E. OS that equips the machine with intelligence.

Thanks to the uniform C.O.R.E. software architecture, exchanging data between UNITED GRINDING machines is easy. The integrated umati API can be used to communicate with third-party systems as well. It also offers access to UNITED GRINDING Digital Solutions™ products directly on the machine. C.O.R.E. not only establishes the technical foundation for this and other IoT and data applications, it also forms the basis of revolutionary yet uniform operation.

What does this mean for you?

- The user-friendly, intuitive, and uniform operation makes work easier for machine setters, machine operators, and maintenance staff
- Standardized data collection and intelligent processing of data creates transparency and supports process optimization
- The uncomplicated and consistent use of modern digital software solutions is guaranteed – directly on the machine
- The technical platform for the use of modern IoT and data applications has been established

C.O.R.E. ELEMENTS



C.O.R.E. PANEL – THE FUTURE OF OPERATION

Intuitive

Thanks to intuitive design with self-explanatory icons, navigation through the machine menu and process steps is quick and easy. Instead of buttons, the user is presented with a modern and clearly arranged multi-touch display.

User-friendly

Each user configures their own user interface individually. This is called up automatically with the RFID chip after logging in. When the user leaves the machine, the panel switches to «Dark Factory Mode.» Production progress and the machine state are also clearly visible from a

distance. And thanks to the ergonomic design, the panel can be tilted and individually adjusted easily.

Efficient

The uniform and intuitive operating philosophy reduces training time. The configurable and role-specific interface helps prevent errors and increases the efficiency and quality of programming. Information can be exchanged quickly and in real-time via the front camera and Bluetooth headset. UNITED GRINDING Digital Solutions™ products can be used directly on the panel.

INDUSTRIAL
MULTI-TOUCH DISPLAY

INTEGRATED
FRONT CAMERA

SELF-EXPLANATORY
ICONS

USER-CONFIGURABLE
DISPLAY

STANDARDIZED
FUNCTION KEYS

ERGONOMIC
OVERRIDE SWITCH

Technical Specifications

- 24" Full HD multi-touch display
- 16-position rotary override switch
- Electronic key switch (RFID)
- Integrated front camera
- Bluetooth V4.0 for headset connection
- 2x USB 3.0 ports
- Adjustable tilt



USER INTERFACE

StuderWIN

The user interface StuderWIN creates a stable programming environment and contributes to the efficient use of the machine. The possibility of fully integrating the measuring system and sensor technology for process control, contact detection and balancing systems in the operator interface enables standardized programming of the different systems. The software of an optional loading system is also integrated. The drive elements are optimally matched to the control system.

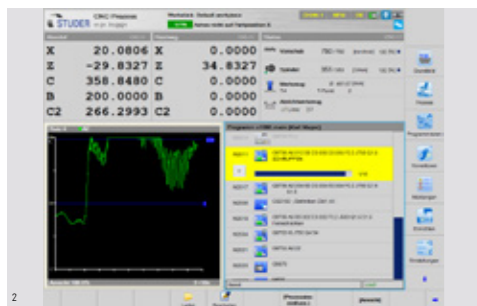
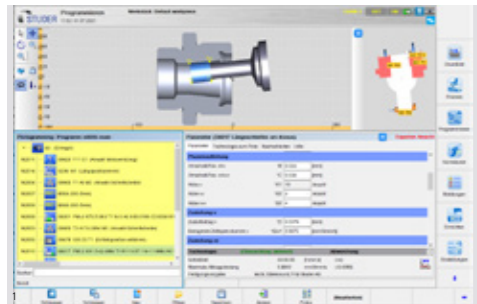
The sophisticated mechanical engineering concept of the S33 is completed by a grinding software program, developed in-house by STUDER and which is continuously being optimized in cooperation with users. This software offers:

- **StuderPictogramming:** The operator strings the individual grinding cycles together – the control unit generates the ISO code.
- **STUDER QuickSet:** The software for measuring the grinding wheel reduces changeover times by up to 90%.
- **Microfunctions:** Free programming of grinding and dressing process sequences for optimization of the grinding process.
- Integrated operating instructions assist safe machine operation.

- The software options for the grinding technology calculations, optimized dressing as well as the Contour, Thread-, and Formgrinding cycles increase the functionality of the machine.

StuderTechnology – More than 110 years of know-how

StuderTechnology Integrated drastically simplifies the operation of cylindrical grinding machines. Component quality, machining time, energy efficiency – in other words: all important production factors – bring enormous benefits. What makes the software unique? Its history! Over 110 years of grinding experience have gone into it. It is a combination of grinding practice, empiricism, and years of expert knowledge. The program contains data from countless grinding tests, where the best processing strategy was determined case-by-case for a wide range of components. StuderTechnology Integrated reverts specifically to these values depending on the case. The integrated grinding knowledge can be further optimized as required by the individual grinding experts and stored as a customer-specific production specification. This also enables operators with little experience to benefit from STUDER expertise.



Integrated Tools

The functionality of STUDER grinding machines can be significantly increased through numerous enhancement packages. STUDER offers the required software packages in the form of integrated tools.

- **StuderDress Integrated** reduces the profiling time of a grinding wheel by up to 80%.
- **StuderThread Integrated**, together with the STUDER thread grinding cycles, offers the full functionality that is otherwise only possible with a special thread grinding machine.
- **StuderContourBasic Integrated** is ideal for traversing geometry contours with the grinding wheel in an easy, quick, and safe manner.
- **StuderContourPRO Integrated** generates the complete grinding program for complex external geometries, typically for peel grinding from solid material.
- **StuderForm Integrated** is the universal out-of-round grinding software for machining curves and polygons for standard applications in low volume production.

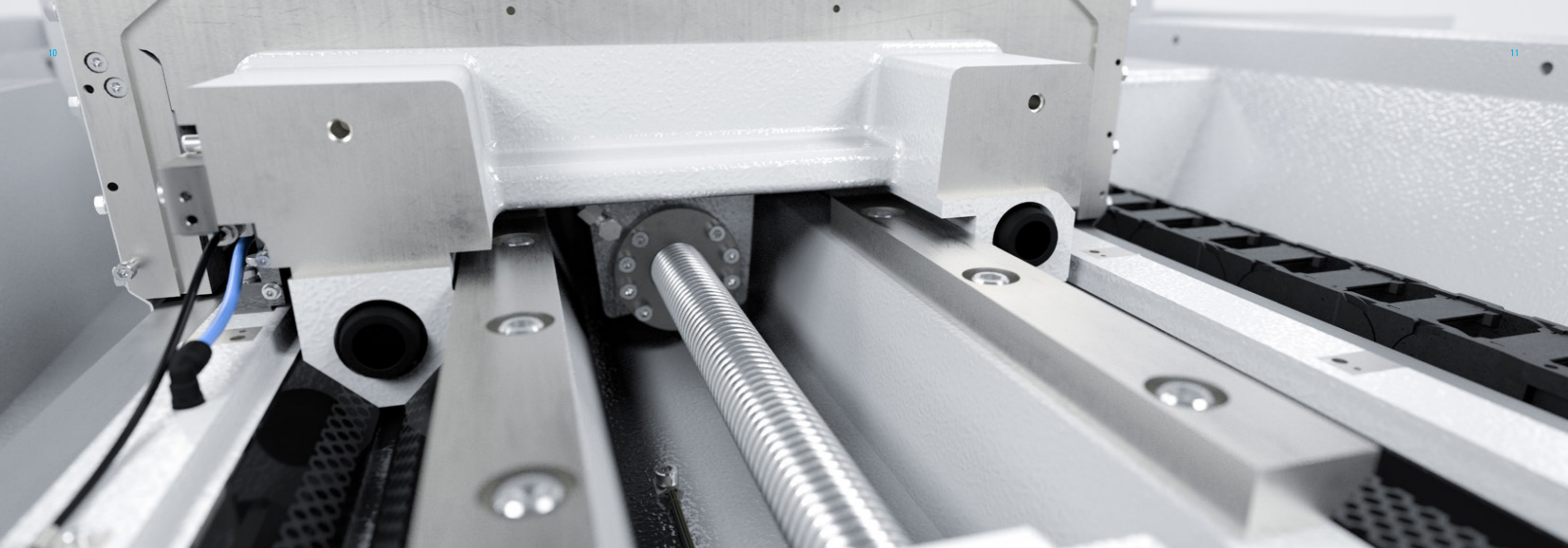
LaserControl™

Non-contact measurement directly on the machine when machining precision workpieces. Not only can “uninterrupted” workpiece diameters of various sizes be measured with the laser measuring device, but also precise control measurements without contact on “interrupted” diameters, such as shafts with keyways or longitudinal grooves, tool cutting edges, guide rails, and gear teeth diameters. The STUDER software logs the measured values after each measuring cycle.

TouchControl™

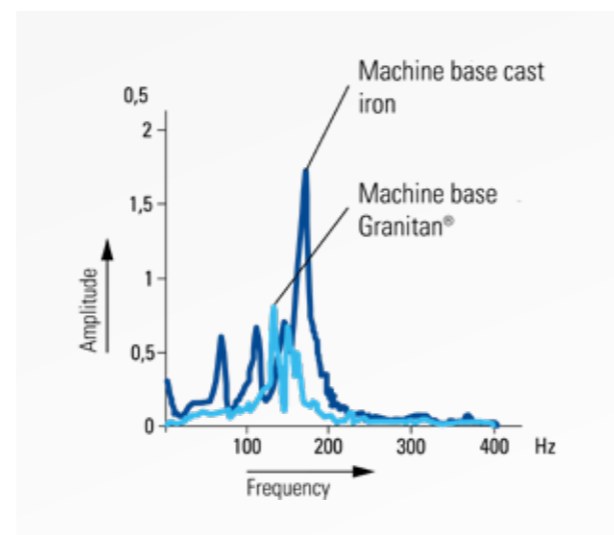
Workpieces are inspected directly on the machine, the results are logged and corrections are transferred to the control system.

- Flexible diameter and length control measurement by means of a touch probe
- Seat-specific and tool-specific calculation of dimensional deviations
- Logging of post-process control data
- Programmable cycle for automatic calibration of the touch probe to the reference diameter or length



GRANITAN® S103 MINERAL CASTING MACHINE BASE

The material structure developed by STUDER, which has proved its worth over many years based on the company's formula, is produced in a plant using the most modern industrial techniques. The excellent damping properties of the machine base ensure outstanding surface quality in the ground workpieces. The life of the grinding wheel increases, leading to reduced non-productive times. Temporary temperature fluctuations are extensively compensated by the favorable thermal behavior of Granitan®, resulting in a high level of dimensional accuracy throughout the day. The StuderGuide® guide system for the longitudinal and cross slides is molded directly into the machine base and finished with a wear-resistant Granitan® S200 surfacing material. The guideways offer the highest possible accuracy through the entire speed range with high load capacity and dampening levels. Thanks to the robust and maintenance-free design, these excellent guideway properties are hardly subject to wear.



- Vibration-damping
- Thermally stable
- Non-wearing

STUDERGUIDE® IN LONGITUDINAL AND CROSS SLIDES

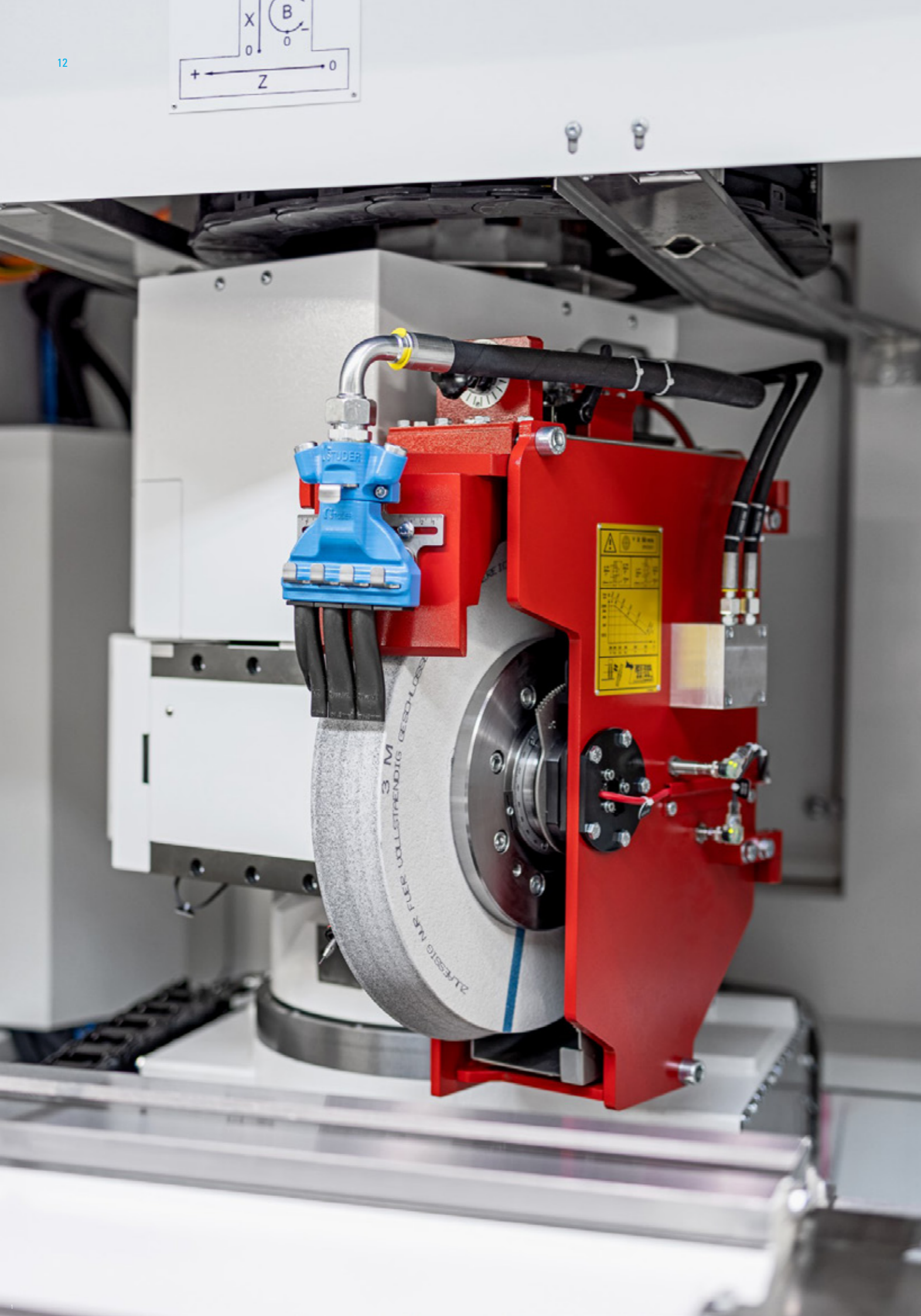
The longitudinal and cross slides are manufactured from high-quality gray cast iron and have highly precise, ground V and flat guideways. The distance between the guideways is an optimal benefit for the machine's overall rigidity. The slides rest completely on the guideways of the machine bed through the entire speed range. This is the cornerstone for the excellent straightness of e.g. <0.003 mm (0.000,120") over 1,000 mm (39.4"). The top of the longitudinal slide has a surface that is ground over its entire length and is the support for the workhead, the tailstock, as well as accessories and devices. A setup scale, recessed in the table, makes it easy to set up and reset the units on the table. An additional double T-slot enables the optimal utilization of dressing units. The StuderGuide® guide system extends the advantages of hydrostatic systems and guideways with a patented surface structure. A huge advantage of StuderGuide® over hydrostatic guideways is the damping component in the direction of movement.

The slides are advanced by ball screws connected to a three-phase servomotor via torsion-resistant, bellows-type couplings.

A swiveling table with a swivel angle of +8.5° and fine adjustment is optionally available for the 650 mm (25.6") and 1,000 mm (39.4") distances between centers.



- High geometrical traverse precision
- Auxiliary scale for setup and resetting
- Effective protection of guideways

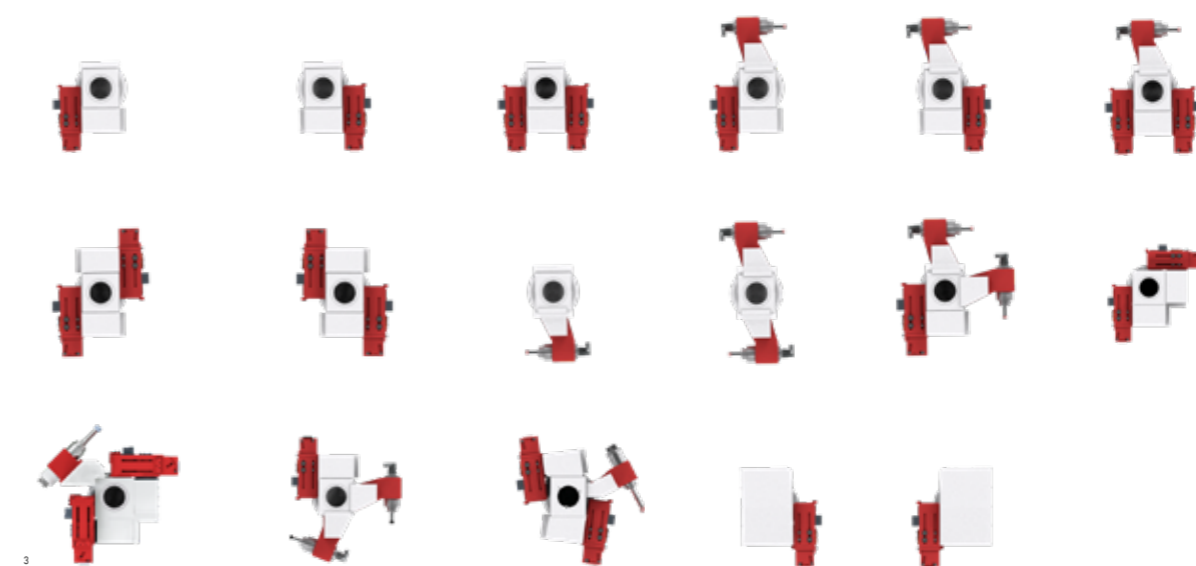
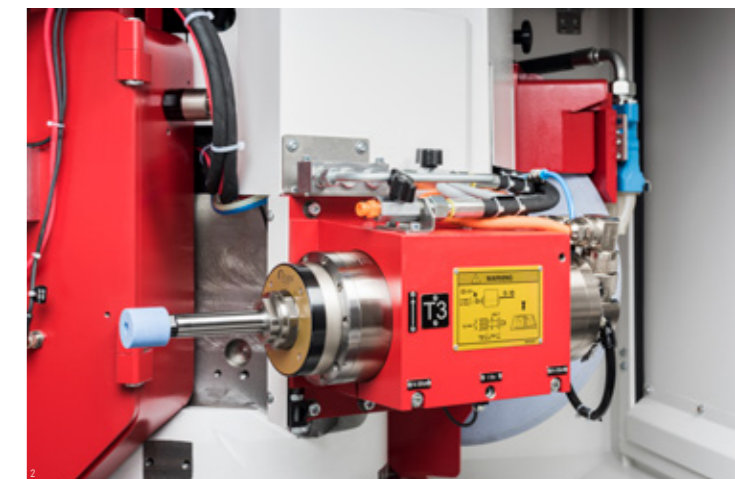


WHEELHEAD

Reduce set-up and resetting costs? It is possible with this machine, especially in single-part or small-batch production, by the wheelhead with several grinding wheels and rapid setup with QuickSet. Boost efficiency with complete machining in a single clamping. The S33 handles internal, external, and face grinding with ease.

The swiveling wheelhead is equipped with water-cooled, roller-based, and maintenance-free motor spindles with infinitely variable speed and the latest generation of contact sensors. The shaft ends hold external wheelheads with a diameter of 500 mm (20") and a width of 63 (80 F5)/ 2.5" (3.2" F5). For internal grinding, it is equipped with powerful high-frequency spindles with 120 mm external diameter. It's your choice: configure the wheelhead to match your specific needs.

- Complete machining
- Motor spindles
- High cutting speed of up to 63 m/s (12,400 sfpm)
- 3 tools (2x external, 1x internal or 1x external, 2x internal)



- 1 Wheelhead with SmartJet® nozzle
- 2 Internal grinding attachment
- 3 Wheelheads variants

WORKHEAD

All requirements are covered by the wide range of workheads. They are all solidly built to the superior STUDER quality and achieve roundness accuracy of 0.0004 mm (0.000,016") (optionally even 0.0002 mm (0.000,008") with live spindle grinding. The simple cylindricity correction contributes towards perfect live spindle grinding results. Customer-specific workpiece clamping and driving systems can be easily used.

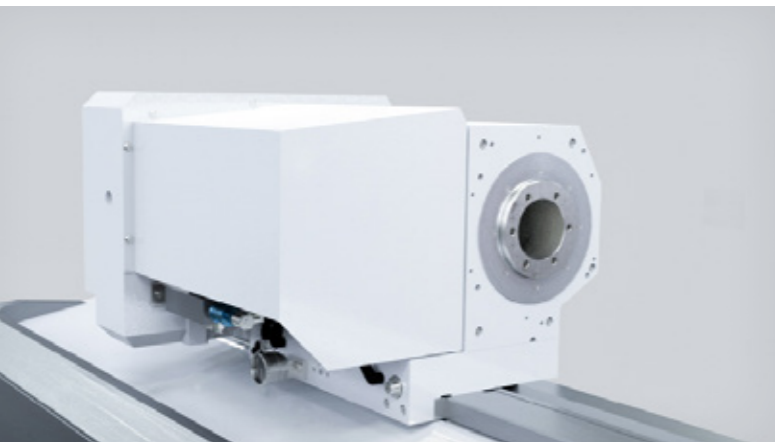
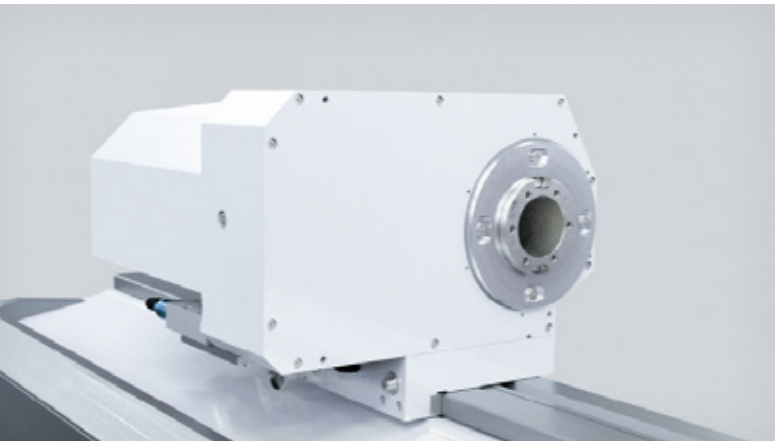
- High roundness accuracy
- Low-maintenance
- Air liftoff

Universal workhead

For external grinding with fixed centers or for live spindle grinding. The spindle is blocked for grinding between fixed centers. C axis applications are possible with the indirect measuring system.

Chuck workhead

For live spindle grinding or external grinding with revolving center. Thanks to the design, with a drive belt at the rear, high loads are possible with live spindle grinding. For high-precision C axis applications, direct measuring system can be installed on the spindle.

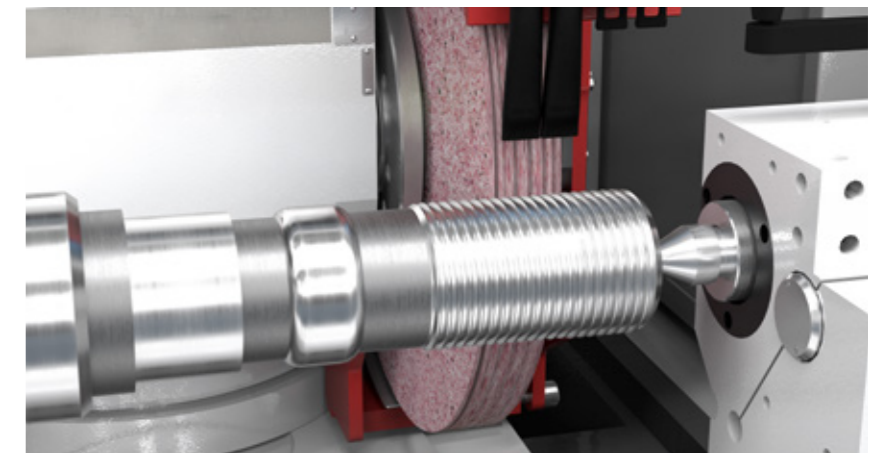


C AXIS FOR FORM AND THREAD GRINDING

Complete machining also entails form and thread grinding operations to an ever-increasing extent. These processes are made possible by the position- and speed-controlled C axis. The optional C axis is also suitable for thread grinding. For maximum form accuracy, a direct measuring system is mounted on the workhead spindle (high accuracy C axis). With their high dynamic rigidity, the axis drives absorb the acceleration and grinding forces without any problem.

Form and Thread Grinding

The S33 offers axis-parallel grinding of fastening threads up to threads of gauge quality. Polygons, excenters, control cams, etc. can be manufactured cost-effectively and to the highest precision.



TAILSTOCK

The generously dimensioned barrel, designed for the use of morse 3 or 4 taper centers, glides in the tailstock housing. The center pressure can be adjusted with the delicate precision required for grinding high-precision workpieces. The tailstock can be equipped with a hydraulically actuated barrel retraction for workpiece change-over. The fine adjustment enables cylindricity corrections in the range below

1µm (0.000,040") when grinding between centers. An air cushion lift-off facilitates simple movement during setup and resetting. Coolant flows through the tailstock and the barrel and diamond holder are flooded to guarantee the highest standard of thermal stability.



Tailstock
Clamping takes place with the help of a spring. This tailstock is suitable for workpiece weights up to 150 kg (330 lbs).



Synchronous Tailstock
Use of the synchronous tailstock is particularly cost-effective when manufacturing part families, grinding a workpiece over its entire length, or if the use of a conventional workpiece driver is not possible. Workpiece weight up to 80 kg (176 lbs).

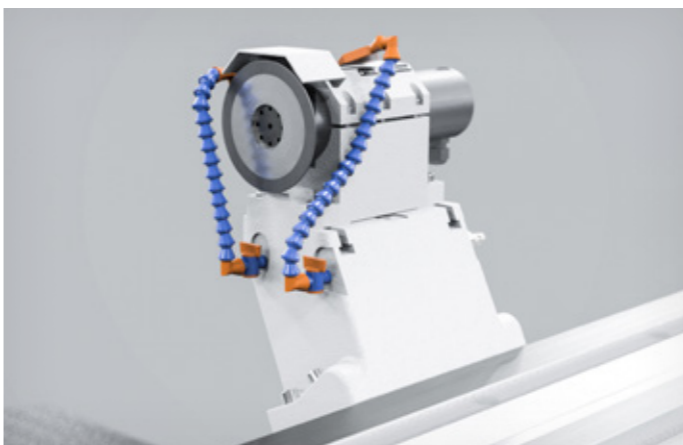
- Cylindricity correction
- Programmable clamping force
- Thermal stabilization by flooding

DRESSING

An easy-cutting grinding wheel is essential for cost-effective and high-quality grinding. STUDER offers a large selection of dressing units to adapt the dressing process flexibly and optimally to the properties specific to the workpiece, tool, or materials. The grinding wheel profile and dressing parameters are easily defined via macros. Another STUDER speciality is the grinding wheel reference points (T-numbers). This

enables programming with nominal dimensions, considerably simplifying the creation of grinding programs.

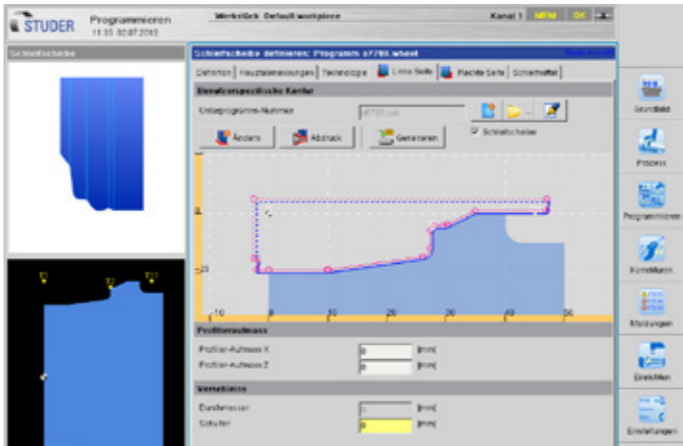
A software package is available to fine tune the dressing process and includes additional dressing functions.



Rotative Dressing
Rotating dressing tools are particularly suitable for dressing CBN grinding wheels.



Diamond Holder Behind Tailstock
The clamping surface with double T-slots is suitable for different dressing tools.

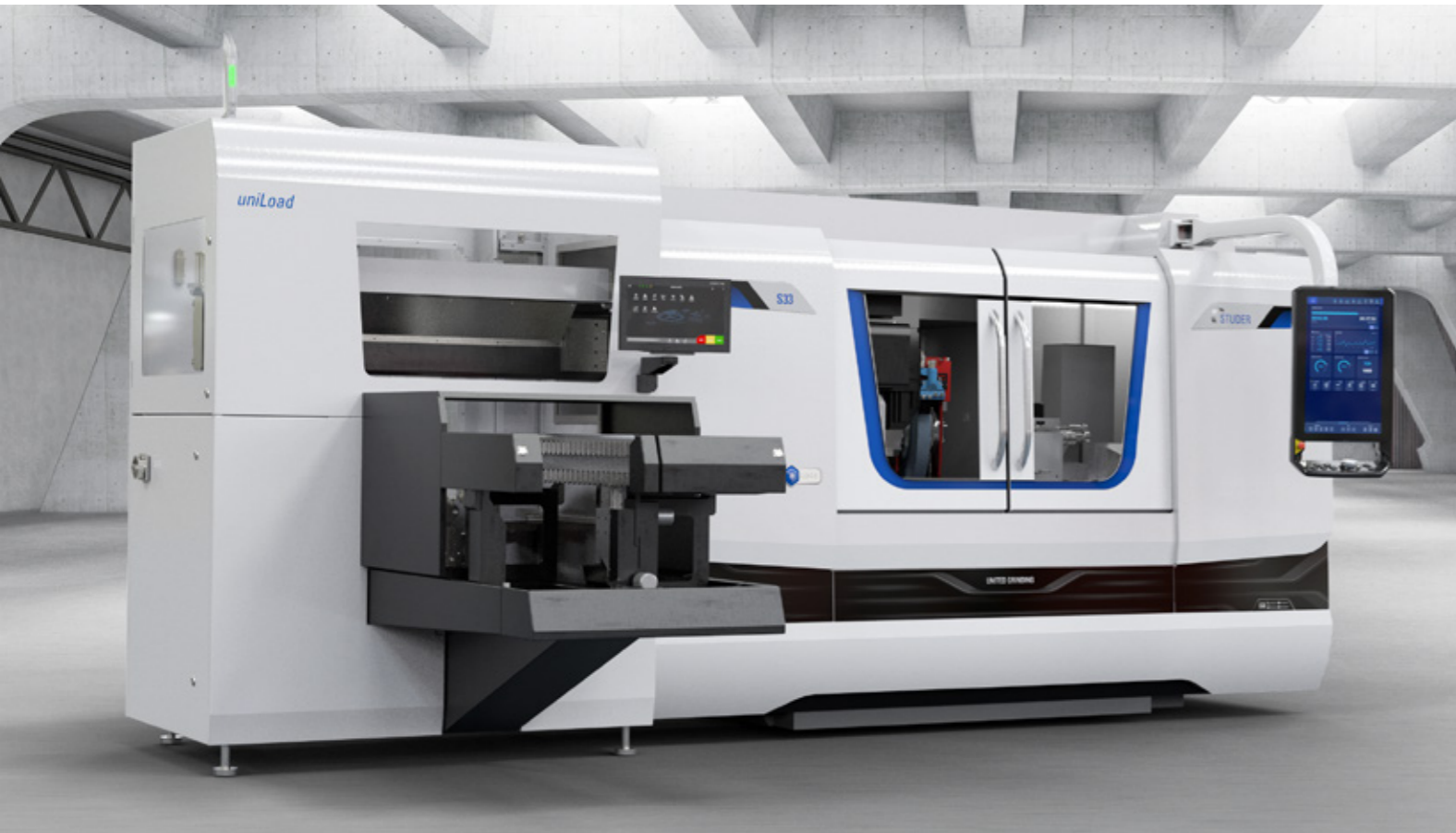


Dialog Screen Grinding Wheel Contour
Easy creation of special grinding wheel contours from the workpiece geometry.

AUTOMATION

Several loading systems are available for the S33. From the cost-effective *easyLoad*, which is operated via the machine control, to the *uniLoad* with its own control unit, through to special solutions that can be precisely adapted to the machine application and machining processes thanks to their modular design. The appropriate peripherals ensure seamless integration into the production process. Using a data matrix code reader or a laser labeling machine, each workpiece is assigned its own identity; process data can be traced at all times. The handling systems communicate with the machine via the standardized

loader interface and enable even complex handling tasks to be solved. Project-specific components such as pre-and post-process measurement stations, de-burring and blow-off stations, calibration part repositories, etc., can be implemented in the system. Comprehensive quality control is possible during the grinding process. This entails: in-process, post-process, recording, evaluation, and correction. In grinding, especially in match grinding, such quality assurance is crucial.



CUSTOMER CARE – WE ARE HERE FOR YOU

Our products are designed to meet customer demands for as long as possible, to operate efficiently, reliably, and be available at any time.

From «start up» to «retrofit» – our Customer Care is there for you throughout the working life of your machine. That's why over 200 expert service contacts working around the world in 10 different languages are available locally.

- We provide fast, uncomplicated support.
- We help to increase your productivity.
- We work professionally, reliably, and transparently.
- We provide professional solutions to your problems.

UNITED GRINDING DIGITAL SOLUTIONS™

We develop solutions to support you in simplifying processes, boosting your machines' efficiency and increasing overall productivity under the «UNITED GRINDING Digital Solutions™» brand.

We are continuously expanding our solution portfolio in the key areas of CONNECTIVITY, USABILITY, MONITORING, and PRODUCTIVITY to make your work in the digital age significantly easier.

Find out more about UNITED GRINDING Digital Solutions™ services on our website in the Customer Care section.



Start up
Commissioning
Warranty extension



Qualification
Training
Product support



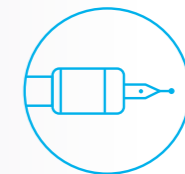
Prevention
Maintenance
Inspection



Service
Customer service
Customer consultation
HelpLine



Digital solutions
Remote Service
Service monitor
Production Monitor



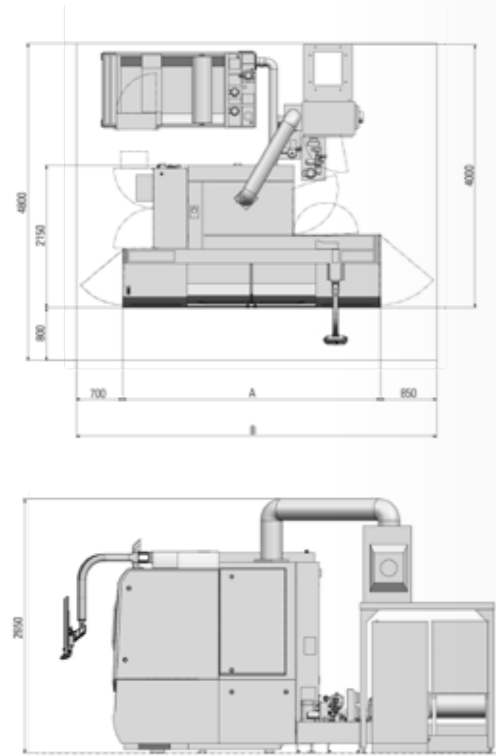
Material
Spare parts
Replacement parts
Accessories



Rebuild
Machine overhaul
Assembly overhaul



Retrofit
Modifications
Retrofits



	A	B
Center distance 400 mm (15.7")	2200 mm (86.6")	4500 mm (177")
Center distance 650 mm (25.6")	3200 mm (126")	5200 mm (205")
Center distance 1000 mm (39.4")	3900 mm (153.5")	5900 mm (232")
Center distance 1600 mm (63")	5100 mm (201")	7100 mm (280")

TOTAL WEIGHT

Center distance 400 (15.7")	8500 kg (18 700 lbs)
Center distance 650 mm (25.6")	9500 kg (20 900 lbs)
Center distance 1000 mm (39.4")	10 500 kg (23 150 lbs)
Center distance 1600 mm (63")	12 000 kg (26 500 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, colours, etc. of the machines supplied candiffer. 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.

TECHNICAL DATA

MAIN DIMENSIONS

Distance between centers	400 / 650 / 1000 / 1600 mm (15.7"/25.6"/39.4"/63")
Centre height:	175 mm (6.9")
Max. workpiece weight between centers	80 / 150 kg (176 lbs / 330 lbs)

CROSS SLIDE: X AXIS

Max. travel	370 mm (14.6")
Speed	0,001 – 15 000 mm / min (0.000,04 – 590 ipm)
Resolution	0,00001 mm (0.000,000,4")

LONGITUDINAL SLIDE: Z AXIS

Max. travel	500 / 800 / 1150 / 1750 mm (19.7"/31.5"/45.3"/68.9")
Speed	0,001 – 20 000 mm / min (0.000,04 – 787 ipm)
Resolution	0.00001 mm (0.000,000,4")

TAILSTOCK

Fitting taper	MT3/MT4	MT4
Travel of barrel	35 mm (1.37")	60 mm (2.36")
Diameter of barrel	50 mm (1.97")	60 mm (2.36")
Fine adjustment for cylindricity corrections	±40 µm (0.0016")	±80 µm (0.0032")

EXTRA-FINE GRINDING TAILSTOCK

Fitting taper	MT3
Barrel stroke	35 mm (1.37")
Diameter of barrel	50 mm (1.97")
Automatic fine adjustment for cylindricity corrections	±40 µm (0.0016")

SYNCHRONOUS TAILSTOCK

Fitting taper	MT4
Travel of barrel	120 mm (4.72")
spindle nose	Ø 70 mm
Workpiece weight between centers	80 kg (176 lbs)
Fine adjustment for cylindricity corrections	±80 µm (0.0032")

GUARANTEED WORKING PRECISION

Straightness of the surface line	
Gauge length 400 mm	0,0020 mm (0.000,08")
Gauge length 650 mm (25.6")	0,0025 mm (0.000,10")
Gauge length 1 000 mm (39.4")	0,0030 mm (0.000,12")
Gauge length 1600 mm	0,0040 mm (0.000,16")

WHEELHEAD

	Type: external	Type: universal
Swiveling range	0° / 15° / 30°	-30° to +225°
Resolution		1 deg Hirth
Fitting taper	Ø 73 mm (2.87")	Ø 73 mm (2.87")
Drive power	max. 11.5 kW (15.4 hp)	max. 12.5 kW (16.75 hp)
Grinding wheel, Ø x width x bore	500 × 63 (80F5) × 203 mm (20" × 2.5" (3.15"F5) × 8")	500 × 63 (80F5) × 203 mm (20" × 2.5" (3.15"F5) × 8")
Circumferential speed	up to 50 m / s (9840 sfpm)	up to 50 m/s (option: 63 m/s (12,400 sfpm))
Internal grinding attachment for high frequency spindles		
Mounting hole		dia. 120 mm (4.73")
Speeds		24 000 – 120 000 rpm

UNIVERSAL WORKHEAD

Speed range	1 – 1,500 rpm	1 – 1,500 rpm
Fitting taper	MT4 / dia. 70 mm (2.7")	MT5
Spindle bore (feedthrough)	dia. 26 mm (1.02")	dia. 30 mm (1.18")
Driving power	3 kW (4 hp)	3 kW (4 hp)
Load during live grinding	70 Nm (52 ft lbs)	70 Nm (52 ft lbs)
Roundness accuracy during live spindle grinding	0.0004 mm (option: 0.0002 mm)	0.0004 mm (option: 0.0002 mm)

Speed range	1 - 1,000 rpm	1 - 1,000 rpm
Fitting taper	MT5 / dia. 110 mm (4.3")	ISO50 / dia. 110 mm (4.3")
Spindle bore (feedthrough)	Ø 38 mm (1.5")	Ø 50 mm (1.97")
Driving power	4 kW (5.4 hp)	4 kW (5.4 hp)
Load during live grinding	180 Nm (134 ft lbs)	180 Nm (134 ft lbs)
Roundness accuracy during live spindle grinding	0,0004 mm (0.000,016")	0,0004 mm (0.000,016")
C axis, indirect measuring system	0,0002°	0,0002°

CHUCK WORKHEAD

Speed range	1 – 1,500 rpm	1 - 1,000 rpm	1 - 1,000 rpm
Fitting taper	MT4 / dia. 70 mm (2.7")	MT5 / dia. 110 mm (4.3")	ISO50 / dia. 110 mm (4.3")
Spindle bore (feedthrough)	Ø 26 mm (1.02")	Ø 38 mm (1.5")	Ø. 50 mm (1.97")
Driving power	3 kW (4 hp)	4 kW (5.4 hp)	4 kW (5.4 hp)
Load during live grinding	100 Nm (74 ft lbs)	250 Nm (186 ft lbs)	250 Nm (186 ft lbs)
Roundness accuracy during live spindle grinding	0.0004 mm (option: 0.0002 mm)	0.0004 mm (option: 0.0002 mm)	0.0004 mm (option: 0.0002 mm)

Option

C axis standard, indirect measuring system	0,0002°	0,0002°	0,0002°
C axis high-precision, direct measuring system	0,0001°	0,0001°	0,0001°

CONTROL UNIT

Fanuc Oi –TF

CONNECTED LOAD

Total connected load	26 kVA
Air pressure	5,5-7 bar (80-102 psi)

FRITZ STUDER AG

The name STUDER stands for more than 110 years of experience in the development and production of precision cylindrical grinding machines. "The Art of Grinding." is our passion, highest precision is our aim and top Swiss quality is our benchmark.

Our product line includes both standard machines, as well as complex system solutions in high-precision cylindrical grinding for machining small and medium-sized workpieces. In addition we offer software, system integration and a wide range of services. As well as receiving a complete tailor-made solution, the customer also benefits from over 110 years of know-how in relation to the grinding process.

Our customers include companies from the machine tool industry, automotive engineering, tool and die makers, the aerospace industry, pneumatics/hydraulics, electronics/electrical engineering, medical technology, the watch industry, and job shops. They value maximum precision, safety, productivity, and longevity. As one of the market and technology leaders in universal, external, internal cylindrical, and contour grinding, with 25,000 systems delivered, STUDER has stood for precision, quality, and durability for decades. STUDER's products and services include hardware, software, and a wide range of services in the pre-sales and after-sales sector.

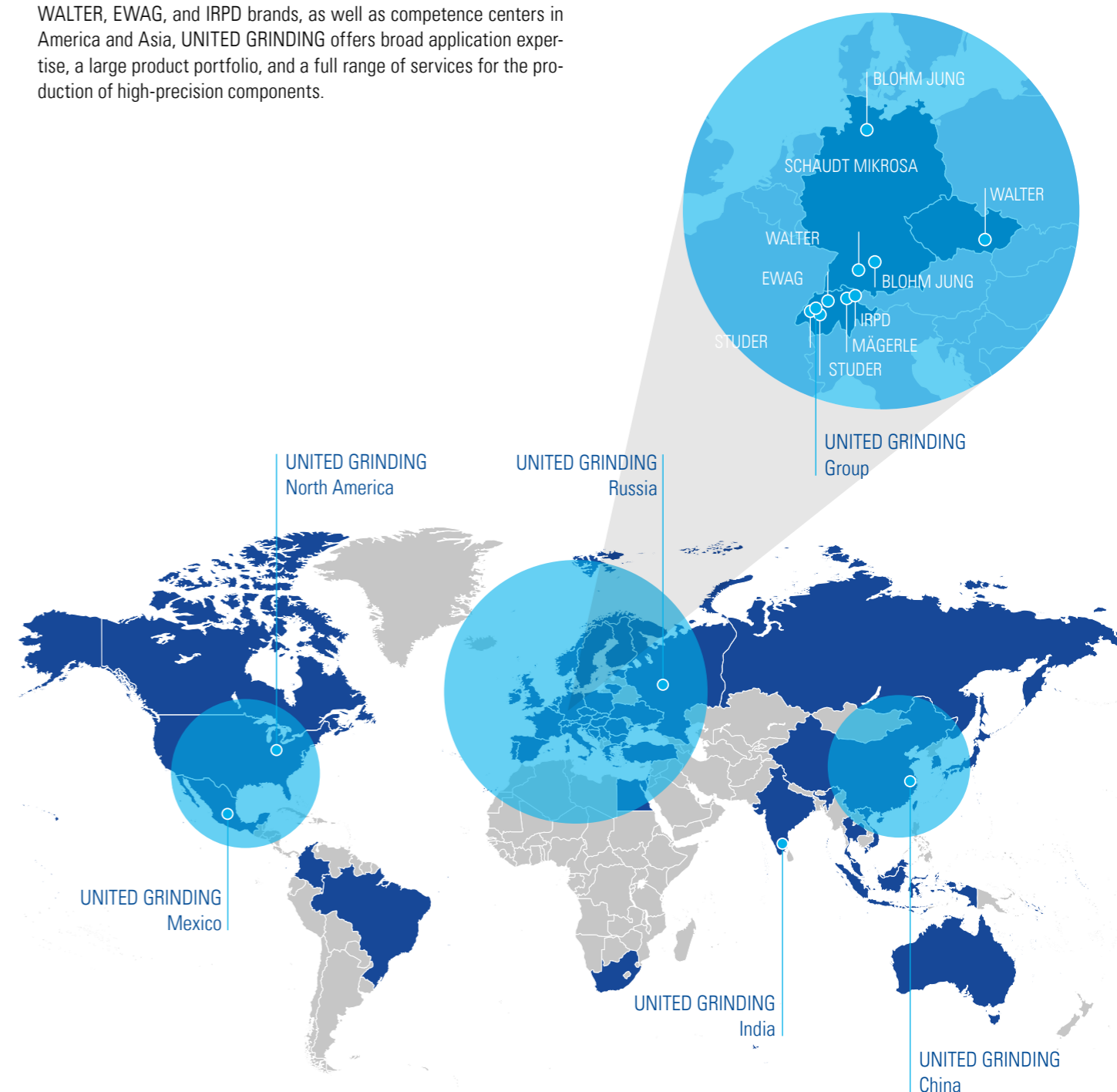


UNITED GRINDING GROUP

UNITED GRINDING Group is one of the world's leading manufacturers of grinding, eroding, laser, and measuring machines as well as machine tools for additive manufacturing. With roughly 2,500 employees at more than 20 manufacturing, service, and sales locations, the Group has an effective and customer-centric organization.

Through its MÄGERLE, BLOHM, JUNG, STUDER, SCHAUDT, MIKROSA, WALTER, EWAG, and IRPD brands, as well as competence centers in America and Asia, UNITED GRINDING offers broad application expertise, a large product portfolio, and a full range of services for the production of high-precision components.

"We want to make our customers even more successful"





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ISO 9001
VDA6.4
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