

S33

The reasonably priced
for individual requirements.



Key data

The S33 is a CNC universal cylindrical grinding machine for the individual and batch production of medium-sized workpieces.

It has distances between centres of 650/1000 mm and a centre height of 175 mm.

It can machine workpieces with a maximum weight of 80/120 kg.

GLOBAL
TECHNOLOGY LEADER
PERFECTION
CUSTOMER FOCUS
EFFICIENCY
SAFETY
SOPHISTICATED PROCESSES
PRECISION

The Art of Grinding.

TECHNOLOGY LEADER
EFFICIENCY
PERFECTION
CUSTOMER FOCUS
PRECISION
GLOBAL
SOPHISTICATED PROCESSES
SAFETY

Fritz Studer AG

The name STUDER stands for more than 100 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 our 100 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 order production. They value maximum precision, safety, productivity and longevity. 24 000 manufactured and delivered systems make us the market leader and are clear evidence of our technological leadership in universal, external, internal and noncircular grinding. Around 800 employees, including 75 apprentices, make it their goal every day to ensure that «The Art of Grinding.» will continue to be closely linked to the name STUDER in the future.

S33

If you don't know today what you'll be grinding tomorrow, then the S33 will impress you with its universality and flexibility: it can be retooled from grinding between centres to live spindle grinding in the record time of under 2 minutes. You can grind even complex workpieces in a single clamping, as well as utilizing the distance between centres with each grinding wheel. This is made possible by the new wheelhead with two motor spindles.

Characteristics

Dimensions

- Distance between centres 650 / 1 000 mm (25.6" / 39.4")
- Centre height 175 mm (6.9")
- Max. workpiece weight 80 / 120 kg (176 / 264 lbs)

Hardware

- Optional wheelhead:
 - Turret wheelhead with two motor spindles (right / right) and an internal grinding attachment with manual swivel 2.5 deg Hirth or automatic swivel 1 deg Hirth.
 - External wheelhead with grinding wheel on the right, can be swivelled on 0 deg and 30 deg end stops.
- External and internal grinding possible in one setup
- C axis for the workhead enabling form and thread grinding
- Granitan® S103 mineral-casting machine base



Software

- Easy programming with StuderWIN on Fanuc 0i-TD with integrated PC
- StuderGRIND programming software for producing grinding and dressing programs on a PC
- Reduced setup and resetting times with STUDER Quick-Set
- Standardized interfaces for peripheral devices



Customer value

- Utilize the max. grinding length with both wheels
- Motor spindle incl. frequency convertor
- Constant cutting speed is included in the standard package
- Two grinding wheels dia. 500 mm
- High-frequency internal grinding spindle

The CNC universal grinding machine for small budgets and high demands.

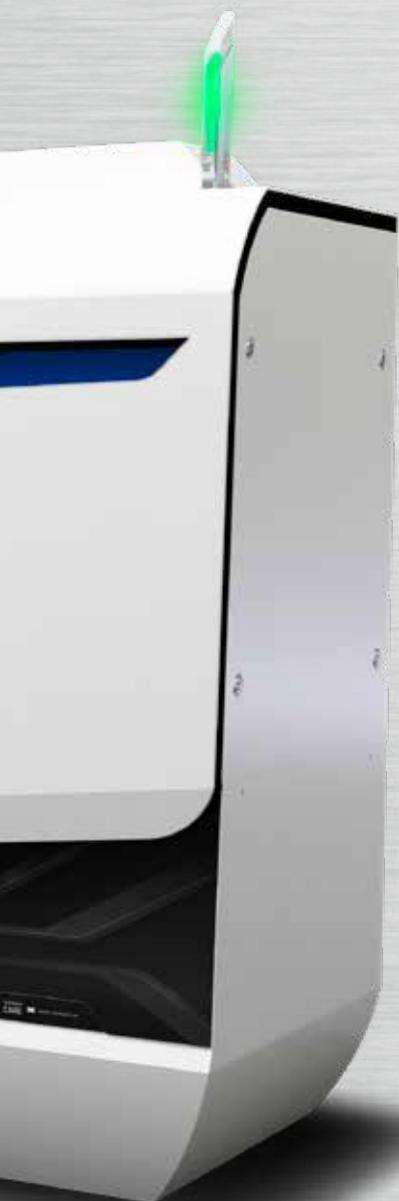
The S33 CNC universal cylindrical grinding machine – designed for grinding medium-sized workpieces in individual and series production – is manufactured with distances between centres of 650 mm (25.6") and 1 000 mm (39.4").

The solid Granitan® S103 machine base forms the basis for a cylindrical grinding machine that is equipped with high quality components, thus guaranteeing maximum precision, performance and reliability over many years. The choice of partial or complete enclosure provides an optimum insight into the grinding process.

The practical STUDER grinding software with its proven StuderPictogramming allows even less experienced users to quickly optimize the potential of this machine. The StuderGRIND software is also available; this enables efficient programming of special applications, such as form and thread grinding. The systematic development, production, assembly and testing of STUDER products are carried out in a process-oriented manner and in strict compliance with the VDA 6.4 and ISO 9001 directives.

Changeover in two minutes

Changing over from grinding between centres to live spindle grinding is particularly easy on the S33. Only a few movements are needed to withdraw the tailstock to its «park position» and free up the space required for internal grinding. Reference points from grinding wheels to dressing tool and workpiece can be registered very quickly with the help of STUDER Quick-Set, the softwarecontrolled set-up device from STUDER. The new grinding cycle can then be started.



Granitan[®] S103 mineral-casting machine base

1



- Vibration-damping
- Thermal stability
- Non-wearing

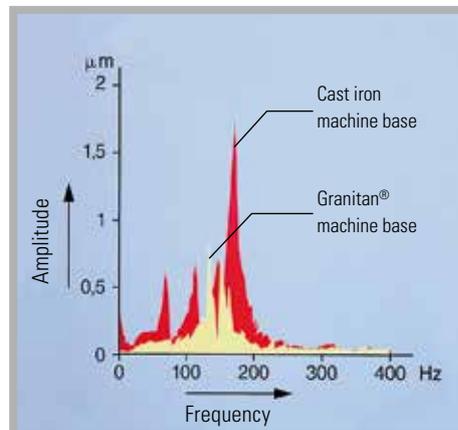
The material structure developed by STUDER and which has proved its superb efficiency over many years is produced in the company's own plant using the most modern industrial techniques.

- The excellent dampening proprieties of the machine base ensures outstanding surfacequality of the ground workpieces. The service life of the grinding wheel is also increased, leading to reduced downtimes.
- Temporary temperature fluctuations are extensively compensated for by the favorable thermal behavior of Granitan[®], resulting in high dimensional accuracy at all times.
- The V and flat guideways for the longitudinal and cross slides are moulded directly into the machine base and are provided with a nonabrasive Granitan[®] S200 slideway coating. The patented knobbed structure of the guideways largely eliminates the slip-stick effect or floating of the slides observed on conventional guideways. 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 characteristics are more or less completely retained.

2



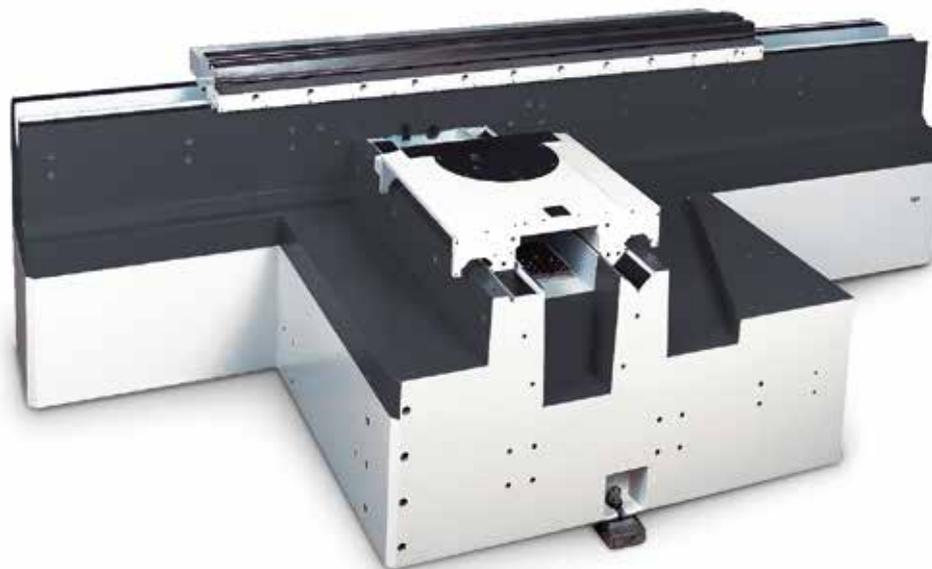
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- 1 Machine bed with longitudinal and cross guideways
- 2 Guideways with patented surface structure
- 3 Vibration behavior of gray cast iron and Granitan[®] S103

Longitudinal and cross slides

1



- High-accuracy axis movements
- Auxiliary scale for setup and resetting
- Effective covering of the guideways

2



The longitudinal and cross slides are manufactured from high-quality gray cast iron and have highly precise, ground V and flat guideways, with the distance between the guideways optimally suited to the machine's overall rigidity. The slides rest completely on the guideways of the machine bed through the entire speed range. This provides the cornerstone for the excellent inherent grinding straightness of 0.0025 mm (0.000,010") over 650 mm (25.6") measured length. The slides are advanced by 40 mm (1.57") diameter circulating ball screws connected to a three-phase servomotor via torsion-resistant, bellow-type couplings.

These axes achieve high process speeds, on the one hand, while on the other hand the short auxiliary times also guarantee maximum precision with in-feed movements of 0.0001 mm (0.000,040"). These axes can be equipped with rotative or linear measuring systems, depending on requirements.

The top of the longitudinal slide has a surface that is ground over its entire length and acts as a support for the workhead, the tailstock, as well as accessories and devices. The scale, recessed in the table, makes it easy to set up and reset the machine.

1 Machine base with longitudinal and cross slides

2 Swivelling table with setup scale

Wheelhead

1



2



3



- Complete machining
- High output
- High cutting speed of 50 m/s (9842 sfpm)

Two variants are available:

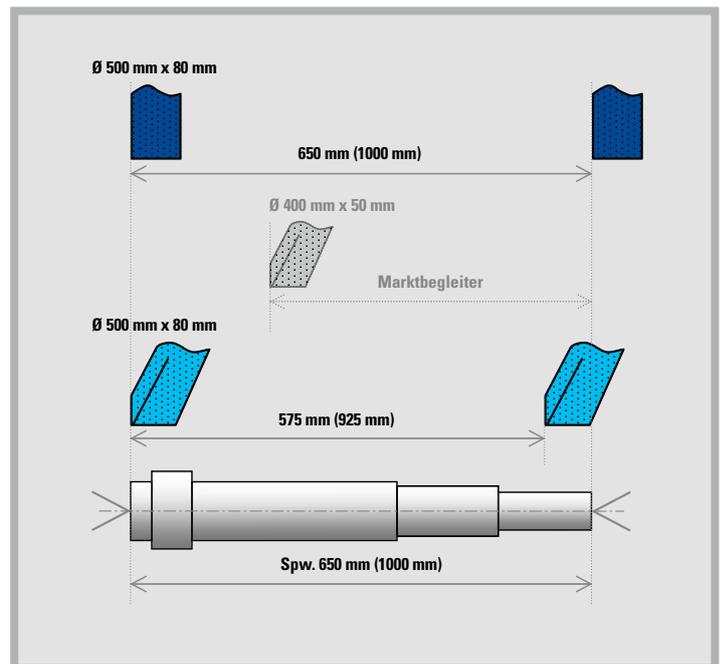
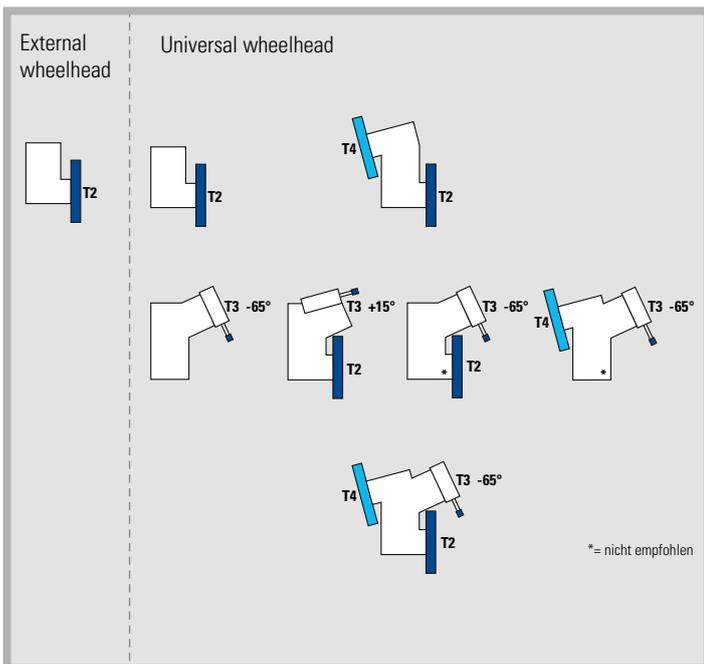
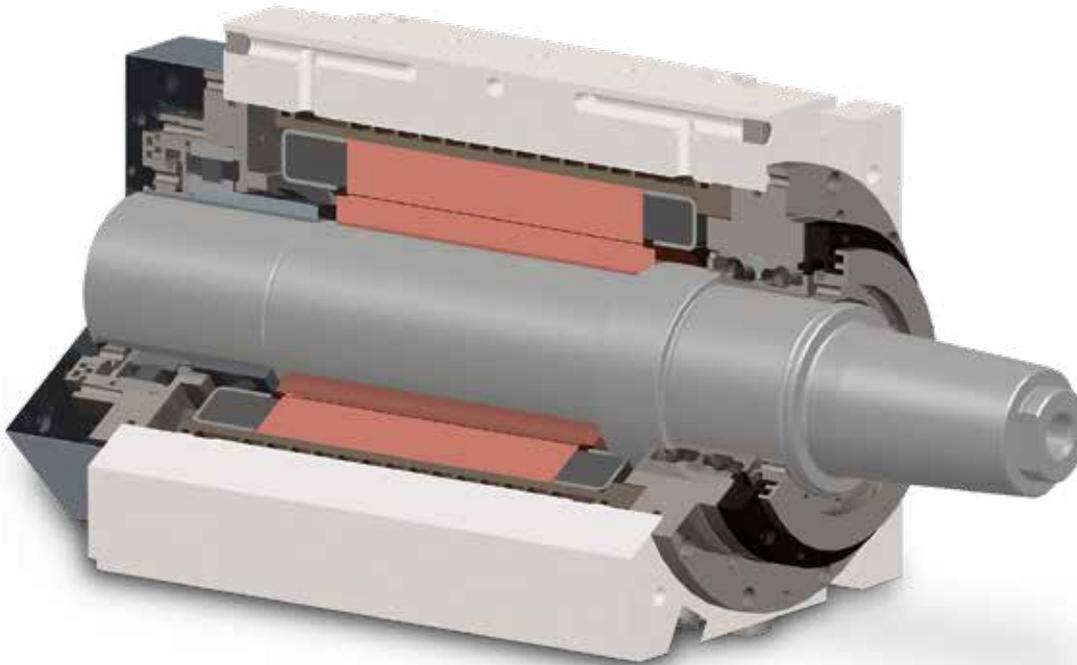
- The new turret wheelhead with two motor spindles and an internal grinding attachment enables grinding of even more complex workpiece geometries in a single clamping.
- An external wheelhead with belt-driven spindle is available for production applications. It can be manually adjusted to 0° or 30°.

The S33 offers maximum grinding lengths for both distances between centres.

The new turret wheelhead can be equipped exactly to customer requirements. Thanks to the sophisticated geometry, the entire distance between centres can be traversed with all grinding wheels. The motor spindles make a large contribution to the legendary STUDER precision. They are manufactured entirely in-house.

- 1 Universal wheelhead
- 2 Internal grinding spindle
- 3 External wheelhead

Motor spindle



Workhead

1



2



3



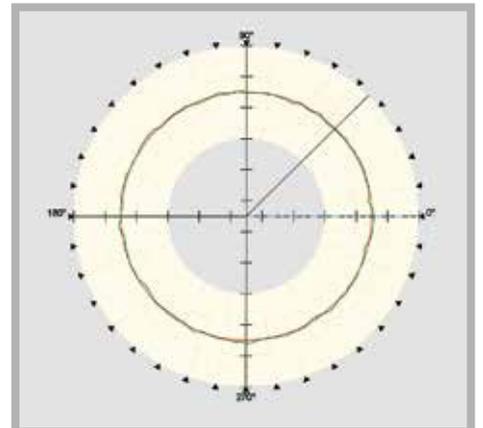
- Pneumatic lifting
- Low-maintenance
- High roundness accuracy

The versatile universal workhead enables both live spindle grinding and grinding between centres. The machine can also be fitted with a specially designed chuck workhead for chuck applications. The workheads are equipped with roller bearings, are low-maintenance and have an excellent roundness accuracy of under 0.0004 mm (0.000,016"), which can be optionally improved to under 0.0002 mm (0.000,008") during live spindle operations. The fine adjustment allows for taper corrections in the 1 µm range during live spindle operations. Like the tailstock, the workhead is also equipped with a

pneumatic lifting device to facilitate movement during setup and resetting.

The optional C-axis enables thread and form grinding, increasing the machine's potential applications. A controlled power chucking cylinder which actuates power chuck and spring collets is available for automatic workpiece clamping.

4



- 1 Universal workhead
- 2 External and internal thread grinding
- 3 Fine adjustment for taper corrections

- 4 Roundness during live spindle grinding operations

Tailstock

1



- Taper corrections
- Barrel flooding

The generously dimensioned barrel, designed for the use of Morse 3 (4) taper centres, glides in the tailstock housing. The centre 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 taper corrections in the range

below 1 μm when grinding between centres. A pneumatic lifting process facilitates movement during setup and resetting.

In order to guarantee optimum thermal stability, the tailstock is flooded with cooling lubricant, as are the barrel and the diamond holder.

2



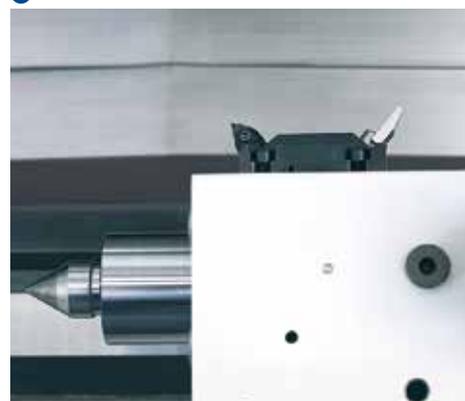
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4



5



1 Tailstock

2 Fine adjustment for taper corrections

3 Tailstock in «Park» position for live spindle grinding

4 Dressing spindle for rotative dressing

5 Dressing tool holder

Machine control and operation

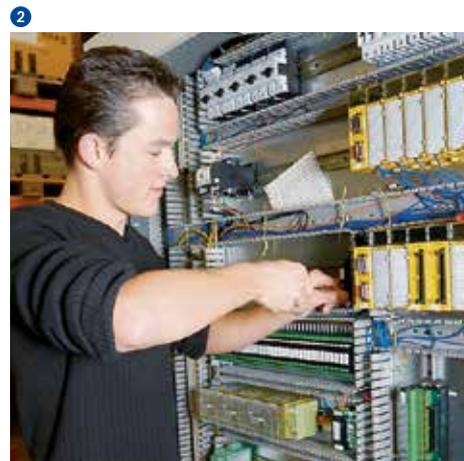


- StuderWIN operator interface
- Touch screen (PC control unit 15")
- Graphic operator prompting
- PCU2 manual control unit

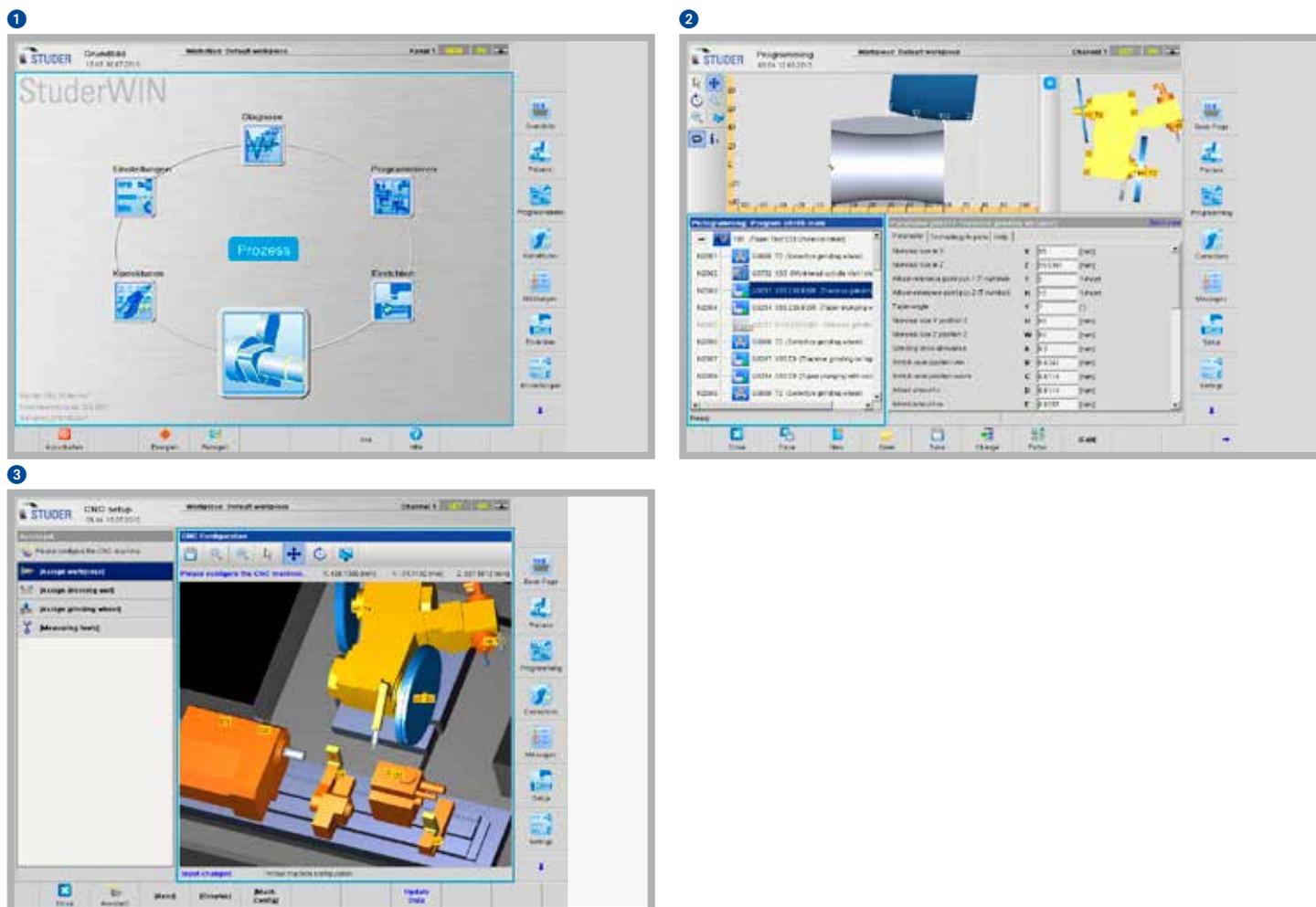
The Fanuc 0i-TD CNC control with integrated PC and 15" touch screen is extremely reliable and optimally matched to the drive elements. The control cabinet is bolted to the machine bed. The electrical equipment complies with established safety standards and is EMC-tested.

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.



StuderWIN



- Latest software technology
- StuderPictogramming
- StuderGRIND programming software

StuderWIN as user interface and the software modules of StuderGRIND create a stable programming environment and contribute to the efficiency of the machine. A PC is integrated into the CNC control. The possibility of fully integrating the in-process gauging and sensor technology for process monitoring as well as contact detection and automatic balancing systems in the Windows control enable standardised programming of the different systems. The software for an internal loading system is also integrated in the control. The drive elements are optimally adapted to the control.

The sophisticated mechanical engineering concept of the S33 is completed by a grinding software program developed in-house by STUDER and continuously further optimized in collaboration with customers.

This software offers:

- StuderPictogramming: The operator strings the individual grinding cycles together – the control unit generates the ISO code.
- STUDER Quick-Set: The software for grinding wheel alignment reduces changeover times by up to 90 %.
- Microfunctions: Free programming of grinding and dressing process sequences for optimization of the grinding process.
- The proven StuderGRIND software modules now also run under StuderWIN. A valuable asset for all customers is StuderTechnology integrated with the technology computer for automatic calculation of grinding parameters.

Further modules:

- StuderDress integrated
- StuderContour integrated
- StuderForm integrated
- StuderThread integrated

StuderGRIND also continues to show its strengths in offline programming. The program is created on the PC and transferred directly to the machine control unit.

Process-optimized complete solutions guarantee greater efficiency and reliability throughout.

1



- Automatic production processes
- Integrated quality control
- Standard loader – interfaces

Several loading systems are available for the S33. From the cost-effective *easyLoad*, which is operated via the machine control, to the *easyLoad NC* with its own control unit, through to special solutions which can be precisely adapted to the machine application and machining processes, thanks to their modular design. The appropriate peripherals ensure seamless integration into the respective production process. The handling systems communicate with the machine via the standardized loader interface and enable even complex handling tasks to be solved. Comprehensive quality control is possible during the grinding process. This entails: in-process, post-process, recording, evaluation and correction. This type of quality assurance is crucial during grinding, but especially during match grinding.

2



3



- 1 STUDER «*easyLoad NC*»
- 2 Working space with workpiece handling
- 3 Post-process station

Customer Care

STUDER cylindrical grinding machines should fulfil the customers requirements for as long as possible, work cost-effectively, function reliably and be available at all times. From «start up» through to «retrofit» – our Customer Care is there for you throughout the working life of your machine. 30 professional helplines and more than 60 service technicians are available in your area, wherever you are in the world.

- We will provide you with fast, uncomplicated support.
- We will help to increase your productivity.
- We work professionally, reliably and transparently.
- We will provide a professional solution to your problems.



Start up

Commissioning
Warranty extension



Qualification

Training
Production support



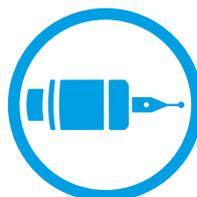
Prevention

Maintenance
Inspection



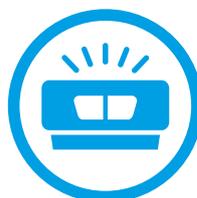
Service

Customer service
Customer consultation
HelpLine
Remote service



Material

Spare parts
Replacement parts
Accessories



Rebuild

Machine overhaul
Assembly overhaul



Retrofit

Modifications
Retrofits

Technical Data

Main dimensions

Distance between centres	650 / 1 000 mm (25.6" / 39.4")
Centre height	175 mm (6.9")
Max. workpiece weight between centres	80 / 120 kg (176 / 264 lbs)

Cross slide: X axis

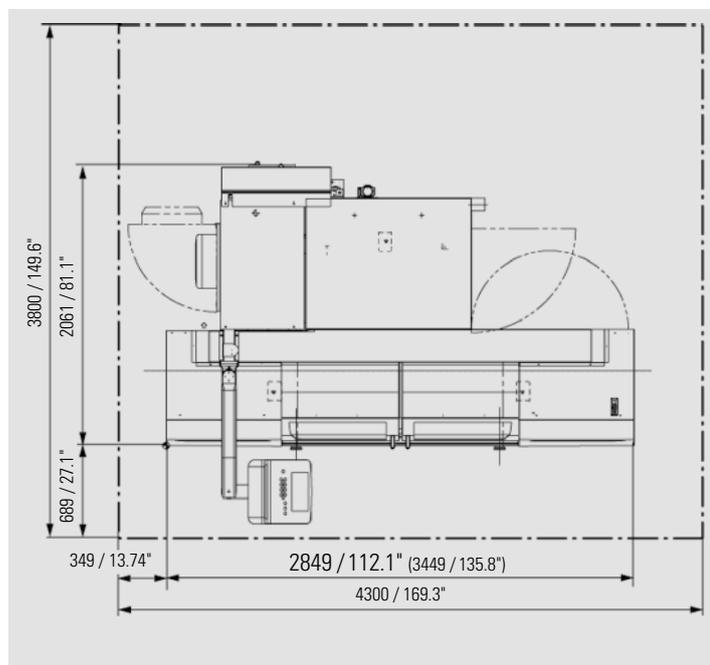
Max. travel	285 mm (11.2")
Speed	0,001 – 10 000 mm/min (0.000,04 – 394 ipm)
Resolution	0,0001 mm (0.000,004")

Longitudinal slide: Z axis

Max. travel	800 / 1 150 mm (31.5" / 45.3")
Speed	0,001 – 20 000 mm/min (0.000,04 – 787 ipm)
Resolution	0,0001 mm (0.000,004")
Machine table swivelling range	8.5 deg

Wheelhead

	Type: external	Type: universal
Positive stop	0 deg / 30 deg	
Swivel range		-15 deg to +225 deg
Manual swivelling axis		2,5 deg Hirth
Automatic swivelling axis		1 deg Hirth
Fitting taper	dia. 63 mm (2.48")	dia. 63 mm (2.48")
Drive power	7.5 kW (10 hp) [9 kW (12 hp)]	11 kW (15 hp)
Grinding wheel right, dia. x width x bore	500 x 63 (80F5) x 203 mm 20" x 2.5" (3.15"F5) x 8"	500 x 63 (80 / 110F5) x 203 mm 20" x 2.5" (3.15" / 4.33"F5) x 8"
Circumferential speed	up to 50 m/s (9840 sfpm)	up to 50 m/s (9840 sfpm)
Internal grinding device for high frequency internal grinding spindles		dia. 120 mm (4.73")
Speeds		24 000 – 120 000 rpm



Universal workhead

Speed range	1 – 1 500 rpm	1 – 1 500 rpm	1 – 1 000 rpm
Fitting taper	MT 4	MT 5	ISO 50
Spindle feedthrough	dia. 26 mm (1.02")	dia. 30 mm (1.18")	dia. 50 mm (1.97")
Drive power	3 kW (4 hp)	1,6/3 kW (2.2/hp)	3/4 kW (4/5.4 hp)
Load during live grinding	70 Nm (52 ft lbs)	70 Nm (52 ft lbs)	180 Nm (134 ft lbs)
Roundness accuracy during live grinding	0.0004 mm (0.000,016") (Option: 0,0002mm/0.000,008")	0.0004 mm (0.000,016") (Option: 0,0002 mm/0.000,008")	0.0004 mm (0.000,016") (Option: 0,0002 mm/0.000,008")
Option:			
C axis standard, indirect measuring system	0.0001 deg	0.0001 deg	0.0001 deg

Chuck workhead

Speed range	1 – 1 500 rpm	1 – 1 000 rpm
Fitting taper	MT 4	ISO 50
Spindle feedthrough	dia. 26 mm (1.02")	dia. 50 mm (1.97")
Drive power	3 kW (2.96 hp)	3/4 kW (2.96/3.95 hp)
Load during live grinding	100 Nm (74 ft lbs)	250 Nm (186 ft lbs)
Roundness accuracy during live grinding	0.0004 mm (0.000,016") (Option: 0.0002 mm/0.000,008")	0.0004 mm (0.000,016") (Option: 0.0002 mm/0.000,008")
Option:		
C axis standard, indirect measuring system	0.0001 deg	0.0001 deg

Tailstock

Fitting taper	MT3/MT4
Travel of barrel	35/50 mm (1.38"/1.97")
Diameter of barrel	50 mm (1.97")
Fine adjustment for cylindricality corrections	±40 µm (0.0016")

Control unit

Fanuc 0i-TD Standalone Panel *i*

Guaranteed working precision

Straightness of the surface line	
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")

Connected loads

Total connected load	20 kVA
Air pressure	5.5 bar (80 psi)

Total weight

Distance between centres 650 mm (25.6")	4 000 kg (8 800 lbs)
Distance between centres 1 000 mm (39.4")	5 000 kg (11 000 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 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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